Uwchraddio'r Grid
Pentir i Drawsfynydd

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Pentir to Trawsfynydd Reinforcement Project

Environmental Statement, Volume 2: Pentir Works

September 2025

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Introduction

i. This document (**Volume 2 – Pentir Works**) forms part of the Environmental Statement which accompanies applications by National Grid Electricity Transmission plc to construct and operate developments which comprise parts of the Pentir to Trawsfynydd Reinforcement Project (the 'Project'). **Volume 2** focuses on the works at the existing Pentir substation. It provides an assessment of likely significant effects that could arise from the decommissioning of elements of the existing equipment and the construction, operation and maintenance of new infrastructure.

Pentir Substation Works Site Location

ii. Pentir substation is an existing substation, in North West Wales approximately 4.5 kilometres (km) south-west of Bangor, in the Gwynedd Local Authority area (see **Figure 2.2.1**). The Pentir works site is on relatively flat ground and mostly surrounded by the Pentir substation Candidate Wildlife Site, with a mixture of Grade 3a, 3b and 5 agricultural land (approximately 80 metres (m) at the nearest point to the proposed works area). The existing Pentir substation is accessed via a single metalled access road from the B4547 to the south-east corner of the substation compound.

Pentir Substation Works Site and the Proposed Works

iii. The Pentir works site is approximately 1.5 hectares. The permanent development will be contained in the existing substation compound and will include part of the existing Pentir substation, the access road, office and welfare facilities, laydown storage and car parking.

iv. Works would include the decommissioning and removal of redundant electrical equipment including existing cable sealing ends and associated steel structures, a section of busbar and overhead line downdropper; draining and decommissioning of the 400 kilovolt (kV) oil filled cables; and removal of concrete foundations. The replacement cables would be installed either above or below the existing services. New infrastructure would include reinforced concrete foundations, steel structures, and 400 kV cables. The cables would pass beneath the existing high voltage circuit busbar; requiring power outages for construction of the cable route.

v. Construction would take place Monday to Friday between 7.30 am – 5.30 pm over a three-year period, anticipated to be between Quarter 1, 2027 and Quarter 2, 2029. During construction the existing metalled access road from the B4547 would be used. A compound would be established in the south-west corner of the Pentir substation and a parking area immediately west of the Pentir substation compound entrance would be used.

vi. The existing Pentir substation is manned and there would be no change in the current frequency of attendance, inspections and maintenance regimes during operation due to the proposed works. Maintenance of the substation would be triggered by any issues arising from monthly visual inspections. Therefore, operational and maintenance impacts have been scoped out of further assessment.

Alternatives

vii. In accordance with the Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017, design alternatives have been considered for the proposed works. National Grid Electricity Transmission plc owns and operates the Pentir works site which comprises part of the existing Pentir substation. As the proposed works require replacement underground cables in the existing Pentir substation, alternative locations for the proposed works were not considered. A route along the existing access road in the Pentir substation compound was considered to install the replacement cables as an alternative to the proposed route, however due to a customer connection being delivered in 2026 this routing would mean a clash of cables which would affect ratings and make construction complex; whilst also using the access road would introduce greater risk to substation operation during installation therefore the proposed route was selected.

Key findings of the Environmental Impact Assessment

Landscape and Visual Amenity

viii. The Study Area for Landscape and Visual Amenity is the Pentir works site and 1 km radius around it. The Study Area does not include any statutory landscape designations. The Pentir works site is largely flat, with a gently undulating surrounding area. The Study Area consists of agricultural land, woodland and watercourses. Visual receptors are limited to a small number of scattered agricultural and residential properties.

ix. Effects on landscape character and visual amenity would be temporary and barely discernible in the context of existing Pentir substation infrastructure and screened by existing vegetation.

x. Further assessment of landscape and visual effects has been scoped out of this Volume of the Environmental Statement due to the limited and temporary nature of potential change, with no likely significant effects.

Ecology and Nature Conservation

xi. The Study Area has been defined by establishing a Zone of Influence where ecological risks could occur as a result of the proposed works. The Zone of Influence considers the nature of the proposed works, nearby land use, habitats, watercourses, species' behaviours, and duration of effects. It incorporates designated sites, sensitive habitats, and protected and notable species within varying distances from the Pentir works site, considering professional good practice and established guidance.

xii. A desk study identified sites designated for nature conservation and records of protected and notable habitats and species, invasive non-native species and water bodies covered by the Water Framework Directive. Ecological records were obtained from Cofnod, the local biological records centre for North Wales. An extended Phase 1 habitat survey was completed in November 2024, covering habitats and notable species within 50 m of the Pentir works site. A badger survey was also conducted on land up to 30 m from the Pentir works site. A ground level tree assessment for roosting bats was carried out on all trees up to 30 m from the Pentir works site.

xiii. The Pentir works site is entirely hardstanding. Habitats within 50 m of the Pentir works site include various types of woodland, scrub, grassland, heath, hedgerows and water features including standing and running water, ditches and a balancing pond. There are four international statutory sites for nature conservation (Special Areas of Conservation, Special Protection Areas and Ramsar sites) within 10 km, with two further Special Areas of Conservation designated for bats within 30 km. Nine other statutory designated sites (Site

of Special Scientific Interest, National Nature Reserve and Local Nature Reserves) are present within 5 km. There are 35 non-statutory sites designated for nature conservation within 2 km, five of which are within 500 m. There are 47 Ancient Woodland sites within 2 km and the closest is 30 m west. Habitats of Principal Importance identified within 1 km include lowland dry acid grassland, purple moor grass and rush pastures and traditional orchards. A number of protected and notable species were identified within 2 km of the Pentir works site.

xiv. The proposed works have the potential to affect ecology and nature conservation through disturbance (light, noise, vibration and human activity), habitat degradation, species mortality and spread of invasive non-native species during construction.

xv. Mitigation measures have been embedded into the proposed works to minimise potential ecological impacts. The proposed works have been designed to avoid impacts on designated sites and key habitats, with buffers applied to woodlands, hedgerows, trees, and watercourses. The Construction Environmental Management Plan will outline measures to address construction dust, pollution, light and noise. As the proposed works are within existing hardstanding areas vegetation clearance will not be required. However, any habitat features which may conceal sheltering reptiles and amphibians will be subject to a hand search. Construction works will be largely during daylight hours, minimising the need for lighting. When lighting is required this will be task and safety lighting conforming with best practice guidelines to prevent disturbance to wildlife. Pre-construction surveys will ensure the latest data on protected species and invasive species are used to inform mitigation measures, including wildlife protection and reasonable avoidance measures for badgers and bats.

xvi. With the implementation of suitable embedded mitigation the assessment has concluded that the proposed works are unlikely to result in significant adverse effects to identified species, habitats and designated sites.

Historic Environment

xvii. Two Study Areas were used for the Historic Environment assessment: a Study Area of 3 km from the Pentir works site has been defined for designated historic assets and a 500 m Study Area for non-designated heritage assets.

xviii. All designated sites were scoped out of the assessment due to scale works required and the distance to designated sites.

xix. All assessment of historic environment effects has been scoped out due to there being no intervisibility between either Scheduled Monuments and Listed Buildings and the proposed works, and a negligible potential to impact unknown archaeological remains, with significant effects unlikely to occur.

Geology, Hydrogeology, Land Use and Agriculture (Soils)

xx. The Study Area comprises the Pentir works site plus a 250 m buffer extending to 1 km for water abstractions.

xxi. The Study Area is underlain with Alluvium, Till and Peat Superficial deposits and Minffordd and Padarn Tuff Formation Bedrock. The existing Pentir substation and access road in the Pentir works site comprises Made Ground. There are no faults or linear features in the Study Area. Ground stability classifies most of the Pentir works site as stable, with some compressibility hazards. The Study Area sits on wet, acidic upload soils with a peaty surface and is in a Geological Landscape classed as moderate. There are no sites designated for geodiversity interest in the Study Area. There is a mineral safeguarding area for sand and

gravel 205 m south-east of the Pentir works site. The Pentir work site is in a non-coal mining area for Vein Minerals. In the Study Area there is one licensed groundwater abstraction point for industrial, commercial and public services, one private water supply, unnamed watercourses and a waste exemption to the south-east of the Pentir works site for the storage of waste. There are no source protection zones, historic landfill sites or sources of ground gas in the Study Area.

xxii. The proposed works have the potential to cause geological and hydrogeological impacts, including potential damage to bedrock and risks associated with Alluvium, such as compressibility and uneven settlement. Construction activities could affect groundwater flow, quality, and levels, and create contamination risks from accidental spills, leaks, and the disturbance of existing contaminants. There is also a risk of importing potentially contaminated materials and exposing workers to harmful substances. However, if contamination is identified post-construction, remediation measures will be implemented, likely resulting in beneficial effects. No effects are anticipated for land use, agriculture and soils therefore they have been scoped out of the assessment.

xxiii. On completion of the proposed works the infrastructure would minimise exposure to residual contamination, with minimal ongoing risks for maintenance workers.

xxiv. Mitigation measures including a Construction Environmental Management Plan, appropriate intrusive ground investigations of selected areas of the Pentir works site, an inspection and discovery strategy, re-use of excavated materials onsite, soil and groundwater pollution control mitigation and a more detailed hydrogeological assessment should dewatering be required. Following the implementation of mitigation measures, no significant impacts on Geology, Hydrogeology, Land Use and Agriculture are anticipated.

Water Quality, Resources and Flood Risk

xxv. The Study Area for the effects of the proposed works consists of the existing Pentir substation and a 1km buffer area around the site. The closest watercourse to the Pentir works site is an unnamed watercourse approximately 70 m south which passes below the Pentir substation access road flowing in an east – west direction. There is a ditch approximately 400 m south-west, running beneath the Pentir substation access road. The Pentir works site is in the Nant-y-Garth River Waterbody Catchment, though the Nant-y-Garth waterbody is 1.5 km to the west, which retains a Good overall status under the Water Framework Directive. The closest recorded Water Framework Directive river is the Afon Cegin approximately 1 km to the east which retains a Moderate overall status under the Water Framework Directive.

xxvi. There are no ponds, lakes, canals or other waterbodies sufficiently close that would be affected or influenced by the proposed works. There are no licensed abstractions, discharges or private water supplies within 100 m of the Pentir works site. The Pentir works site is shown to lie above Till, Devensian – Diamicton superficial deposits, Minffordd Formation bedrock and the Llyn and Eryri Water Framework Directive groundwater body which retains a Poor overall status under the Water Framework Directive.

xxvii. All assessment of Water Quality, Resources and Flood Risk has been scoped out of this Volume as the proposed works are not anticipated to have significant impacts in the immediate or local area with embedded mitigation measures in place as set out in the Construction Environmental Management Plan.

Traffic and Transport

xxviii. The Study Area is the likely catchment area for construction traffic, which includes likely routes to the Pentir works site from the strategic road network and from local and regional

population centres between a 30 – 45-minute drive time of the Pentir works site. Automatic Traffic Counts have been carried out on all the roads identified in the Study Area.

xxix. The roads in the Study Area form part of the strategic road networks, local highway network and unclassified roads. Access to the Pentir works site via Public Rights of Way, buses and rail is limited and it has been assumed that staff would access the Pentir works site via private vehicles. Over the last seven years there have been 39 collisions in the Study Area, four fatal, 11 serious and 24 slight. The Automatic Traffic Counts (ATC) conducted between 26th September – 2nd October 2024 (due to a sensor failure, the survey along the A5 east of the A4244 were completed between 9 – 15th October 2024) concluded the 24-hour annual average daily traffic was 132,343 across the 14 ATC sites, 2,945 of which were heavy duty vehicles.

xxx. The potential construction impacts from the proposed works include construction traffic increase, severance of communities, non-motorised user amenity, fear and intimidation, road vehicle driver and passenger delay and road user and pedestrian safety.

xxxi. Embedded mitigation measures include traffic management where construction vehicles interact with the public road network, restricting the use of certain roads, restricting arrivals and departures to avoid peak traffic flow, implementing a Delivery Management System to control deliveries, encouraging car sharing. Following the implementation of embedded mitigation measures, impacts would not be significant on any of the assessed roads in the Study Area. None of the assessed roads are predicted to experience substantial increases in traffic volumes that would lead to adverse effects.

Air Quality and Emissions

xxxii. An area of 10 km from the Pentir works site has been considered with respect to published baseline information on existing air quality. Specific Study Areas were used to assess dust emissions generated during construction activities: dust emissions from construction activities include amenity or human health receptors in 250 m of the construction site and 50 m of the construction route; and ecological receptors in 50 m of the site or construction route, up to 250 m from the Pentir works site entrance.

xxxiii. There are three ancient woodlands and two Candidate Local Wildlife Sites (Pentir Substation Candidate Wildlife Site and Near Breaker's Yard Candidate Wildlife Site) in the 250 m Study Area which would be sensitive to the impacts of dust settling either directly or indirectly through increased stresses on the plants. There are no residential properties or recreational activities in 250 m of the Pentir works site.

xxxiv. The source of potential Air Quality and Emissions effects during the construction phase includes construction dust emissions and site plant emissions. Dust emissions are assessed using Institute of Air Quality Management guidelines. Earthworks, construction activities and trackout are all classed as having a small magnitude impact on air quality at identified receptors. The area surrounding the Pentir works site, is predominantly rural with limited human health and nature conservation receptors and is considered to have low sensitivity to dust soiling, human health impacts, and nature conservation impacts. The small dust emissions and the low sensitivity of the area equates to a negligible impact to dust soiling, human health and nature conservation receptors.

xxxv. A series of mitigation measures recommended by the Institute of Air Quality Management would be adopted during construction. Regular site visits would be conducted to monitor compliance with the Construction Environmental Management Plan. Dust mitigation will be implemented on the Pentir works site throughout the works, and the residual effects are anticipated to be negligible and not significant.

Noise and Vibration

xxxvi. The Study Area has been defined as 300 m from the Pentir works site for construction noise and 100 m for construction vibration. There is one sensitive receptor within 300 m of the Pentir works site; the residential receptor comprising Gamekeepers Cottage, Rhos Fawr. Residential receptors are considered to have Medium sensitivity to noise.

xxxvii. The enabling, trench digging and reinstatement works would generate the highest levels of noise. During enabling works, the highest noise levels would arise from the breaking of concrete. This has a potential noise level of 62 dB LAeq,T (equivalent continuous sound level) at Gamekeeper Cottage, approximately 310 m from the nearest area of hardstanding to be broken, representing a minor adverse and not significant impact. Trench digging works would generate noise from excavators, with a noise level of 51 dB LAeq,T at the same location, resulting in a negligible effect. Reinstatement works involving compaction would produce noise at 49 dB LAeq,T, also leading to a negligible effect. All activities are expected to cause temporary, low to negligible impacts on a medium sensitivity residential receptor, with no significant effects.

xxxviii. Measures to control noise as defined in Annex B of BS 5228-1 and measures to control vibration as defined in Section 8 of BS 5228-2 will be adopted where reasonably practicable. These measures will be implemented during the construction works and secured through the Construction Environmental Management Plan.

xxxix. The assessment of construction noise identifies a worst-case temporary Minor Adverse residual effect, which is not significant.

Socio-Economics

xl. Various Study Areas were used for the Socio-Economics assessment: a 60-minute drive area (Principal Economic Impact Area) which applies to employment generation, skills and training and Gross Value added; a 30-minute and 60-minute drive area for temporary accommodation services; up to 500 m radius from the Pentir works site for Public Rights of Way and recreational services, residential properties, business premises, visitor attractions and development land; and a 1 km radius from the Pentir works site for community facilities.

xli. The baseline outlines the population, economy and local resources in the various Study Areas. The Principal Economic Impact Area had a population of 488,708 in 2021, with 24.1% of the population aged over 65. Employment rates and employment by industry is similar to Gwynedd and Wales: the largest industries include human health and social activities; wholesale and retail trade; and repair of motor vehicles and motorcycles. Gwynedd is relatively less deprived on average compared to Wales. Accommodation capacity in a 30-minute and 60-minute drive of the Pentir works site is sufficient, although it varies seasonally. There are no Public Rights of Way, recreational routes, open space, residential properties, visitor attractions, business premises or development land in 500 m or community facilities in 1 km of the Pentir works site.

xlii. It has been demonstrated that the proposed works are not anticipated to have significant impacts on Socio-Economics in the immediate or local area and, Socio-Economics has therefore been scoped out of this Volume of the Environmental Statement.

Climate Change

xliii. The Study Area for the greenhouse gas (GHG) assessment includes direct greenhouse gas emissions (arising through works on the Pentir works site) and indirect greenhouse gas emissions (occurring outside the Pentir works site). The Climate Change Risk Assessment Study Area encompasses the temporary and completed works that make up the proposed

works. The In-combination Climate Change Impact Assessment is determined by the other topic assessments.

xliv. The GHG assessment uses the current condition of the Pentir works site, which consists of the carbon stock and sources of greenhouse gas emissions as the baseline. Greenhouse gas emissions are reported in line with the life cycle stages (pre-construction, product, construction process and operation). It is estimated the 90% of all emissions from the proposed work will arise from the pre-product, product and construction process stages. Based on a qualitative assessment, the impact of greenhouse gas emissions associated with the proposed works is minor adverse and not significant. No mitigation is required.

xlv. The GHG assessment is consistent with the ruling of the UK Supreme Court in the case of Finch v Surrey County Council. That ruling requires that planning authorities take account of the indirect as well as the direct environmental effects of a proposed works. The qualitative GHG assessment for the Pentir substation includes all relevant direct and indirect environmental impacts.

xlvi. The Climate Change Risk Assessment considers how resilient the proposed works and surrounding environment are to current and project climate hazards. The consequence of climate change impacts was identified as insignificant and minor in terms of their impact on the proposed works. Risks identified are not significant and no specific mitigation measures are required.

xlvii. No In-combination Climate Change Impacts (ICCI) on the receptors are anticipated and this has therefore been scoped out of the climate assessment.

Materials and Waste

xlviii. Assessment of Materials and Waste effects have been scoped out of this Volume of the ES as the proposed works are not anticipated to have significant impacts on Materials and Waste.

In-combination Effects

xlix. In-combination effects occur where a single receptor is affected by more than one type of effect arising from different aspects of the proposed works. In-combination effects are not assessed in this Volume: an assessment of the potential in-combination effects is undertaken at a Project level and is discussed in **Volume 7: The Project and Cumulative Effects**.

Cumulative Effects

l. Cumulative effects occur when two or more planned developments have an effect on the same receptor leading to an increase in the effect, and possibly an effect of greater significance. A 2 km buffer from the Pentir works site has been implemented to assess the cumulative effects.

li. Two proposed developments were identified for potential cumulative effects:

- Proposed Energy Storage facility, related access, landscaping, infrastructure, ancillary equipment, with a grid connection import and export capacity of 57 MW.
- Application for the installation of underground 132 kV grid connection cables between the Glyn Rhonwy Storage Facility and the Pentir substation. Two applications to extend the commencement period have been submitted: C21/0934/15/AC and C23/0959/15/AC.

lii. The cumulative effects have been assessed in **Volume 7: The Project and Cumulative Effects.**

1. Introduction

1.1 Introduction

1.1.1 **Volume 2** (this document) forms part of the Environmental Statement (ES) that accompanies applications by National Grid Electricity Transmission plc (NGET) to construct and operate developments which comprise parts of the Pentir to Trawsfynydd Reinforcement Project (the 'Project').

1.1.2 This Volume focuses on works at the existing Pentir substation. It provides an assessment of likely effects that could arise from the construction, operation and maintenance of this aspect of the Project. A description of the works at Pentir substation is provided in **Chapter 2: Pentir Substation Works**.

1.2 Structure of the Volume

1.2.1 This Volume is structured as follows:

- **Chapter 1: Introduction.**
- **Chapter 2: Pentir Substation Works.**
- **Chapter 3: Assessment of Alternatives.**
- **Chapter 4: Landscape and Visual Amenity.**
- **Chapter 5: Ecology and Nature Conservation.**
- **Chapter 6: Historic Environment.**
- **Chapter 7: Geology, Hydrogeology, Land Use and Agriculture (Soils).**
- **Chapter 8: Water Quality, Resources and Flood Risk.**
- **Chapter 9: Traffic and Transport.**
- **Chapter 10: Air Quality and Emissions.**
- **Chapter 11: Noise and Vibration.**
- **Chapter 12: Socio-Economics.**
- **Chapter 13: Climate Change.**
- **Chapter 14: Materials and Waste.**
- **Chapter 15: In-combination Effects.**
- **Chapter 16: Cumulative Effects.**

1.3 Figures and Appendices

1.3.1 All figures in this Volume are in an appendix attached to this Volume, all other supporting documents will be compiled in **Volume 8: Appendices**.

1.3.2 The figure numbering system is as follows: Volume number, chapter number then 1, 2, 3 etc. For example, **Figure 1.1.1**.

1.3.3 The appendix numbering system is as follows: Volume number, chapter number, then A, B, C etc. For example, **Appendix 1.1.A**. All figures associated with a given appendix will follow the same system, followed by the figure number, for example, a figure to Appendix 1.1.A would be Figure 1.1.A.1, 2, 3 etc.

2. Pentir Substation Works

2.1 Introduction

2.1.1 This chapter provides a description of the proposed works at Pentir substation ('the proposed works), their location ('the proposed works site'), the infrastructure proposed and construction and operation details.

2.2 Pentir Location

2.2.1 Pentir substation is an existing 400 kilovolt (kV) substation in North West Wales, approximately 4.5 kilometres (km) south-west of Bangor, in the Gwynedd Local Authority area (see **Figure 2.2.1**). The works would be centred on Grid Reference SH 559677 in the existing Pentir substation compound (the 'Pentir works site').

2.2.2 The proposed works site lies at approximately 110 metres (m) Above Ordnance Datum (AOD) on relatively flat topography. There is a single metalled access road from the B4547 into the southern extent of the existing Pentir substation compound. The remainder of the compound is bounded by the Pentir Substation Candidate Wildlife Site (cWS) with an area of ancient woodland to the west. The wider area comprises agricultural land which the Agricultural Land Classification (ALC) data identifies as a mixture of Grade 3a (good to moderate), 3b (moderate) and 5 (very poor quality) (Ref 2.1).

2.2.3 The SPEN 132 kV Substation compound abuts the existing Pentir substation compound boundary to the south. Pentir substation is the northernmost point of the existing 4ZC overhead line which exits the existing Pentir substation to the south. The 4ZA overhead line leaves Pentir substation to the north; and the 4ZB overhead line leaves the Pentir substation to the east. The pylons are visible from many views in the vicinity of the Pentir works site due to the flat topography.

2.2.4 The existing Pentir substation is accessed from the west via the B4547, which runs in a north-west to south-east direction immediately west of the Pentir works site. There is an unnamed, single tracked road 50 m east of the existing Pentir substation compound. The Pentir Substation cWS heavily screens the substation and views are very restricted from the road network.

2.2.5 There are a number of isolated farms and residential properties in vicinity of the works site: the closest is approximately 400 m west. The Rhos Fawr Camping site (only open August to September) is approximately 350 m north-west of the Pentir works site. The closest Public Right of Way (PRoW) is Footpath Pentir No 14, 730 m north-west of the Pentir works site (Ref 2.2) at its nearest point.

2.3 Proposed Pentir Works

2.3.1 The Pentir works site boundary is shown on **Figure 2.2.2,** covers an area of approximately 1.5 hectares (ha); however, the permanent works will be entirely

contained in the existing Pentir substation. The land in the Pentir works site includes part of the existing Pentir substation, the access road, a compound (comprising office and welfare facilities), laydown storage and car parking.

2.3.2 The proposed works are summarised below:

- Removal of existing redundant oil-filled cables and associated electrical equipment.
- Reconfigure cable terminations.
- Install replacement and new 400 kV cables.
- Reinstatement of the working areas within the exiting Pentir substation compound.

2.3.3 The proposed works are described in more detail in the following sections.

Removal of Existing Equipment

2.3.4 The existing electrical apparatus to be removed is the existing cable sealing ends and associated steel structures; which will be disconnected and dismantled; all dismantled equipment would be disposed of into designated recycling waste skips in the Pentir works site. A section of busbar and overhead line downdropper also would be removed.

2.3.5 Existing above and below ground earth tape would be temporarily removed and permanently reinstated on completion of the works.

2.3.6 A specialist Contractor would be appointed to drain, decommission and dismantle the old existing redundant oil-filled 400 kV cables and associated plant i.e. three 225 litre tanks (one per phase). All waste material would be disposed offsite to designated licenced waste and recycling sites.

2.3.7 Redundant concrete foundations would be broken down and the resultant arisings would be disposed of in a designated waste skip in the Pentir works site.

2.3.8 There are services along the proposed cable route that would be confirmed following trial holes along the route. The replacement cables would be installed either above or below the identified services.

New Equipment

Electrical Equipment

2.3.9 The new replacement electrical apparatus to be installed is new cable sealing ends and associated steel structures. Existing Capacitive Voltage Transformers with support structures will be relocated from the present location to the other side of the circuit (to accommodate the additional set of cable sealing ends). There will also be a replacement section of busbar, replacement overhead line downdropper and earth switch and above and below ground earthing.

Cables

2.3.10 New 2,500 millimetres squared (mm^2) single core 400 kV cables comprising a segmented copper conductor, semi-conducting polymer conductor screen, extruded cross-linked polyethylene insulation, extruded semi-conducting polymer insulated screen, smooth welded aluminium sheath and high-density polyethylene outer sheath will be installed. A complete cable outer diameter is approximately 145 millimetres (mm).

2.3.11 The new cables would pass beneath the existing electrical high voltage circuit busbar, requiring power outages for this part of the works. The cables would be in ducts in either a single trench or separate trenches approximately 1 m deep, as illustrated on Plate **2-1**.

Cable works would also be required below the overhead line downleads.

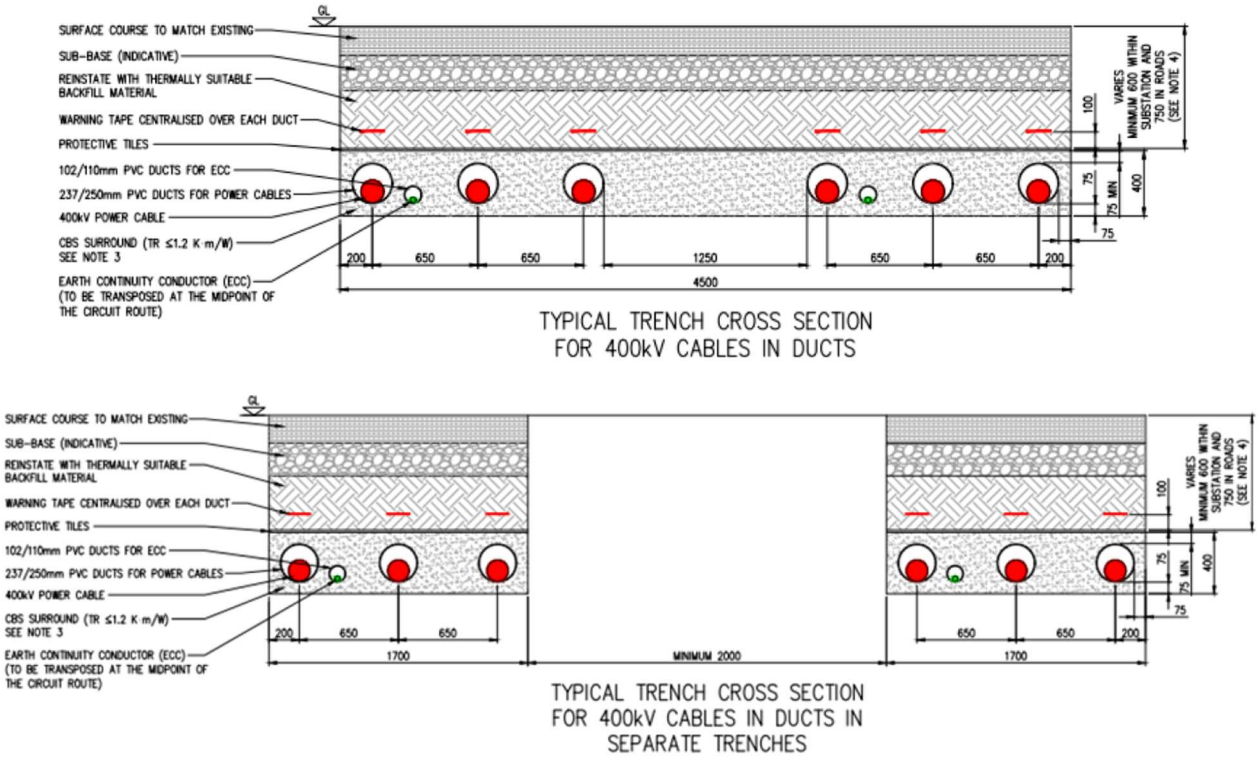


Plate 2-1– Typical cable trench cross section

Reinstatement

2.3.12 All working areas in the existing Pentir substation compound would be reinstated with 300 mm of type 1 and 75 mm of 10 mm limestone chippings. All scaffolding used for cable termination and mounting to structures would be removed.

2.4 Construction

General Construction Information

2.4.1 During installation, the appointed Contractor would be required to operate under a detailed site-specific Construction Environmental Management Plan (CEMP). It would, as a minimum, implement the mitigation measures identified in this ES and the outline CEMP (**Volume 8, Appendix 2.2.A: Outline Construction Environmental Management Plan**). The CEMP would set out a variety of control measures for managing the potential environmental effects of the proposed works including control and management of noise, dust, surface water runoff, waste and pollution control.

Lighting

2.4.2 Temporary lighting would be required in low light conditions during the construction working hours to ensure safe pedestrian passage from the working area to the site welfare facilities as well as task lighting at the working area. It would adhere to guidance such as Institute of Lighting Professionals Guidance Note 08/23 Bats and Artificial Lighting at Night (Ref 2.3) and Institute of Lighting Professionals Guidance Note 1 for the Reduction of Obtrusive Light (Ref 2.4).

Installation Activities

2.4.3 Foundations for the new structures (cable sealing ends and associated steel structures) and relocated equipment (existing Capacitive Voltage Transformers) would be constructed from reinforced concrete delivered to the Pentir works site by truck mixer from the nearest supplier.

2.4.4 Stone and aggregate would be delivered to the Pentir works site as required.

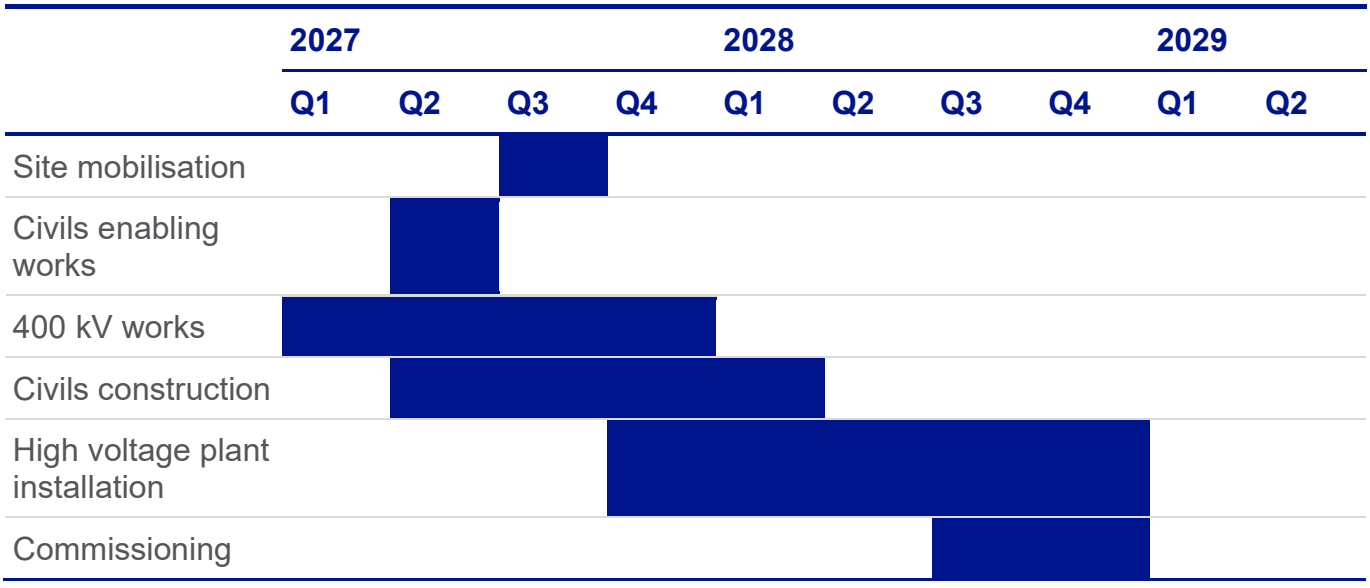
2.4.5 Steel structures and associated electrical infrastructure would be erected using a combination of mobile cranes, mobile elevated work platforms (MEWPs) and telehandlers. Mobile cranes will be used for any heavy equipment; HV plant equipment, MEWPs will be used for bolting, fixing, busbars and telehandlers will be used for small lifts and traversing the site.

2.4.6 The ducts and cable drums would be securely stored in the compound area. A combination of hydraulic winches and a crane would be used to install the cables into the ducts.

2.4.7 Sheet scaffolding would be placed around the cable sealing end structure to provide suitable access for cable termination and mounting structures, the scaffolding would be removed on completion.

Construction Programme

2.4.8 The proposed works are planned to be undertaken over a period of approximately three years from Q1 2027 – Q2 2029 to coordinate with the wider Project. Construction will occur in phases which will include activities summarised below.



- Site mobilisation – site set up for cabins and civils.
- Civils enabling works – access, main site office establishment, earthworks, drainage and platform.
- 400 kV works – de-oiling and purging of the existing cables; removing lids, breaking concrete bound sand and exposing cables; cutting at capping at joint bays, removal of cables; and clean throughs and removal of steelwork.
- Civils construction – cable sealing end bases and structures.
- High voltage plan installation.
- Commissioning – commissioning test, starting with testing the individual items of plant and culminating with testing the installed system as a whole before being brought into operation.
- Demobilisation – removal of all temporary infrastructure i.e. cabins and offices.
- Close out – handover assets and final as built drawings.

Construction Access

2.4.9 The existing metalled access road from the B4547 to the existing Pentir substation would be used during construction and no works are needed to it.

Construction Site Layout

2.4.10 The compound would be established in the south-west corner of the existing Pentir substation compound (see **Figure 2.2.2**). It would comprise office space, welfare facilities and laydown storage space.

2.4.11 A designated parking area immediately west of the Pentir substation compound entrance would be used (see **Figure 2.2.2**); the area currently comprises hardstanding and would remain unmodified.

Staffing and Employment

2.4.12 The number of staff on the Pentir works site would vary according to the construction phase and activities being undertaken; some activities may be run concurrently. It is anticipated that the following would be required for each phase of work:

- Removing and decommissioning old equipment, concrete break out and service diversions – 12 operatives.
- Constructing the new duct routes for the two circuits – 12 operatives.
- Installing, terminating and testing the new cables – eight operatives.

2.4.13 Site staff would oversee the proposed works.

Hours of Working

2.4.14 Generally, construction activities would be undertaken during daytime periods only, from Monday to Friday 7.30 am – 5.30 pm (including an hour set up and hour shut down). No bank holiday or weekend working will be undertaken, unless agreed with the Local Planning Authority.

2.4.15 There may be some periods of extended or 24-hour working, however this would be by agreement with the Local Planning Authority.

2.5 Operation and Maintenance

2.5.1 The Pentir substation is manned and there would be no change in the current frequency of attendance, inspections and maintenance regimes during operation due to the proposed works. Maintenance of the substation is triggered by issues arising from monthly visual inspection. If the substation required refurbishment or replacement works, these are accessed via the existing access road from the B4547. Given the works will not introduce any new operational or maintenance activities, operational impacts are scoped out of assessment for the Pentir Works.

Electric and Magnetic Fields

2.5.2 All equipment that generates, distributes or uses electricity produces electric and magnetic fields (EMFs). A separate EMF report has been produced which sets out the technical specifications of the Pentir substation and how the proposed works complies with EMF exposure guidelines. This report is in **Volume 8, Appendix 7.1.A: Electric and Magnetic Field Assessment.**

3. Assessment of Alternatives

3.1 Introduction

3.1.1 This chapter outlines the alternatives to the proposed works that have been considered by NGET.

3.2 Requirement for the Consideration of Alternatives

3.2.1 Part 5, 17 (3)(d) of the Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017 (the '2017 TCP EIA Regulations') (Ref 3.1) states that an ES should include;

"a description of the reasonable alternatives studied by the applicant or appellant, which are relevant to the proposed development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the significant effects of the development on the environment."

3.2.2 To accord the 2017 TCP EIA Regulations, design alternatives have been considered for the proposed works.

3.2.3 The proposed works are required at the existing Pentir substation, owned and operated by NGET, to meet the project need of reinforcing the connection between Pentir and Trawsfynydd. NGET has therefore not considered alternative locations for the proposed works.

3.3 Design Alternatives

3.3.1 NGET considered an alternative route along the existing access road in the Pentir substation compound to install the replacement cables. However, using the access road would introduce greater risk to substation operation during installation and the proposed route was selected.

4. Landscape and Visual Amenity

4.1 Introduction

4.1.1 This chapter presents an assessment of the likely Landscape and Visual Amenity effects that could arise from the construction of the proposed works at Pentir as described in **Chapter 2: Pentir Substation Works**.

4.1.2 This chapter describes the baseline conditions currently existing in the Study Area (as defined in **Section 4.3**) and the scope of the assessment.

4.1.3 This chapter is supported by the appendix listed below:

- **Volume 8, Appendix 1.1.A: Legislation, Policy and Guidance.**

4.1.4 Other chapters that are useful to review in association with this chapter are as follows:

- **Chapter 5: Ecology and Nature Conservation.**
- **Chapter 6: Historic Environment.**

4.2 Legislation and Planning Policy

4.2.1 This section summarises the legislation and planning policy framework that is relevant to the Landscape and Visual Amenity assessment. Details are in **Volume 8, Appendix 1.1.A: Legislation, Policy and Guidance.**

Legislation

4.2.2 The following legislation is relevant to Landscape and Visual Amenity:

- The European Landscape Convention (Ref 4.1)
- Environment Act 2021 (Ref 4.2).

National Policy

4.2.3 The following national policy is relevant to Landscape and Visual Amenity:

- Future Wales: The National Plan 2040 (Ref 4.3).
- Planning Policy Wales (PPW) – Edition 12 (Ref 4.4).
- Technical Advice Notes (TAN):
  - TAN 5: Nature conservation and planning (Ref 4.5).
  - TAN 6: Planning for sustainable rural and communities (Ref 4.6).
  - TAN 12: Design (Ref 4.7).

Regional Policy

4.2.4 The Strategic Development – North Wales (Ref 4.8) regional policy is relevant to Landscape and Visual Amenity.

Local Policy

4.2.5 The following local policy is relevant to Landscape and Visual Amenity:

- Anglesey and Gwynedd Joint Local Development Plan 2011 – 2026 (Ref 4.9).
- Gwynedd Council Supplementary Planning Guidance 'Landscape Character' (Ref 4.10).

4.3 Study Area

4.3.1 Guidelines for Landscape and Visual Impact Assessment Third Edition (Ref 4.11) suggest that the Study Area should be proportionate to the proposed works itself and may include refinement by professional judgement. In the case of the proposed works, the Study Area has been defined through professional judgement and extends to a 1 km radius of the Pentir works site.

4.4 Assumptions and Limitations

4.4.1 The assessment is based on the known construction methods to be utilised during the construction.

4.5 Baseline

Designations

4.5.1 The Pentir works site and Study Area are not covered by any statutory landscape designations. The closest part of the nearest National Landscape is approximately 3.5 km to the west at Anglesey. The nearest National Park is Eryri National Park approximately 6 km to the east at its closest part.

Landscape Character

4.5.2 The landform of the Pentir works site is generally flat at approximately 110 m AOD. The landform of the Study Area is gently undulating with small hills and typical of the lowlands areas in the foothills of the Eryri National Park. Land use is predominantly agricultural, consisting of a series of medium scale fields. There are occasional woodland blocks and linear belts of woodland along the many watercourses in the area. These provide a local sense of enclosure within an otherwise open agricultural landscape.

National Landscape Character

4.5.3 The Pentir works site and Study Area lie in the National Character Area (NLCA) 03 Arfon (Ref 4.12) and exhibits some of the key characteristics of the NLCA:

- Pastoral land cover predominates.
- Lowland – upland contrasts from the intimate, wooded, lush, soft, sheltered lowland and pastures to the exposed, open, heavily grazed, marginal upland fringes.
- Mosaic of small fields becomes apparent, primarily pastoral, bounded by combinations of hedgerows, cloddiau and stone walls, and interspersed with hedgerow trees and small coverts.

The Registered Landscapes of Outstanding and of Special Interest in Wales

4.5.4 The Pentir works site is in the Dinorwig Registered Historic Landscape (Ref 4.13). Many of the elements associated with this listing including the *"scenic grandeur of the area"* remain as part of the rural character of the area.

Local Landscape Character

4.5.5 The Pentir works site and Study Area are in Landscape Character Area (LCA) LCA 4 Caernarfon-Coast and Plateau identified in the Gwynedd Landscape Strategy Update 2012 (Ref 4.14).

4.5.6 LCA 04 Caernarfon-Coast and Plateau is characterised by:

- A long broad fringe adjacent to the Menai Coast LCA, extending to the upland fringes of MoelTryfan and Mynydd y Cillgwyn.
- Character of landscape influenced by glacial actions and resultant deposits and landforms.

Visual Amenity

4.5.7 Visual receptors are the people who would potentially be affected by changes to views or visual amenity as a result of the proposed works. Visual receptors can be static or dynamic and can be largely placed in the following groups:

- Residents within settlements and rural properties.
- People using recreational routes such as footpaths and cycleways.
- People at work, including those working in the landscape.
- People in vehicles and others using public roads.

4.5.8 Residential settlement is limited to a small number of scattered farms and individual properties in the vicinity of the Pentir works site. The principal transport routes in the vicinity of the Pentir works site are the B4547 from where the existing Pentir substation is accessed, the A4244, and B4366. There are also local and minor roads connecting between scattered farms and individual properties. No long-distance walking route or national cycle network routes have been identified close to the Pentir works site. There are limited PRoW in the vicinity of the Pentir works site and there is no public footpath to the Pentir works site. The existing Pentir substation is secured with gates and fences and is accessible only by authorised persons.

Future Baseline

4.5.9 Landscape change is an ongoing and inevitable process and will continue across the Study Area irrespective of whether the proposed works proceed. Change could arise through natural processes (for example, the maturity of woodlands) and natural systems (for example, river erosion) or as a result of human activity including land use and land management.

4.5.10 The future baseline which assumes that there will be minor changes to the receiving landscape.

4.6 Scope of Assessment

4.6.1 This section describes the scope of the assessment of effects on Landscape and Visual Amenity. A Scoping Opinion was not sought as explained in **Volume 1, Chapter 2: EIA Process**.

4.6.2 The baseline presented in **Section 4.4** does not identify any receptors on which the proposed works has the potential to cause significant effects. Therefore, an assessment of Landscape and Visual potential effects has been scoped out. **Table 4-1** below details the reasons for each impact being scoped out.

Table 4-1 – Scope of Landscape and Visual Amenity assessment

Receptor	Scoped in/out	Justification
Landscape character	Out	The proposed works would occur in the existing operational boundary. Effects on landscape character would be temporary and barely discernible as they would occur within the context of the existing Pentir substation infrastructure that is screened from surrounding views by the adjacent woodland.
Visual amenity receptors	Out	Substantial existing woodland around Pentir substation screens the Pentir works site from surrounding views.

4.7 Summary

4.7.1 The proposed works would occur in the existing Pentir substation. Effects on landscape character and visual amenity would be temporary and barely discernible as they would occur within the context of existing Pentir substation infrastructure that is screened by surrounding existing vegetation.

4.7.2 All assessment of landscape and visual effects is proposed to be scoped out of this Volume of the ES due to the limited and temporary nature of potential change, with no likely significant effects occurring.

5. Ecology and Nature Conservation

5.1 Introduction

5.1.1 This chapter presents an assessment of the likely significant effects on ecologically sensitive receptors that could arise from the construction of the works at Pentir as described in **Chapter 2: Pentir Substation Works**.

5.1.2 This chapter describes the baseline ecological conditions in the Pentir works site and associated Study Area (as defined in **Section 5.3**). The chapter also presents the scope of the assessment, potential impacts and resulting effects, the mitigation measures required to prevent, reduce or offset any significant negative effects, and the likely residual effects after these mitigation measures have been adopted.

5.1.3 Effects on ecology from infrastructure projects can arise from direct and indirect impacts on designated sites, habitats and, or species, and can be temporary or permanent. Indirect effects can occur through pollution of air and water and via changes in lighting, noise or hydrology. This chapter is supported by the figures and appendices listed:

- **Figure 2.5.1:** Statutory Designated Sites for Nature Conservation in the Wider Area (up to 30 km).
- **Figure 2.5.2:** Statutory Designated Sites for Nature Conservation within 5 km.
- **Figure 2.5.3:** Non-Statutory Designated Sites for Nature Conservation within 2 km.
- **Figure 2.5.4:** Ancient Woodland and Habitats of Principal Importance within 2 km
- **Figure 2.5.5:** Species Desk Study Records within 2 km.
- **Figure 2.5.6:** Phase 1 Habitat Survey.
- **Volume 8, Appendix 1.1.A: Legislation, Policy and Guidance.**
- **Volume 8, Appendix 1.4.A: Topic Assessment Methodology.**
- **Volume 8, Appendix 2.5.A Aquatic Ecology Report**
- **Volume 8, Appendix 2.5.B Statutory Designated Sites Citations**
- **Volume 8, Appendix 2.5.C: Arboricultural Impact Assessment.**
- **Volume 8, Appendix 2.5.D: Net Benefit for Biodiversity and Green Infrastructure Statement.**
- **Volume 8, Appendix 2.2.A: Outline Construction Environmental Management Plan.**
- **Volume 8, Appendix 7.1.B: Report to Inform Habitats Regulation Assessment.**

5.1.4 Other chapters that are useful to review in association with this chapter are:

- **Chapter 4: Landscape and Visual Amenity.**
- **Chapter 8: Water Quality, Resources and Flood Risk** (which includes hydrology and water pollution).

- **Chapter 10: Air Quality and Emissions.**
- **Chapter 11: Noise and Vibration.**
- **Chapter 13: Climate Change.**

5.2 Legislation and Planning Policy

5.2.1 This section sets out the legislation and planning policy framework that is relevant to the Ecology and Nature Conservation assessment. Details are in **Volume 8, Appendix 1.1.A: Legislation, Policy and Guidance**.

Legislation

5.2.2 The following legislation is relevant to Ecology and Nature Conservation:

- The Conservation of Habitats and Species Regulations 2017 (as amended) (Ref 5.1.
- Ramsar Convention (Ref 5.2).
- Convention on Biological Diversity 1992 (Ref 5.3).
- Wildlife and Countryside Act 1981 (WCA) (as amended) (Ref 5.4).
- The Environment Act 2021 (Ref 4.2).
- The Environment (Wales) Act 2016 (Ref 5.5).
- The Countryside and Rights of Way Act 2000 (Ref 5.6).
- The Protection of Badgers Act 1992 (Ref 5.7).
- The Hedgerows Regulations 1997 (Ref 5.8).
- The Invasive Alien Species (Enforcement and Permitting) Order 2019 (as amended) (Ref 5.9).
- Animal Welfare Act 2006 (Ref 5.10).
- Salmon and Freshwater Fisheries Act 1975 (Ref 5.11).
- Eels (England and Wales) Regulations 2009 (Ref 5.12).
- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (Ref 5.13).

National Policy

5.2.3 The following national policy is relevant to Ecology and Nature Conservation:

- PPW – Edition 12 (2024) (Ref 4.4).
- The Nature Recovery Action Plan for Wales 2020 – 2021 (Ref 5.14).
- Future Wales: The National Plan 2040 (Ref 4.3).

Local Policy

5.2.4 The following local policy is relevant to Ecology and Nature Conservation:

- Anglesey and Gwynedd Joint Local Development Plan 2011 – 2026 (Ref 4.9).
- Anglesey and Gwynedd Joint Local Development Plan Review Report (Ref 5.15).

Guidance

5.2.5 The following guidance is relevant to Ecology and Nature Conservation:

- Environmental Improvement Plan 2023 (Ref 5.16).
- Cyfoeth Naturiol Cymru/Natural Resources Wales (NRW) Protected Species Licensing (Ref 5.17).
- Birds of Conservation Concern (BoCC) (Ref 5.18).
- Birds of Conservation Concern Wales (BoCCW) (Ref 5.19).
- The International Union for Conservation of Nature Red List of Threatened Species 2022 (Ref 5.20).
- UK Biodiversity Framework (JNCC) on Behalf of the Four Countries' Biodiversity Group (2024) (Ref 5.21).
- Nature Gwynedd Biodiversity Action Plan (Ref 5.22).
- Chartered Institute of Ecology and Environmental Management (CIEEM) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine (Ref 5.23).
- Institute of Air Quality Management (IAQM) Guidance on the Assessment of Dust from Demolition and Construction (Ref 5.24).
- Institute of Lighting Professionals Guidance Note 08/23 Bats and Artificial Lighting at Night (Ref 2.3).
- Institute of Lighting Professionals. Guidance Note 1 for the Reduction of Obtrusive Light (Ref 2.4).
- Joint Nature Conservation Committee. Handbook for Phase 1 habitat survey – a technique for environmental audit (Ref 5.25).
- Mammal Society. Surveying for Badgers (Ref 5.26).
- Bat Surveys for Professional Ecologists: Good Practice Guidelines (4th edition). The Bat Conservation Trust (Ref 5.27).

5.2.6 Guidance used for ecological surveys are detailed in **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**.

5.3 Study Area

5.3.1 The Study Area was defined in accordance with standard guidance and included ecological features which may be at risk from direct and indirect impacts that might arise from the proposed works and is the initial basis for determining a Zone of Influence (ZoI). CIEEM guidance (Ref 5.23) defines a ZoI as: *"… the area over which ecological features may be affected by biophysical changes as a result of the proposed project and associated activities"*.

5.3.2 The ZoI is based on the:

- Nature of the proposed works, activities, and the potential for effects at the construction phase.
- Nature of the land use and habitats nearby, the number of watercourses and waterbodies, their connectivity in and outside of the Pentir works site and how they may be used by different species or species groups.
- Habitats, behaviours and preferences of different species or species groups and whether these could be affected both spatially and temporally.

5.3.3 All designated sites, sensitive habitats, and protected and notable species that occur in the initial ecological ZoI of the proposed works have been considered in this assessment. The distances assessed for each receptor reflect standard, professional good practice and are those that statutory consultees would typically expect to be considered for identification of potentially affected features in and around the Pentir works site.

5.3.4 For this assessment, the baseline ecological Study Areas are defined below:

- 10 km from the Pentir works site for statutory designated sites of international nature conservation value (e.g., Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Ramsar sites, as well as proposed or potential sites). This is extended to 30 km for SACs designated for bats, or where bats are listed as a qualifying feature.
- 5 km from the Pentir works site for other statutory designated sites of nature conservation value (e.g., Sites of Special Scientific Interest (SSSIs), National Nature Reserves (NNRs) and Local Nature Reserves (LNRs)).
- 2 km from the Pentir works site for non-statutory sites for conservation (e.g., Local Wildlife Sites (WS), cWS and Sites of Importance for Nature Conservation (SINC)).
- 2 km from the Pentir works site for Ancient Woodland.
- 2 km from the Pentir works site for Habitats of Principal Importance (HoPI), as listed under Section 7 of the Environment Wales Act (2016) (Ref 5.5).
- 2 km from the from the Pentir works site for records dated in the last ten years (2014 onwards) of protected and notable species.
- 50 m from the Pentir works site for ancient and veteran trees not in areas of Ancient Woodland.
- 50 m from the Pentir works site for other habitats not covered above.

5.3.5 The avoidance of potential effects through implementation of good practice avoidance measures, such as those that would be contained in a site-specific CEMP (described in **Section 2.4**) (e.g., control measures for dust suppression), has been taken into account during the determination of the ZoI for ecological features and biophysical changes.

5.3.6 The ZoI with regard to habitats and sedentary species lost to site clearance for construction are easiest to define as they should be restricted to the footprint of the proposed works in the Pentir works site. Although there is no natural or semi-natural habitat or sedentary species in the Pentir works site above ground, roots of adjacent trees could be present in the Pentir works site below ground. For those biophysical changes that can extend beyond the boundary of the Pentir works site, the ZoI has been determined by the nature of the biophysical change and the sensitivity to this change of the ecological feature in question. For example, a badger may be subject to

disturbance from light pollution, such as sudden increases in light, if directly adjacent to their sett or foraging site; whereas bats may be subject to disturbance and certain species, but not all, may actively avoid habitats subject to light pollution over a wider area.

5.3.7 Taking account of this, the extent of the ZoI beyond the Pentir works site was determined based on good practice and professional judgement, with reference to data (where available) relating to the sensitivity of specific ecological features, and in consultation with other environmental technical specialists (i.e., for air quality and water).

5.3.8 The Study Areas described are representative of the ZoIs for those receptors identified as important ecological features (IEF) in this chapter.

5.4 Assumptions and Limitations

5.4.1 The assessment presented in this chapter reflects the information obtained and evaluated at the time of reporting (March 2025), and has referenced published data, records and web-based information obtained to date.

5.4.2 The assessment is based on a review of desk study data, aerial photography, field survey data collected between 2016 and 2018 for the adjacent National Grid North Wales Connection (NWC) ES (Ref 5.28) (which has since been mothballed), and verification of the Phase 1 habitat survey data during a site visit on 07 November 2024. Information from recent adjacent projects such as the Pentir Energy Source Project Preliminary Ecological Appraisal (PEA) (2023) (Ref 5.29) was also reviewed to determine whether they contain relevant information.

5.4.3 The avoidance of potential effects through implementation of good practice avoidance measures, such as those that would be contained in a site-specific CEMP (described in **Section 2.4**) (e.g., control measures for dust suppression), has been taken into account during the determination of the ZoI for ecological features and biophysical changes.

5.5 Baseline

5.5.1 This section outlines the baseline ecological characteristics of the Pentir works site and relevant Study Areas.

Data Sources

5.5.2 The sources of published information that have been used to establish the baseline conditions are set out in **Volume 8, Appendix 1.4.A: Topic Assessment Methodology.**

Methods

Desk Study

5.5.3 A desk study was undertaken to identify sites designated for nature conservation and records of protected and notable habitats and species (ecology features) and invasive non-native species (INNS) that are relevant to the Pentir works site. The desk study also identified the status of water bodies covered by the Water Framework Directive (WFD) 2017 (Ref 5.13) to identify those likely to be impacted from an ecological perspective.

5.5.4 Cofnod, the relevant local biological records centre, was contacted in September 2024 to gain information on pre-existing ecological data (i.e. locally designated sites, HoPI, ancient woodland, existing records of protected and notable species, and INNS within 2 km of the Pentir works site). These data were refreshed in November 2024.

5.5.5 Online data resources that were reviewed for the desk study comprise:

- Multi-Agency Geographic Information for the Countryside (MAGIC) website (Ref 5.30) and NRW website (Ref 5.31) for information on statutory designated sites of nature conservation interest and to confirm reasons for their designation and their condition.
- Joint Nature Conservation Committee (JNCC) website (Ref 5.31) for site information and designation details of SACs, SPAs and Ramsar Sites identified in the relevant study areas.
- Ordnance Survey (OS) Mastermap 1:1,250, OS mapping 1:25,000 mapping and aerial photography (Google.com/maps) (Ref 5.32).
- North Wales Environmental Information Service (Cofnod) (Ref 5.33) information on pre-existing ecological data (i.e., locations of locally designated sites, HoPI, ancient woodland and existing records of protected, notable and INNS within 2 km of the Trawsfynydd works site). This data was refreshed on a six monthly basis; the latest refresh was November 2024.
- DataMapWales (Ref 5.34) for information on the location and extent of HoPI.
- Woodland Trust Ancient Tree Inventory website (Ref 5.35) for records of veteran and ancient trees in and up to 50 m from the Trawsfynydd works site
- Eryri National Park Authority website (Ref 5.36).
- Welsh Government website (Ref 5.37).

Extended Phase 1 Habitat Survey

5.5.6 An extended Phase 1 habitat survey was completed on 07 November 2024.

5.5.7 The Phase 1 habitat survey comprised a walkover of all safely accessible areas in and up to 50 m from the Pentir works site to observe and categorise all habitats present, in accordance with the methodology described in the Handbook for Phase 1 habitat survey – a technique for environmental audit (Ref 5.25). The survey was 'extended' so that observations relating to protected or notable fauna and flora encountered were recorded as 'Target Notes' (TN), such as direct sightings, potentially suitable habitat or field signs. This included a search for evidence of badger (including setts), INNS, and features (such as trees) potentially suitable for roosting bats, as described in the following sections.

Badger

5.5.8 A badger survey was conducted on land in and up to 30 m from the Pentir works site, except for land within the existing Pentir substation compound, on 07 November 2024. Land in the existing Pentir substation compound was not accessed as it is surrounded by a perimeter fence which badger are unable to penetrate. The survey comprised a systematic search for evidence of badger and followed the methodology outlined in Surveying for Badgers (Ref 5.26). Evidence of badger searched for comprised:

- Sett entrances - holes characteristically at field edges, in hedgerows or on earth embankments marking the entrance to a sett which are frequently accompanied by other field signs and mounds of earth (spoil).
- Footprints – usually distinctive and easily recognisable for being broader than they are long which can be seen in recently dug earth or soft mud.
- Badger trails through vegetation - badgers will often use the same routes within their territory, so the paths are usually well worn and obvious, being at least 20 centimetres (cm) in width and often linking feeding grounds with the badger sett.
- Dung pits – can be found along territory boundaries and near to inhabited setts and on average are 15 cm across and 15 cm deep.
- Latrines – where dung pits are grouped together.
- Excavations – badgers often create shallow depressions to pass under fencing or push the fencing up to open up commuting routes.
- Badger hair – black and white and coarse hair which can become snagged when the badger slides under fencing or past thorny vegetation.
- Scratch marks – found on scratching poles close to the sett entrance, with shredded or scored bark to a height between approximately 60 – 90 cm, as well as sometimes seen on rocks in the spoil heap close to a sett entrance where they have been loosened by badgers.
- Snuffle holes – excavated depressions in areas of bare earth where the badger has been searching for worms or insects.
- Bedding and bedding trails – piles of old bedding (bracken, dead leaves and dry grass) in or near the entrance to a sett is a good sign that the sett is active or has been very recently and as badgers can gather bedding up to 100 m away from the sett bedding can sometimes be seen along well-used badger trails.
- Other signs – for example sightings of live badgers or the remains of dead badgers.

5.5.9 Where a badger sett is identified it can be classified as either active or disused, based on the presence or absence of field signs (such as prints and hairs) in and around the immediate vicinity of the sett. Active setts are those which display signs indicating current use by badger.

5.5.10 Setts can be further classed using sett classification criteria as a main, annex, subsidiary or outlying sett. Summary definitions for each of these categories are provided in **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**.

Ground Level Tree Assessment – Roosting Bats

5.5.11 A ground-level tree assessment survey was carried out on all trees up to 30 m from the Pentir works site on 21 November 2024 to ascertain the potential for roosting bats.

5.5.12 Trees outside the Pentir substation were examined from the ground using close focusing binoculars for Potential Roost Features (PRF) such as loose bark, cavities and ivy (*Hedera helix*) that could be used by bats, in accordance with the Bat Conservation Trust (BCT) guidance (Ref 5.27). Trees were also checked for any signs of bats such as droppings and scratch marks.

5.5.13 During the inspections, each tree was either classified as having no PRF (NONE), requiring further assessment (FAR) or one or more PRF visible (PRF) concordant with the BCT guidelines. Trees classified as FAR or PRF would require further survey to more definitively establish whether they are suitable for roosting bats, should they be at risk of impacts from the proposed works.

eDNA Surveys – Great Crested Newts

5.5.14 One pond was found to be present within 500 m and was noted to have only recently been created as a balancing pond. For completeness a Habitat Suitability Indices (HSI) (Ref 5.38) assessment to determine their suitability for great crested newt and an eDNA survey was carried out in April 2025.

Existing Baseline

Site Context

5.5.15 The Pentir works site is wholly in the Pentir substation boundary, plus the existing unamended access road and adjacent car parking area, and comprises hardstanding surfaces only.

5.5.16 A review has been made of recent survey data, desk study data, aerial imagery and previous information gathered from an analysis of the National Grid NWC project ES (Ref 5.28), and Pentir Energy Source Project PEA (Ref 5.29). A site visit was also carried out on 07 November 2024 to confirm the habitats present in and up to 50 m from the Pentir works site.

5.5.17 Habitats in 50 m of the Pentir works site (shown in **Figure 2.5.6**) comprise:

- Semi-natural broadleaved woodland.
- Semi-natural mixed woodland.
- Planted broadleaved woodland.
- Planted mixed and coniferous woodland (some of which are recorded as Ancient Woodland).
- Dense or continuous scrub.
- Scattered scrub.
- Scattered trees (broadleaf and coniferous).
- Semi-improved neutral grassland.
- Improved grassland.
- Marshy grassland.
- Poor semi-improved grassland.
- Tall ruderal vegetation.
- Dry acid heath.
- Standing water.
- Running water.
- Intact hedge – native species-rich.

- Intact hedge – native species-poor.
- Ephemeral or short perennial vegetation.
- Amenity grassland.

5.5.18 The closest watercourse to the Pentir works site is unnamed and passes below the Pentir substation access road flowing in an east to west direction. This was recorded as dry during field surveys undertaken in 2018 to inform the National Grid NWC project but contained water during the site visit on 7th November 2024. Another ditch further west also runs beneath the Pentir substation access road. This was recorded as dry during the 2018 and 2024 surveys.

5.5.19 There is a recently created balancing pond present approximately 27 m east of the Pentir works site.

Sites Statutorily Designated for Ecological Importance

5.5.20 There are four international statutory sites for nature conservation (i.e., SACs, SPAs and Ramsar sites) in the 10 km Study Area. There are two further SACs designated for bats within 30 km of the Pentir works site.

5.5.21 Nine other statutory designated sites for nature conservation (SSSIs, NNRs, LNRs) are present in the 5 km Study Area.

5.5.22 The locations of these statutory sites are shown in **Figure 2.5.1** and **Figure 2.5.2**, and designation details of all statutorily designated sites are summarised in **Table 5-1**. The designated sites are listed in order of distance, starting with International designated sites, then national and local statutory designated sites. Designation details are summarised in **Volume 8, Appendix 2.5.B: Statutory Designated Sites Citations**.

Table 5-1 – Statutory sites designated for nature conservation in 10 km (international) and 5 km (national) of the Pentir works site (extended to 30 km for international sites designated for bats)

Site name and designation	Approximate distance (km) and direction from closest point to the Pentir works site	Importance or value
Eryri/ Snowdonia SAC	2.89 km south-east	International (Very high)
Y Fenai a Bae Conwy/Menai Strait and Conwy Bay SAC	3.11 km west	International (Very high)
Traeth Lafan/Lavan Sands Conway Bay SPA	6.06 km north-east	International (Very high)
Afon Gwyrfai a Llyn Cwellyn SAC	8.76 km south-west	International (Very high)
Glynllifon SAC	13.62 km south-west	International (Very high)
Coedydd Derw a Safleoedd Ystlumod Meirion /Meirionnydd Oakwoods and Bat Sites SAC	17.09 km south-east	International (Very high)
Mwyngloddiau Fforest Gwydir / Gwydyr Forest Mines SAC	21.06 km east	International (Very high)
Eryri SSSI	2.89 km south-east	National (High)
Eithinog SSSI	2.93 km north	National (High)
Moelyci a Chors Ty'n y Caeau SSSI	3.09 km east	National (High)
Coedydd Afon Menai SSSI	3.30 km north-west	National (High)
Glannau Porthaethwy SSSI	3.61 km north	National (High)
Sgistau Glas Ynys Mon SSSI	4.34 km north-west	National (High)
Caeau Tyddyn Dicwm SSSI	4.62 km east	National (High)

Site name and designation	Approximate distance (km) and direction from closest point to the Pentir works site	Importance or value
Llyyn Padarn SSSI	4.88 km south	National (High)
Coed Cyrnol LNR	3.68 km north	National (High)

Non-Statutory Sites Designated for Nature Conservation

5.5.23 There are 35 non-statutory sites designated for nature conservation identified in the Study Area (as defined in **Section** Error! Reference source not found.). Five of these are within 500 m of the Pentir works site.

5.5.24 These sites have been designated as WS and cWS for their biodiversity value at a local level and are known to have or have the potential for supporting value to a wide variety of protected and ecologically important species or habitats. It is noted that cWS have not yet been designated but are included in this chapter, as they are being considered for designation and may become so within the lifetime of the proposed works.

5.5.25 These sites are shown on **Figure 2.5.3** and are summarised in **Table 5-2**. The non-statutory sites are listed in ascending order, with those closest to the Pentir works site listed first.

Table 5-2 – Non-statutory sites in 2 km of the Pentir works site

Site name	Description	Location	Importance or value
Pentir Substation cWS	Coniferous woodland; broadleaved woodland	Immediately adjacent[1]	County (Medium)
Near breakers' yard cWS	Semi-improved neutral grassland	Immediately adjacent[2]	County (Medium)
Coed Ty'n-llwyn cWS	Broadleaved woodland; neutral grassland	130 m south-east	County (Medium)
Coed Rhos-fawr cWS	Coniferous woodland; acid grassland	170 m north-east	County (Medium)
Coed Nant y Garth WS	Mixed lowland woodland, stream	500 m north-west	County (Medium)
Parc Nant-y-garth cWS	Coniferous woodland	510 m west	County (Medium)
Glan-rhyd reservoir cWS	Standing water; semi-improved neutral grassland; marshy grassland	540 m south-east	County (Medium)
Coed Pont Ladi-wen WS	Coniferous woodland	580 m north-west	County (Medium)
Tyddyn -Heilyn WS	Semi-improved neutral grassland; swamp; marshy grassland	620 m north-east	County (Medium)
Tyddyn Forgan cWS	Semi-improved neutral grassland	660 m west	County (Medium)

[1] The boundary of this site slightly overlaps the existing Pentir Substation access road, instead of following the edge of the road. It is designated for woodland habitats which will not be directly affected by the proposed works use of the existing access road into the Substation.

[2] This site is adjacent to the Pentir works site access road, which will not be modified by the proposed works.

Site name	Description	Location	Importance or value
Seion cWS	Semi-improved neutral grassland; marshy grassland	780 m south-west	County (Medium)
Coed Tyddyn Badyn cWS	Broadleaved woodland	800 m south-east	County (Medium)
Ty'n-llwyn cWS	Broadleaved woodland; acid grassland	850 m south-east	County (Medium)
Fachell cWS	Broadleaved woodland	860 m south-west	County (Medium)
Ynysllecharian-bach cWS	Broadleaved woodland; acid and marshy grassland; Semi-improved neutral grassland	910 m south	County (Medium)
Ty-mawr cWS	Marshy and acid grassland	1.01 km south-west	County (Medium)
Ty'n y Rhos cWS	Marshy grassland, broadleaved woodland, standing water	1.18 km south-west	County (Medium)
Ynys Iago cWS	Semi-improved neutral grassland; broadleaved woodland	1.24 km south-east	County (Medium)
Fodol Ganol cWS	Broadleaved woodland	1.30 km north-west	County (Medium)
Coed Pant-y-cyff cWS	Broadleaved, coniferous and mixed woodland; Semi-improved neutral grassland	1.30 km east	County (Medium)
Carfan cWS	Semi-improved neutral grassland	1.30 km south-east	County (Medium)
Bach yr Hilfry cWS	Semi-improved neutral grassland	1.37 km south	County (Medium)
Tan-yr-wylfa cWS	Coniferous woodland	1.41 km west	County (Medium)
Coed Wern cWS	Broadleaved woodland	1.43 km north	County (Medium)
Ty-newydd WS	Semi-improved neutral grassland; broadleaved woodland	1.49 km north-east	County (Medium)
Coed Rhydau cWS	Coniferous and broadleaved woodland	1.51 km south-east	County (Medium)
Nr Cefn Gwyn cWS	Marshy grassland	1.66 km west	County (Medium)

Site name	Description	Location	Importance or value
Tyn y Ffridd cWS	Marshy grassland	1.69 km east	County (Medium)
Bryniau-heulog WS	Broadleaved woodland, Semi-improved neutral grassland	1.70 km north	County (Medium)
Coed Tandinas cWS	Broadleaved woodland	1.75 km south-west	County (Medium)
Waen Pentir cWS	Acid and marshy grassland	1.80 km south-east	County (Medium)
Vaynol Park woodlands and lake cWS	Broadleaved woodland; standing water	1.84 km north-west	County (Medium)
Goetra Isaf WS	Broadleaved woodland; Semi-improved neutral grassland	1.84 km north	County (Medium)
Coed Pant-yr-afallen cWS	Coniferous woodland; broadleaved woodland	1.92 km west	County (Medium)
Cyttir Lane Woods WS	Broadleaved woodland	1.98 km north-east	County (Medium)

Habitats

Ancient Woodland

5.5.26 There are 47 areas of Ancient Woodland in the Study Area (as defined in **Section** Error! Reference source not found.), as shown in **Figure 2.5.4**. The nearest is a Plantation on Ancient Woodland Site which directly abuts the western boundary of the Pentir substation, approximately 30 m from the Pentir works site. This woodland was assessed as part of the National Grid NWC project in 2018 and determined to be in poor condition at that time.

Veteran Trees

5.5.27 A review of the Woodland Trust Ancient Tree Inventory (Ref 5.35) does not indicate any ancient or veteran trees in the Study Area (as defined in **Section** Error! Reference source not found.); the closest is an ancient tree 1.6 km to the south-west of the Pentir works site.

Habitats of Principal Importance (HoPI)

5.5.28 Data supplied by Cofnod identified the following HoPI in the Study Area (defined in **Section 5.3**). The locations of these habitats are shown in **Figure 2.5.4**:

- Lowland dry acid grassland (approximately 2 m from the Pentir works site (access road)).
- Purple moor grass and rush pastures (260 m west of the Pentir works site).

- Traditional orchards (910 m north of the Pentir works site).
- Lowland fens and reedbeds (1.15 km north-east of the Pentir works site).

5.5.29 Further HoPI likely to be present in the Study Area, but not currently identified by Cofnod or on the Datamap Wales website (Ref 5.34) are:

- Hedgerows.
- Rivers.
- Standing water or ponds.
- Deciduous woodland.

Broad Terrestrial Habitats

5.5.30 This assessment is based on Phase 1 Habitat survey data verified on 07 November 2024, desk study data, aerial photography, and field survey data collected between 2016 and 2018 for the adjacent National Grid NWC project.

5.5.31 **Table 5-3** presents a summary of broad terrestrial habitats that are present in 50 m of the Pentir works site, alongside an evaluation of their ecological importance.

Table 5-3 – HoPI and non-HoPI present up to 50 m from the Pentir works site, and their ecological importance, ordered by habitat type

Habitat	Ecological importance	Rationale
A1.1.1 Semi-natural broadleaved woodland	Up to County (Medium)	Lowland mixed deciduous woodland is a HoPI listed under Section 7 of the Environment (Wales) Act (2016 Ref 5.5). Adjacent the Pentir works site.
A1.1.2 Planted broadleaved woodland	Local (Low)	Common and widespread. Not a HoPI. Adjacent the Pentir works site.
A1.2.2 Planted coniferous woodland	Site (Very low)	Common and widespread. Not a HoPI. Approximately 35 m north-west of the Pentir works site.
A1.3.1 Semi-natural mixed woodland	Up to County (Medium)	Lowland mixed deciduous woodland is a HoPI listed under Section 7 of the Environment (Wales) Act 2016 (Ref 5.5). Adjacent the Pentir works site.
A1.3.2 Planted mixed woodland	Local (Low)	Common and widespread. Not a HoPI. Adjacent the Pentir works site.
A2.1 Dense scrub	Site (Very low)	Common and widespread. Not a HoPI. Approximately 10 m west of the Pentir works site.
A2.2 Scattered scrub	Site (Very low)	Common and widespread. Not a HoPI. Approximately 10 m south-west of the Pentir works site.
A3.1 Scattered broadleaved trees	Site (Very low)	Common and widespread. Not a HoPI. Adjacent the Pentir works site.
A3.2 Scattered coniferous trees	Site (Very low)	Common and widespread. Not a HoPI. Adjacent to the Pentir works site.

Habitat	Ecological importance	Rationale
B2.2 Semi-improved neutral grassland	Local (Low)	Common and widespread. Not a HoPI. Adjacent to the Pentir works site.
B4 Improved grassland	Site (Very low)	Common and widespread. Not a HoPI. Adjacent to the Pentir works site.
B5 Marshy grassland	Up to County (Medium)	Purple moor grass and rush pasture is a form of marshy grassland that is a HoPI listed under Section 7 of the Environment (Wales) Act 2016 (Ref 5.5). Rhos pasture HAP is listed in the Gwynedd BAP (Ref 5.22). Approximately 260 m west of the Pentir works site. Marshy grassland not listed as a HoPI is present approximately 10 m south of the Pentir works site.
B6 Poor semi-improved grassland	Site (Very low)	Common and widespread. Not a HoPI. Adjacent to the Pentir works site.
C3.1 Other tall herb and fen – ruderal	Site (Very low)	Common and widespread. Not a HoPI. Present in the Pentir works site.
D1.1 Dry acid heath	County (Medium)	Lowland Heathland is an Annex I European Protected Habitat (Ref 5.39) and HoPI listed under Section 7 of the Environment (Wales) Act 2016 (Ref 5.5). Lowland heathland is also listed in the Gwynedd BAP (Ref 5.22). Approximately 2 m from the Pentir works site. The Phase 1 Habitat survey carried out on 07 November 2024, confirmed the presence of dry acid heath in an area previously recorded as lowland dry acid grassland HoPI by Cofnod.
G2 Running water (field drains and streams)	Local (Low)	Drains, smaller watercourses and streams are common and widespread. Rivers are HoPI listed under Section 7 of the Environment (Wales) Act 2016 (Ref 5.5). River corridors are listed in the Gwynedd BAP (Ref 5.22). Adjacent the Pentir works site.
J1.2 Cultivated or disturbed land – amenity grassland.	Site (Very low)	Common and widespread. Not a HoPI. Present in the Pentir works site.
J1.3 Cultivated or disturbed land – ephemeral or short perennial vegetation.	Site (very low)	Common and widespread. Not a HoPI. Approximately 20 m south of the Pentir works site.
J2.1.1 Intact hedge – native species-rich	Up to County (Medium)	Hedges are HoPI listed under Section 7 of the Environment (Wales) Act 2016 (Ref 5.5) and legally protected under the Hedgerows Regulations (Ref 5.8). Approximately 10 m west of the Pentir works site.
J2.1.2 Intact hedge – species-poor	Up to County (Medium)	Hedges are HoPI listed under Section 7 of the Environment (Wales) Act (2016) (Ref 5.5) and legally

Habitat	Ecological importance	Rationale
		protected under the Hedgerows Regulations (Ref 5.8). Adjacent to the Pentir works site.
J2.1.1 Intact hedge – native species-rich	Up to County (Medium)	Hedges are HoPI listed under Section 7 of the Environment (Wales) Act (2016) (Ref 5.5) and legally protected under the Hedgerows Regulations (Ref 5.8). Located 15 m west of the Pentir works site.
J2.6 Dry ditch	Site (Very low)	Common and widespread. Not a HoPI. Adjacent the Pentir works site.
J3.6 Buildings	Site (Very low)	Not a HoPI. In the Pentir works site.
J4 Bare ground	Site (Very low)	Not a HoPI. In the Pentir works site.

Protected and Notable Species and INNS

5.5.32 The desk study data search, obtained from Cofnod in November 2024, returned records of protected and notable species in the 2 km Study Area for the preceding 10 years.

5.5.33 **Table 5-4** presents a summary of protected or notable species that have been identified as present, or potentially present, in the Pentir works site and their respective Study Areas alongside an evaluation of their ecological importance, legal or conservation status and relationship to the Pentir works site.

Table 5-4 – Summary of baseline details for legally protected and notable species, alongside assessment of ecological importance

Species or species group	Baseline detail	Ecological importance	Rationale
Terrestrial invertebrates	The desk study returned two records of small heath butterfly (*Coenonympha pamphilus*) in 2 km of the Pentir works site. The closest record is approximately 330 m west.	Local importance (Low)	Some terrestrial invertebrate species, including small heath, are Priority Species under Section 7 of the Environment (Wales) Act 2026 (Ref 5.5). The Pentir works site, where temporary land take is required, is hardstanding and will not support notable or rare invertebrate assemblages, however they could be present in habitats surrounding the site such as woodland, grassland and dry acid heath.
Aquatic macroinvertebrates	The desk study returned no records of aquatic macroinvertebrates in the 2 km Study Area. During field surveys for the Wider Works, one site on the Afon Cegin, fell within the Pentir Study Area approximately 810 m south-east. Here, the leech *Dina lineata* was the only species observed.	Local importance (Low)	The Pentir works site, where temporary land take is required, is hardstanding and unsuitable for aquatic macroinvertebrates. The closest watercourses pass below the Pentir works site, where the existing access road crosses the watercourses. One of the two watercourses contained water during the 7th November 2024 site visit, but was previously shown to be a dry ditch when surveyed as part of the NWC project; it is periodically wet and could support aquatic macroinvertebrates should the ditch be ephemeral. The second was dry on both survey dates.
Aquatic macrophytes	The desk study returned records of the notable northern yellowcress (*Rorippa islandica*) in the 2 km Study Area. No other notable aquatic macrophytes were recorded in the 2 km Study Area. No aquatic macrophyte surveys were conducted in the Study Area.	Local importance (Low) for northern yellowcress	The Pentir works site, where temporary land take is required, is hardstanding and unsuitable for aquatic macrophytes. The closest watercourses pass below the Pentir works site, where the existing access road crosses the watercourses. One of the two watercourses contained water during the 7th November 2024 site visit, but was previously shown to be a dry ditch when surveyed as part of the NWC project; it is periodically wet and could support aquatic macrophytes should the ditch be ephemeral such as

Species or species group	Baseline detail	Ecological importance	Rationale
			the northern yellowcress identified during the desk study. The second was dry on both survey dates.
Fish	The desk study returned a single fish record in the Study Area; brook lamprey (*Lampetra planeri*) 1.4 km south-east of the site. No fish surveys were conducted in the Study Area.	National (High) for brook lamprey	Brook lamprey are listed in the Habitats Directive Annex II (Ref 5.39), which requires significant populations of these species to be protected through the UK's National Site Network (i.e. SACs). They are also listed under Bern Convention Appendix III (Ref 5.40) which protects vulnerable migratory fauna. The Pentir works site, where temporary land take is required, is hardstanding and unsuitable for fish species. The closest watercourses pass below the existing Pentir works site access road. One of the two watercourses was previously shown to be a dry ditch when surveyed as part of the NWC project and represents unsuitable habitat for lamprey ammocoetes and fish more widely, although it did hold water during the 07 November 2024 survey. The second was dry on both survey dates.
Breeding and non-breeding birds	The desk study returned records of 74 bird species in the 2 km Study Area. Twelve of the species were listed on Schedule 1 of the Wildlife and Countryside Act (WCA) 1981 (as amended) (Ref 5.4); 20 further species were listed as Priority Species in Wales; 19 species included on the BoCC Red List (Ref 5.18); 16 species on the BoCC Red Wales list (Ref 5.19), 35 species included on the BoCC Amber List (Ref 5.18) and 39 on the BoCC	Local (Low)	All nesting birds are protected under the WCA 1981 (as amended) (Ref 5.4). The Pentir works site, where temporary land take is required, is hardstanding and unsuitable for breeding birds and suboptimal for non-breeding birds. Habitats present adjacent to the Pentir works site are likely to support breeding and non-breeding birds.

Species or species group	Baseline detail	Ecological importance	Rationale
	Amber Wales list (Ref 5.19). Eight records were returned of birds in the Pentir works site; the most notable are red kite (*Milvus milvus*), spotted flycatcher (*Muscicapa strata*) and dunnock (*Prunella modularis*). The National Grid NWC ES report concluded breeding birds were abundant in the wooded areas surrounding the Pentir works site. Birds were also recorded in heath, gorse and grassland habitats to the east of the Pentir substation access road, where a combination of woodland and scrub passerines such as linnet (*Linaria cannabina*) and stonechat (*Saxicola rubicola*) and ground nesting birds such as meadow pipit (*Anthus pratensis*) and skylark (*Alauda arvensis*) were present.		
Bats	The desk study returned 74 bat records in the 2 km Study Area, none of which are from the Pentir works site. These records comprised 25 soprano pipistrelle (*Pipistrellus pygmaeus*), 22 common pipistrelle (*Pipistrellus pipistrellus*), two unspecified pipistrelle (*Pipistrellus* sp.), 11 *Myotis* sp. records, one brown long-eared bat (*Plecotus auritus*) record, and one lesser horseshoe bat (*Rhinolophus*	Up to County (Medium) Importance for *Myotis* sp. and lesser horseshoe bat and Local Importance for other species found to be present that are common and widespread.	All bat species and their roosts are legally protected in the UK under the WCA 1981 (as amended) (Ref 5.4) and Habitats Regulations (Ref 5.1), which implemented the Habitats Directive (Ref 5.39). Four bat species are also included as Priority Species under Section 7 of the Environment (Wales) Act 2016 (Ref 5.5). Lesser horseshoe bat is listed on the Species Action Plan (SAP) list of the Gwynedd BAP Ref 5.22). The Pentir works site, where temporary land take is required, is hardstanding, unsuitable for roosting bats

Species or species group	Baseline detail	Ecological importance	Rationale
	hipposideros) record and 12 noctule (Nyctalus noctula) records. The closest records are approximately 60 m from the Pentir works site and consists of data collected during the 2016-2018 AECOM bat activity surveys conducted to support the National Grid NWC Project, and subsequently provided to Cofnod. Species recorded during the transect surveys were soprano and common pipistrelle, noctule and *Myotis* sp. with lesser horseshoe bat recorded by static detector only. Bat activity levels were relatively low when compared to other transects recorded in the NWC Project. No bat roosts were identified in 50 m of the Pentir works site. No trees with suitable features for roosting bats were recorded in 50 m of the Pentir works site during the 7th November 2025 survey.		and suboptimal for foraging bats. Habitat adjacent to the Pentir works site and in the wider area, is likely to support roosting, foraging and commuting bats. No trees in 50 m of the Pentir works site were found to have features suitable for roosting bats.
Badger (*Meles meles*)	The desk study returned 11 badger records in the 2 km Study Area. None of these records fall in the Pentir works site. The closest record is in woodland approximately 120 m from the Pentir works site and consists of data collected during the 2016-2018	Local (Low)	Badgers are protected under The Protection of Badgers Act 1992 (Ref 5.7). Badgers are relatively common in a local, regional and national context. The Pentir works site, where temporary land take is required, is hardstanding and unsuitable for the construction of badger setts. Habitat present adjacent

Species or species group	Baseline detail	Ecological importance	Rationale
	AECOM badger surveys conducted to support the National Grid NWC Project and subsequently provided to Cofnod. No badger setts were recorded in 30 m of the Pentir works site during a survey on 7th November 2024.		to the Pentir works site is suitable for badger, but no active setts are known to be present within 30 m.
Great crested newt (*Triturus cristatus*)	The desk study returned no records of great crested newt (GCN) in the 2 km Study Area. One pond is present in 500 m of the Pentir works site. A balancing pond has been recently constructed 27 m east of the Pentir works site. A GCN Habitat Suitability Index Assessment (Ref 5.38) was carried out at this pond on 7 November 2024 which returned a score of 0.72 (Good), which suggests the pond has potential to support GCN.	N/A	GCN are protected in the UK under the WCA 1981 (as amended) (Ref 5.4) and Habitats and Species Regulations (Ref 5.1), which implement the EC Directive 92/43/EEC (Ref 5.39). There are no records of GCN in the Study Area and no ponds in 500 m of the Pentir works site, aside from the recently created balancing pond, which reduces the likelihood of them being present in this new pond.
Red squirrel (*Sciurus vulgaris*)	The desk study returned no records of red squirrel in the 2 km Study Area. Grey squirrel (*Sciurus carolinensis*) is frequently recorded in woodland adjacent to the Pentir works site, which reduces the likelihood of red squirrel being present.	N/A	Red squirrels are protected under Schedule 5 of the WCA 1981 (Ref 5.4) and are listed as a Species of Principal Importance under Section 7 of the Environment (Wales) Act 2016 (Ref 5.5). Red Squirrel are Endangered status in Wales under the International Union for the Conservation of Nature (IUCN) (Ref 5.20). The Pentir works site, where temporary land take is required, is hardstanding and unsuitable for red squirrel. The surrounding woodland is inhabited by

Species or species group	Baseline detail	Ecological importance	Rationale
			grey squirrel, and red squirrel are unlikely to be present.
Otter (*Lutra lutra*)	The desk study returned seven records of otter in the 2 km Study Area. None of these records are from the Pentir works site; the closest is approximately 300 m north-west and was of an otter found dead. Watercourses in proximity to the proposed works area (approximately 200 m) were surveyed for otter in 2016 by AECOM, conducted to support the National Grid NWC Project. No signs of otter were recorded at the time of survey. These watercourses could potentially be used by otter, however the NWC project reported them as dry at the time of survey in 2018 and otter were suspected absent. The survey completed on 7th November 2024 identified that the westernmost of the two watercourses was dry, but the other contained slow-flowing water (up to 15 cm deep) to the west of the access road, and appears to eventually join the Afon Heulyn, which flows into the Y Fenai a Bae Conwy/Menai Strait and Conwy Bay SAC.	District (Medium)	Otter is protected under Schedule 5 of the WCA 1981 (as amended) (Ref 5.4) and Habitats and Species Regulations (Ref 5.1), which implement the EC Directive 92/43/EEC (Ref 5.39). Otter is also a Species of Principal Importance under Section 7 of the Environment (Wales) Act 2016 (Ref 5.5). Otter is listed on the SAP list of the Gwynedd BAP (Ref 5.22) and are Vulnerable under the IUCN (Ref 5.20). The Pentir works site, where temporary land take is required, is hardstanding and unsuitable for otter. There are no watercourses in or directly abutting the works area; although two watercourses pass beneath the existing access road.

Species or species group	Baseline detail	Ecological importance	Rationale
Water vole (*Arvicola amphibius*)	The desk study returned one record of water vole in the 2 km Study Area, approximately 1.77 km north of the Pentir works site. Watercourses in proximity to the proposed works area (approximately 200 m) were surveyed for water vole in 2016 by AECOM to support the National Grid NWC Project. No signs of water vole were recorded. The survey completed on 7th November 2024 identified that the western-most of the two watercourses was dry, but the other contained water. Both are unsuitable for water vole.	Up to County (Medium)	Water vole is afforded legal protection under the WCA 1981 (as amended) (Ref 5.4). Water vole is a Species of Principal Importance under Section 7 of the Environment (Wales) Act 2016 (Ref 5.5). Water vole is listed on the SAP list of the Gwynedd BAP (Ref 5.22) and are of Endangered status under the IUCN (Ref 5.20). The Pentir works site, where temporary land take is required, is hardstanding and unsuitable for water vole. The two watercourses that pass beneath the existing access road into the Pentir substation are also unsuitable for water vole.
Hedgehog (*Erinaceus europaeus*)	The desk study returned 23 records of hedgehog in the 2 km Study Area. None of these records are from the proposed works area; the closest record is approximately 580 m north-west.	Local (Low)	Hedgehog is a Species of Principal Importance under Section 7 of the Environment (Wales) Act 2016 (Ref 5.5) and of Vulnerable status in Wales under the IUCN (Ref 5.20). Hedgehog is widespread and abundant across the UK, but declining. The Pentir works site, where temporary land take is required, is hardstanding and suboptimal for hedgehog. Hedgehogs are likely to be present in adjacent hedgerows, woodland, scrub and grassland habitats.
Brown hare (*Lepus europaeus*)	The desk study returned seven records of brown hare in the 2 km Study Area. None of these records are from the Pentir works site; the	Local (Low)	Brown hare is a Species of Principal Importance under Section 7 of the Environment (Wales) Act 2016 (Ref 5.5) and listed on the SAP list of the Gwynedd BAP (Ref 5.22).

Species or species group	Baseline detail	Ecological importance	Rationale
	closest record is approximately 170 m south-east.		Brown hare is widespread and abundant across the UK. The Pentir works site, where temporary land take is required, is hardstanding and suboptimal for brown hare. Brown hare are likely to be present in adjacent scrub and grassland habitats.
Polecat (*Mustela putorius*)	The desk study returned four records of polecat in the 2 km Study Area. None of these records are from the Pentir works site; the closest is approximately 1.34 km north-west of an adult found dead on the road.	Local (Low)	Polecat is a Species of Principal Importance under Section 7 of the Environment (Wales) Act 2016 (Ref 5.5) and listed on the SAP list of the Gwynedd BAP (Ref 5.22). Polecat is of Least Concern status in Wales under the IUCN (Ref 5.03). Polecats are found throughout Wales where valleys and farms are favoured. Historically, Gwynedd is considered a Welsh stronghold for polecat (Gwynedd BAP (Ref 5.22)). The Pentir works site, where temporary land take is required, is hardstanding and suboptimal for polecat. Polecats are potentially present in adjacent woodland, hedgerow, scrub and grassland habitats.
Reptiles	The desk study returned one slow worm (*Anguis fragilis*) record and nine common lizard (*Zootoca vivipara)* records in the 2 km Study Area. None of these records are from the Pentir works site. The closest is approximately 130 m north-west and consists of data collected during the 2016-2018 AECOM reptile surveys conducted to support the National Grid NWC Project and subsequently provided to Cofnod.	Local (Low)	All reptiles are protected from intentional injuring or killing under the WCA 1981 (as amended) (Ref 5.4) and are Species of Principal Importance under Section 7 of the Environment (Wales) Act 2016 (Ref 5.5). Adder (*Vipera berus*) is listed on the SAP list of the Gwynedd BAP (Ref 5.22). The Pentir works site, where temporary land take is required, is hardstanding and suboptimal for reptiles. Only widespread species of reptile (such as slow worm, common lizard, grass snake (*Natrix helvetica*)) and adder are likely to be present in adjoining habitats and are unlikely to occur in significant numbers or

Species or species group	Baseline detail	Ecological importance	Rationale
			assemblages due to the suitability and extents of the habitats adjacent to the Pentir works site.
Other (more commonly recorded) amphibians	The desk study returned one common frog (*Rana temporaria*) record, three common toad (*Bufo bufo*) records, and one palmate newt (*Lissotriton helveticus*) record in the 2 km Study Area. No records were identified from in the Pentir works site, the closest record is for common frog, approximately 1.22 km west.	Local (Low)	The common toad is a Species of Principal Importance under Section 7 of the Environment (Wales) Act 2016 (Ref 5.5) The Pentir works site, where temporary land take is required, is hardstanding and suboptimal for amphibians. Common amphibians are likely to inhabit nearby drains and woodland, scrub and hedgerow habitats. They may also inhabit the recently created balancing pond approximately 27 m from the Pentir works site (access road).
Flora	The desk study returned six bluebell (*Hyacinthoides non-scripta*) records in the 2 km Study Area. The closest record is approximately 620 m south-west. No protected or notable plants were recorded in the Pentir works site.	Local (Low)	No rare or notable plant species have been recorded in 500 m of the site. The Pentir works site, where temporary land take is required, is hardstanding and suboptimal for notable or rare plants. Such plants could potentially be present in nearby habitats.
INNS	The desk study returned records of 14 INNS in the 2 km Study Area, six of which are listed on Schedule 9 of the of the WCA 1981 (as amended) (Ref 5.6). Wall cotoneaster (*Cotoneaster horizontalis*), Montbretia *(Crocosmia pottsii* x *aurea* = C. x *crocosmiiflora*), Japanese rose (*Rosa rugosa*), pontic rhododendron (*Rhododendron ponticum*), Himalayan balsam (*Impatiens glandulifera*) and Japanese knotweed	N/A	Several confirmed INNS species are listed in Schedule 9 of the WCA 1981 (as amended) (Ref 5.4). There are statutory constraints regarding their potential spread (as set out in **Volume 8, Appendix 1.1.A: Legislation, Policy and Guidance**) as it is illegal to deliberately introduce and spread invasive species, and mitigation will be required during construction to prevent their introduction and spread, if present in the Pentir works site.

Species or species group	Baseline detail	Ecological importance	Rationale
	(*Reynoutria japonica*). The closest record is of Himalayan balsam approximately 140 m north-west of the proposed works, collected during the 2016-2018 Phase 1 Habitat surveys conducted to support the National Grid NWC Project and subsequently provided to Cofnod. The invasive New Zealand mud snail (*Potamopyrgus antipadarum) and the non-native Crangonyx pseudogracilis/floridanua* were recorded during aquatic macroinvertebrate surveys.		

Future Baseline

5.5.34 This section considers those changes to the baseline conditions, previously described, that might occur in the absence of the proposed works and during the time period over which the proposed works would have been in place.

5.5.35 In the absence of the proposed works, the habitats present in the Pentir works site will continue to be an unsuitable or suboptimal habitat for species. Adjoining habitats will continue to provide habitats for a variety of species including breeding and non-breeding birds, bats, reptiles and badger in adjoining woodlands. The distribution of some species in adjoining habitats may change in response to changes in livestock management, while the species assemblages are likely to remain broadly the same.

5.5.36 If the proposed works were not constructed, the hardstanding in the Pentir works site would continue to be maintained. The existing habitats present adjacent to the Pentir works site and in the wider local area are likely to continue to be present. However, some changes in habitat extent, composition and structure will occur adjacent to the Pentir works site as a result of ecological succession e.g., the gradual establishment of tree and shrub seedlings in woodland areas and along hedgerows. These resultant gradual changes in habitat composition are unlikely to materially alter the ecological baseline and the habitats and species present are very unlikely to undergo significant change prior to the start of construction or during the construction period.

5.6 Consultation and Scope of Assessment

5.6.1 This section describes Stakeholder consultation carried out and the scope of the assessment of effects on Ecology and Nature Conservation.

Consultation

5.6.2 Consultation in relation to Ecology and Nature Consultation has been carried out with stakeholders. Table **5-5** provides an overview of consultation and the actions taken to address any responses within the assessment.

Table 5-5 – Consultation and stakeholder engagement

Consultee	Date and nature of consultation	Summary of response	How and where addressed
NRW	12 September 2024 – Introduction to surveys	No specific comments for Pentir works	n/a
Gwynedd Council	29 May 2024 – Project Introduction	No specific comments for Pentir works	n/a

5.6.3 Based on CIEEM guidelines (Ref 5.23) and using professional judgement, features of Site importance, i.e., less than Local (Low) importance, are not considered further in the assessment process. In addition, any receptors unlikely to be affected due to the absence of suitable habitats, are also not considered further in the assessment process. The following habitats and species are excluded from further consideration:

- Dense scrub, scattered scrub, scattered broadleaved and coniferous trees, coniferous plantation woodland, improved grassland, poor semi-improved grassland, amenity grassland, ruderal and ephemeral vegetation, dry ditches, buildings and bare ground.
- Water vole, great crested newts, and red squirrel.

5.6.4 Construction of the proposed works is likely to lead to an increase in the number of vehicles on the local highway network (see Chapter 9: Traffic and Transport). IAQM guidance (Ref 5.41) sets out criteria to establish the need for an air quality assessment for construction of a development as being a change of more than 200 Heavy-Duty Vehicle (HDV) (also known as HGV) or more than 1,000 total vehicles (as two-way annual daily average traffic flow). As detailed in Chapter: 10 Air Quality and Emissions, owing to the expected traffic levels from the proposed works being below IAQM guidance (Ref 5.41), a detailed dispersion modelling exercise was not conducted as the effect is not anticipated to be significant. Since no significant effects are anticipated, this chapter does not assess potential impacts on ecological features (e.g. habitats, sites, and species) from construction-phase traffic-related air quality changes. Similarly, as described in **Chapter 2: Pentir Substation Works**,

5.6.5 With regards construction dust, air quality assessments (detailed in **Chapter 10: Air Quality and Emissions**) have followed the IAQM construction dust guidance (Ref 5.41). This examines the risk of construction dust to ecological sites holding a National or European designation within 50 m of the Pentir works site. WSs and cWS have also been considered within this chapter.

5.6.6 Table **5-6** summarises the potential Ecology and Nature Conservation receptors that have been reviewed and states whether they have been included or excluded from the Ecology and Nature Conservation assessment with a justification of the decision.

Table 5-6– Scope of the Ecology and Nature Conservation assessment

Receptor	Scoped in/out	Justification
Statutory Designated Sites (in 10 km (international) and 5 km (national) of the Pentir works site (extended to 30 km for international sites designated for bats))	Out	There are no statutory designated sites in 2 km of the Pentir works site; the closest part of the nearest site is 2.89 km east. Statutory designated sites will not be directly impacted by the proposed works or maintenance activities through habitat loss or disturbance. There are no watercourses in the Pentir works site with hydrological links to any statutory designated sites. Two watercourses pass beneath the existing Pentir substation access road, one of which could potentially ultimately link to Y Fenai a Bae Conwy/Menai Strait and Conwy Bay SAC, approximately 3.2 km downstream. However, no modifications are proposed to this access road to facilitate the proposed works and no indirect impacts to statutory designated sites from potential water pollution are anticipated. At this distance, indirect disturbance impacts to species using designated sites through increased noise, lighting or visual disturbance will not lead to significant effects. The Pentir works site provides suboptimal foraging and commuting habitat for bats, and although there is suitable habitat in the wider area, the Pentir works site is already subject to a degree of disturbance and lighting being a working substation. Additional lighting proposed will only be required temporarily during cable installation in the winter. Impacts to bats affiliated with statutory sites in 30 km (approximately 13.62 km and 17 km at their closest points) are not anticipated.
Non-Statutory Designated Sites (WS, cWS) (in 2 km of the Pentir works site)	In	Intrusive activities may be required: • Degradation of habitat. • Indirect air quality impacts from construction dust and impacts to water quality to WS and cWS, including Pentir cWS.

Receptor	Scoped in/out	Justification
Priority Habitats, Ancient Woodland and habitats of Local ecological importance adjacent to the Pentir works site	In	Intrusive activities may be required: • Degradation of habitat. • Indirect air quality impacts from construction dust and impacts to water quality to Ancient Woodland, semi-natural woodlands, dry acid heath, purple moor grass rush pastures and, hedgerows and other notable habitats.
Priority Habitats, Ancient Woodland and habitats of Local ecological importance adjacent to the Pentir works site	Out	Works are proposed only within existing hardstanding or existing access roads. No habitats will be directly affected.
Protected and notable species	In	Incidental mortality, disturbance (noise or vibration, visual, lighting), temporary habitat degradation, modification and fragmentation for the following species: • Terrestrial invertebrates. • Breeding and non-breeding birds. • Bats. • Badger. • Otter. • Other mammals (hedgehog, brown hare and polecat). • Reptiles. • Common amphibians. • Protected and notable flora. • Fish. • Aquatic macrophytes.

Receptor	Scoped in/out	Justification
		• Aquatic macroinvertebrates.
Protected and notable species	Out	Works are proposed only within existing hardstanding or existing access roads. No habitats will be directly affected.
Designated sites and notable habitats susceptible to air quality impacts in 250 m of the affected road network and 50 m of construction activities	Out	It is assessed that construction traffic flows will not exceed the IAQM vehicle trips criteria. An assessment of air quality impacts associated with construction road traffic will therefore not be required for protected or otherwise notable habitats in 250 m of the affected road network and 50 m of construction activities.
Designated sites, protected and notable species susceptible to INNS/INNAS adjacent to the Pentir works site	In	Potential for introduction and spread of INNS or INNAS during works and movement around the Pentir works site leading to degradation of existing habitat quality surrounding the Pentir works site, and reduction in native species due to being out-competed.

5.7 Methodology

5.7.1 Details of the technical methods used to determine the baseline conditions, sensitivity of the receptors, magnitude of effects and the significance criteria that have been used for the Ecology and Nature Conservation assessment are in **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**.

5.8 Potential Effects

5.8.1 The proposed works have the potential to affect ecology and nature conservation (positively or negatively), during construction.

Construction

5.8.2 The sources of potential effects on IEFs during construction are:

- Disturbance – indirect impacts resulting from a change in normal conditions (i.e., light, noise, vibration, human activity) that result in individuals or populations of species changing behaviour or range.
- Habitat degradation – direct or indirect impacts resulting in the reduction in the condition of a habitat and its suitability for some or all of the species it supports, e.g., changes in air quality affecting ancient woodland from construction dust, or impacts on tree root protection zones which lie in the Pentir works site.
- Species mortality – direct impacts on species populations associated with mortalities due to construction activities, e.g., site clearance.
- Spread of INNS – construction methods resulting in introduction of INNS.

Embedded Mitigation

5.8.3 Mitigation measures have been incorporated into the proposed works design and how it will be constructed. Likely impacts have been assessed on this basis and opportunities to mitigate them identified with the aim of preventing or reducing impacts as much as possible. This approach provides the opportunity to prevent or reduce potential adverse impacts from the outset. Embedded mitigation has been considered when evaluating the significance of the potential effects on the relevant IEFs. The following mitigation will be secured within the site-specific CEMP, as appropriate.

5.8.4 Primary avoidance and other mitigation measures will be embedded into the proposed works to minimise construction impacts on IEF and these are presented in the following sections.

Design

5.8.5 The proposed works will avoid direct and indirect impacts to statutorily designated sites for nature conservation; the closest of which is 2.89 km south-east at its closest point.

5.8.6 No non-statutory designated sites will be directly impacted by the proposed works. Measures will be set out in the CEMP to ensure that indirect impacts from construction dust to Pentir Substation cWS (part of which contains Ancient Woodland), which directly abuts the Pentir works site, will be Negligible and not significant.

Habitat Avoidance Measures

5.8.7 The proposed works have been designed to avoid key nature conservation and ecological features present in or adjacent to the Pentir works site as far as practicable. The following minimum buffers from key habitat features are applied where practicable, for the Pentir works site excluding use of the laydown and storage area on existing hardstanding, and the use of the unmodified existing access road and car parking areas which may fall in these buffers:

- 15 m from woodlands.
- 10 m from hedgerows increasing to 15 m where there are hedgerow trees.
- 15 m from individual trees.
- A minimum of 10 m from watercourses (bank top), including dry ditches, to protect riparian habitats and to mitigate for potential hazards such as chemical and soil spills into watercourses or waterbodies, with the exception of where the existing access road crosses watercourses, as no modification of the existing crossing and road is required.

Construction Environmental Management Plan (CEMP)

5.8.8 The CEMP (**Volume 8, Appendix 2.2.A: Outline Construction Environmental Methodology Statement**) will detail the measures required to mitigate construction related effects on biodiversity, including those associated with construction dust deposition, air pollution, pollution incidents, water quality, light, noise and vibration. The implementation of the CEMP will manage the environmental effects of the proposed works and demonstrate compliance with environmental legislation.

Vegetation Clearance and Building Works

5.8.9 The Pentir works site is comprised entirely of hardstanding areas and vegetation clearance will not be required.

5.8.10 Any habitat features in such areas which may conceal sheltering reptiles and amphibians (e.g. rubble mound bunds, any other debris) will be subject to a hand search by an Ecological Clerk of Works (ECoW) and will not be dismantled during their inactive season (i.e., November to February inclusive).

Construction Lighting

5.8.11 It is anticipated that during construction, works will be restricted to daylight hours wherever practicable, to remove the need for artificial lighting, with focussed task-specific lighting provided where this is not practicable. However, task specific and fixed general lighting may be required in months with reduced daylight hours (early mornings and up to 5.30 pm for general workforce) to meet safety requirements.

5.8.12 Where lighting is required, it will conform to best practice guidelines with respect to minimising light spill into adjacent habitats and prevent disturbance to bats and other species, including Institute of Lighting Professionals Guidance Notes (in particular GN08/23 Bats and Artificial Lighting at Night (Ref 2.3) which was produced in collaboration with the Bat Conservation Trust, and GN-1: Reduction of Obtrusive Light (Ref 2.4) in so far as it is reasonably practicable. The following such measures will be taken:

- Lights installed will be of the minimum brightness and power rating capable of performing the desired function.
- Light fittings will be used that reduce the amount of light emitted above the horizontal (reduce upward lighting).
- Light fittings will be positioned correctly, inward facing and directed downwards, and away from watercourses or dry ditches.
- Direction of lights will seek to avoid spillage onto neighbouring properties, habitats, highway or waterway.

Wildlife Legislation Compliance

5.8.13 To comply with relevant wildlife legislation, pre-construction surveys, such as updated Phase 1 and badger walkovers, and bat roost assessments of any affected trees near the proposed works, will be undertaken to support the baseline findings. The purpose of these pre-construction surveys is to ensure mitigation during construction is based on the latest protected species information. These surveys will also provide an update on the presence and location of any INNS, the findings of which will inform the implementation of measures to prevent their spread into the wild and will be secured through the CEMP.

5.8.14 During construction (and maintenance), Reasonable Avoidance Measures (RAMs), including appropriate buffers (up to 30 m) around any identified badger setts, or trees with bat roost suitability (buffer of 15 m) (as detailed in Habitat Avoidance Measures) in proximity to the proposed works area will be implemented, should any be found during preconstruction surveys.

5.8.15 Implementation of measures to avoid animals being injured or killed in construction working areas, such as through the inclusion of perimeter fencing and covering excavations or providing a means of escape, will exclude them from such areas and prevent them from becoming trapped in excavations.

Construction Effects

5.8.16 **Table 5-7** provides a summary of the magnitude of impacts and likely significance of environmental effects on IEFs during the construction of the proposed works taking into account the embedded mitigation described.

5.8.17 Impacts related to air quality upon sensitive receptors, such as Ancient Woodland are detailed in **Chapter: 10 Air Quality and Emissions.**

Table 5-7 – Assessment of construction impacts and significance of effects on IEFs during construction

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes or no)
Pentir Substation cWS	County (Medium)	Habitat loss. (Temporary and permanent).	Suitably sized buffers from Pentir Substation cWS are embedded into the design of the proposed works, with no loss of cWS habitat. No incursion into the cWS Root Protection Area (RPA) will occur. The existing access road, which will remain unmodified, crosses the cWS boundary slightly, however this is due to the boundary of the cWS being drawn as a straight line over a section of the curved road and not following the edge of the road.	N/A	No effect	No
		Habitat degradation – impacts to water quality through pollution and construction works runoff. Temporary (short-term), reversible.	The only known potential connection is a ditch that passes beneath the Pentir works site (access road; water in the ditch, flowing west, was present during the 07 November 2025 survey). Standard environmental protection measures set out in the CEMP will include pollution prevention measures. Any indirect effects on this receptor would not be significant.	Low	Minor adverse	No
		Habitat degradation due to dust and other pollutants. Temporary (short-term), reversible.	Standard environmental protection measures set out in the CEMP will includes dust suppression and pollution prevention measures. **Chapter 10: Air Quality and Emissions** concludes that the construction dust effects on this receptor would be not significant.	Low	Minor adverse	No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes or no)
Near Breaker's Yard cWS	County (Medium)	Habitat loss. (Temporary and permanent).	The existing access road, will be used but not modified and comprises existing hard standing only, runs adjacent to this cWS with no incursion into the cWS.	N/A	No effect	No
		Habitat degradation – impacts to water quality through pollution and construction works runoff. Temporary (short-term), reversible.	A ditch lies beneath the existing access road, which will be used but not modified, and enters this cWS. Standard environmental protection measures set out in the CEMP will include pollution prevention measures.	Low	Minor adverse	No
		Habitat degradation due to dust and other pollutants. Temporary (short-term), reversible.	Standard environmental protection measures set out in the CEMP will includes dust suppression and pollution prevention measures. **Chapter 10: Air Quality and Emissions** concludes that the construction dust effects on this receptor would be not significant.	Low	Minor adverse	No
Other WS and cWS (as shown on **Figure 2.5.3:** Non-Statutory Sites Designated for Nature	County (Medium)	Habitat loss. (Temporary and permanent).	These remaining 33 non-statutory designated sites all lie outside the Pentir works site. The closest is Coed Ty'n-llwyn cWS, which is approximately 130 m south-east. There will be no direct habitat loss in these non-statutory sites due to the proposed works.	N/A – No impact	No effect	No
		Habitat degradation – impacts to water quality through	There are no known hydrological connections between the Pentir works site and the majority of these WS or cWS via the natural drainage	Very low	Negligible	No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes or no)
Conservation in 2 km)		pollution and construction works run off. Temporary (short term), reversible.	network. The only known potential connection is a ditch that passes beneath the Pentir works site (access road); water in the ditch, flowing west, was present during the 07 November 2024 survey. Standard environmental protection measures set out in the CEMP will include pollution prevention measures.			
		Habitat degradation due to dust and other pollutants. Temporary (short term), reversible.	Standard environmental protection measures set out in the CEMP will include dust suppression and pollution prevention measures. **Chapter 10: Air Quality and Emissions** concludes that the construction dust effects on these receptors would be not significant.	Very low	Negligible	No
Ancient Woodland Semi-natural woodland (broad-leaved and mixed), including HoPI Planted broadleaved and planted mixed woodland	County (Medium) Up to County (Medium)	Habitat loss. (Temporary and permanent).	Suitably sized buffers from such habitats are embedded into the design of the proposed works, with no loss of semi-natural broadleaved or mixed woodland required. No incursion into the woodland RPA is anticipated. The existing access road which will remain unmodified, does fall in the buffers and lies adjacent to these habitats.	N/A – No impact	No effect	No
	Local (Low)	Habitat degradation due to dust and other pollutants. Temporary (short-term), reversible.	Standard environmental protection measures set out in the CEMP includes dust suppression and pollution prevention measures. **Chapter 10: Air Quality and Emissions** concludes that the construction dust effects on these receptors would be not significant.	Low	Minor adverse	No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes or no)
		Habitat degradation – impacts to water quality through pollution and construction works run off. Temporary (short-term), reversible.	There are no known hydrological connections between the Pentir works site and these HoPI via the natural drainage network; the only known potential connection is a wet ditch that passes beneath the access road which will remain unmodified. Standard environmental protection measures set out in the CEMP includes pollution prevention measures.	Very low	Negligible	No
		Habitat degradation due to dust and other pollutants. Temporary (short-term), reversible.	Standard environmental protection measures set out in the CEMP will include dust suppression and pollution prevention measures. **Chapter 10: Air Quality and Emissions** concludes that the construction dust effects on this receptor would be not significant.	Very low	Negligible	No
Hedgerows	Up to County (Medium)	Habitat degradation due to dust and other pollutants. Temporary (short term), reversible.	Standard environmental protection measures set out in the CEMP will include dust suppression and pollution prevention measures. **Chapter 10: Air Quality and Emissions** concludes that the construction dust effects on this receptor would be not significant.	Very low	Negligible	No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes or no)
Running water, including wet ditches	Wet ditches or drains (smaller watercourses) – Local (Low)	Habitat degradation due to construction pollution or siltation. Temporary (short term), reversible.	No works will be undertaken within at least 10 m of watercourses which is considered sufficient to mitigate for potential hazards such as chemical and soil spills to avoid potential direct impacts to watercourses. Standard pollution prevention measures will be implemented and adopted during construction, set out in the CEMP. This would prevent effects as a result of construction traffic utilising the existing access road.	Low	Minor adverse	No
Protected or notable terrestrial invertebrates	Local (Low)	Degradation of habitat for invertebrates due to dust and other pollutants. Temporary (short term), reversible.	Standard environmental protection measures set out in the CEMP will include dust suppression and pollution prevention measures to prevent effects on habitats potentially utilised by protected or notable invertebrates.	Very low	Negligible	No
Breeding and non-breeding birds	Local (Low)	Disturbance due to noise or visual. Temporary (short term), reversible.	Best practice construction methods as set out in the CEMP includes implementation of measures to minimise noise and visual disturbance to breeding and non-breeding birds.	Low	Minor adverse	No
Bats	Up to County (Medium) Importance for Myotis sp. and lesser horseshoe bat and Local	Direct loss of roosts through tree removal, which could result in injuring or killing bats. (Permanent).	The proposed works avoid direct impacts to trees or buildings with bat roost suitability and these features will be retained. The Pentir works site (comprising existing hardstanding and infrastructure) is unsuitable for roosting bats. No existing buildings will be lost.	N/A – No impact	No effect	No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes or no)
	Importance for other species	Disturbance to roosting bats due to construction noise or lighting. Temporary (short term) reversible.	A minimum of 15 m stand-off buffers will be applied to retained trees (located outside the Pentir works site) to limit the potential for disturbance to roosting bats which may be present. The existing access road which will remain unmodified, falls in the buffers and lies adjacent to retained trees and woodland, however it is already used for access to the existing Pentir substation and is unlikely to increase disturbance to a significant effect. During construction, works will be restricted to daylight hours wherever practicable to remove the need for artificial lighting, with focussed task specific lighting provided where this is not possible. Where lighting is required, it will conform to best practice guidelines (Ref 2.3 and Ref 2.4) with respect to minimising light spill into adjacent habitats and preventing disturbance to bats and other species. Such measures will be set out in the CEMP.	Low	Minor adverse	No
		Loss or severance of foraging or commuting habitat (e.g., hedgerows, watercourses, grasslands). (Temporary and permanent).	The proposed works design avoids impacts upon hedgerows and other boundary features, and woodland edges which will retain connectivity across and around the Pentir works site for commuting and foraging bats. The Pentir works site (comprising existing hardstanding) is suboptimal for foraging and commuting bats.	N/A – No impact	No effect	No
Badger	Local (Low)	Damage to active badger setts.	No setts are present in the Pentir works site, and no active setts have been found within 30	N/A – No impact	No effect	No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes or no)
		(Temporary and permanent).	m of the boundary of the Pentir works site. A disused sett was noted in the wider area; however, would not be affected. A pre-construction badger survey will be undertaken to determine whether baseline conditions remain the same as recorded in November 2024. If an active badger sett was at risk of being disturbed or destroyed then a Natural Resources Wales licence would be required, and mitigation measures would be updated accordingly. A minimum of 30 m stand-off buffer would be applied to active badger setts (located outside the Pentir works site) to limit the potential for damage to sett tunnels and disturbance of badgers, should they be present.			
		Species mortality. (Permanent).	Measures will be implemented to avoid animals being injured or killed in construction working areas, through excluding them from such areas and preventing them from becoming trapped in excavations. The perimeter fence of the existing substation prevents badgers entering. Vehicles using the existing access road will be subject to appropriate speed restrictions. This will be set out in the CEMP.	Very Low	Negligible	No
Otter	District (Medium)	Disturbance to commuting, resting or foraging otter through	During construction, works will be restricted to daylight hours wherever practicable to remove the need for artificial lighting, with focussed task specific lighting provided where this is not possible. Where lighting is required, it will	Low	Minor adverse	No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes or no)
		construction noise, visual, or lighting. Temporary (short term), reversible	conform to best practice guidelines (Ref 2.3 and Ref 2.4) with respect to minimising light spill into adjacent habitats and prevent disturbance to otter and other species and set out in the CEMP.			
		Habitat degradation – impacts to water quality through pollution of watercourses. Temporary (short term), reversible.	No works will be undertaken within at least 10 m of watercourses which is sufficient to mitigate for potential hazards such as chemical and soils spills to avoid potential direct impacts to watercourses. Standard pollution prevention measures will be implemented and adopted during construction and set out in the CEMP. This would prevent effects from construction traffic using the existing access road.	Very low	Negligible	No
Great crested newt	District (Medium)	Loss or fragmentation of terrestrial and aquatic habitats used by GCN	The proposed works avoid aquatic habitats with suitability for GCN. The Pentir works site (comprising existing hardstanding) is suboptimal terrestrial for great crested newt, and better habitat is available for GCN in the wider area which will remain unaffected. GCN are unlikely to be present as no records are noted, and only one pond lies in 500 m which was only recently created as a balancing pond. A preconstruction eDNA survey was undertaken on this pond in April 2025 to confirm GCN presence or likely absence, as it would have more time to develop prior to construction. The eDNA survey returned a	Very low	Negligible	No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes or no)
			negative result, indicating GCN absence at the time of the survey.			
Other mammals (hedgehog, brown hare, polecat)	Local (Low)	Habitat loss or fragmentation. (Temporary and permanent).	The proposed works retains and avoids habitats of value to mammals, including woodland, grassland margins, ditches, scrub and hedgerows. The Pentir works site (comprising existing hardstanding) is suboptimal for mammals.	N/A – No impact	No effect	No
		Incidental killing, injury or disturbance Temporary (short-term), reversible.	Measures will be implemented to avoid animals being injured or killed in construction working areas, through excluding them from such areas and preventing them from becoming trapped in excavations. If excavations are required to be left open overnight, ramps will be provided to allow animals a means of escape. Such measures will be set out in the CEMP.	Very low	Negligible	No
Reptiles and common amphibians	Local (Low)	Loss or fragmentation of terrestrial and aquatic habitats used by reptiles and amphibians for foraging, breeding, or shelter. Temporary (short-term), reversible.	The proposed works avoids aquatic habitats of value to reptiles and amphibians as well as optimal terrestrial habitat. The Pentir works site (comprising existing hardstanding) is suboptimal for reptiles and amphibians, although reptiles could bask on hardstanding.	Very low	Negligible	No
		Incidental killing, injury or	The hardstanding affected by the proposed works is of low value to reptiles and	Very low	Negligible	No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes or no)
		disturbance of reptiles and amphibians present in habitats in the Pentir works site. Temporary (short-term), reversible.	amphibians. Any habitat features in such areas which may conceal sheltering reptiles and amphibians (e.g., log piles, rubble mound bunds, any other debris) will not be dismantled during their inactive season (i.e., November to February inclusive). Such measures will be set out in the CEMP. In addition, inspections of the ground would be undertaken prior to working to ensure no reptiles were basking.			
Aquatic macroinvertebrates	Local (Low)	Habitat degradation and disturbance - impacts to water quality through pollution spills or surface run-off, leading to mortality of aquatic species. Temporary (short-term), reversible	The Pentir works site, where temporary land take is required, is hardstanding and unsuitable for aquatic species. There is a low risk that proposed construction works will impact watercourses within 2 km of the Pentir works site causing incidental mortality of associated protected species. No works will be undertaken in at least 10 m of watercourses which is sufficient to mitigate for potential hazards such as chemical and soil spills to avoid potential direct impacts to watercourses. Standard environmental protection measures will be provided in the CEMP (**Volume 8, Appendix 2.2.A: Outline Construction Environmental Management Plan**), and will be implemented as described above.	Low	Minor, adverse	No
Aquatic macrophytes	Local (Low)			Low	Minor, adverse	No
Fish	National (High)			Low	Minor, adverse	No

5.9 Mitigation and Residual Effects

Additional Mitigation

5.9.1 No additional mitigation measures have been recommended over and above the application of embedded mitigation measures described in paragraphs 5.8.3 - 5.8.15.

Monitoring

Pre-Construction

5.9.2 Pre-construction surveys will be carried out during the appropriate seasons prior to the construction of the proposed works. These will inform detailed design where needed, provide up to date status of protected species that require mitigation, and inform any protected species licensing that may be required should species distribution change or detailed design result in licensing requirements for species such as bats, badger or otter, which are currently not anticipated to be necessary.

Construction

5.9.3 Ongoing monitoring of habitats and species will be carried out throughout construction of the proposed works, overseen by an appointed ECoW with suitable experience. The ECoW will have the authority to review RAMS, oversee works and recommend action as appropriate, including temporarily stopping works where necessary to safeguard protected species and their habitats, or where any other breaches of environmental legislation could occur.

Residual Effects

5.9.4 With the implementation of suitable embedded mitigation (as detailed in paragraphs 5.8.3 - 5.8.15), the assessment of effects on the IEFs has concluded that the construction of the proposed works are unlikely to result in significant adverse effects to identified species, habitats and designated sites. No additional mitigation is required, and the residual effects remain the same as the likely effects presented in **Table 5-7.**

5.10 Summary

5.10.1 As the entirety of the proposed works will be confined to the existing hardstanding area of the Pentir works site, significant effects on IEFs are not anticipated.

6. Historic Environment

6.1 Introduction

6.1.1 This chapter presents an assessment of the likely Historic Environment effects that could arise from the construction of the proposed works as described in **Chapter 2: Pentir Substation Works**.

6.1.2 This chapter describes the baseline conditions currently existing in the Study Area (as defined in **Section 6.3**) and the scope of the assessment.

6.1.3 This chapter is supported by appendices as listed below:

- **Volume 8, Appendix 1.1.A: Legislation, Policy and Guidance.**
- **Volume 8, Appendix 2.6.A: Historic Environment Desk Based Assessment.**
- **Volume 8, Appendix 2.6.B: Gazetteer of Historic Assets and Archaeological Investigations.**

6.2 Legislation and Planning Policy

6.2.1 This section sets out the legislation and planning policy framework that is relevant to the Historic Environment assessment. Details are in **Volume 8, Appendix 1.1.A: Legislation, Policy and Guidance.**

Legislation

6.2.2 The following legislation is relevant to Historic Environment:

- Ancient Monuments and Archaeological Areas Act 1979 (Ref 6.1).
- Historic Environment (Wales) Act 2023 (Ref 6.2) and relevant regulations.
- Planning (Listed Buildings and Conservation Areas) Act 1990 (Ref 6.3).

National Policy

6.2.3 The following national policy is relevant to Historic Environment:

- Future Wales: The National Plan to 2040 (Ref 4.3).
- PPW – Edition 12 (Ref 4.4).
- TAN 24: The Historic Environment (Ref 6.4).
- Conservation Principles for the sustainable management of the Historic Environment in Wales (Ref 6.5).

Local Policy

6.2.4 The following local policy is relevant to Historic Environment:

- Anglesey and Gwynedd Joint Local Development Plan 2011 – 2026 (Ref 4.9).
- World Heritage Convention (Ref 6.6).

Guidance

6.2.5 The following guidance is relevant to Historic Environment:

- Conservation Principles for the sustainable management of the Historic Environment in Wales (Ref 6.5).
- Heritage Impact Assessment in Wales (Ref 6.7).
- Setting of Historic Assets in Wales (Ref 6.8).
- Managing Change to Listed Buildings in Wales (Ref 6.9).
- Managing Change to Registered Historic Parks and Gardens in Wales (Ref 6.10).
- Managing Conservation Areas in Wales (Ref 6.11).
- Managing Historic Character in Wales (Ref 6.12).
- Managing Lists of Historic Assets of Special Local Interest (Ref 6.13).
- Chartered Institute for Archaeologists (2020) Standard and guidance for historic environment desk-based assessment (Ref 6.14).

6.3 Study Area

Designated Historic Assets

6.3.1 The settings of designated assets of the highest value (i.e., World Heritage Sites, scheduled monuments, Grade I and II* listed buildings, Registered Parks and Gardens and Conservation Areas containing a number of assets of the highest value) will be considered up to 3 km from the Pentir works site. The proposed works have the potential to result in long-term change to the settings of designated assets, some of which may be located at distance from the Pentir works site (refer to **Figure 2.6.A.1 in Volume 8, Appendix 2.6.A: Historic Environment Desk Based Assessment**).

Non-designated Historic Assets

6.3.2 A Study Area of 500 m from the Pentir works site has been defined to provide historical and archaeological context and to identify non-designated assets with the potential to be affected by the proposed works (refer to **Figure 2.6.A.2 in Volume 8, Appendix 2.6.A: Historic Environment Desk Based Assessment**). This Study Area will allow for non-designated heritage assets to be set in their wider context and allow for the assessment of archaeological potential in the Pentir works site.

6.4 Assumptions and Limitations

6.4.1 The current assessment examines possible physical and setting impacts resulting from the proposed works during the construction phase.

6.5 Baseline

6.5.1 A detailed baseline is set out in **Volume 8, Appendix 2.6.A: Historic Environment Desk-based Assessment.** The Desk Based Assessment (DBA) sets out a chronological narrative of known assets and assesses the potential for unknown heritage assets to be present in the Pentir works site.

6.5.2 All historic assets (the designated assets and non-designated assets) were scoped out of further assessment in the baseline study (see **Volume 8, Appendix 2.6.A: Historic Environment Desk-based Assessment**) due to the lack of potential for impacts resulting from the proposed work at Pentir.

Future Baseline

6.5.3 This section considers any changes to the baseline conditions described above that might occur over the lifespan of the proposed works, but in the absence of the proposed works (i.e. if the works did not take place).

Existing Baseline (2024)

6.5.4 Based on available information, there are no reasons to expect that there would be any marked change in the historic environment baseline in the absence of the proposed works. Land-uses in the Pentir works site would remain as they are currently which would retain the existing settings of built historic assets and impacts to below ground archaeological remains would be minimal and limited to taphonomic processes (i.e. erosion, degradation, corrosion etc.).

Future Baseline

6.5.5 This assessment of future baseline conditions recognises that below ground archaeological remains reach an equilibrium with their environment and tend to not experience noticeable change, unless their environment changes as a result of human or natural intervention. Similarly, it is recognised that for above ground historic assets, there may be some decay over time in the absence of the proposed works as they near the natural end of their design lifespan. It is not likely that significant numbers of historic assets will be added to the baseline during the future baseline scenario. The future baseline is unlikely therefore to undergo significant change.

6.6 Consultation and Scope of Assessment

6.6.1 This section describes the scope of the assessment of effects on the Historic Environment.

Consultation

Table 6-1 – Consultation responses in response to Historic Environment

Consultee	Date and nature of consultation	Summary of response	How and where addressed
Senior Archaeologist Heneb	11 September 2024. Email correspondence.	AECOM sent an email to Heneb requesting feedback regarding the Study Areas to be used in the DBA and ES, and if a Written Statement of Investigation (WSI) was required in advance of Historic Environment Record (HER) data request.	The DBA (**Volume 8, Appendix 2.6.A: Historic Environment Desk-based Assessment**) of the ES has been carried out in accordance with a WSI agreed with Heneb. The DBA's Study Area has been agreed with Heneb.

HER Officer Heneb	11 September 2024. Email correspondence.	A data request for HER data in the Pentir works site and in 500 m of the Pentir works site was requested.	HER data received from Heneb was used in the DBA assessment (**Volume 8, Appendix 2.6.A: Historic Environment Desk-based Assessment**) and to support the ES.

Scope of the Assessment

6.6.2 The assessment considered in this chapter of the ES is as follows:

- Physical impacts to below ground archaeological remains during the construction phase of the proposed works.
- Changes to the setting of assets as a result of the proposed works during the construction phase of the proposed works.

6.6.3 This chapter focuses solely on the historic environment and assesses potential impacts as a result of the proposed works.

6.6.4 The Pentir works site is in the administrative boundary of Gwynedd Council.

6.6.5 **Table 6-2** summarises the potential Historic Environment receptors that have been reviewed and states whether they have been included or excluded from the Historic Environment assessment.

Table 6-2 – Scope of Historic Environment assessment

Receptor	Scoped in/out	Justification
World Heritage Site	Out	There is no intervisibility between the Pentir works site and the asset, and the proposed works would not result in changes to the setting of the asset, or impact on the attributes of outstanding universal value of the asset.
Scheduled Monuments	Out	There would be no intervisibility between the Pentir works site and the assets, and the proposed works would not result in changes to the setting of the assets.
Listed Buildings	Out	There would be no intervisibility between the Pentir works site and listed buildings, and the proposed works would not result in changes to the setting of the assets.
Unknown archaeological remains	Out	Negligible potential to impact unknown archaeological remains. The proposed works are in the existing Pentir substation where potential unrecorded buried archaeological remains would already have been removed.

6.7 Summary

6.7.1 All assessment of historic environment effects has been scoped out of this Volume of the ES due to there being no intervisibility between the World Heritage Site, Scheduled

Monuments and Listed Buildings and the proposed works, and a negligible potential to impact unknown archaeological remains, with significant effects unlikely to occur.

7. Geology, Hydrogeology, Land Use and Agriculture (Soils)

7.1 Introduction

7.1.1 This chapter presents an assessment of the likely Geology, Hydrogeology, Land Use and Agriculture (Soils) effects that could arise from the construction of the works at Pentir as described in **Chapter 2: Pentir Substation Works**.

7.1.2 This chapter describes the baseline conditions currently existing in the Study Area (as defined in **Section 7.3**), the scope of the assessment, the potential effects, the mitigation measures required to prevent, reduce or offset any significant negative effects, and the likely residual effects after these mitigation measures have been adopted.

7.1.3 This chapter is supported by a number of figures and appendices as listed here:

- **Figure 2.7.1:** Made Ground and Superficial Geology.
- **Figure 2.7.2:** Bedrock Geology.
- **Figure 2.7.3:** Hydrogeology.
- **Figure 2.7.4:** Groundwater Vulnerability.
- **Figure 2.7.5:** Potential Sources of Contamination.
- **Figure 2.7.6:** Historic Potential Sources of Contamination
- **Figure 2.7.7:** Mining, Quarrying and Mineral Resources.
- **Volume 8, Appendix 1.1.A: Legislation, Policy and Guidance.**
- **Volume 8, Appendix 1.4.A: Topic Assessment Methodology.**
- **Volume 8, Appendix 2.7.A: Initial Conceptual Site Model and Risk Assessment.**

7.1.4 Other chapters that are useful to review in association with this chapter are as follows:

- **Chapter 8: Water Quality, Resources and Flood Risk** (which covers surface water and hydrology)**.**

7.2 Legislation and Planning Policy

7.2.1 This section summarises the legislation and planning policy framework that is relevant to Geology, Hydrogeology, Land Use and Agriculture (Soils) assessment. Details are in **Volume 8, Appendix 1.1.A: Legislation, Policy and Guidance.**

Legislation

7.2.2 The following legislation is relevant to Geology, Hydrogeology, Land Use and Agriculture (Soils):

- The Environment Act 2021 (Ref 4.2).
- The Environmental Protection Act 1990 and Part IIA (the Contaminated Land Regime) (Ref 7.1).
- 2017 TCP EIA Regulations (Ref 3.1).
- The Water Act 2003 (Ref 7.2).
- The Environment Act 1995 (Ref 7.3).
- The Water Resources Act 1991 (as amended) (Ref 7.4).
- The Land Drainage Act 1991 (as amended) (Ref 7.5).
- The Building Act 1984 and the Building (Amendment) Regulations 2016 (Ref 7.6).
- The Water Environment (Water Framework Directive (WFD)) (England and Wales) Regulations 2017 (Ref 5.13).
- Groundwater (England and Wales) Regulations 2009 (Ref 7.7).
- The Private Water Supplies (Wales) Regulations 2017 (Ref 7.8).
- The Environmental Permitting (England and Wales) Regulations 2016 (Ref 7.9).
- The Environmental Damage (Prevention and Remediation) (Wales) Regulations 2015 (Ref 7.10).
- Contaminated Land (Wales) Regulations 2006 (Ref 7.11).
- Hazardous Waste (England and Wales) (Amendment) Regulations 2016 (Ref 7.12).
- Anti-Pollution Works Regulations 1999 (Ref 7.13).
- Control of Asbestos Regulations 2012 (Ref 7.14).
- Construction Design Management Regulations 2015 (Ref 7.16).

National Policy

7.2.3 The following national policy is relevant to Geology, Hydrogeology, Land Use and Agriculture (Soils):

- PPW – Edition 12 (Ref 4.4).
- Future Wales: The National Plan 2040 (Ref 4.3).

Local Policy

7.2.4 The following local policy is relevant to Geology, Hydrogeology, Land Use and Agriculture (Soils):

- Anglesey and Gwynedd Joint Local Development Plan 2011 – 2026 (Ref 4.9).

Guidance

7.2.5 The following guidance is relevant to Geology, Hydrogeology, Land Use and Agriculture (Soils):

- Contaminated Land Statutory Guidance for Wales (Ref 7.16).

- Environment Agency's online guidance for the management of land contamination 'Land Contamination Risk Management' (Ref 7.17).
- National House Building Council, Environment Agency, Chartered Institute of Environmental Health report R&D Publication 66 'Guidance for the Safe Development of Housing on Land Affected by Contamination' (Ref 7.18).
- CIRIA C552 'Contaminated Land Risk Assessment – A Guide to Good Practice' (Ref 7.19).
- Welsh Local Government Association (WLGA), Welsh Land Contamination Working Group: 'The Development of Land Affected by Contamination: A Guide for Developers' (Ref 7.20).
- British Standard (BS) 10175 (2011 + A2:2017), 'Investigation of Potentially Contaminated Sites - Code of Practice' (Ref 7.21).
- BS 5930 (2015 + A1:2020), 'Code of practice for Site Investigations' (Ref 7.22).
- BS 8576 (2013), 'Guidance on Investigations for Ground Gas. Permanent Gases and Volatile Organic Compounds (VOCs)' (Ref 7.23).
- CIRIA C811 (2015), 'Environmental Good Practice On Site Guide'. 5th edition. (Ref 7.24).
- BS 8485 (2015+A1:2019), 'Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings' (Ref 7.25).
- CIRIA C665 (2007), 'Assessing Risks Posed by Hazardous Ground Gases to Buildings' (Ref 7.26).
- Design Manual for Roads and Bridges (DMRB), 'LA 109 Geology and Soils' (2019) (Ref 7.27).
- DMRB, 'LA 104 Environmental Assessment and Monitoring' (2020) (Ref 7.28).
- DMRB, 'LA 113 Road Drainage and the Water Environment' (2020) (Ref 7.29).
- CL:AIRE, 'Definition of Waste: Development Industry Code of Practice' (2011) (Ref 7.30).
- Ministry of Agriculture, Fisheries and Food, Agricultural Land Classification 1988 (Ref 7.31).
- Defra, Construction Code of Practice for the Sustainable Use of Soils on Construction Sites 2009 (Ref 7.32).
- Institute of Environmental Management and Assessment (IEMA)[3], A New Perspective on Land and Soil in EIA 2022 (Ref 7.33).
- Institute of Quarrying, Good Practice Guide for Handling Soils in Mineral Workings 2021 (Ref 7.34).
- Welsh Assembly Government, TAN 6: Planning for Sustainable Rural Communities 2010 (Ref 7.35).

[3] The Institute of Environmental Management and Assessment (IEMA) changed its name to the Institute of Sustainability and Environmental Professionals on 17 July 2025. At the time of writing, guidance was still IEMA branded and will be referred to throughout this volume.

- Welsh Assembly Government, The Code of Good Agricultural Practice for the Protection of Water, Soil and Air for Wales No. 20 2011 (Ref 7.36).
- British Society of Soil Science, Guidance Document 3 Working with Soil Guidance Note on Benefitting from Soil Management in Development and Construction 2022 (Ref 7.37).

7.3 Study Area

7.3.1 The Study Area for this assessment is the area over which the potential direct and indirect effects of the proposed works are predicted to occur during the construction.

7.3.2 The direct effects on geology and hydrogeology are those that may arise during construction.

7.3.3 The indirect effects involve disturbing the ground in such a way that contaminant linkages (source-pathway-receptor) are created, for example, introducing a new pathway allowing potentially contaminated dusts, during construction, to migrate offsite to nearby residential or commercial properties.

7.3.4 The Study Area for geology and hydrogeology is the entirety of the ground in the Pentir works site (**Figure 2.7.1**), along with a buffer extending to 250 m around the Pentir works site to identify potential off-site sources of contamination to inform the baseline condition in and adjacent to the proposed works, including temporary works. With regards to groundwater abstractions and Source Protection Zones (SPZs) the Study Area includes a buffer extending 1 km beyond the Pentir works site.

7.3.5 Impacts from the proposed works on geological features and sites and mineral safeguarding and preferred areas will typically occur directly within the Pentir works site where construction activities and temporary works would take place or interface directly with these receptors. However, for the purposes of determining the wider geological context, geodiversity and to support the conceptual understanding of the ground model, the geological features and sites and minerals baseline will consider an extended 250 m Study Area from the Pentir works site.

7.3.6 Impacts to soils in relation to agricultural land typically occur only on the land directly impacted by the proposed works, including land used for access and compounds. A wider Study Area is not applied when describing and considering agricultural soils unless stripped soil is transported off-site.

7.3.7 These Study Areas are appropriate for the assessment of Geology, Hydrogeology, Land Use and Agriculture (Soils) in accordance with methodology set out in the DMRB LA 109 Geology and Soils (Ref 7.27). The Study Area distance has been used to identify potential receptors such as designated sites as well as identifying sources such as landfills. The environmental datasets obtained include a 250 m, 500 m and 1 km (for water abstractions) buffer for the Pentir works site. The Study Areas are also based on professional judgement by competent experts with relevant and appropriate experience of assessing land contamination.

7.4 Assumptions and Limitations

7.4.1 The assessment presented in this chapter reflects the information obtained and evaluated at the time of reporting (October 2024 to March 2025), and has referenced published data, records and web-based information obtained to date.

7.4.2 The baseline presented is based on data gathered through desktop research.

7.4.3 The assessment includes consideration of the construction of the proposed works and is based upon the design information in **Chapter 2: Pentir Substation Works**.

7.4.4 This assessment has been undertaken considering all proposed activities are confined wholly within the boundaries of the Pentir substation, specifically within existing hardstanding areas. The proposed works will be accessed via the existing Pentir substation access road, which will not require any modifications from its current condition.

7.4.5 A geotechnical and geo-environmental ground investigation will be undertaken to inform the detailed design of the proposed works. This is a commitment which will be captured in the CEMP (**Volume 8, Appendix 2.2.A: Outline Construction Environmental Management Plan**).

7.5 Baseline

7.5.1 The following section provides a summary of the existing ground conditions in the respective subtopic Study Area for the Pentir works site. The information is presented based on the division of significant sources and receptors. Generally, the baseline conditions presented refer to sources and receptors in the Pentir works site; however, relevant significant sources and receptors identified that are outside of the Pentir works site that may affect or be affected by the proposed works, are also identified in the baseline.

Data Sources

7.5.2 The known or predicted current and future baseline environment described in this section has been informed by the following data sources:

- British Geological Survey (BGS) 1:50,000 mapping Sheet 106 Bangor (Ref 7.38).
- BGS 1:10,000 mapping, SH56NE (Ref 7.39).
- Geological Memoirs Geology of the country around Bangor 1985 (Ref 7.40).
- BGS GeoIndex Online Mapping Service (Ref 7.41).
- Groundsure Free Data Viewer (Ref 7.42).
- Welsh Government (Data Map Wales) for geological SSSI, Geological Conservation Review (GCR) sites, Regionally Important Geodiversity Sites (RIGS), SPZ and Licensed Water Abstractions (Ref 7.43).
- Unexploded Ordnance (UXO) Risk Map Risk Maps | Zetica UXO (Ref 7.44).
- Mineral Safeguarding Areas (MSA) GIS data from Gwynedd Council received 31 May 2024 (Ref 7.45).
- Mining Remediation Authority Map Viewer (Ref 7.46).
- Private Water Abstraction Record from Gwynedd Council received 26 November 2024 (Ref 7.47).
- Potential Land Contamination Points from Gwynedd Council received 23 January 2025 (Ref 7.48).
- Defra MAGIC maps (Ref 7.49).

- Natural Resource Wales (NRW), LANDMAP (Ref 7.50).
- Data Map Wales (Ref 7.43) Groundsure Enviro, Geo and Map Insight data referenced GSIP-2024-16474-21178 and 21179 (provided as GIS data on 21 November 2024) (Ref 7.51).

Geology

Published Records

7.5.3 The published 1:50,000 scale geological map of the area Sheet 106 – Bangor (Ref 7.38), 1:10,000 SH56NE (Ref 7.39) and GIS data sourced from the BGS online (Ref 7.41) indicate the Pentir works site is underlain by the geological succession summarised in **Table 7-1** and shown on **Figures 2.7.1** and **Figure 2.7.2**.

Table 7-1 – Geological succession across the Pentir works site and 250 m Study Area

Age	Group	Geological stratum
Quaternary period (116 thousand and 11.8 thousand years ago)	Superficial deposits	Alluvium (across the central and southern-most spur of the Pentir works site and Study Area). Till (across the remainder of the Pentir works site and Study Area, also potentially underlying the alluvium). Peat (off-site, approximately 180 m north-west of the Pentir works site).
Cambrian period (526 million and 508 million years ago)	Bedrock	Minffordd Formation – Sandstone and Conglomerate interbedded (across the whole of the Pentir works site and majority of the Study Area). Padarn Tuff Formation – Tuff, Felsic (off-site, approximately 185 m south-west of the Pentir works site).

Artificial Deposits

7.5.4 Artificial Deposits (Made Ground) are not mapped within the Pentir works site. However, it is expected to be present in the area of the existing Pentir substation and access road currently in the Pentir works site.

Superficial Deposits – Alluvium

7.5.5 Alluvium, consisting of clay, silt, sand and gravel is presented on the BGS Geoindex (Ref 7.41) in the central and southern tip of the Pentir works site.

Superficial Deposits – Till

7.5.6 Devensian Till deposits are recorded to underlie the Pentir works site and Study Area. Till is unsorted and unstratified drift, generally over consolidated, deposited directly by and underneath a glacier without subsequent reworking by water from the glacier. It consists of a heterogenous mixture of clay, sand, gravel, and boulders varying widely in size and shape (diamicton).

Superficial Deposits – Peat

7.5.7 Peat is present approximately 180 m north-west of the Pentir works site. Peat is a partially decomposed mass of semi-carbonized vegetation which has grown under waterlogged, anaerobic conditions, usually in bogs or swamps.

Bedrock Geology – Minffordd Formation

7.5.8 Minffordd Formation – Sandstone and Conglomerate interbedded. These sedimentary rocks are shallow-marine in origin. They are detrital, ranging from coarse- to fine-grained (locally with some carbonate content) forming interbedded sequences.

Bedrock Geology – Padarn Tuff Formation

7.5.9 Padarn Tuff Formation – Tuff, Felsic is approximately 185 m south-west of the Pentir works site. This is described by the BGS as *'strongly welded rhyolitic ash-flow tuffs with abundant phenocrysts of quartz and sodic plagioclase, subordinate air-fall tuffs and rhyolite lavas.'*

Faults & Linear Features

7.5.10 The published 1:50,000 scale geological map of the area (Ref 7.38) indicates there are no faults or linear features in 250 m of the Pentir works site.

Historical BGS Borehole Logs

7.5.11 There are historical borehole logs on the BGS GeoIndex viewer (Ref 7.41) in the Pentir works site and Study Area. However, these records are private and confidential and, therefore, have not been reviewed.

Ground Stability

7.5.12 The following information relating to ground stability is provided in the Groundsure report (Ref 7.51) for the Pentir works site:

- Collapsible Ground Stability:
  - The majority of the Pentir works site is classified as Class B, *'deposits with potential to collapse when loaded and saturated are unlikely to be present.'*
  - The alluvium superficial deposits are classified as Class A, *'deposits with potential to collapse when loaded and saturated are believed not to be present.'*
- Compressible Ground Stability:
  - The majority of the Pentir works site is classified as Class A, *'compressible strata are not thought to occur.'*
  - The alluvium superficial deposits are classified as Class D, *'compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.'*
- Ground Dissolution Stability:
  - The entire Pentir works site is classified as Class A, *'soluble rocks are either not thought to be present within the ground, or not prone to dissolution. Dissolution features are unlikely to be present.'*
- Landslide Ground Stability:
  - The entire Pentir works site is classified as Class B, *'slope instability problems are not likely to occur but consideration to potential problems of adjacent areas impacting on the site should always be considered.'*
- Running Sand Ground Stability:

- The majority of the Pentir works site is classified as Class B, *'running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.'*
- The alluvium superficial deposits are classified as Class C, *'running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.'*

- Shrinking or Swelling Clay Ground Stability:
  - The majority of the Pentir works site is classified as Class A, *'ground conditions predominantly non-plastic.'*
  - The alluvium superficial deposits are classified as Class B, *'ground conditions predominantly low plasticity.'*

Soils

7.5.13 The existing Pentir substation sits in slowly permeable, wet, very acidic upland soils with a peaty surface over soils of humose loamy texture. Some soils are capable of improvement to grassland but most only support rough grazing of low or moderate grazing value.

Sites Designated for Geodiversity Interest

7.5.14 According to the NRW LANDMAP (Ref 7.50), the overall valuation of the Geological Landscape Aspect Area, where the Pentir works site is, is 'Moderate' defined as '*An overall rating of 'Moderate' is appropriate where the Aspect Area concerned is not known to include any exceptional or notable features, although it may still be 'representative' of its underlying geology or surface geomorphology.*'

7.5.15 A review of currently available information on Data Map Wales (Ref 7.43) did not identify any specific sites of interest, including geological SSSI, GCR sites or RIGS in the Pentir works site or in the 250 m Study Area.

Mineral Safeguarding Areas

7.5.16 The Joint Local Development Plan 2017 (Ref 4.9) indicates that *'Safeguarding policies will be required to ensure that mineral resources which may be needed at some time in future are not sterilised by other forms of development, without consideration of that need. A decision to safeguard a particular mineral resource does not imply that planning permission will be granted for its working. The method of identification of the MSA will need to be explained and justified and the MSA's shown on the Proposals Maps.'*

7.5.17 Paragraph 5.14.7 of PPW (Ref 4.4) states that; '*It is important that access to mineral resources, including secondary, recycled and marine dredged materials, which society may need, as well as the minerals related infrastructure to deliver this need, is safeguarded in order to prevent sterilisation by other forms of permanent development. Planning authorities should consider the long term and the need for preventative action to avoid the creation of problems in the future. Safeguarding does not indicate an acceptance of mineral working, but that the location and quality of the mineral is known and that the environmental constraints associated with extraction, including the potential for extraction of mineral resources prior to undertaking other forms of development, have been considered.'*

7.5.18 According to MSA GIS data (provided by Gwynedd Council on 31 May 2024) (Ref 7.45), there is an MSA for sand and gravel approximately 205 m south-east of the Pentir works site. There are no MSA present across the Pentir works site itself.

7.5.19 According to the Joint Local Development Plan 2017 Proposals Map (Ref 4.9), there are no sand and gravel preferred areas in the Pentir works site or 250 m Study Area.

Historical and Current Mineral Surface Ground Workings, Underground Workings and Coal and Non-Coal Mining

7.5.20 No historical and current mineral surface ground workings or underground workings were recorded by Groundsure either in the Pentir works site or 250 m Study Area.

Non-Coal Mining

7.5.21 The Pentir works site and 250 m Study Area has been mapped as a Class B non-coal mining area for Vein Mineral. This class consists of areas where '*Underground mine workings may have occurred in the past or current mines may be working at significant depth to modern engineering standards. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.*'

Coal Mining

7.5.22 The Mining Remediation Authority Map Viewer (Ref 7.46) does not show the Pentir works site to be in a coal mining reporting area.

Hydrogeology

Aquifer Designation

7.5.23 Aquifer designations in the Pentir works site and Study Area are shown on **Figure 2.7.3**. The aquifers in the Study Area are summarised in **Table 7-2**.

Table 7-2 – Summary of aquifer designations

Stratum	Description	Aquifer designation
Superficial deposits	Alluvium	Secondary A
	Till	Secondary undifferentiated
	Peat	Unproductive strata
Bedrock	Minffordd Formation – sandstone and conglomerate interbedded	Secondary A
	Padarn Tuff Formation – Tuff, Felsic	Secondary A

Groundwater Vulnerability

7.5.24 The BGS Geoindex (Ref 7.41) identifies the Superficial Deposits and Bedrock beneath the majority of the Pentir works site as being medium vulnerability (**Figure 2.7.4**). However, these Secondary aquifers are shown to be high vulnerability in proximity to the eastern area of the works site.

7.5.25 The BGS indicate that groundwater vulnerability identified as high relates to areas that can easily transmit pollution to groundwater which are characterised by high-leaching

soils and the absence of low-permeability superficial deposits. Medium vulnerability relates to areas that offer some groundwater protection.

Source Protection Zones

7.5.26 There are no SPZ in the 1 km Study Area according to Data Map Wales (Ref 7.43).

Groundwater Abstractions

7.5.27 Data Map Wales (Ref 7.43) showed there was 1 no. licensed groundwater abstraction in 1 km the Study Area. This data has since been removed from the Data Map Wales website. Details of the licensed groundwater abstraction was as follows:

- 50 m south-west (B4547 and A4244 roads) for industrial, commercial and public services from superficial deposits. Permit number WA/065/0016/0019, operated by Morgan Sindall for construction dewatering from superficial deposits.

Private Water Supplies

7.5.28 According to Gwynedd Council, the following private water supplies (PWS) are within 1 km of the Pentir works site:

- Glanrhyd – residential PWS approximately 775 m south-east of the Pentir works site.

7.5.29 The strata for the abstraction are not indicated in the information from the Council. However, a borehole record (BGS Reference: SH56NE129) is provided on GeoIndex for Glanrhyd which shows the presence of soils, clay sand and gravel to 15 m depth and black mudstone bedrock to 56 m (base of borehole). The groundwater level is indicated at 16.5 m below ground level. The record shows 56 m of well casing was installed; 26 m of plain casing from the surface into the bedrock and then 30 m of slotted well casing.

Hydrology

7.5.30 There are unnamed water courses in the Pentir works site (culverted beneath the access roads) and in the 250 m Study Area. These are tributaries to the Afon Cegin (which is outside the 250 m Study Area), approximately 700 m south-east of the Pentir works site.

7.5.31 Further details regarding hydrological features are presented in **Chapter 8: Water Quality, Resources and Flood Risk.**

Ground Investigation Information

7.5.32 No information has been received regarding previous ground investigations at the Pentir works site.

7.5.33 A search of the Council's planning portal (10 February 2025) has not located any previous ground investigation information for the Study Area.

Unexploded Ordnance

7.5.34 Online Zetica UXO risk mapping (Ref 7.44) shows 'Low Risk' for the whole Study Area. A pre-desk study assessment was obtained from Zetica and recommends that '*while always prudent, a detailed desk study is not considered essential in this instance*'.

Landfilling

7.5.35 The Groundsure report does not contain any records of recent or historical landfill sites in 250 m of the Pentir works site.

Waste Sites

7.5.36 A waste exemption is mapped 80 m south-east of the Pentir works site for storage of waste in a secure place at Morgan Sindall Construction & Infrastructure Ltd. Other than this, no waste sites are documented in the Groundsure data either within the Pentir works site or Study Area.

Ground Gas

7.5.37 No significant potential sources of ground gas have been identified.

7.5.38 The potential for gas generation has been assessed based on the possible sources identified using guidance provided in British Standards (BS) 8576 (Ref 7.23). Alluvium and Peat have been identified, mapped across limited areas of the Pentir works site (Alluvium) and approximately 180 m north-west of the Pentir works site (Peat). BS 8576 (Ref 7.23) indicates that natural soil strata such as peat and alluvium with a low degradable organic content would have a very low gas generation. Made Ground is likely to be present at the site (albeit anticipated to be limited in thickness) which is anticipated to have a low degradable organic carbon and, therefore, represent a very low gas generation potential.

Radon

7.5.39 The Groundsure data shows that the site lies in an area where less than 1% of the properties are above the Action Level. Radon protection should not be required.

Regulated Activities

7.5.40 The following information was obtained from the Groundsure data for the Pentir works site and 250 m Study Area.

7.5.41 An electrical substation operated on the Pentir works site since the 1970s. Pylons and masts have been mapped in 250 m of the Pentir works site. A historical tank is mapped approximately 10 m south of the northern area of the Pentir works site.

7.5.42 There is one off-site licensed discharge to controlled waters point in the Study Area. This is for sewage discharges (final and treated effluent) to a tributary of Afon Heulyn and is approximately 210 m north of the northern area of the Pentir works site.

7.5.43 There are no radioactive substance authorisations, pollution incidents, List 1 or 2 dangerous substances, historical licensed industrial activities, Control of Major Accident Hazards sites, hazardous substance storage and usage, licensed industrial activities (Part A(1)), licensed pollutant releases (Part A(2)/B, to public sewer, or to surface waters (red list)), pollution inventories, sites determined as contaminated land or regulated explosive sites in the Pentir works site or Study Area.

Environmental Designated Sensitivities

7.5.44 A review of currently available information on MAGIC (Ref 7.49) and from Gwynedd Council did not identify any SSSI, Ramsar sites, SAC, NNR or LNR in 250 m of the Pentir works site.

7.5.45 There are three cWS and areas of ancient woodland in 250 m of the Pentir works site.

Site History

7.5.46 Online data indicates the site was historically rough ground and open fields with two water courses in the immediate vicinity of the site in 1963.

7.5.47 According to the Groundsure data, the existing Pentir substation has been mapped in the north of the site since 1970. A small historical tank has also been mapped to the south of the northern area of the Pentir works site from 1970.

7.5.48 Areas associated with storage and car parking for the substation are to the south-east of the site. According to Google Earth, this area was constructed between 2021 and 2023. In this time, an access road has been cleared in the site boundary towards the B4547.

Potential Areas of Contaminated Land

7.5.49 The Study Area is in a predominately rural setting, however, the following potentially contaminative land uses have been identified:

7.5.50 On-site:

- Made Ground – Made Ground is anticipated in the vicinity of Pentir substation and roads associated with current and historical development.
- Existing Pentir substation – Uses associated with the Pentir substation.

7.5.51 Off-site (in 250 m):

- Wider Pentir substation – The existing substation extends to the north and south of the Pentir works site, along with car parking areas and a waste exemption to the south-east.
- Agricultural Land – There are farms in the surrounding area, potential contamination sources could include fuels, oils and lubricants, chemicals including sheep dip, slurry pits, buried materials.
- Made Ground/Fill – There is the possibility for Made Ground off-site relating to the wider substation, limited existing and former areas of development and potential for non-coal mine workings (although not confirmed).

7.5.52 No other potentially contaminating land uses have been identified in 250 m of the Pentir works site.

Contaminated Land Risk Assessment

7.5.53 A qualitative risk assessment for contaminated land has been undertaken for the construction of the proposed works. The risk assessment is based on the assumption that standard best practices would be implemented during the works and has been used to identify where additional mitigation measures would be required.

7.5.54 The initial Conceptual Site Model (iCSM) and qualitative preliminary risk assessment for the proposed works has been provided in **Volume 8, Appendix 2.7.A: Initial Conceptual Site Model and Risk Assessment**.

7.5.55 The potential risks include the potential for on-site and off-site sources impacting controlled water (surface waterbodies, Secondary Undifferentiated aquifers and Secondary A aquifers) through sub-surface migration.

7.5.56 The receptors identified in the iCSM and Risk Assessment have been brought forward into the potential effect assessment.

Future Baseline

7.5.57 The Pentir works site is in predominantly agricultural or open land. The Pentir works site is occupied by an electricity substation (since 1970s), and associated land uses such as roads, masts and pylons.

7.5.58 Although there is the potential for the baseline presented in this chapter to change over time, the data presented provides a good representation of geological, hydrogeological, land use and agriculture (soils) conditions at this stage of the proposed works. The baseline presented provides a realistic platform upon which to base any impact assessment work.

7.5.59 With respect to land contamination, any future development in the Study Area is subject to appropriate consenting regimes. This requires consideration of the potential for contamination to be present. The developer would be required to carry out remediation to ensure the development is suitable for its proposed use.

7.5.60 Furthermore, natural attenuation processes have the potential to mitigate risks over time from any existing sources of contaminants present in soil and groundwater.

7.5.61 Changes in groundwater abstractions could affect the groundwater flow regime and climate change could influence the future baseline conditions, due to changes on the rainfall regime, recharge, groundwater levels and flow. However, these changes are long-term and are not predictable at this stage.

7.6 Scope of Assessment

7.6.1 This section describes the scope of the assessment of effects on Geology, Hydrogeology, Land Use and Agriculture (Soils).

7.6.2 A number of potential effects are associated with an assumed worst case relating to potential soil and groundwater contamination for the Pentir works site, which have been derived by a qualitative assessment based on desk study research, iCSM and risk assessment presented in **Volume 8, Appendix 2.7.A: Initial Conceptual Site Model and Risk Assessment.** In order to accurately mitigate the impacts of potential contaminants, the actual nature, extent and magnitude of the presence of any significant potential contamination needs to be assessed through investigation during the construction works if contamination is encountered.

7.6.3

7.6.4 **Table** 7-3 summarises the potential Geology, Hydrogeology, Land Use and Agriculture (Soils) receptors that have been reviewed and states whether they have been included or excluded from the assessment. Justifications are provided where receptors have been both included and excluded from the assessment.

Table 7-3 – Scope of Geology, Hydrogeology, Land Use and Agriculture (Soils) assessment

Receptor	Scoped in/out	Justification
Geology (from physical works)		
Geology	In	The overall evaluation of the Geological Landscape Aspect Area, where the Pentir works site is, is 'Moderate' defined as *'An overall rating of 'Moderate' is appropriate where the Aspect Area concerned is not known to include any exceptional or notable features, although it may still be 'representative' of its underlying geology or surface geomorphology.'* In accordance with DMRB LA 109 (Ref 7.27), it is considered to be a 'low' sensitivity receptor (non-designated geological exposures). Construction impacts have been scoped in as although the works are in the existing, substation compound, additional disturbance of geology may occur through redevelopment.
Sites designated for geodiversity interest	Out	No geological SSSI, GCR sites or RIGS in the Pentir works site or in the Study Area.
Ground stability	In	Changes in subsoil or rock structure or shallow groundwater that could affect ground instability. The Study Area is not in an area where mining has been identified and is predominantly in areas of low potential for ground instability, except for a limited area of alluvium in the area of the access road and southern end of the existing Pentir substation. Ground stability risks for the proposed works will be considered further as part of a detailed geotechnical Preliminary Sources Survey Report/Ground Investigation Report/Geotechnical Design Report to inform the detailed design.
Hydrogeology (from physical works)		
Groundwater – Secondary A and undifferentiated aquifers and industrial, commercial and public services groundwater abstraction	In	Foundation and trench work may create a pathway for potential contaminants to groundwater during construction. Water abstraction closest to the Pentir works site (adjacent to the B4547) is operated for dewatering from the superficial deposits. The PWS at Glanrhyd is installed in mudstone bedrock and approximately 775 m from the Pentir works site. Sensitivity based on the possibility this is being used for drinking water as it is identified as a residential PWS.
Groundwater – In vicinity of the	In	

Receptor	Scoped in/out	Justification
residential PWS		
MSA (from physical works)		
MSA	Out	No MSA in the Pentir works site. The closest is approximately 205 m south-east of the Pentir works site (MSA for sand and gravel).
Preferred areas for minerals	Out	No preferred areas for sand and gravel in the Pentir works site or in the Study Area.
Agricultural Soils (from physical works)		
Agricultural land	Out	Temporary and permanent loss of land is not anticipated during the construction works as the works are entirely in the boundary of the existing Pentir substation (already developed land).
Receptors to Land Contamination		
Construction workers	In	Contamination could be present in some areas i.e., Made Ground and around the existing Pentir substation. Activities relating to foundation construction, earthworks and associated transportation activities and material storage have the potential to expose construction workers to contaminants in soil, dust, vapours or groundwater excavations. Potential impacts may result from the accidental leak of fuels, oils or chemicals from plant or from stored liquids. Other impacts may also result from the use of materials and substances polluting potential (e.g. concrete, fuel, oils and soil) which have the potential to be mobilised to ground or controlled waters. Risk of encountering unexpected contamination during excavations. Potential for impact from ground gases to enclosed structures.
Off-site human health receptors (isolated farms and residential over 250 m away)	Out	The nearest off-site human health receptors are in isolated residential properties over 250 m from the Pentir works area. Therefore, these receptors have been scoped out of the assessment.
Off-site human health receptors (agricultural land users)	Out	Risks will be mitigated during construction through C811 (Ref 7.24) (see paragraph 7.9.8). Therefore, these receptors are scoped out of the assessment.

Receptor	Scoped in/out	Justification
Surface water - Unnamed watercourses in the Pentir works site and 250 m Study Area	In	Potential for the creation of new contaminant linkages i.e. through foundation construction or excavations through an aquiclude into aquifers. Changes to the hydrogeological regime (as a result of ground disturbance and potential dewatering (if required) during construction) may mobilise existing contamination in soil, groundwater and to surface watercourses. Potential impacts may result from the accidental leak of fuels, oils or chemicals from plant or from stored liquids. Other impacts may also result from the use of materials and substances polluting potential (e.g. concrete, fuel, oils and soil) which have the potential to be mobilised to ground or controlled waters in run-off. Water abstraction closest to the Pentir works site (adjacent to the B4547) is operated for dewatering from the superficial deposits.
Groundwater - Secondary A and undifferentiated aquifers and industrial, commercial and public services groundwater abstraction	In	
Groundwater - In vicinity of the residential PWS (775 m south-east of the Pentir works site)	In	
Development infrastructure (foundations and underground cables)	In	Potential impacts from direct contact with contaminated land (known and unknown) – aggressive ground conditions.
Ecological sites/flora and fauna (cWS and ancient woodland)	In	There are no NNR, Ramsar sites, SSSI, SAC or SPA in the Pentir works site and 250 m Study Area. There are three cWS and areas of ancient woodland in 250 m of the Pentir works site.

7.6.5 No effects are anticipated for land use, agriculture and soils which have been scoped out of the assessment and are not considered further in this assessment.

7.7 Methodology

7.7.1 Details of the technical methods used to determine the baseline conditions, sensitivity of receptors, magnitude of effects and the significance criteria that have been used for the Geology, Hydrogeology and Land Contamination assessment can be found in **Volume 8, Appendix 1.4.A: Topic Assessment Methodology.**

7.8 Potential Effects

7.8.1 The anticipated effects resulting from the loss or change to Geology, Hydrogeology and Land Contamination during construction of the proposed works are outlined as follows:

7.8.2 A number of the potential effects are associated with an assumed worst case relating to Geology, Hydrogeology and Land Contamination for the proposed works, which have been derived by a qualitative assessment based on a desk study. To accurately mitigate the impacts of potential contaminants, the actual nature, extent and magnitude of the presence of any significant potential contamination needs to be assessed through investigation during the construction works if contamination is encountered.

7.8.3 The potential effects for Geology, Hydrogeology and Land Contamination are detailed below. Mitigation measures and the overall residual effect and its significance are present in **Section 7.9**.

7.8.4 Potential receptors in the context of the Geology, Hydrogeology and Land Contamination assessment are considered to be geology, hydrogeology (aquifers and groundwater abstractions), human health (construction and maintenance workers), development infrastructure and ecological sites.

7.8.5 The source of potential Geology, Hydrogeology and Land Contamination effects during the construction phase includes:

Geology

7.8.6 Site clearance and preparation works for installation of the proposed works has the potential to result in adverse impacts (loss or damage) on the identified geological receptors (i.e. the bedrock geology), without appropriate controls or mitigation.

7.8.7 There are no sites designated for geodiversity interest in 250 m requiring mitigation.

7.8.8 The overall potential for ground instability is considered low. No evidence of mining has been identified in the Study Area. However, a potential ground instability risk has identified associated with the Alluvium due to compressibility and uneven settlement hazards probably being present and also as running sand conditions may be present.

Hydrogeology

7.8.9 Foundation and trench work may affect the hydrogeological regime such as groundwater flow, groundwater levels or groundwater quality (through earthworks and dewatering activities, for example).

Land Contamination

During Construction:

- Contamination of shallow groundwater from accidental leaks and spills, or plant breakdown. Other temporary impacts may result from the use and storage of materials and substances (e.g. concrete, fuel, oils and soil) which have the potential to be mobilised to ground or controlled waters directly or within run-off.
- Risks from existing potential contamination from:
  - Creation of new contaminant linkages (e.g. foundation construction through existing Made Ground and into underlying natural soils or shallow bedrock and excavation through an aquiclude and into an aquifer).
  - Disturbance of potentially contaminated soils and perched groundwater and creation of new pathways allowing migration of such contaminants to reach sensitive receptors (including human health, controlled waters and ecological receptors) during construction.

- The potential mobilisation of existing contamination via the exposure of soils and increases in rainwater infiltration through changes in ground cover and in excavations or bulk earthworks.

- Importation of potentially contaminated fill materials such as aggregates posing a potential risk to human health and underlying groundwater quality.
- Requirement to remove and reinstate spoil resulting from the removal of the buried cables (redundant, oil-filled), tanks, existing foundations and other services, posing a potential risk to human health and the environment.
- Exposure of construction workers to contaminants in soil or groundwater, gases or vapours during excavations or in confined spaces.
- Potential exposure of buried structures (building foundations and infrastructure) to aggressive ground conditions.

Effects Realised Post-Construction:

- It is anticipated that if the requirement for remediation due to contamination was identified in the Pentir works site, there will, in most instances, be overall beneficial effects. If required (subject to ground investigation and subsequent assessment), site-specific remediation measures, which will focus on source removal, pathway breakage or receptor protection, will be developed during the detailed design stage and implemented during the construction phase. These measures would be agreed with the Local Authority and NRW to reduce risks to human health, controlled waters and property from contamination, including from ground gases or vapours, to an acceptable level.

7.9 Mitigation and Residual Effects

7.9.1 Most of the effects and the mitigation required to reduce them to acceptable levels apply to all elements of the proposed works. The mitigation of these effects is considered jointly below, unless specifically stated.

Construction Phase Mitigation

Construction Environmental Management Plan

7.9.2 The main mitigation measure to prevent adverse effects on Geology, Hydrogeology and Land Contamination during all phases of the proposed works would be to ensure good site practice and management. A CEMP (**Volume 8, Appendix 2.2.A: Outline Construction Environmental Management Plan**) will be developed and implemented by the appointed Contractor and will form the basis of the approach to mitigating potential effects on the natural and built environment and the local community.

7.9.3 The CEMP will include a range of standard site management and construction methodology techniques which have been identified in **Chapter 2: Pentir Substation Works** to minimise the risk to construction workers, and pollution of uncontaminated strata and controlled waters (groundwater and surface waters). Measures contained in the CEMP will limit the potential for dispersal and accidental releases of potential contaminants, soil derived dusts and uncontrolled run-off to occur during construction. For example, the CEMP will set out how material is to be excavated, segregated, and stockpiled to minimise the potential for run-off, soil quality degradation and wind dispersal of dusts. The CEMP will also establish procedures for dealing with unexpected soil or groundwater contamination if encountered during construction.

Ground Investigation

7.9.4 An appropriate intrusive ground investigation of selected areas of the Pentir works site will be undertaken in accordance with the relevant guidance including Eurocode 7 (BS EN 1997-2:2007) (Ref 7.52), BS 5930 (2015 + A1 2020) (Ref 7.22) and BS 10175 (2011 + A2 2017) (Ref 7.21) and using the UK Specification for Ground Investigation (2022) (Ref 7.53).

7.9.5 The ground investigation will be designed to target the potentially contaminative sources identified in the site associated with the existing Pentir substation. There will also be a need to obtain geotechnical information to inform the proposed works including on the potential for ground instability. Investigation will be undertaken to achieve the following objectives:

- Determine the ground conditions to allow design of foundations and structures.
- Assess the nature, extent and magnitude of soil and groundwater contamination present.
- Assess the risks (if any) from potential contaminants to human health and controlled waters.
- Assess the ground gas regime.

7.9.6 If areas of the Pentir works site are shown to pose a risk, infrastructure could be moved to a different location if feasible. However, if it is not possible to move the infrastructure in contact with the ground, remedial measures would be identified and implemented.

Dealing with Potential Contamination during Construction

7.9.7 An inspection and discovery strategy will be devised and agreed with the regulatory authorities (including the Local Authority and NRW) if required, for implementation during the construction works should unexpected contamination be identified.

7.9.8 Potential impacts specific to construction workers (and any adjacent site users) during the construction phase would be controlled and mitigated by the following measures and through working in accordance with CIRIA C811 (Ref 7.24):

- Measures to minimise dust generation and run-off.
- Provision of Personal Protective Equipment (PPE), such as gloves, barrier cream, overalls etc. to minimise direct contact with soils.
- Provision of adequate hygiene facilities and clean welfare facilities for all construction site workers.
- Monitoring of confined spaces for potential ground gas accumulations, restricting access to confined spaces, i.e., to suitably trained personnel only, and use of specialist PPE, where necessary.
- Preparation and adoption of a site and task specific health and safety plan as is required under Health and Safety legislation.

Excavated Materials and Soils and Waste Management

7.9.9 Materials excavated during construction will be re-used on-site where possible. Whilst the approach will need to be confirmed by the construction works contractor, this typically involves the preparation of a plan for materials management following the protocols in the Contaminated Land Application in the Real Environment (CL:AIRE) Definition of Waste: Development Industry Code of Practice (Ref 7.30) to ensure that

excavated materials are re-used appropriately, sustainably and remain outside the waste hierarchy. Materials which need to be removed from the Pentir works site will be disposed of to an appropriately permitted facility. The materials management plan will be prepared along with a qualified person declaration to CL:AIRE prior to the construction works commencing.

7.9.10 Any material imported to the Pentir works site, such as for supporting foundations, will be natural quarried stone or, if recycled, the material will undergo chemical testing. The suite of contaminants and site use criteria will be agreed with regulatory authorities to demonstrate that the material is suitable for use on the Pentir works site and does not pose a risk to human health or the environment.

7.9.11 There is potential for asbestos to be present in Made Ground in the Pentir works site boundary. Any Made Ground found to be contaminated with asbestos will require suitable management if it is to be retained on-site or removed (in line with the CAR 2012 (Ref 7.14) and CAR-SOIL 2016 (Ref 7.54). As asbestos only presents a risk if it is disturbed, it is considered that the highest risk would be during the construction of the proposed works. An asbestos management plan will need to be prepared by a suitably competent person before carrying out works involving asbestos and include methods to be used to prevent or reduce exposure to asbestos and clearly describe how disturbance and spread of asbestos will be minimised or prevented.

7.9.12 The disposal of soil waste contaminated or otherwise, to landfill sites would be mitigated by minimisation of the overall quantities of waste generated during construction, and by considering whether that excavated material consigned to landfill cannot, as an alternative, be put to use either on the Pentir works site or on other sites.

7.9.13 Where there is a requirement to dispose of surplus excavated materials off-site as waste, the material will be characterised to determine firstly whether it is Hazardous or Non-Hazardous waste in accordance with the Technical Guidance WM3 (Ref 7.55) and then once this is established, the appropriate disposal facility will be determined through Waste Acceptance Criteria analysis, as required.

7.9.14 A Soil Management Plan will be prepared and followed, consistent with guidance in the Defra (2009) Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (or updated version thereof) (Ref 7.32) and other relevant documents such as The Institute of Quarrying's Good Practice Guide for Handling Soils in Mineral Workings (Ref 7.34).

Soil and Groundwater Pollution Control Mitigation

7.9.15 It is unlikely that the proposed works will require deep excavations although currently the foundation construction is unknown. There will be a requirement to avoid creating flow paths between potentially contaminated soils and groundwater in the underlying superficial deposits and the bedrock aquifers.

7.9.16 Various fuels, oils and chemicals would be required during the construction of the proposed works. Measures to reduce potential effects associated with these substances during construction include (and are to be included in the CEMP):

- A Pollution Prevention Plan will outline key pollution mitigation measures to be adopted including a Control of Substances Hazardous to Health, fuel inventory and key contacts to be notified in the event of a significant pollution incident, which may subsequently lead to the contamination of controlled waters or soils.
- Hazardous materials will be stored in designated locations with specific measures to prevent leakage and the release of their contents. This will include a requirement

for storage areas to be set back an appropriate distance from surface water features and drains to prevent any uncontrolled discharge (and take into consideration the positions of any groundwater abstraction wells), on an impermeable base with an impermeable bund that has no outflow and is of adequate capacity to contain at least 110% of the contents. Valves and trigger guns will be protected from vandalism and kept locked when not in use.

- Only well-maintained plant and other equipment will be used during construction to minimise the potential for accidental pollution from leaking machinery or damaged equipment. Static machinery and plant are expected to be stored on hardstanding areas when not in use and, where necessary, to make use of drip trays beneath oil tanks, engines, gearboxes and hydraulics. Spill response kits containing equipment that is appropriate to the types and quantities of materials being used and stored during construction will be maintained in the proposed works boundary for the duration of the works.

7.9.17 Reference should also be made to the mitigation measures detailed in **Chapter 8: Water Quality, Resources and Flood Risk.**

Hydrogeological Mitigation

7.9.18 An understanding of groundwater throughout the proposed works will be obtained from ground investigation and monitoring: including before, during and after construction.

7.9.19 A more detailed hydrogeological assessment will be undertaken where dewatering is required in higher sensitivity groundwater environments (Secondary A aquifer, for example) or where dewatering is required to facilitate open cut installation.

7.9.20 Where dewatering is required, a dewatering scheme will be developed prior to construction to demonstrate that there is an effective strategy to manage water arising from the operations and, where required, sufficient proposals to treat the water prior to controlled discharge. Any such assessment will consider the effects of any draw down or impacts on nearby abstractions or resources along with ground instability. Dewatering will be developed in consultation with NRW and other stakeholders if appropriate.

Residual Effects

7.9.21 The potential effects assessment is detailed below along with the mitigation measures and the overall residual effect and its significance.

7.9.22 Effects categorised as ‘Neutral’ or ‘Slight’ are ‘Not Significant’. Effects categorised as ‘Moderate’, ‘Large’ or ‘Very Large’ are potentially ‘Significant’.

7.9.23 The sensitivity of the receptor has been assigned a relevant rating in accordance with **Table 5-1** presented in **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**.

7.9.24 The magnitude of the potential impacts have been assigned the relevant rating according to **Table 5-2** presented in **Volume 8, Appendix 1.4.A: Topic Assessment Methodology** where appropriate examples have also been listed.

7.9.25 In relation to ground stability, the ratings are drawn from published policy and good practice guidance and based on professional judgements and have been successfully used on other assessments.

Table 7-4 – Residual effects

Residual effect	Description	Receptor	Mitigation and significance (with consideration of the magnitude of impact and sensitivity of the receptor)
Geology			
Impact on geological receptors	Potential adverse impact and/or damage to sensitive geological receptors (i.e., the bedrock geology)	Geology	The overall evaluation of the Geological Landscape Aspect Area, where the Pentir works site lies, is 'Moderate' (*'not known to include any exceptional or notable features'*) and is therefore a 'Low' sensitivity receptor. There is no ground investigation information available for the Pentir works site and therefore the extent/depth of superficial deposits above the bedrock is unknown. The proposed works at the Pentir works site[4], aren't anticipated to involve significantly deep excavations (albeit design details have not been provided). Given the unlikely potential for deep excavations, and the development already present at the Pentir works site, the magnitude of impact is 'negligible'. The significance would be a 'neutral to slight' adverse (not significant) effect.
Ground instability	Potential adverse impact and/or damage during excavations and to structures	Structures, excavations	Majority of the site identified as low potential for ground instability except for where the Alluvium is present. Potential for encountering shallow groundwater in the superficial deposits during excavations which could require temporary dewatering which could lead to instability particularly if granular strata is present. Ground investigation will be undertaken to consider the potential for ground instability and requirement for mitigation during construction and mitigation. Mitigation will be implemented in accordance with the CEMP, such as during excavations and dewatering. The significance would be a 'neutral' adverse (not significant) effect.

[4] Including removal works (electrical apparatus, earth tape, old existing redundant oil filled cables and tanks, concrete foundations and other services) and new installations (electrical equipment and cables)

Residual effect	Description	Receptor	Mitigation and significance (with consideration of the magnitude of impact and sensitivity of the receptor)
Hydrogeology			
Requirement for dewatering, reducing flow to groundwater abstractions and surface water bodies.	In order to excavate below groundwater, dry working will be required for the installations and foundations, and dewatering may be required in the excavations during construction. Groundwater is likely to be extracted from sumps in the excavation and discharged to surrounding ground. Groundwater levels could be locally and temporarily affected, and a reduction in levels could lead to reduced baseflow to watercourses and to groundwater abstraction points. In addition, the quality of surrounding soils could be affected, through a reduction of soil water changing the soil structure.	Hydrogeology and hydrology	Shallow groundwater could be encountered in the superficial deposits. In order to excavate below groundwater, dry working will be required for the installations and foundations, and, therefore, temporary dewatering may be required in excavations. The site is underlain by Till and Alluvium superficial deposits. Where these comprise predominantly clay or silt this should limit the potential for encountering significant quantities of groundwater and also the area of effect, although granular horizons could be present which could result in more groundwater being present. The impact of any dewatering would reduce considerably with the distance from the abstraction point. Under normal conditions it is unlikely that significant effects would be recorded more than 50 m from the point of abstraction, although effects may be recorded more than 100 m from the excavation. It is anticipated that there will be limited drawdown, and a relatively short duration of dewatering required. Dewatering will also be temporary and below ground structures which could have a significant impact on groundwater flow are not anticipated. Hydrogeological mitigation as indicated in paragraph 7.9.18 will be adhered to. Any short-term changes to the quality of the surrounding soils due to lowering of the groundwater levels, would be of minor magnitude and given the medium sensitivity of the Secondary A and undifferentiated aquifers and industrial, commercial and public services groundwater abstraction 50 m south-west (which is used for dewatering from the superficial deposits) and surface water courses, the significance would be a ‘slight’ effect (not significant). For the PWS, this is 775 m south-east of the Pentir works site in mudstone bedrock. The magnitude of impact is negligible for this high

Residual effect	Description	Receptor	Mitigation and significance (with consideration of the magnitude of impact and sensitivity of the receptor)
			sensitivity receptor given the distance. The significance would be a 'slight' effect (not significant).
Land Contamination			
Groundwater and ground pollution due to chemical spillages and leaks.	Potential for plant to leak or spill oil and fuel. Leaks and spillages could occur in any area of the Pentir works site in which the plant is operating and during refuelling. Additionally, the potential exists for spills and drips to occur associated with stored fuels and chemicals brought onto the Pentir works site to facilitate construction. There is potential that such spillages could enter the underlying uncontaminated strata and contaminate shallow groundwater.	Groundwater and surface watercourses	Spillages or leaks are unlikely to occur due to the construction management measures that will be put in place as part of the CEMP, and if they did, they would be very unlikely to be widespread. The magnitude of impact of chemical spillages and leaks during construction of the proposed works would be 'negligible'. The sensitivity of the groundwater is 'medium' based on Secondary A and undifferentiated aquifers with a nearby groundwater dewatering abstraction and the significance of effect would be 'neutral or slight' adverse (not significant). Groundwater sensitivity in the vicinity of the residential PWS would be 'very high', however, this is 775 m south-east from the Pentir works site in mudstone bedrock and together with the 'negligible' magnitude of impact, the significance of effect would be 'slight' adverse (not significant). This effect is driven by the 'very high' sensitivity of the receptor; however the effect is unlikely to be realised. It is primarily the low risk of a leak or spillage that limits the impact significance, although it is recognised that the risk is not zero. Two surface water drains cross the site area beneath the existing access road, although there are others nearby (<250m) in the surrounding area. Spills are unlikely to be widespread and mitigation management measures will be put in place as part of the CEMP should spills occur. Surface watercourses are 'low' sensitivity and the significance of effect would be 'neutral or slight' adverse (not significant).

Residual effect	Description	Receptor	Mitigation and significance (with consideration of the magnitude of impact and sensitivity of the receptor)
		Human Health	The most sensitive human health receptors are the construction and maintenance workers; these are 'medium' sensitivity receptors. The residual effect from chemical spillages and leaks during construction would be 'neutral to slight' adverse (not significant) as spillages would be unlikely and if they did occur would be managed to have no measurable impact on human health through appropriate incident response procedures (magnitude of impact of 'negligible').
Risks from existing potential contamination from: - Creation of new contaminant linkages (e.g. foundation construction) through existing Made Ground and into underlying natural soils or shallow bedrock and/or excavation through an aquiclude and into an aquifer; - Disturbance of potentially contaminated soils and perched groundwater and creation of new pathways allowing	The excavation and disturbance of the sub-soils during construction could lead to a number of effects associated with contaminated ground: • Vehicles tracking over potentially contaminated ground have the potential to spread contamination and carry it off-site. • Construction and maintenance workers may be exposed during the excavation of material to potentially harmful contaminants and ground gases. • Disturbance of ground may alter the chemical conditions in the Pentir works site resulting in	Soils (supporting ecological receptors), groundwater and surface watercourses	The baseline assessment has identified potential contaminative land uses in the Pentir works site and Study Area and a number of potential effects associated with the presence of contaminated materials. The baseline has demonstrated that the potential scale and type of ground contamination in the Pentir works site is a low to moderate risk with the majority of potential contamination sources being associated with Made Ground and the existing Pentir substation. No ground investigation works have been undertaken to date. Areas of contaminated ground (if encountered during the ground investigation) would be avoided, where possible. Where this is not possible, remediation would be undertaken to either remove the source or prevent the creation of pathways to receptors as described in the CEMP. There would be no significant residual effects. If unexpected contamination were to be encountered during the construction works this would be managed in accordance with the discovery strategy provided in the CEMP. As access road and working areas would follow the mitigation measures used during construction there is unlikely to be a risk from ground contamination or a risk to groundwater from ground contamination during maintenance as contaminated ground would have been avoided, removed and/or mitigated during construction. Minor works being undertaken in the existing Pentir substation in excess of 100 m from the closest watercourse. Access will be via the existing Pentir substation access road. No new watercourse crossings

Residual effect	Description	Receptor	Mitigation and significance (with consideration of the magnitude of impact and sensitivity of the receptor)
migration of such contaminants to reach sensitive receptors (including human health, controlled waters and ecological receptors) during construction; and - The potential mobilisation of any existing contamination via the exposure of soils, increases in rainwater infiltration through changes in ground cover, in excavations or bulk earthworks.	mobilisation of potential contaminants. • The surfaces of contaminated material may be exposed in excavations, which could cause mobilisation of contaminants by percolating rainwater. • Arisings from the excavation of ground could potentially result in the stockpiling of contaminated soils on the Pentir works site, and reuse on-site. The exposed soils could lead to increased migration of potential contaminants both on-site and off the Pentir works site through dust generation and to underlying soils and controlled waters through leaching and surface water runoff.		or culverting required to facilitate the works. A CEMP will be produced and cover relevant mitigation measures for the on-site works, including mitigation for excavations and stockpiling. Therefore, for the reasons indicated, there will be a 'negligible' magnitude of impact for the low to moderate sensitivity receptors, resulting in a 'neutral or slight' adverse effect (not significant).
		Human Health	The risks posed to construction and maintenance workers during construction and remediation works (if any) would be mitigated by design and adherence to health and safety procedures as detailed in the CEMP. As these measures would prevent measurable adverse health effects on construction and maintenance workers (medium sensitivity), slight' adverse (not significant).
Importation of contaminated aggregates posing a potential risk to human health and	Without controls in place natural or recycled stone imported to create access tracks and other working areas could be contaminated and	Human health, soils (supporting ecological	The use of imported recycled aggregates during construction and maintenance, for example for the construction of access tracks and/or compounds, etc, may pose a risk to underlying soils and groundwater quality, and to construction workers, if the aggregates were to be contaminated. However, the mitigation measures outlined in the CEMP

Residual effect	Description	Receptor	Mitigation and significance (with consideration of the magnitude of impact and sensitivity of the receptor)
underlying soils, geology and groundwater quality.	pose a risk to construction workers and underlying uncontaminated strata and groundwater.	receptors) and groundwater	would mean that only materials suitable for use would be imported. As a result, effects of the importation of aggregates would be at worst minimal, with no measurable effects on the identified receptors. The magnitude of impact would be negligible to the low to medium sensitivity receptors. The significance would be 'neutral to slight' adverse (not significant) effect.
Requirement to remove and reinstate spoil from the removal of the buried cables (redundant, oil-filled), tanks, existing foundations and other services, posing a potential risk to human health and the environment.	Spoil from the excavations could be generated and be reused elsewhere in the Pentir works site or require removal from the Pentir works site.	Soils (supporting ecological receptors), geology	Where superficial deposits are excavated as part of the proposed works, these materials may be re-used on-site for reinstatement during the construction phase. Materials would be re-used under the CEMP to ensure they would be physically and chemically suitable for re-use. The natural composition of the material in relation to the placement location will also be assessed for suitability for re-use. If material were to be unsuitable, they would be disposed of off-site to a suitable site in accordance with the CEMP. Further details on Excavated Materials and Soils and Waste Management have also been provided in paragraphs 7.9.9 to **Error! Reference source not found.**. As a result, the residual effects on soils and geology would be of negligible magnitude as the re-use of material in suitable locations in the proposed works would mean that changes from the baseline conditions would be barely distinguishable. The significance would be 'neutral' adverse (not significant) effect.
Aggressive ground conditions	Potential adverse impact and/or damage to structures and buried drinking water pipes	Buried structures, drinking water pipes	Ground investigation will be undertaken to consider the potential for aggressive ground conditions such as due to the presence of sulphate for buried concrete or organic contaminants for plastic drinking water pipes. If the requirement for mitigation is identified, this will be implemented during construction. The requirement for drinking water pipes will be agree with the relevant water authority as part of the construction works. The significance would be 'neutral' adverse (not significant) effect.

Residual effect	Description	Receptor	Mitigation and significance (with consideration of the magnitude of impact and sensitivity of the receptor)
Effects from remediation (if required)	If required (subject to ground investigation), site-specific permanent remediation measures, which will focus on source removal, pathway breakage or receptor protection, will be developed during the detailed design stage and implemented during the construction phase. These measures will reduce risks to human health, controlled waters and property from contamination, gas and vapours in the ground, to an acceptable level.	Soils (supporting ecological receptors), groundwater and human health	It is anticipated that if any remediation is carried out on potentially contaminated sites identified in the Pentir works site (if encountered), there will, in most instances, be overall beneficial effects. Given the anticipated low to moderate potential for contamination, the magnitude of impact is anticipated to be negligible to minor to the low to medium sensitivity receptors resulting in a 'neutral to slight' beneficial (not significant) effect.

7.10 Summary

7.10.1 It has been demonstrated that the proposed works are not anticipated to have significant effects on Geology, Hydrogeology, Land Use and Agriculture (Soils) in the Study Area. The mitigation measures discussed in this chapter are expected to prevent any significant effects during construction.

8. Water Quality, Resources and Flood Risk

8.1 Introduction

8.1.1 This chapter presents an assessment of the likely Water Quality, Resources and Flood Risk effects that could arise from the construction of the proposed works as described in **Chapter 2: Pentir Substation Works**.

8.1.2 This chapter describes the baseline conditions currently existing in the Study Area (as defined in **Section 8.3**) and the scope of the assessment.

8.1.3 This chapter is supported by the appendix listed below:

- **Volume 8, Appendix 1.1.A: Legislation, Policy and Guidance.**

8.1.4 Other chapters that are useful to review in association with this chapter are as follows:

- **Chapter 5: Ecology and Nature Conservation.**
- **Chapter 7: Geology, Hydrogeology, Land Use and Agriculture (Soils).**

8.2 Legislation and Planning Policy

8.2.1 This section sets out the legislation and planning policy framework that is relevant to the Water Quality, Resources and Flood Risk assessment. Details are in **Volume 8, Appendix 1.1.A: Legislation, Policy and Guidance.**

Legislation

8.2.2 The following legislation is relevant to Water Quality, Resources and Flood Risk:

- Priority Substances Directive (2008/105/EC) (Ref 8.1), amending Directive of the Priority Substances Directive (2013/39/EU) (Ref 8.2).
- The European Union (EU) Floods Directive (2007/60/EC) (Ref 8.3), as enacted into domestic law by the Flood Risk Regulations 2009 (Ref 8.4).
- The EU Water Framework Directive (2000/60/EC) (WFD) (Ref 8.5) as enacted into UK domestic law by the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (Ref 5.13).
- The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 (Ref 8.6).
- Floods and Water Management Act 2010 (Ref 8.7).
- Water Resources Act 1991 (Ref 7.4).
- Water Act 2003 (Ref 7.2).
- Environment Act 1995 (Ref 7.3).
- Land Drainage Act 1991 (Ref 7.5) and 1994 (Ref 8.8).

- Environmental Protection Act 1990 (Ref 7.1).
- Control of Pollution Act 1974 (Ref 8.9).

National Policy

8.2.3 The following national policy is relevant to Water Quality, Resources and Flood Risk:

- TAN 15: development, flooding and coastal erosion (Ref 8.10).
- Future Wales: The National Plan 2040 (Ref 4.3)
- PPW – Edition 12 (Ref 4.4)

Flood Zone Definitions

8.2.4 TAN 15 (Ref 8.10) provides guidance in relation to development and flooding and contains a Development Advice Map (Ref 8.12) incorporates flood risk extents based on predicted climate change over the next century.

8.2.5 In the Flood Map for Planning, Flood Zones are provided for different sources of flooding and are defined as follows:

- Rivers, Rivers and Sea combined, Surface Water and small watercourses:
  - Flood Zone 1 – areas with less than 0.1% chance of flooding in a given year, including the effects of climate change.
  - Flood Zone 2 – areas with between 0.1% and 1% chance of flooding in a given year, including the effects of climate change.
  - Flood Zone 3 – areas with greater than 1% chance of flooding in a given year, including the effects of climate change.
- Sea
  - Flood Zone 1 – areas with less than 0.1% chance of flooding from the sea in a given year, including the effects of climate change.
  - Flood Zone 2 – areas with between 0.1% and 0.5% chance of flooding from the sea in a given year, including the effects of climate change.
  - Flood Zone 3 – areas with greater than 0.5% chance of flooding from the sea in a given year, including the effects of climate change.

8.2.6 TAN 15 Defended Zones are areas that benefit from Risk Management Authority flood defences with the following minimum Standard of Protection, of 1% (present day) for rivers and 0.5% (present day) for the sea.

Local Policy

8.2.7 The following local policy is relevant to Water Quality, Resources and Flood Risk:

- West of Wales Shoreline Management Plan (Ref 8.13).
- Anglesey and Gwynedd Joint Local Development Plan 2011-2026 (Ref 4.9).

Guidance

8.2.8 The following National Grid Guidance is relevant to Water Quality, Resources and Flood Risk:

- National Grid Policy Statement (Transmission) 095 - Flood Mitigation Policy (Ref 8.13).

8.3 Study Area

8.3.1 The proposed works are in the existing Pentir substation compound. The Study Area for the effects of the proposed works consists of the substation and an area within 1 km of the site.

8.4 Assumptions and Limitations

8.4.1 The assessment presented in this chapter reflects the published data records and web-based information obtained and evaluated at the time of reporting (March 2025).

8.4.2 The assessment includes consideration of the construction of the proposed works and is based on the design information in **Chapter 2: Pentir Substation Works.**

8.4.3 As the works will be confined to hardstanding areas accessed via the existing Pentir substation access road, neither a detailed Flood Consequence Assessment nor Drainage Strategy are required and this assessment is based on a review of desk study data and aerial photography.

8.5 Baseline

8.5.1 The closest watercourse to the Pentir works site is an unnamed watercourse approximately 70 m south and passes below the Pentir substation access road flowing in an east – west direction. The unnamed watercourse is not recorded under the Western Wales Framework Directive River Waterbodies dataset.

8.5.2 A ditch is present approximately 400 m south-west of the Pentir works site, which runs beneath the Pentir substation access road.

8.5.3 The Pentir works site is in the Nant-y-Garth River Waterbody Catchment, though the Nant-y-Garth waterbody is 1.5 km to the west of the Pentir works site, which retains a Good overall status under the WFD. The closest recorded WFD river waterbody is the Afon Cegin approximately 1 km to the east of the Pentir works site which retains a Moderate overall status under the WFD. A tributary (an unnamed watercourse) of the Agon Cegin is present approximately 700 m south-east of the Pentir works site.

8.5.4 With the exception of a SuDS attenuation basin, there are no ponds, lakes, canals or other waterbodies sufficiently close to be affected or influenced by the proposed works.

8.5.5 There are no licensed abstractions, discharges or private water supplies in 100m of the Pentir works site.

8.5.6 The Pentir works site is shown to lie above the following geological classifications (refer to **Chapter 7: Geology, Hydrology, Land Use and Agriculture (Soils))**:

- Superficial – Till, Devensian - Diamicton. Sedimentary superficial deposit formed between 116 thousand and 11.8 thousand years ago during the Quaternary period.
- Bedrock – Minffordd Formation - Sandstone and conglomerate, interbedded. Sedimentary bedrock formed between 526 million and 508 million years ago during the Cambrian period.

8.5.7 The Pentir works site and surrounding area lies above the Llyn and Eyri WFD groundwater body which retains a Poor overall status under the WFD.

8.5.8 The Pentir works site is more than 2 km from the nearest designated site (SSSI, Ramsar, SPA, SAC, NNR), though a cWS (part of which contains Ancient Woodland) directly abuts the Pentir works site.

8.5.9 In accordance with NRW Flood Map for Planning (Ref 8.12), the Pentir works site is:

- Not in the vicinity of a main river – the closest main river to the Pentir works site is the Afon Cegin approximately 1 km to the east.
- Shown to lie outside of the mapped areas of fluvial or tidal flooding so in Flood Zone 1 (Rivers, Tidal and Sea) and at a low risk from this source.
- Shown to lie outside of the mapped areas of flooding from small watercourses and surface water flooding so in Flood Zone 1 (flooding from Small Watercourses and surface water mapping) and at a low risk from this source.
- Shown to lie outside of any mapped reservoir flood extents and at a very low risk from this source.
- Not shown to be impacted by any historic flood events (Flood Map for Planning).

8.5.10 In accordance with Development Advice Map (Ref 8.12), the Pentir works site is:

- Shown to lie in Flood Zone A.
- Accessed via the existing access road to Pentir substation which crosses an area of Flood Zone B.

Future Baseline

8.5.11 The future baseline scenario has considered Pentir substation as developed and operational. There would be minimal change in future baseline scenarios unless the substation was decommissioned and demolished. Impermeable area coverage is unlikely to change and changes to surface water and groundwater regimes are therefore unlikely.

8.5.12 Climate Change is expected to influence hydrological processes in the Pentir works site (and elsewhere). Climate Change will impact rainfall intensity, tidal and coastal levels and peak river flows, which in turn will likely lead to increase flood risk.

8.5.13 Peak rainfall intensity is predicted to increase between 20% to 40% (Central and Upper estimate, respectively) by the 2080s (2070 to 2115). Peak river flows for the Western Wales river basin district are predicted to rise between 30% to 75% (Central and Upper estimate, respectively) by the 2080s (2070 to 2115).

8.6 Scope of Assessment

8.6.1 This section describes the scope of the assessment of effects on Water Quality, Resources and Flood Risk.

8.6.2 The baseline presented in **Section 8.4** does not identify any receptors on which the proposed works have the potential to cause significant effects. Therefore, an assessment of Water Quality, Resources and Flood Risk potential effects has been scoped out. **Table 8-1** below provides justification for scoping out each potential impact area.

8.6.3 **Table 8-1** includes for all construction work to be carried out under a detailed site-specific CEMP (**Volume 8, Appendix 2.2.A: Outline Construction Environmental Management Plan**). The CEMP will set out a variety of control measures for managing the potential environmental effects of construction works including control and management of surface water runoff and pollution control and set out responsibilities for the preparation and implementation of the plan.

Table 8-1 – Scope of the Water Quality, Resources and Flood Risk assessment

Receptor	Scoped in/out	Justification
Unnamed Watercourse – Flood Risk	Out	The Pentir works site does not have any direct hydraulic connection to the wider water environment. Minor works being undertaken in the existing Pentir substation in excess of 100 m from the closest watercourse. The Pentir works site is shown to lie outside of any mapped fluvial, coastal or surface water and small watercourses flood extents. There will be no increase in impermeable area as a result of the works. An operational drainage system is in place at the Pentir substation. Access will be via the existing Pentir substation access road. No new watercourse crossings or culverting required to facilitate the works. CEMP will be produced and cover relevant mitigation measures for the onsite works.
Unnamed Watercourse – Water Quality	Out	Minor works being undertaken in the existing substation in excess of 100 m from the closest watercourse. Access will be via the existing Pentir substation access road. No new watercourse crossings or culverting required to facilitate the works. CEMP will be produced and cover relevant mitigation measures for the onsite works.
Afon Cegin WFD River waterbody (ID GB 110065058540)	Out	Currently at Moderate status. Minor works being undertaken in the existing Pentir substation and at a distance greater than 1 km from the Afon Cegin.
Nant-y-Garth (Menai Strait) WFD River waterbody (ID GB 110065058490)	Out	Currently at Good status. Minor works being undertaken in the existing Pentir substation and at a distance greater than 1 km from the Nant-y-Garth.
Llyn and Eyri WFD groundwater body	Out	Currently at Poor Status. Minor works being undertaken in the existing Pentir substation with an operational drainage system in situ as part of the

Receptor	Scoped in/out	Justification
(ID GB 41002G204600)		operational workings at the Pentir substation. No new groundwater pathways are anticipated to be created as part of the works

8.7 Summary

8.7.1 It has been demonstrated that the proposed works are not anticipated to have significant impacts on Water Quality, Resources and Flood Risks in the immediate or local area. The embedded mitigation measures are expected to prevent any significant water quality, resources and flood risk effects during construction.

9. Traffic and Transport

9.1 Introduction

9.1.1 This chapter of the ES presents the findings of an assessment of the likely significant Traffic and Transport effects that could arise from the construction of the proposed works as described in **Chapter 2: Pentir Substation Works**.

9.1.2 This chapter describes the baseline conditions currently existing in the Study Area (as defined in **Section 9.3**), the scope of the assessment, the potential effects, the mitigation measures required to prevent, reduce or offset any significant negative effects, and the likely residual effects after these mitigation measures have been adopted.

9.1.3 This chapter is supported by the figures and appendices listed below:

- **Figure 2.9.1:** Traffic and Transport Study Area and Traffic Survey Locations.
- **Figure 2.9.2:** Study Area Road Network.
- **Figure 2.9.3:** Traffic Accident Locations.
- **Figure 2.9.4:** Indicative Heavy Goods Vehicle (HGV) Routing.
- **Volume 8, Appendix 1.1.A: Legislation, Policy and Guidance.**
- **Volume 8, Appendix 1.4.A: Topic Assessment Methodology.**
- **Volume 8, Appendix 2.9.A: Traffic Flow Diagrams.**
- **Volume 8, Appendix 2.9.B: Traffic Base Counts.**

9.2 Legislation and Planning Policy

9.2.1 This section summarises the legislation and planning policy framework that is relevant to the Traffic and Transport assessment. Details are in **Volume 8, Appendix 1.1.A: Legislation, Policy and Guidance.**

Legislation

9.2.2 The following legislation is relevant to Traffic and Transport:

- Active Travel (Wales) Act 2023 (Ref 9.1).

National Policy

9.2.3 The following national policy is relevant to Traffic and Transport:

- PPW – Edition 12 (Ref 4.4).
- Future Wales: The National Plan 2040 (Ref 4.3).
- National Transport Delivery Plan (2022 – 2027) (Ref 9.2).

Local Policy

9.2.4 The following local policy is relevant to Traffic and Transport:

- Anglesey and Gwynedd Joint Local Development Plan 2011 – 2026 (Ref 4.9).
- North Wales Joint Local Transport Plan (NWLTP) (Ref 9.3).
- Mid Wales Local Transport Plan (MWLTP) (Ref 9.4).

Guidance

9.2.5 The following guidance is relevant to Traffic and Transport:

- IEMA Guidelines – Environmental Assessment of Traffic and Movement (2023) (hereafter referred to as the 'IEMA Guidelines') (Ref 9.5).
- DMRB CD 123 Geometric Design of at Grade Priority and Signal-Controlled Junctions (November 2021) (Ref 9.6).

9.3 Study Area

9.3.1 Based on the extent of the Pentir works site, several roads on the local and strategic highway network have been identified as roads that could be used by traffic associated with the proposed works and could be subject to increases in traffic. The roads identified cover likely routes to the Pentir works site from the strategic road network and from local and regional population centres between a 30–45-minute drive time of the Pentir works site. This is the likely catchment area for construction traffic.

9.3.2 The roads in the Study Area were determined as follows:

- B4547 east and west of Pentir substation access road.
- A4244 east of B4547.
- A4244 south of B4547.
- B4366 west of A4244.
- B4409 east of A4244.
- A4244 north of B4409.
- A5 east of A4244.
- A5 west of A4244.
- A487 south of B4547.
- Bangor Street.
- B4547 east of Bangor Street.
- A487 north of B4547.
- A4087 east of A487.

9.3.3 Automatic Traffic Counts (ATCs) have been carried out at specific locations on the roads above which, collectively, form the Study Area. ATCs collect data in relation to traffic flows passing a point on the road network in both directions. Further details of the ATCs are provided in **Section 9.5** and summarised as the average annual daily traffic flows. A plan of the locations which, collectively, define the extent of the Study Area as shown in **Figure 2.9.1**.

9.4 Assumptions and Limitations

9.4.1 The Pentir works site is in a predominantly rural area where access may be limited by highway design and availability of public transport. It is assumed that the road network and local services will remain unchanged, with the future baseline conditions closely reflecting the current baseline.

9.4.2 Baseline traffic surveys reflect average annual daily traffic conditions, and construction traffic flows have been estimated based on a best assessment of likely construction needs.

9.4.3 This chapter's approach employs a worst-case scenario, focusing on 24-hour annual average daily two-way vehicle trips and the maximum daily two-way HGV and worker movements during the construction period.

9.4.4 A construction period of 28 months is considered the shortest feasible timeline for completing the works and is used as a reasonable worst-case scenario for estimating maximum daily trips. If the construction period were extended, traffic impacts would remain the same or decrease because the activities would be less intensified. Additionally, if construction were to commence later than modelled, the impacts would remain unaffected.

9.5 Baseline

9.5.1 This section describes the baseline conditions for the Traffic and Transport assessment, with specific reference to the highway network, walking, cycling and public transport facilities on the strategic and local highway network.

Existing Baseline

9.5.2 The existing baseline provides a description of the Strategic Road Network (SRN), the local highway network, accessibility in terms of walking, cycling, and public transport, road safety, and the baseline traffic flows. This section is supported by the following figures:

- **Figure 2.9.1**: Pentir Study Area and Traffic Survey Locations.
- **Figure 2.9.2**: Study Area Road Network.
- **Figure 2.9.3**: Traffic Accident Locations.
- **Figure 2.9.4**: Indicative HGV Routing.

9.5.3 This section is also supported by the traffic count data provided in **Volume 8, Appendix 2.9.B: Traffic Base Counts.**

Strategic Road Network

A5

9.5.4 The A5 is a major road in North Wales running from London to Holyhead. Within the extent of the Study Area, the A5 functions as a key arterial route connecting Bangor to the west and Betws-y-Coed to the east. This road is largely used for both local and regional traffic, serving as a primary route for accessing North Wales's interior regions.

9.5.5 In addition to serving local and regional traffic, the A5 also accommodates other, less frequent uses. These include tourism-related traffic, particularly in peak seasons due to

the road's proximity to Eryri National Park, as well as some commercial freight transport, although this is more limited compared to primary freight routes. Occasional use by agricultural vehicles is also noted, given the rural areas it traverses.

9.5.6 In the vicinity of the Pentir works site, the A5 is a dual carriageway road, though its width may vary, particularly where the road passes through more constrained sections or approaches key junctions. The road is typically lined with grass verges and hedgerows, with occasional laybys and passing places. The A5 is subject to the national speed limit in most sections, with lower limited sections near complex alignment or at critical junctions.

9.5.7 The A5 is expected to be an important route for freight and passenger traffic, including construction related HGVs and workers traveling to and from the Pentir works site. Its importance as a main artery through North Wales means that traffic volumes can be substantial, especially during peak tourist seasons.

A487

9.5.8 The A487 is a key trunk road running in a generally north-south direction, connecting coastal towns and key inland areas across North Wales. In the vicinity of Pentir works site, the A487 serves as a major route facilitating connectivity between Bangor to the north and Porthmadog to the south. This road forms part of the Welsh SRN, providing vital access to regional and national destinations, including the A55 North Wales Expressway, which links to the broader UK motorway network.

9.5.9 Near the Pentir works site, the A487 is predominantly a single carriageway road with one lane in each direction. As the A487 approaches the A487/A4087/B4547 roundabout, sections of the road are dualled. It is characterised by a mix of rural and semi-urban surroundings, with stretches bordered by agricultural land and occasional residential properties. The road features grass verges and sporadic footways, particularly as it approaches more built-up areas. Speed limits on this section of the A487 vary, with national speed limits applicable in rural areas, reducing to 30 miles per hour (mph) or 40 mph as the road passes through residential zones or near key junctions.

9.5.10 Due to its strategic importance, the A487 carries a significant proportion of HGVs, making it a critical route for the transportation of construction materials and equipment to the Pentir works site. Commuter traffic, especially during peak hours, and seasonal tourist traffic also contribute to fluctuations in traffic volumes. Construction vehicles using this road will need to account for potential delays, particularly during peak travel periods.

Local Highway Network

A4244

9.5.11 The A4244 is a secondary road connecting the A487 near Pentir to the A4086 and A5, serving as a vital link between these major routes. Running in an east-west direction, the A4244 provides access to local communities, including Deiniolen and Llanberis, and acts as a feeder road for traffic heading towards the A55, and the wider road network.

9.5.12 In the vicinity of the Pentir works site, the A4244 is a single carriageway road with one lane in each direction, flanked by grass verges and occasional hedgerows. The road is subject to a variety of speed limits, typically adhering to the national speed limit in rural sections, with lower limits near built-up areas or junctions. The road’s alignment includes several bends and changes in elevation, which may affect visibility and could be challenging for larger vehicles, particularly HGVs.

9.5.13 Given its role as a connector between major routes, the A4244 is likely to see moderate traffic volumes from construction-related vehicles, especially those accessing the Pentir works site from the east.

A4087

9.5.14 The A4087 is a short road linking the A4244 with the A487 and A5. It runs in a south-west/north-east direction, providing a direct route between Bangor and the A55 to the north and the A4244 to the south. The road serves as a key connector for local and regional traffic, facilitating movements between the Pentir area and Bangor, as well as access to the A55.

9.5.15 The A4087 is a single carriageway road, typically flanked by grass verges and some roadside development. Between the A487 and A5, the national speed limit applies to vehicles travelling along the road, dropping to 40 mph as the road approaches Bangor.

9.5.16 This route, though relatively short, experiences significant traffic volumes, particularly during peak travel times, due to its role in linking major routes in the region. Construction vehicles, especially HGVs, will likely use this road when accessing the Pentir works site from Bangor or the A55.

B4409

9.5.17 The B4409 is a secondary road running parallel to the A5 for much of its length, connecting the communities of Bethesda and Tregarth to the A4244 and A55. This road serves as a local access route for villages along the Ogwen Valley and provides an alternative to the A5 for local traffic.

9.5.18 In the Pentir area, the B4409 is a single carriageway road with one lane in each direction, characterised by rural surroundings with minimal roadside development. The road is narrow in places, with limited visibility due to sharp bends and changes in elevation. The B4409 is subject to a mix of speed limits, reflecting its local access function and the nature of the road. In Tregarth, the B4409 is subject to a 20-mph speed limit, increasing to 40 mph on the approach to Bethesda.

9.5.19 Traffic volumes on the B4409 are relatively low compared to the nearby A5, with the road primarily serving residents and agricultural traffic. However, it may be used as an alternative route for construction traffic, particularly for smaller vehicles or those servicing local communities. The road's narrow and winding nature may limit its suitability for large HGVs, so careful consideration will be required in route planning.

B4366

9.5.20 The B4366 is another secondary road in the region, running in a north-east/south-west direction and connecting the A4087 near Pentir with the A487 to the south. This road serves as a local access route for communities such as Bethel and Rhiwlas, providing a link between these villages and the primary road network.

9.5.21 In the vicinity of the Pentir works site, the B4366 is a single carriageway road, featuring narrow lanes and limited passing opportunities. The road is flanked by grass verges and occasional hedgerows, with a largely rural character. Speed limits on the B4366 vary, with lower limits in place near residential areas and higher limits in more open rural sections.

9.5.22 The B4366 is likely to experience light traffic volumes from construction-related vehicles, primarily staff vehicles. The road's narrow alignment requires careful navigation, which may face challenges in passing or turning on this route.

B4547

9.5.23 The B4547 is a minor road running east-west, connecting Y Felinheli to the west and the A4244 to the east. It serves as a local route for accessing small communities scattered across the hillsides between these secondary roads.

9.5.24 Near Pentir, the B4547 is a single carriageway, typically narrow, with stone walls or hedgerows lining its edges. The road features steep gradients and sharp bends, especially as it navigates the region's hilly terrain. Speed limits vary along the route, with lower limits of 20 to 30 mph in Bethel, increasing to the national speed limit towards Pentir.

9.5.25 Traffic on the B4547 is predominantly local, accommodating residents and visitors. The Pentir substation's access road is approximately 500 m from the A422/B4366/B4547 roundabout, meaning the B4547 will handle all construction-related traffic. Given the road's challenging alignment and rural character, caution and careful navigation will be essential for construction vehicles.

Unclassified Road

9.5.26 An unclassified road, which runs north to south from the B4547 provides access to Pentir substation. It is a single lane road with no road markings and occasional passing spaces. A bell mouth, give way junction with warning signs, but no signals, is in place where the road meets the B4547.

Walking and Cycling

9.5.27 The Definitive PRoW Map for Gwynedd (Ref 2.2) has been reviewed in the Study Area, using a comprehensive dataset that is regularly updated by each county council or unitary authority in England and Wales.

9.5.28 An extract from the Definitive Map highlights the three nearest PRoW to the Pentir works site. However, these PRoW are not expected to be impacted by the proposed works. The identified PRoW and closest distances are:

- Llanddeiniolen 111 footpath, connecting Fodolydd Lane and the B4547 (1 km west of the Pentir works site).
- Llanddeiniolen 57 footpath, connecting Llanddeiniolen and the B4366 (1.3 km south of the Pentir works site).
- Llanddeiniolen 60 footpath, connecting the A4244 and Rhiwlas (1.2 km east of the Pentir works site).

9.5.29 These routes do not intersect the Pentir works site.

Public Transport Facilities

Bus

9.5.30 There are several services that may be affected by the proposed works due to temporary traffic management measures (e.g., temporary traffic signals) and the presence of construction traffic along bus routes. The Study Area is served by multiple bus routes that provide access to key locations (see **Table 9-1**). The primary routes include the A4244, B4547, B4366 and B4409, each offering varied levels of service frequency, which are essential for local connectivity. -

Table 9-1 – Public transport services – bus

Route section	Bus route	Frequency
B4547	S2	1 hour
	S3	2 hours
	5C	20 minutes
A4244	S2	1 hour
B4366	S3	2 hours
B4409	G10	2 hours

9.5.31 The variety of bus services in the Study Area demonstrate that the Pentir works site is generally well-served by public transport, facilitating movement for both residents, visitors and workers. However, it is noted that the variability in services to the Pentir works site may influence the convenience and reliability of public transport as a primary mode of travel, particularly during off-peak hours.

Rail

9.5.32 The nearest rail facilities to the Pentir works site include Llanfairpwll (7.4 km), and Bangor (8.7 km), to the north-west, and north, respectively. Based on these distances and the lack of other public transport facilities alongside insufficient footway provision, using the train from these locations is unlikely to be viable for workers.

Summary

9.5.33 In summary, it can be concluded that opportunities to support sustainable travel are limited. People wishing to cycle will be encouraged and accommodated, but not relied on in terms of trip assessment.

9.5.34 It has been assumed for assessment purposes that all staff working on-site will predominantly travel by private vehicles (sole occupancy or car sharing).

Road Safety

9.5.35 A review of road safety on the local highway network has been carried out. Personal Injury Collision (PIC) statistics have been obtained from CrashMap (Ref 9.7) for the local highway network in the Study Area for the most recent seven-year period available. The road network in the Study Area is shown in **Figure 2.9.2** and the accident locations are shown in **Figure 2.9.3**.

9.5.36 Over the seven years, 39 collisions occurred in the accident Study Area, categorised as either slight, severe, or fatal. A slight collision is one in which at least one person has been slightly injured. A serious collision is one in which at least one person has been seriously injured and a fatal collision is one in which at least one person has been killed.

9.5.37 **Table 9-2** provides a summary of collisions by severity and year and shows that the greatest number of collisions occurred in 2018 and 2020 with a total of nine collisions in each year (six slight, three serious; six slight, two serious, one fatal, respectively); 2017 recorded the lowest number, with a total of one slight collision. The information also shows that since 2016, collisions have generally increased up to 2022.

Table 9-2 – Collisions by year and severity

Year	Slight	Serious	Fatal	Total
2016	3	1	1	5
2017	1	0	0	1
2018	6	3	0	9
2019	3	2	0	5
2020	6	2	1	9
2021	2	0	2	4
2022	3	3	0	6
Total	**24**	**11**	**4**	**39**

9.5.38 **Table 9-3** shows the data split by collisions on road links and collisions that occurred at or near junctions. The highest number of collisions were recorded on the A4244 East of B4547 (six) and the A487 North of B4547 (six), with the remaining links having fewer recorded incidents.

Table 9-3 – Collisions by link and severity

Link	Slight	Serious	Fatal	Total
B4547 east of Pentir substation access road	1	1	1	3
A4244 east of B4547	5	1	0	6
A4244 south of B4547	1	2	0	3
B4366 west of A4244	0	0	0	0
B4409 east of A4244	1	0	0	1
A4244 north of B4409	2	1	1	4
A5 east of A4244	1	0	0	1
A5 west of A4244	2	1	0	3
B4547 west of Pentir substation access road	2	1	0	3
A487 south of B4547	1	2	0	3
Bangor Street	0	0	0	0
B4547 east of Bangor Street	2	0	0	2
A487 north of B4547	4	1	1	6

Link	Slight	Serious	Fatal	Total
A4087 east of A487	2	1	1	4
Total	**24**	**11**	**4**	**39**

9.5.39 The information in **Table 9-4** further analyses the temporal variation in terms of collisions on the A4244 east of B4547 and the A487 north of B4547.

Table 9-4 – Collisions on A4244 east of B4547 and A487 north of B4547

Year	A4244 east of B4547	A487 north of B4547
2016	1	1
2017	0	0
2018	2	1
2019	1	0
2020	1	2
2021	0	1
2022	1	1
Total	**6**	**6**

9.5.40 The collision record on the A4244 east of B4547 shows that six collisions have occurred between 2016 to 2022. The highest number of collisions (two) occurred in 2018, while no collisions were recorded in 2017 and 2021. In terms of A487 north of B4547, there were a total of six recorded collisions. 2020 had the highest number of collisions (two), while 2017 and 2019 had no collisions recorded.

9.5.41 **Table 9-5** shows the collisions that occurred at, or close to, junctions with those that occurred away from a junction discarded from the dataset.

Table 9-5 – Collisions by junction and severity

Link	Slight	Serious	Fatal	Total
A487/A4087/ B4547 Roundabout	3	1	0	4
A4087/Hafod Road	2	0	0	2
B4547/Bangor Street	2	0	0	2
B4547/Fordolydd Road	1	1	0	2
A4344/A5 Roundabout	4	1	0	5
A4244/High Street	1	0	0	1
Total	**13**	**3**	**0**	**16**

9.5.42 The data indicates that the highest number of recorded incidents occurred at the A4344/A5 Roundabout to the north-east of the Pentir works site, with five recorded

collisions (four slight and one serious). This is followed by the A487/A4087/B4547 Roundabout which recorded four collisions (three slight and one serious). Other junctions, including A4087/Hafod Road, B4547/Bangor Street and B4547/Fordolydd Road, each recorded two collisions.

9.5.43 Based on the PIC data provided, there are no incidents occurring frequently at any location in the Study Area in any given year.

Baseline Traffic Flows

9.5.44 To understand baseline traffic levels, ATC surveys were carried out at 14 locations surveyed during the week of Thursday 26 September 2024 to Wednesday 02 October 2024. The surveys carried out during this period were undertaken to cover roads potentially affected by traffic associated with the proposed works. However, due to a sensor failure during this period, the survey at ATC 2.7 (A5 east of A4244) in the north-westbound direction was carried out separately, from Wednesday 09 October 2024 to Tuesday 15 October 2024.

9.5.45 Traffic count data has been collected by Road Data Services Ltd, with the survey locations agreed with North and Mid Wales Trunk Road Agent. The ATC locations form the extent of the Study Area, shown in **Figure 2.9.1**.

9.5.46 Data was recorded for seven days, 24 hours a day at 60-minute intervals. The surveys were undertaken during a neutral survey month, timed outside of the school holidays to provide representative traffic levels.

9.5.47 The following traffic data has been included: 24-hour Annual Average Daily Traffic (AADT).

9.5.48 Winter working hours for workers are expected to be shorter, with worker numbers expected to fluctuate. Worker hours may be reduced in winter depending on the timing of the proposed works. However, the worst-case scenario for traffic impacts is still expected to be within peak periods of the summer months.

9.5.49 **Table 9-6** below shows the baseline traffic flows for total vehicles and HGVs in 2024 that will be used as the basis for assessment.

Table 9-6 – 2024 baseline traffic flows (two-way) – total vehicles and HGVs

ATC	Link	24 Hour AADT	
		Total vehicles	HGVs
2.1	B4547 east of Pentir substation Access	5,763	91
2.2	A4244 east of B4547	6,917	153
2.3	A4244 south of B4547	6,755	128
2.4	B4366 west of A4244	4,527	88
2.5	B4409 east of A4244	1,351	17
2.6	A4244 north of B4409	7,117	150
2.7	A5 east of A4244	11,489	218
2.8	A5 west of A4244	18,697	396

ATC	Link	24 Hour AADT	
		Total vehicles	HGVs
2.9	B4547 west of Pentir substation Access	5,763	163
2.10	A487 south of B4547	20,138	606
2.11	Bangor Street	3,847	105
2.12	B4547 east of Bangor Street	9,014	199
2.13	A487 north of B4547	17,799	427
2.14	A4087 east of A487	13,166	204

Future Baseline Traffic Flows

9.5.50 This section considers those changes to the baseline conditions, described above, that might occur in the absence of the proposed works during the period over which the proposed works would have been in place.

9.5.51 Subject to being granted consent and following a final investment decision, the earliest construction could start is 2027.

9.5.52 The proposed works involve the replacement of cross-site cables in the existing Pentir substation compound. Construction activities will be centred around Grid Reference SH 559677, a relatively flat area surrounded by agricultural land and a local wildlife site. Access to the Pentir works site is via the B4547, an unnamed single-lane road, and is screened by a local wildlife site, limiting visibility from the road network.

9.5.53 The peak year for traffic movements is assumed to be 2027 and has been used as the future assessment year.

9.5.54 Future baseline traffic flows for the assessment year of 2027 for the peak construction have been derived by applying the national standard Trip End Model Presentation Program v8.1 (TEMPro) to derive traffic growth factors. TEMPro growth factors include a forecast of local development growth and attempt to capture growth attributed to these other developments. Theoretically, cumulative schemes have been captured in the future baseline. The following locations were used to apply a growth factor to the baseline data:

- Gwynedd 002 – W02000011 – Bangor South.
- Gwynedd 003 – W02000012 – Bethesda.
- Gwynedd 004 – W02000013 – Bethel and Llanrug.
- Gwynedd 005 – W02000014 – Llanberis and Deiniolen.

9.5.55 This growth factor as shown in **Table 9-7** has been considered when comparing the baseline and future traffic scenarios.

Table 9-7 – TEMPro growth factors (2024-2027)

Period	Region	Region growth factor	Average growth factor
2024-2027	Gwynedd 002	1.0274	

	Gwynedd 003	1.0226	1.0241
	Gwynedd 004	1.0217	
	Gwynedd 005	1.0247	

9.5.56 The 2027 baseline traffic flows are shown in **Table 9-8**. These are the anticipated baseline flows for the peak of the construction period, with the absence of the proposed works along local road links.

Table 9-8 – 2027 baseline traffic flows (two-way) – total vehicles and HGVs

ATC	Link	24 hour AADT	
		All vehicles	HGVs
2.1	B4547 east of Pentir substation access road	5,902	93
2.2	A4244 east of B4547	7,083	157
2.3	A4244 south of B4547	6,917	131
2.4	B4366 west of A4244	4,636	90
2.5	B4409 east of A4244	1,384	18
2.6	A4244 north of B4409	7,288	153
2.7	A5 east of A4244	11,766	223
2.8	A5 west of A4244	19,148	405
2.9	B4547 west of Pentir substation access road	5,902	167
2.10	A487 south of B4547	20,623	621
2.11	Bangor Street	3,939	107
2.12	B4547 east of Bangor Street	9,231	204
2.13	A487 north of B4547	18,228	437
2.14	A4087 east of A487	13,483	209

9.6 Scope of Assessment

9.6.1 This section outlines the scope of the assessment for Traffic and Transport, which has been produced to follow the methodology outlined in the IEMA Guidelines. Full details of the approach and assessment methodology are contained in **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**.

9.6.2 **Table 9-9** summarises the potential Traffic and Transport receptors that have been reviewed following the IEMA Guidelines and states whether they have been included or excluded from the Traffic and Transport assessment. Justifications are provided where receptors have been included or excluded from the assessment.

Table 9-9 – Scope of Traffic and Transport assessment

Receptor	Scoped in/out	Justification
Severance	In	Construction could generate potentially significant impacts on severance due to an overall increase in traffic volumes, which may disrupt local connectivity and access.
Driver Delay	In	Construction is likely to result in potentially significant impacts on driver delay, due to increased traffic levels and possible congestion at key junctions.
Pedestrian Delay	In	Significant effects related to pedestrian delay are unlikely during construction due to low expected levels of pedestrian activity surrounding the Pentir works site.
Non-motorised user (NMU) amenity	In	Construction may generate potentially significant impacts on pedestrian and cyclist amenities due to increased traffic levels affecting the safety and comfort of non-motorised users.
Fear and intimidation	In	Construction could have potentially significant impacts on fear and intimidation, as higher traffic volumes may increase perceived risks for vulnerable road users.
Road safety and accidents	In	Construction is anticipated to result in potentially significant impacts on road safety due to increased traffic levels and potential changes in driver behaviour.
Total traffic increase	In	Construction could lead to potentially significant impacts on traffic levels as a result of increased vehicular activity associated with the development.
HGV increase	In	Construction may result in potentially significant impacts in relation to HGV numbers, contributing to overall traffic volume and potentially affecting road safety and local amenity.
Hazardous loads	Out	There are no nearby road features which suggest that the transfer of hazardous materials poses a risk beyond that which would be expected on the general highway network, indicating no significant impacts during the construction.

9.7 Methodology

9.7.1 Details of the technical methods used to determine the baseline conditions, sensitivity of receptors, magnitude of effects and the significance criteria that have been used for the Traffic and Transport assessment can be found in **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**. This appendix provides comprehensive guidance on the methodologies applied, ensuring the assessment's conclusions are based on well-established and recognised standards.

Sources of Information

9.7.2 In preparation of this chapter, the following sources of information have been referenced:

- PIC data has been gathered from CrashMap (Ref 9.7).
- ATCs have been undertaken at 14 locations in the Study Area to identify the baseline traffic conditions on the surrounding highway network. The resulting traffic flow diagrams are presented in **Volume 8, Appendix 2.9.A: Traffic Flow Diagrams** and the traffic data is summarised in **Table 9-6**.
- Local travel information has been gathered from various sources including local bus and rail operators.
- Ordnance Survey (OS) and Architectural Base Mapping has been used to ascertain an accurate geographical representation of the areas in the vicinity of the proposed works.
- Population data from the City Population website.

9.7.3 A physical site visit was not conducted; instead, the transport and traffic technical team utilised Google Street View extensively. This virtual assessment allowed for a thorough review of the local road network and nearby facilities. The information obtained has been used to inform the baseline conditions contained in **Section 9.5** of this chapter. These observations were also used to support the road link sensitivity designations, as provided in **Table 9-10**.

Methodology

9.7.4 The purpose of the Traffic and Transport assessment is to evaluate the potential impacts of development-generated traffic on the surrounding road network during various phases of the proposed works, with a focus on construction. This assessment aims to identify and quantify the potential adverse effects on road users, non-motorised users, and local communities, ensuring that any significant impacts are recognised and appropriately mitigated. The assessment considers both the sensitivity of the receptors (e.g., communities, road users) and the magnitude of changes in traffic conditions to determine the overall significance of the effects.

9.7.5 The methodology used for this assessment is based on the IEMA Guidelines, which outline specific criteria for including highway links in the study, such as a 30% increase in traffic flows or a 10% increase in high-sensitivity areas. The assessment covers a range of potential effects, including severance, driver delay, non-motorised user amenity, fear and intimidation, and road safety. By systematically applying these criteria, the assessment provides a robust analysis of the potential impacts during construction, with consideration given to mitigation measures to reduce adverse effects.

Receptor Sensitivity

9.7.6 The methodology for assessing the impact of the proposed works generated traffic will be based on that outlined in the IEMA Guidelines and is stated in **Volume 8, Appendix 1.4.A: Topic Assessment Methodology.**

Link Sensitivity

9.7.7 The road link sensitivity has been based upon the worst-case sensitivity of the whole link considering the criteria outlined in **Table 7.1** of **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**. The links are represented by the ATC locations:

Table 9-10 – Link sensitivity

ATC	Link	Sensitivity
2.1	B4547 east of Pentir substation access road	Very Low
2.2	A4244 east of B4547	Low
2.3	A4244 south of B4547	Very Low
2.4	B4366 west of A4244	Very Low
2.5	B4409 east of A4244	Low
2.6	A4244 south of B4409	Low
2.7	A5 east of A4244	Low
2.8	A5 west of A4244	Low
2.9	B4547 west of Pentir substation access road	Very Low
2.10	A487 south of B4547	Very Low
2.11	Bangor Street	Medium
2.12	B4547 east of Bangor Street	Low
2.13	A487 north of B4547	Low
2.14	A4087 east of A487	Very Low

Magnitude

9.7.8 The link sensitivities outlined above have been used to assess the significance of the impact of the proposed works by combining the magnitude of change. The impact magnitude criteria is outlined in **Table 7.2** of **Volume 8, Appendix 1.4.A: Topic Assessment Methodology.**

Significance

9.7.9 The significance of effects considering the sensitivity of the receptor, and the magnitude of impact are defined as beneficial or adverse and stated in **Table 7.3** of **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**. Effects predicted to be 'major' or 'moderate' are considered 'significant' whilst effects predicted to be 'minor' or 'negligible' are considered 'not significant'.

Trip Generation

9.7.10 This section outlines the trips generated by the proposed works during construction. It is important to highlight that there is very limited data in the Trip Rate Information Computer System trip generation database for standalone cabling upgrades, and a first principles approach has been adopted to estimate the anticipated vehicle trip generation. This methodology relies on professional judgement and input from the project team. The peak of construction in terms of generated trips is projected to occur between Months 1–12 of the construction programme when the civils and earthworks will take place.

9.7.11 The peak construction year is expected to be 2027, which has been incorporated into the assessment.

Construction Staff

9.7.12 The current estimate is that a peak of 50 Full Time Equivalent workers will be on-site per day at Pentir substation. These numbers include workers associated with the replacement of the existing cross-site cables and those associated with the installation of the new cross site cables.

9.7.13 In order to minimise the number of vehicle trips generated, it is expected that car-sharing measures will be promoted by the contractor during peak construction stages. For the purposes of this assessment, it is assumed that a proportion of workers will participate in car-sharing schemes, based on the traffic distribution information derived from the population data (**Table 9-12**). A percentage of workers that may engage in car-sharing has been estimated based on professional judgement.

9.7.14 It is assumed that approximately 50% of the workforce (25 out of 50 workers) will participate in car-sharing. This estimate is informed by car-sharing uptake observed at other relevant infrastructure projects. A realistic car-sharing ratio of 1.5 workers per vehicle has been applied. This results in an estimated 17 one-way daily car movements for the car-sharing workers.

9.7.15 For the remaining 25 workers who do not engage in car-sharing, it is assumed they will travel individually by private vehicles. Adding these 25 movements to the 17 movements generated by car-sharing workers results in a total of 42 one-way daily vehicle movements per day for the workforce.

9.7.16 For the purposes of this assessment, it is assumed that the proposed works will generate a total of 84 two-way daily vehicle movements (42 in and 42 out).

Construction HGVs

9.7.17 In terms of HGVs, it is estimated there would be a peak of up to five HGV deliveries (including waste removal) per day (five inbound and five outbound). These numbers include all HGVs associated with the proposed works.

Total Vehicles

9.7.18 **Table 9-11** provides a summary of the 24-hour AADT trip generation by vehicle type, presenting the number of private vehicles, HGVs and the Total (Two-Way). This table outlines the overall traffic impact associated with the Scheme across a full 24-hour period, without breaking down specific time periods.

Table 9-11 – 24-hour AADT trip generation by vehicle type

Vehicle Type	In	Out	Total (two-way)
Cars	42	42	84
HGVs	5	5	10
Total	**47**	**47**	**94**

Vehicle Distribution

9.7.19 This section provides details of the anticipated characteristics of journeys generated by the construction of the proposed works. The below summarises the forecasting of how vehicle trips will be distributed across the road network.

Construction Staff

9.7.20 Construction staff will be encouraged to take the most direct route to the Pentir works site using 'higher' order roads, such as A and B classified roads.

9.7.21 Workers will park in the Pentir works site during the construction.

9.7.22 For this assessment, the distribution of construction worker trips has been determined using a gravity model approach, estimating the origins of their journeys from significant settlements in a 90-minute estimated drive time. This methodology has been applied to private car trips as it is a reasonable approach given that exact locations of the construction workforce are not known at this stage.

9.7.23 The locations, settlement weightings, and the resulting distribution are provided in **Table 9-12**.

Table 9-12 – Worker distribution

Town	Population	Distance (km)	Distance^2	Population/ distance^2	Distribution
Bangor	15,060	10	100	150.6	31%
Anglesey	69,291	27	729	95.0	20%
Llandudno	19,716	36.7	1,347	14.6	3%
Conwy	15,725	28.6	818	19.2	4%
Chester	96,510	99.5	9,900	9.7	2%
Porthmadog	3,970	41	1,681	2.4	0%
Colwyn Bay	10,576	37.5	1,406	7.5	2%
Prestatyn	16,680	63.4	4,020	4.1	1%
Mold	9,891	86.4	7,465	1.3	0%
Wrexham	65,200	114.3	13,064	5.0	1%
Ellesmere Port	65,421	103	10,609	6.2	1%
Liverpool	891,211	116.5	13,572	65.7	14%
Birkenhead	109,848	114.6	13,133	8.4	2%
Pwllheli	3,622	43.1	1,858	1.9	0%
Caernarfon	9,827	10.6	112	87.5	18%

9.7.24 The potential route choices from these origins to the Pentir works site have then been assumed using an iterative process with an online interactive mapping tool that shows the fastest route. No restrictions have been applied to possible routes workers could take to and from the Pentir works site.

Construction HGVs

9.7.25 Construction HGVs will travel to the Pentir works site firstly via the SRN, then use the most appropriate routes to avoid unnecessary routing though local villages and rural areas.

9.7.26 HGVs have been distributed across the road network based on the routing set out below. The vehicle routing plan showing the routing strategy for HGVs is shown in **Figure 2.9.4**. Further details are also shown in **Volume 8, Appendix 2.9.A: Traffic Flow Diagrams**.

- A55 from the east – 50%.
- A55 from the west – 25%.
- A487 – 25%.

9.7.27 Travelling from the SRN to the Pentir works site, HGVs will take the following routes:

- HGVs travelling west on the A55 will exit at J11, then travel along the A4244 before travelling north-west on the B4547 for 500 m to the Pentir works site access.
- HGVs travelling east on the A55 will exit at J9, then travel south on the A487, before turning onto the B4547 leading south-east to the Pentir works site access.
- HGVs travelling from the south will travel on the A487, then turn onto the B4547 at the roundabout with the A487/A4087/B4547.

Trip Assignment

Construction Staff Assignment

9.7.28 Based on the trip distribution exercise and the proposed trip generation outlined in the sections above, **Table 9-13** outlines the total number of expected construction workers to drive (private car and car share) from each location.

Table 9-13 – Trip generation overview

Town	Total worker(s)	Total driving	Private car	Car share (vehicle 1.5 ratio)
Bangor	16	16	10	5
Anglesey	10	10	7	3
Llandudno	2	2	1	1
Conwy	2	2	1	1
Chester	1	1	1	0
Porthmadog	0	0	0	0
Colwyn Bay	1	1	1	0
Prestatyn	0	0	0	0
Mold	0	0	0	0

Town	Total worker(s)	Total driving	Private car	Car share (vehicle 1.5 ratio)
Wrexham	1	1	0	0
Ellesmere Port	1	1	0	0
Liverpool	7	7	5	2
Birkenhead	1	1	1	0
Pwllheli	0	0	0	0
Caernarfon	9	9	6	3
Total	**50**	**50**	**33**	**17**

9.7.29 The traffic movements have been distributed across the ATC locations in the Study Area based on the distribution parameters outlined **in Section 9.7**. The daily two-way movements are presented in **Table 9-14**. These are also shown in traffic flow diagrams provided in **Volume 8, Appendix 2.9.A: Traffic Flow Diagrams.**

9.7.30 The distribution is based on the access arrangements outlined in **Section 9.7.**

Table 9-14 – Daily profile of total two-way construction traffic link by link

ATC	Link	Daily	
		All vehicles	HGV
2.1	B4547 east of Pentir substation Access	31	5
2.2	A4244 east of B4547	30	5
2.3	A4244 south of B4547	0	0
2.4	B4366 west of A4244	1	0
2.5	B4409 east of A4244	0	0
2.6	A4244 north of B4409	30	5
2.7	A5 east of A4244	0	0
2.8	A5 west of A4244	15	3
2.9	B4547 west of Pentir substation access road	63	5
2.10	A487 south of B4547	18	3
2.11	Bangor Street	0	0
2.12	B4547 east of Bangor Street	63	5
2.13	A487 north of B4547	19	3
2.14	A4087 east of A487	26	0

9.7.31 It is considered that individual junction assessments are not required at these locations as traffic will be zero during the network AM peak hour (8.00 am – 9.00 am) and will be minimal due to management of traffic movements during the network PM peak hour (5.00 pm – 6.00 pm).

9.8 Potential Effects

9.8.1 The anticipated effects resulting from the increases in traffic associated with the construction of the proposed works are outlined as follows:

Construction

9.8.2 The peak construction traffic generated by the proposed works is anticipated to be between **Months 1 and 12**, with Month 6 of construction potentially occurring as early as 2027.

9.8.3 Access to the Pentir works site will be via the B4547, with all staff and HGV movements entering and exiting through the Pentir substation access. Both staff vehicles and HGVs will use this access point exclusively. The proposed increase in two-way vehicle movements across the day (24 hours), in terms of actual increases and percentage increases relative to the future baseline traffic flows, are presented in the tables below at each link location.

9.8.4 **Table 9-15** provides an overview of the total percentage increase for total vehicles on each of the links associated with the proposed works during the peak construction year (2027).

Table 9-15 – 2027 future year flows AADT (two-way)

		24 Hour AADT				
ATC	**Link**	**Base**	**Development**	**Total**	**All vehicle % increase**	**HGV % increase**
2.1	B4547 east of Pentir substation access road	5,933	98	6,031	0.5%	5.4%
2.2	A4244 east of B4547	7,113	162	7,275	0.4%	3.2%
2.3	A4244 south of B4547	6,917	131	7,048	0.0%	0.0%
2.4	B4366 west of A4244	4,637	90	4,727	0.0%	0.0%
2.5	B4409 east of A4244	1,384	18	1,401	0.0%	0.0%
2.6	A4244 north of B4409	7,318	158	7,477	0.4%	3.3%
2.7	A5 east of A4244	11,766	223	11,989	0.0%	0.0%

2.8	A5 west of A4244	19,163	408	19,571	0.1%	0.6%
2.9	B4547 west of Pentir substation Access	5,965	172	6,138	1.1%	3.0%
2.10	A487 south of B4547	20,641	623	21,264	0.1%	0.4%
2.11	Bangor Street	3,939	107	4,047	0.0%	0.0%
2.12	B4547 east of Bangor Street	9,294	209	9,503	0.7%	2.5%
2.13	A487 north of B4547	18,247	439	18,687	0.1%	0.6%
2.14	A4087 east of A487	13,510	209	13,719	0.2%	0.0%

*The numbers highlighted in **bold** represent where there is an increase in traffic of >30%.*

9.8.5 The results in **Table 9-15** indicate the following:

- The proposed works are anticipated to have the largest proportional increase in daily traffic levels at ATC 2.9 (B4547 west of Pentir substation access road), with only a 1.1% increase in average daily traffic.
- Both the B4547 west of Pentir substation access road and the B4547 east of Bangor Street are predicted to experience the highest levels of additional traffic associated with the proposed works during the construction period. On an average day, it is expected that 63 construction worker vehicles, including private car workers, will travel along the roads to arrive at the proposed works, contributing to the slight overall increase in AADT on the road network.

9.8.6 With reference to the IEMA Guidelines (Ref 9.5), a two-rule approach can be used to assess the extent of any traffic assessment as follows:

- **Rule 1 –** Include highway links where traffic flows will increase by more than 30% (or the number of heavy goods vehicles will increase by more than 30%).
- **Rule 2 –** Include highway links of high sensitivity where traffic flows have increased by 10% or more.

9.8.7 **Table 9-15** indicates that none of the assessed links would experience an increase in average daily traffic (AADT) of more than 30%.

9.8.8 The following sections summarise the likely effects on receptors in terms of local construction traffic, severance, pedestrian amenity, fear and intimidation and highway safety.

9.8.9 **Table 9-16** indicates the magnitude of impact for the AADT measured against the criteria set out in **Table 7.2** of **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**.

9.8.10 If necessary, for the purposes of the assessment, professional judgement has been used to amend the ‘High’ magnitudes for road links to ‘Medium’ where baseline flows are low, and there is a sufficient capacity on the road network to accommodate the trips generated by the proposed works. The basis of this assumption is detailed as part of **Table 7.2** of **Volume 8, Appendix 1.4.A: Topic Assessment Methodology.**

9.8.11 For the purposes of the highway safety analysis, all links estimated to experience increases in total traffic flows above 30% have been analysed further on a case-by-case basis.

Table 9-16 – Magnitude of impact (construction) – 2027 AADT

ATC	Link	Sensitivity	All traffic increase %	Construction traffic	Severance of communities	NMU amenity	Fear and intimidation	Road vehicle driver and passenger delay	Accidents and safety
2.1	B4547 east of Pentir substation Access	Very Low	0.5%	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
2.2	A4244 east of B4547	Low	0.4%	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
2.3	A4244 south of B4547	Very Low	0.0%	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
2.4	B4366 west of A4244	Very Low	0.0%	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
2.5	B4409 east of A4244	Low	0.0%	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
2.6	A4244 north of B4409	Low	0.4%	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
2.7	A5 east of A4244	Low	0.0%	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
2.8	A5 west of A4244	Low	0.1%	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
2.9	B4547 west of Pentir substation access road	Very Low	1.1%	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low

ATC	Link	Sensitivity	All traffic increase %	Construction traffic	Severance of communities	NMU amenity	Fear and intimidation	Road vehicle driver and passenger delay	Accidents and safety
2.10	A487 south of B4547	Very Low	0.1%	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
2.11	Bangor Street	Medium	0.0%	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
2.12	B4547 east of Bangor Street	Low	0.7%	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
2.13	A487 north of B4547	Low	0.1%	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
2.14	A4087 east of A487	Very Low	0.2%	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low

9.8.12 As shown in **Table 9-16**, none of the assessed links are predicted to experience either a medium or high magnitude of impact within any of the assessment criteria categories.

9.8.13 Given the assessment results, no links require adjustments based on baseline traffic flows or professional judgment, as none exhibit conditions indicative of a medium or high magnitude of impact.

9.8.14 With reference to **Table 7.3** (significance of effects matrix) in **Volume 8, Appendix 1.4.A: Topic Assessment Methodology** in combination with the above impact magnitudes and applied sensitivity of the transportation links, traffic and transport-related significance of effects are detailed in **Table 9-17** during the peak construction year (2027) in the average annual day.

Table 9-17 – Summary of the assessment (significance of effect) – 2027 + construction AADT

ATC	Link	Construction traffic	Severance of communities	NMU amenity	Fear and intimidation	Road vehicle driver and passenger delay	Accidents and safety	Overall significance
2.1	B4547 east of Pentir substation access road	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Not Significant
2.2	A4244 east of B4547	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Not Significant
2.3	A4244 south of B4547	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Not Significant
2.4	B4366 west of A4244	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Not Significant
2.5	B4409 east of A4244	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Not Significant
2.6	A4244 north of B4409	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Not Significant
2.7	A5 east of A4244	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Not Significant
2.8	A5 west of A4244	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Not Significant
2.9	B4547 west of Pentir substation access road	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Not Significant

ATC	Link	Construction traffic	Severance of communities	NMU amenity	Fear and intimidation	Road vehicle driver and passenger delay	Accidents and safety	Overall significance
2.10	A487 south of B4547	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Not Significant
2.11	Bangor Street	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Not Significant
2.12	B4547 east of Bangor Street	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Not Significant
2.13	A487 north of B4547	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Not Significant
2.14	A4087 east of A487	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Not Significant

9.8.15 As shown in **Table 9-16**, none of the links assessed are predicted to experience a significant effect across any of the assessment criteria.

Accidents and Safety

9.8.16 No road links in the Study Area are predicted to experience a 30% or higher increase in total traffic along the network, as stated in **Table 7.2** (magnitude of effects) of **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**. Therefore, no links have been considered further in terms of accidents and safety.

9.8.17 The analysis of collision data across all assessed links does not indicate any patterns of safety concerns that could be exacerbated by the proposed works. No specific measures related to traffic increases are necessary at this stage, and all road links have been assigned a magnitude of "very low" for accidents and safety impacts.

9.8.18 Although no significant effects are anticipated, measures would be implemented during construction to minimise traffic impacts, as per the CEMP.

Summary

9.8.19 A summary table of the assessments of the potential effects for Traffic and Transport is provided in **Table 9-18.**

Table 9-18 – Summary of assessment effects – Traffic and Transport

Phase	Potential impacts	Duration	Embedded mitigation	Likely significance of effect
Construction	**Construction Traffic Increase** Negligible or minor adverse at all links.	Short Term Temporary (construction only)	Embedded mitigation is described in **Section 9.9**.	Not significant at all other locations.
	Severance of Communities Negligible or minor adverse at all links.	Short Term Temporary (construction only)	Embedded mitigation is described in **Section 9.9**.	Not significant at all locations.
	NMU Amenity Negligible or minor adverse at all links.	Short Term Temporary (construction only)	Embedded mitigation is described in **Section 9.9**.	Not significant at all locations.
	Fear and Intimidation Negligible or minor adverse at all links.	Short Term Temporary (construction only)	Embedded mitigation is described in **Section 9.9**.	Not significant at all locations.
	Road vehicle driver and passenger delay Negligible or minor adverse at all links.	Short Term Temporary (construction only)	Embedded mitigation is described in **Section 9.9**.	Not significant at all locations.
	Road user and pedestrian safety Negligible or minor adverse at all links.	Short Term Temporary (construction only)	Embedded mitigation is described in **Section 9.9**.	Not significant at all other locations.

9.9 Mitigation and Residual Effects

Embedded Mitigation

9.9.1 The proposed works have been designed, as far as practicable, to avoid and reduce impacts and effects on Traffic and Transport through the process of design development, and by embedding measures into the proposed works design. In addition, how the proposed works are constructed, operated and maintained would be appropriately controlled to manage and minimise potential environmental impacts.

9.9.2 Embedded measures that are part of the standard practice and proposed design have been incorporated into the assessment to ensure that likely environmental effects are realistic. This approach avoids assessing scenarios that do not account for these practical measures, providing a more accurate reflection of expected impacts.

Measures Embedded into the Proposed Works Design

9.9.3 The specific measures embedded into the proposed works design are outlined below with respect to the construction.

9.9.4 During construction the following embedded mitigation measures will be included:

- Swept path analysis for HGVs would be carried out to ensure suitable routing.
- HGVs will follow the designated routes as shown in **Figure 2.9.4**. There are anticipated to be 10 two-way trips associated with cable deliveries to the substation.
- Utilising internal routes in the Pentir works site to avoid using the existing road network where practicable.
- Traffic management would be employed where construction vehicles need to interact with the public road network, including providing adequate visibility splays between construction traffic and other road users. Measures such as advanced signage to notify the public of works, and temporary traffic signals or barriers will be implemented. Construction traffic should generally give priority to other road users.
- Restricting HGV movements to certain routes as follows: A5 – A4244 – B4547; A487 – B4547; A4087 – B4547.
- Restricting HGV movements to ensure arrivals and departures between 9.00 am and 5.00 pm to avoid increasing traffic levels on the surrounding highway network during the typical weekday peak hours.
- Implementing a Delivery Management System to control the bookings of HGV deliveries from the start of the construction period. This would be used to regulate the arrival times of HGVs via timed delivery slots, as well as to monitor compliance with HGV routing. In addition, adequate space would be made available in the Pentir works site to ensure no queuing back onto the surrounding road network occurs.
- Implementing a monitoring system to record the route of all HGVs travelling to and from the Pentir works site, to record any non-compliance with the agreed routing strategy and delivery hours and to communicate any issues to the relevant suppliers to ensure the correct routes and times are followed.

- Construction staff (e.g. non-HGV vehicles) would be directed to take the most direct route to the Pentir works site using ‘higher’ order roads, such as A and B classified roads or the SRN.
- Encouraging construction workers to car share to reduce single occupancy car trips would promote the benefits of car sharing, such as reduced fuel costs and environmental impact. A car share system should be implemented to match potential sharers and to help staff identify any colleagues who could potentially be collected along their route to and from the Pentir works site.
- Providing limited (but sufficient) on-site car and cycle parking to accommodate the expected parking demand of workers on the Pentir works site.
- A specialised haulage service would be employed to allow AILs to transport components with the necessary escort, permits and traffic management, with the contractor consulting the relevant highways authorities to ensure the correct permits are obtained. The police will also be given advanced notification under the Road Vehicle Authorisation of Special Types Order 2003 (Ref 9.8).

Residual Effects

9.9.5 Based on the outcome of the assessments, no significant adverse effects are anticipated at any of the assessed links. Traffic levels are expected to increase only slightly, and none of the links will experience increases substantial enough to result in significant impacts.

9.9.6 Throughout the 24-hour period during construction, traffic increases across all links are projected to remain low, with percentage increases well below thresholds that would trigger concerns related to link sensitivity.

9.9.7 This indicates that the overall magnitude of impact (based on the magnitude of impact criteria information in **Table 7.2** of **Volume 8, Appendix 1.4.A: Topic Assessment Methodology** on the road network will be low at all link locations during an average annual day.

Summary

9.9.8 **Table 9-18** provide a summary of the residual effects in relation to traffic and transport.

Table 9-18 – Residual effects – Traffic and Transport (construction phase)

Receptor	Description of impacts including duration	Embedded mitigation	Significance of effect with embedded mitigation	Additional mitigation/ enhancement measures	Residual effect
Road Links	Increase in construction traffic (medium-term, temporary)	Access point to the Pentir works site.	Negligible/Minor Adverse (All links) – Not Significant	None identified.	Negligible/Minor Adverse (All links) – Not Significant
Road Links	Increase in construction HGV traffic (medium-term, temporary)	Access point to the Pentir works site.	Negligible/Minor Adverse (All links) – Not Significant	None identified.	Negligible/Minor Adverse (All links) – Not Significant
Road Links	Severance during construction (medium-term, temporary)	Access point to the Pentir works site.	Negligible/Minor Adverse (All links) – Not Significant	None identified.	Negligible/Minor Adverse (All links) – Not Significant
Road Links	Driver delay during construction (medium-term, temporary)	Access point to the Pentir works site.	Negligible/Minor Adverse (All links) – Not Significant	None identified.	Negligible/Minor Adverse (All links) – Not Significant
Pedestrians and Cyclists	NMU amenities during construction (medium-term, temporary)	Access point to the Pentir works site.	Negligible/Minor Adverse (All links) – Not Significant	None identified.	Negligible/Minor Adverse (All links) – Not Significant
Pedestrians and Cyclists	Fear and intimidation during construction (medium-term, temporary)	Access point to the Pentir works site.	Negligible/Minor Adverse (All links) – Not Significant	None identified.	Negligible/Minor Adverse (All links) – Not Significant

Receptor	Description of impacts including duration	Embedded mitigation	Significance of effect with embedded mitigation	Additional mitigation/ enhancement measures	Residual effect
Road Users	Road safety during construction (medium-term, temporary)	Access point to the Pentir works site.	Negligible/Minor Adverse (All links) – Not Significant	None identified.	Negligible/Minor Adverse (All links) – Not Significant
Road Users	Road safety during construction (medium-term, temporary)	Access point to the Pentir works site.	Negligible/Minor Adverse (All links) – Not Significant	None identified.	Negligible/Minor Adverse (All links) – Not Significant

9.10 Summary

9.10.1 This chapter of the ES presents the findings of an assessment of the likely significant effects of Traffic and Transport as a result of the proposed works.

9.10.2 The assessment concludes that, following the implementation of embedded mitigation measures, impacts would not be significant at any of the assessed links. None of the links are predicted to experience substantial increases in traffic volumes that would lead to adverse effects.

9.10.3 The actual increase in traffic levels across all links due to the proposed works is minimal. Given that the assessed routes generally experience moderate baseline traffic flows, the projected increases in vehicle numbers result in relatively low percentage changes. Consequently, the overall magnitude of impact is considered low, and the resulting effects are assessed as 'Not Significant.'

9.10.4 No further mitigation measures beyond those already embedded are deemed necessary, as the predicted impacts are in acceptable limits for the Study Area. This conclusion reinforces that the proposed works would not materially affect traffic conditions or road safety across the assessed network.

10. Air Quality and Emissions

10.1 Introduction

10.1.1 This chapter presents an assessment of the likely Air Quality and Emissions effects that could arise from the construction of the works at Pentir as described in **Chapter 2: Pentir Substation Works**.

10.1.2 This chapter describes the baseline conditions currently existing in the Study Area (as defined in **Section 10.3**), the scope of the assessment, the potential effects, the mitigation measures required to prevent, reduce or offset any significant negative effects, and the likely residual effects after these mitigation measures have been adopted.

10.1.3 This chapter is supported by figures and appendices as listed below:

- **Figure 2.10.1:** Construction Dust Assessment.
- **Volume 8, Appendix 1.1.A: Legislation, Policy and Guidance.**
- **Volume 8, Appendix 1.4.A: Topic Assessment Methodology.**

10.1.4 Other chapters that are useful to review in association with this chapter are as follows:

- **Chapter 5: Ecology and Nature Conservation.**
- **Chapter 9: Traffic and Transport.**

10.2 Legislation and Planning Policy

10.2.1 This section summarises the legislation and planning policy framework that is relevant to the Air Quality and Emissions assessment. Details are in **Volume 8, Appendix 1.1.A: Legislation, Policy and Guidance.**

Legislation

10.2.2 The following legislation is relevant to Air Quality and Emissions:

- The Environment Act 1995 (Ref 7.3).
- The Environment Act 2021 (Ref 4.2).
- The Air Quality Regulations 2000 (Ref 10.1).
- The Air Quality Standards Regulations 2010 as amended (Ref 10.2).
- The Non-Road Mobile Machinery (Type-Approval and Emission of Gaseous and Particulate Pollutants) Regulations 2018 (Ref 10.3).

10.2.3

10.2.4 **Table** 10-1 provides the Air Quality Standards (AQS) and Air Quality Objectives (AQO) relevant to this assessment.

Table 10-1 – Relevant air quality standards and objectives

Pollutant	Averaging period	Value (micrograms per metre cubed (µg/m^3))
Nitrogen Dioxide (NO_2)	Annual mean	40
	1-hour mean (not to be exceeded more than 18 times per year)	200
Particulate Matter (PM_{10})	Annual mean	40
	24-hour mean (not to be exceeded more than 35 times per year)	50
$PM_{2.5}$	Annual mean	20
	Annual mean (by 2040)	10
	Interim target (by end of January 2028)	12

National Policy

10.2.5 The following national policy is relevant to Air Quality and Emissions:

- The 2007 Air Quality (England) Strategy England, Scotland, Wales and Northern Ireland (Ref 10.4).
- PPW – Edition 12 (Ref 4.4).
- The Clean Air Plan for Wales (Ref 10.5).
- Future Wales: The National Plan 2040 (Ref 4.3)

Local Policy

10.2.6 The following local policy is relevant for Air Quality and Emissions:

- Anglesey and Gwynedd Joint Local Development Plan 2011 – 2026 (Ref 4.9).

Guidance

10.2.7 A summary of guidance relevant to Air Quality and Emissions is provided below:

- Institute of Air Quality Management (IAQM) Guidance on the assessment of dust from demolition and construction (Reg 10.6).
- IAQM and Environmental UK (EPUK) Land-Use Planning & Development Control: Planning For Air Quality (Ref 10.7).

10.3 Study Area

10.3.1 The Study Area for this assessment is the area over which potential direct and indirect effects of the proposed works on local air quality are predicted to occur during the construction period.

10.3.2 The methodological approach to defining the spatial extent of the Study Area for air quality has been informed by the IAQM (Ref 10.6 and Ref 10.7). An area within 10 km

of the Pentir works site has been considered with respect to published baseline information on existing air quality. The following Study Areas have been used where an assessment of dust emissions generated by construction activities is required:

10.3.3 An amenity or human health sensitive receptor in:

- 250 m of the limits of construction activity in the Pentir works site; or
- 50 m of the construction route on the public highway, up to 250 m from the Pentir works site entrance.

10.3.4 An ecological receptor in:

- 50 m of the limits of construction activity in the Pentir works site; or
- 50 m of the construction route on the public highway, up to 250 m from the Pentir works site entrance.

10.3.5 The Study Area is effectively 250 m from the Pentir works site and this is illustrated in **Figure 2.10.1**, along with surrounding air quality-related constraints.

Sensitive Receptors

Dust Soiling Receptors

10.3.6 Dust soiling receptors are land uses that are susceptible to harm to amenity from the deposition of dust. There are no residential properties or other amenities identified in 250 m of the Pentir works site which will have sensitivity to dust soiling impacts. However, there are a limited number of receptors with lesser sensitivity present, including the surrounding agricultural land and staff car parking areas.

Receptors Sensitive to the Human Health Impact of PM_{10}

10.3.7 Receptors sensitive to human health impacts are land uses where members of the public are present for a period of time comparable to the averaging periods of the short-term PM_{10} air quality objective (24-hours). There are no residential properties or other land uses identified in 250 m of the Pentir works site where people will be present for up to 24-hours. The assessment has precautionarily assumed that the National Grid offices adjacent to the Pentir works site are sensitive to the short-term human health impact of PM_{10}.

Ecological Receptors

10.3.8 Ecological receptors are designated nature conservations sites and priority habitats. Three patches of ancient woodland (Ancient Woodland IDs 43537, 43538 and 48974) have been identified in 50 m of the Pentir works site, as have two Candidate Local Wildlife Sites (Pentir Substation Candidate Wildlife Site and Near Breaker's Yard Candidate Wildlife Site) which will have potential sensitivity to the impacts of dust settling either directly (through smothering or changes in acidity) or indirectly through increased stresses on the plants. The nearest receptors with high sensitivity, such as internationally designated ecological sites, is the Eryri/Snowdonia SAC, approximately 2.8 km away from the Pentir works site.

10.4 Assumptions and Limitations

10.4.1 The construction dust assessment methodology is informed by professional judgement including consideration of estimates of construction activities, vehicle movements and number of plant at the worksite, the area of ground to be worked, and the volume of

structures erected. Where exact data has not been available, precautionary assumptions have been made to ensure the potential for impact is over-estimated, rather than under-estimated.

10.5 Baseline

Dust Deposition

10.5.1 A background level of dust exists in all urban and rural locations in the UK. Dust can be generated on a local scale from vehicle movements and from the action of wind on exposed soils and surfaces. Dust levels can be affected by long range transport of dust from distant sources into the local vicinity. The concentrations of dust can vary depending on a range of parameters, such as meteorological conditions and time of year.

10.5.2 Ambient dust deposition rates are not monitored extensively in the UK. Monitoring that is undertaken is usually connected with specific activities such as mining and mineral extraction operations or specific large-scale construction programmes. Dust monitoring may also be undertaken to investigate specific complaints received by local authorities, who are then required to investigate dust nuisance under the Environmental Protection Act 1990 (Ref 7.1). Therefore, there is currently no quantitative baseline information for dust deposition available in the Study Area.

Summary of Data Sources

10.5.3 The following data sources have been used to inform the air quality baseline:

- North Wales Authorities Collaborative Project 2023 Air Quality Progress Report (Ref 10.8).
- Mapped estimates of background concentrations provided by Defra's UK Air Information Resource (UK-air) (Ref 10.9).
- Designated ecological sites provided by Natural England's MAGIC maps (Ref 7.49).

Pollutant Concentrations

10.5.4 The Study Area for the air quality assessment covers an area in the local authority area of Gwynedd Council.

10.5.5 As part of Local Air Quality Management (LAQM) duties, local authorities are required to monitor pollutant concentrations. There are three monitoring sites in 2 km of the Pentir works site – monitoring sites 012, 038 and 039 – which measure annual mean concentrations of NO_2. Site 012 is adjacent to the A487 at Faenol Roundabout and, Covid-19 affected years aside, measures annual mean concentrations typically between 25 and 27 µg/m^3. 038 and 039 are adjacent to the A55 at Caerhun and, Covid-19 affected years aside, measure annual mean concentrations typically between 26 and 29 µg/m^3. These sites are adjacent to busy and congested roads and are not particularly representative of conditions in the immediate vicinity of the proposed works which is more rural. Lower concentrations would therefore be expected in the vicinity of the proposed works. However, measured annual mean NO_2 concentrations at monitoring sites are well below the relevant air quality objective.

10.5.6 No monitoring of PM_{10} or $PM_{2.5}$ is undertaken within 10 km of the proposed works, nor is any undertaken in Gwynedd Council administrative area.

10.5.7 The UK-AIR website provides data for background concentrations of NO_X, NO_2, PM_{10} and $PM_{2.5}$. These background concentrations represent 1 km^2 grid squares. **Table 10-2** shows the range in estimated background concentrations in the Study Area in 2024. As expected for all pollutants, background concentrations in the Study Area are low, due to the predominantly rural nature of the area.

Table 10-2 – Defra mapped pollutant background concentrations for the Pentir works site ($\mu g/m^3$)

NO_2 ($\mu g/m^3$)	NO_X ($\mu g/m^3$)	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)
3.35 - 3.71	4.14 - 4.59	8.28 - 8.62	5.33 - 5.36

Future Baseline

10.5.8 Future baseline conditions are assumed to be similar to existing baseline conditions although concentrations of NO_2 and NO_X are expected to fall in future years, due to decarbonisation of the transport and energy sectors. This decrease is likely to be larger in urban areas and smaller in rural areas.

10.6 Scope of Assessment

10.6.1 This section describes the scope of the assessment of effects on Air Quality and Emissions.

10.6.2 **Table 10-3** summarises the potential Air Quality receptors that have been reviewed and states whether they have been included or excluded from the Air Quality assessment. Justifications are provided where receptors have been both included and excluded from the assessment.

Table 10-3 – Scope of Air Quality and Emissions assessment

Receptor	Scoped in/out	Justification
Pentir Substation cWS	In	With the exception of the existing access road, the existing Pentir substation is bound by the Pentir Substation cWS surrounds, therefore there is a potential for the construction works to generate dust emissions which may impact the Pentir Substation cWS.
Ancient Woodland	In	The ancient woodland is in the Pentir Substation cWS that surrounds the existing Pentir substation compound, there is a potential for the construction works to generate dust emissions which may impact the Pentir Substation cWS.
Human health (from emissions from construction traffic)	Out	No residential or recreational activities in 250 m of the Pentir works site, therefore significant effects are unlikely. The IAQM and Environmental Protection UK guidance (Ref 10.7) screens out road traffic emissions impacts on human health receptors where average development HGV flows are less than 100 two-way movements per day on any given road link. For nature conservation impacts, guidance is taken from the DMRB

Receptor	Scoped in/out	Justification
		guidance (Ref 10.10), which screens out road traffic emissions where development HGV flows (and cumulative flows associated with committed and reasonably foreseeable development in the area) are less than 200 two-way movements per day on any given road link.

10.7 Methodology

10.7.1 Full details of the technical methods used to determine the baseline conditions, sensitivity of receptors, magnitude of effects and the significance criteria that have been used for the Air Quality and Emissions assessment can be found in **Volume 8, Appendix 1.4.A: Topic Assessment Methodology.**

10.8 Potential Effects

10.8.1 The anticipated effects resulting from the change to Air Quality and Emission elements and features during construction of the proposed works are outlined as follows:

10.8.2 The source of potential Air Quality and Emissions effects during the construction phase includes:

- Construction dust emissions.
- Site plant emissions.

10.8.3 Construction traffic emissions would also be considered in an air quality and emissions assessment. However, they have been scoped out of this assessment as the expected number of vehicle movements is unlikely to exceed the criteria above which significant air quality effects could occur.

Construction Dust Emissions

10.8.4 The assessment considers the potential impact for the area surrounding the Pentir works site.

10.8.5 As described in **Section 10.4** and **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**, the construction dust and particulate matter assessment follows the step-by-step approach set out in relevant IAQM guidance (Ref 10.6). This process is summarised in the sub-sections below.

Step 1: Screen the Requirements for a Detailed Assessment

10.8.6 Step 1 of the IAQM construction dust guidance is to screen the requirement for a more detailed assessment. According to the guidance, no further assessment is required if there are no receptors in a specified distance of the works. The screening distances set by the IAQM guidance are:

- Receptors sensitive to amenity and human health impacts in 250 m of the construction Pentir works site and/or in 50 m of a public road used by construction traffic that is in 500 m of the Pentir works site entrance.

- Nature conservation receptors in 50 m of the construction Pentir works site or in 50 m of a public road used by construction traffic that is in 500 m of the Pentir works site entrance.

10.8.7 **Figure 2.10.1** shows a 250 m buffer from the edge of the Pentir works site in which human health and amenity receptors may be impacted by construction activities. The surrounding areas are predominantly rural with no human health sensitive receptors in 250 m of the Pentir works site.

10.8.8 There is no SAC, SSSI, NNR in 50 m of the existing Pentir works site, nor are there SPA or Ramsar sites.

10.8.9 There are, however, two cWS in 50 m of the Pentir works site, and three areas of ancient woodland. Due to the presence of these nature conservation sites, the more detailed assessment of construction dust impacts is required and is set out below.

Step 2: Assess the Risk of Dust Impacts

Step 2A: Determine the Dust Emissions Magnitude

10.8.10 Step 2A requires the determination of the dust emission magnitude, as set out in **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**, which the guidance states is based on the scale of the anticipated works with the following activities: demolition; earthworks; construction (i.e. the building and erection of structures); and trackout (the deposition of dust and particulate matter onto public roads by construction vehicles), and should be classified as Small, Medium, or Large.

10.8.11 Construction activities associated with the proposed works are described in **Chapter 2: Pentir Substation Works**. Works are limited to the replacement of existing underground cables and the installation of new underground cables with the Pentir substation site.

Demolition

10.8.12 No demolition is anticipated as part of the proposed works**.**

Earthworks

10.8.13 The Pentir works site will require earthworks associated with excavation of existing hard surface and subsurface material, to access the existing cables being replaced and areas for the new cables to be installed. For this assessment, the area of earthworks is less than 18,000m^2, and there is anticipated to be fewer than 5 heavy earth moving vehicles in operation at any one time. The IAQM guidance (Ref 10.6) classifies the dust emissions magnitude of such a site for earthworks as Small.

Construction

10.8.14 This Pentir works site will require limited construction activity that isn't already covered by the earthworks element of the assessment. The volume of construction work is less than 12,000m^3, which is the lowest criteria set by the IAQM guidance (Ref 10.6) for this element of the works. The dust emissions magnitude for construction is also assigned as Small.

Trackout

10.8.15 Trackout is associated with the deposition of mud and potentially dusty material onto the public network from construction vehicles leaving site. There is anticipated to be 5 outward constructions related Heavy Duty Vehicle (all vehicles over 3.5 tonnes) movements in any one day, and these vehicles will access the works area using paved site roads and areas of hardstanding. The dust emissions magnitude for trackout is also assigned as Small.

Step 2B: Determine the Sensitivity of the Area

10.8.16 Step 2B of the IAQM construction dust guidance, as described in **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**, requires the determination of the sensitivity of the area to construction dust impacts. According to the guidance, this is based on the sensitivity of individual receptors, the proximity and number of those receptors, background PM_{10} concentrations and site-specific factors, such as local terrain, meteorology and natural and existing windbreaks.

10.8.17 The IAQM criteria breaks up sensitivity into determining the sensitivity of the area on dust soiling and based on human health sensitivities of PM_{10}. **Table 10-4** summarises the distribution of receptors to dust soiling and **Table 10-5** presents the distribution of receptors which are sensitive to the health effects of PM_{10}. **Table 10-6** presents the distribution of nature conservation sites.

Table 10-4 – Receptors sensitive to dust soiling

Receptor sensitivity	Distance from the Pentir works site			
	0 – 20 m	20 – 50 m	50 – 100 m	100 – 250 m
High	0	0	0	0
Medium	1	0	0	0
Low	1	0	0	0

Table 10-5 – Receptors sensitive to human health effects from PM_{10}

Receptor sensitivity	Distance from the Pentir works site			
	0 – 20 m	20 – 50 m	50 – 100 m	100 – 250 m
High	0	0	0	0
Medium	0	0	0	0
Low	1	0	0	0

Table 10-6 – Receptors sensitive to ecological impacts

Receptor sensitivity	Distance from the Pentir works site	
	0 – 20 m	20 – 50 m
High	0	0
Medium	0	0
Low	5	0

10.8.18 There is a single low and a single medium sensitivity receptor to dust soiling in 250 m of the Pentir works site – the agricultural land adjacent to sections of the Pentir works site and the staff car parking areas respectively. In line with the IAQM construction dust guidance, this equates to an area of Low sensitivity for dust soiling amenity impacts.

10.8.19 There is a single human health sensitive receptor in 250 m of the Pentir works site – staff working in the National Grid offices. Background PM_{10} concentrations are estimated to be below 24µg/m^3 this coupled with the Low number of receptors near the Pentir works site, means that the sensitivity of the area to human health impacts is Low.

10.8.20 With regards to nature conservation sites, there are five Low sensitivity receptors in 20m of the Pentir works site. These include three patches of Ancient Woodland, the Pentir Sub-Station and Near Breaker's Yard Candidate Wildlife Sites.

10.8.21 In line with the IAQM guidance, the individual sensitivity, number and proximity of receptors results in a Low sensitivity area to dust soiling, human health and nature conservation impacts.

Step 2C: Determine the Risk of Dust Impacts

10.8.22 Step 2C of the IAQM construction guidance concerns the determination of the risk of dust impacts, which is informed by the dust emission magnitude identified in Step 2A and the sensitivity of the area identified in Step 2B.

10.8.23 In this instance, the Small dust emissions magnitude and the Low sensitivity of the area equates to a Negligible impact to dust soiling, human health and nature conservation receptors.

Construction Site Plant and Non-Road Mobile Machinery Emissions

10.8.24 According to the IAQM guidance (Ref 10.6) exhaust emissions from on-site plant (and Non-Road Mobile Machinery (NRMM)) and the Pentir works site traffic are unlikely to contribute significantly to local air quality. This is also likely to be the case for the Pentir works site due to the distance from sensitive human health and nature conservation receptors. No quantitative assessment of exhaust emissions has therefore been undertaken.

10.8.25 At each location, emissions from site plant and NRMM will be transient and intermittent.

10.8.26 A review of site plant and NRMM machines indicates that the effect of impacts will not be significant on the identified receptors, in line with the IAQM guidance, for the following reasons:

- The good standard of baseline air quality.
- The transient and intermittent nature of emissions.
- The limited duration of time in which site plant and NRMM emissions will be present in close proximity of sensitive receptors.
- The distance between emission sources and the nearest high sensitivity receptors at the majority of locations.
- The effectiveness of standard practice emission control measures, including:
  - Use of plant with low NO_X, PM_{10} and $PM_{2.5}$ emissions.
  - Prohibiting unnecessary idling.
  - Prohibiting unnecessary NRMM movements; and

— Keeping plant and NRMM in a good state of repair.

10.9 Mitigation and Residual Effects

Mitigation

Step 3: Determine the Level of Mitigation

10.9.1 As discussed in **Section 10.6**, the construction dust assessment follows a step-by-step approach to determine the level of mitigation required to ensure that a significant effect will not occur. Step 3 of the IAQM guidance relates to the level of mitigation required following consideration of the risk of impacts identified during Step 1 and Step 2, which are described in **Section 10.7**.

10.9.2 The following mitigation measures are highly recommended by the IAQM and will be adopted during the construction phase:

- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
- Display the name and contact details of person(s) accountable for air quality and dust issues on the construction compound fence. This may be the environment manager or environmental engineer or the site manager.
- Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
- Make the complaints log available to the local authorities when asked.
- Record any exceptional incidents that cause dust and/or air emissions, either on- or off-site, and the action taken to resolve the situation in the log book.
- Undertake daily on-site and off-site inspection (including roads), where receptors are nearby, to monitor dust, record inspection results, and make the log available to the Local Authority when asked.
- Carry out regular site inspections to monitor compliance with the CEMP commitments, record inspection results, and make an inspection log available to the Local Authorities when asked.
- Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
- Ensure all vehicles switch off engines when stationary - no idling vehicles.
- Sustainable power sources (solar panels etc.) to be used where practicable. Where available, generators are to be low emission with hybrid battery systems (or to current best practice).
- Use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
- Ensure an adequate water supply on the site for effective dust and particulate matter suppression mitigation, using non-potable water where possible and appropriate.

- Use enclosed chutes and conveyors (if used) and covered skips.
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
- Avoid site runoff of water or mud.
- Avoid the use of diesel- or petrol-powered generators and use mains electricity or battery powered equipment where practicable.
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.

10.9.3 A schedule of environmental commitments will be presented in the CEMP.

Residual Effect

10.9.4 Step 4 of the IAQM construction dust guidance is to determine whether the effects, after the application of the identified level of mitigation (Step 3 – Section 10-8), are significant or not. The IAQM guidance states that:

10.9.5 “For almost all construction activity, the aim should be to prevent significant effects on receptors through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be ‘not significant’”.

10.9.6 Providing a sufficient level of dust mitigation is implemented on the Pentir works site throughout the works, with reference to those presented in Section 10.7, which are considered standard practice on all well managed construction sites of this scale, the residual effects from the proposed works are anticipated to be Negligible and not significant.

10.10 Summary

10.10.1 Existing air quality in the Study Area is of a good standard, with pollutant concentrations well within the air quality objective values set for the protection of human health. Much of the land around the Pentir works site is rural in nature with isolated residential properties beyond 250 m of the Pentir works site.

10.10.2 There are patches of ancient woodland and Candidate Local Wildlife Sites adjacent to the Pentir works site. These locations are potentially sensitive to emissions to air and could be adversely impacted by the construction of the proposed works.

10.10.3 The assessment has followed the IAQM guidance on assessing construction site air quality impacts. It has determined that, providing all construction activities adhere to the mitigation measures listed in this chapter and in the CEMP, the potential magnitude of impacts will be negligible and not significant.

10.10.4 The impact of NRMM emissions is anticipated to be not significant. This is due to the good standard of baseline air quality, the transient and intermittent nature of emissions from this source, the limited duration of time in which such machinery will be operation, and the effectiveness of standard practice emissions control measures.

10.10.5 Construction road traffic emissions impacts were screened out of the assessment. The increase in traffic during construction is such that there is no potential for them to contribute to a significant effect on local air quality.

11. Noise and Vibration

11.1 Introduction

11.1.1 This chapter presents an assessment of the likely Noise and Vibration effects that could arise from the construction of the works at Pentir as described in **Chapter 2: Pentir Substation Works**.

11.1.2 This chapter describes the baseline conditions currently existing in the Study Area (as defined in **Section 11.3**), the scope of the assessment, the potential effects, the mitigation measures required to prevent, reduce or offset any significant negative effects, and the likely residual effects after these mitigation measures have been adopted.

11.1.3 This chapter is supported by the appendices listed below:

- **Volume 8, Appendix 1.1.A: Legislation, Policy and Guidance.**
- **Volume 8, Appendix 1.4.A: Topic Assessment Methodology.**

11.1.4 Other chapters that are useful to review in association with this chapter are as follows:

- **Chapter 5: Ecology and Nature Conservation.**
- **Chapter 9: Traffic and Transport.**

11.2 Legislation and Planning Policy

11.2.1 This section summarises the legislation and planning policy framework that is relevant to the Noise and Vibration assessment. Details are in **Volume 8, Appendix 1.1.A: Legislation, Policy and Guidance.**

Legislation

11.2.2 The following legislation is relevant to Noise and Vibration:

- Control of Pollution Act 1974 (Ref 8.9).
- Environmental Protection Act 1990 (Ref 7.1).

National Policy

11.2.3 The following national policy is relevant Noise and Vibration:

- PPW – Edition 12 (Ref 4.4).
- Future Wales: The National Plan 2040 (Ref 4.3).

11.3 Study Area

11.3.1 The Study Area has been defined to include construction noise and vibration sensitive receptors that may be adversely affected by possible direct and indirect impacts that might arise from the proposed works. For construction noise and vibration effects, the

area for which impacts are expected is 300 m from the Pentir works site, based on guidance in BS 5228-1:2009+A1:2014 (Ref 11.1), which states construction noise predictions are generally reliable up to 300 m. For construction vibration, it is expected that receptors at a distance of at least 100 m would not experience perceptible levels of vibration. This Study Area is referenced from the DMRB LA 111 (Ref 11.2), which, although the document is aimed at road projects, is considered reasonable to reference in the absence of any other guidance on construction vibration.

11.4 Assumptions and Limitations

11.4.1 It is assumed that, due to the rural location of the Pentir works site, ambient noise conditions at sensitive receptors are likely to be low and so the most conservative criteria for assessing construction noise have been applied.

11.4.2 Construction noise predictions have been undertaken using typical items of plant that are used in such developments. These items of plant are taken to be representative of the plant that will be used during the construction process of the proposed works. Noise predictions were carried out to represent a conservative scenario where all construction plant is operational on-site. Consequently, noise predictions may overestimate construction noise levels and can therefore be considered as worst-case.

11.5 Baseline

11.5.1 A desktop review has been undertaken of the surrounding area in 300 m of the Pentir works site to identify any receptors that are sensitive to noise that may be impacted by the proposed works. Sensitive receptors that may be affected by noise include, but are not limited to, residential properties, educational centres, places of worship, hospitals and hotels.

11.5.2 There is one sensitive receptor in 300 m of the Pentir works site: the residential receptor comprising Gamekeepers Cottage, Rhos Fawr. Residential receptors are defined as of Medium sensitivity to noise.

11.5.3 A review of noise mapping carried out by Extrium (Ref 11.3) was undertaken to determine baseline noise conditions at the sensitive receptor; however, the noise maps do not extend as far as the sensitive receptor. A qualitative review of noise sources has been undertaken using aerial imagery to determine baseline noise conditions.

11.5.4 Gamekeepers Cottage is in a rural location on a single-lane road that is expected to experience minimal traffic and generate low levels of noise. The nearest road with traffic flows that would generate a material level of noise is the B547, which is approximately 700 m to the south of Gamekeepers Cottage. At this distance, road traffic noise is not a material contribution to baseline noise levels. As the area is rural with no dominant sources of noise, the area is likely to be quiet with daytime ambient noise levels expected to be around 40dB $L_{Aeq,T}$.

Future Baseline

11.5.5 No new developments are planned near the Pentir works site that would result in a material change to baseline ambient noise conditions at identified sensitive receptors. Assumptions made regarding baseline noise conditions are applicable to the future baseline.

11.6 Scope of Assessment

11.6.1 This section describes the scope of the assessment of Noise and Vibration effects on sensitive receptors.

11.6.2 **Table 11-1** summarises the potential Noise and Vibration receptors that have been reviewed and states whether they have been included or excluded from the Noise and Vibration assessment.

Table 11-1 – Scope of Noise and Vibration assessment

Receptor	Scoped in/out per phase	Justification
Noise sensitive receptors	In	All works will be contained in the existing Pentir substation compound and there is one noise sensitive receptor in 300 m of the Pentir substation.
Vibration sensitive receptors	Out	All works will be contained in the existing substation boundary and there are no vibration sensitive receptors in 100 m of the Pentir substation.

11.7 Methodology

11.7.1 Full details of the technical methods used to determine the baseline conditions, sensitivity of receptors, magnitude of effects and the significance criteria that have been used for the Noise and Vibration assessment can be found in **Volume 8, Appendix 1.4.A: Topic Assessment Methodology.**

11.8 Potential Effects

11.8.1 The anticipated effects resulting from noise emissions resulting from proposed works construction activities are detailed in this section.

Construction Noise

11.8.2 Construction works required consist of replacing and laying new underground cables. As such, the main phase of activities that would generate the highest levels of noise would consist of the following:

- Enabling works.
- Trench digging.
- Reinstatement.

11.8.3 During enabling works, the highest level of noise is likely to occur during breaking of concrete. Gamekeepers Cottage is approximately 310 m from the nearest area of hard standing to be broken out. Information in BS 5228-1 identifies a sound pressure level of 92 dB $L_{Aeq,T}$ at 10 m for noise from a concrete breaker on a wheeled backhoe loader (Table C.1, Reference 1). The noise level at Gamekeeper Cottage if continuous concrete breaking activities occurred at the nearest hard standing area would be 62 dB $L_{Aeq,T}$. There is potential for a worst-case temporary Low impact to occur at a Medium

sensitivity residential receptor. This is equivalent to a **Minor Adverse** effect and not significant.

11.8.4 During trench digging works, the highest level of noise is likely to occur from excavators digging the trench. Information in BS 5228-1 identifies a sound pressure level of 79 dB $L_{Aeq,T}$ at 10 m for noise from a tracked excavator (Table C.2, Reference 29). The noise level at Gamekeeper Cottage if continuous excavation activities occurred at the nearest Pentir works site location (250 m away) would be 51 dB $L_{Aeq,T}$. There is potential for a worst-case temporary Negligible to occur at a Medium sensitivity residential receptor. This is equivalent to a **Negligible** effect and not significant.

11.8.5 During reinstatement works, the highest level of noise is likely to occur during compaction of newly laid concrete. The nearest hard standing area to Gamekeepers Cottage is approximately 310 m away. Information in BS 5228-1 identifies a sound pressure level of 79 dB $L_{Aeq,T}$ at 10 m for noise from a roller (Table C.2, Reference 37). The noise level at Gamekeeper Cottage if continuous compacting activities occurred at the nearest hard standing area would be 49 dB $L_{Aeq,T}$. There is potential for a worst-case temporary Negligible to occur at a Medium sensitivity residential receptor. This is equivalent to a **Negligible** effect and not significant.

11.9 Mitigation and Residual Effects

Construction

11.9.1 Measures to control noise as defined in Annex B of BS 5228-1 and measures to control vibration as defined in Section 8 of BS 5228-2 will be adopted where reasonably practicable. These measures that will be implemented during construction works and secured through the CEMP are presented below:

- All appropriate processes, procedures and measures will be in place to minimise noise before works begin and throughout the construction programme.
- All contractors to be made familiar with current legislation and the guidance in BS 5228 (Parts 1 and 2) which should form a prerequisite of their appointment.
- Noise and vibration will be controlled at source (e.g. the selection of inherently quiet plant and low vibration equipment) through a review of the construction programme and methodology to consider quieter methods and consideration of the location of equipment on-site and control of working hours.
- Modern plant that comply with applicable UK noise emission requirements will be used.
- Hydraulic techniques for breaking concrete will be used in preference to percussive techniques.
- Drop heights of materials will be minimised.
- Plant and vehicles will be sequentially started up rather than all together.
- Off-site pre-fabrication where reasonably practicable.
- Regular and effective maintenance by trained personnel will be undertaken to keep plant and equipment working to manufacturer's specifications.
- All construction plant and equipment to be properly maintained, silenced where appropriate, operated to prevent excessive noise and switched off when not in use.

- Loading and unloading of vehicles, dismantling of site equipment or moving equipment or materials around the Pentir works site to be conducted in such a manner as to minimise noise generation.
- All vehicles used on-site shall incorporate reversing warning devices as opposed to the typical tonal reversing alarms to minimise noise disturbance.
- Provision of information to the relevant local authority and local residents to advise of potential noisy works that are due to take place.
- Unnecessary revving of engines will be avoided, and equipment will be switched off when not in use.
- Plant will always be used in accordance with manufacturers' instructions. Care will be taken to site equipment away from noise-sensitive areas. Where possible, loading and unloading will also be carried out away from such areas.

11.9.2 The assessment of construction noise identifies a worst-case temporary **Minor Adverse** residual effect, which is not significant. This residual effect is precautionary as it would only occur when concrete breaking is taking place in 400 m[5] of the Gamekeeper Cottage. For the majority of the construction programme, residual noise effects would be **Negligible** and not significant.

11.10 Summary

11.10.1 It has been demonstrated that the proposed works at Pentir substation are not anticipated to result in significant Noise and Vibration effects on sensitive receptors in the immediate or local area. The embedded mitigation measures are expected to prevent any effects during construction.

[5] Estimated based on a sound pressure level of 92 dB $L_{Aeq,T}$ at 10 m for noise from a concrete breaker on a wheeled backhoe loader.

12. Socio-Economics

12.1 Introduction

12.1.1 This chapter presents an assessment of the likely Socio-Economics effects that could arise from the construction of the proposed works as described in **Chapter 2: Pentir Substation Works**.

12.1.2 This chapter describes the baseline conditions currently existing in the Study Area (as defined in **Section 12.3**) and the scope of the assessment.

12.1.3 This chapter is supported by the figures and appendices listed below:

- **Figure 2.12.1:** Socio-Economic Land Use Receptors.
- **Figure 2.12.2:** 60 minute Peak Hour Drive Time from Pentir substation.
- **Figure 2.12.3**: Public Rights of Way
- **Volume 8, Appendix 1.1.A: Legislation, Policy and Guidance.**

12.1.4 Other chapters that are useful to review in association with this chapter are as follows:

- **Chapter 9: Traffic and Transport.**
- **Chapter 15: Cumulative Effects.**

12.2 Legislation and Planning Policy

12.2.1 This section summarises the legislation and planning policy framework that is relevant to Socio-Economics. Details are in **Volume 8, Appendix 1.1.A: Legislation, Policy and Guidance.**

Legislation

12.2.2 The following legislation is relevant to Socio-Economics:

- Environment (Wales) Act 2016 (Ref 5.5).
- The Planning (Wales) Act 2015 (Ref 12.1).
- Well-being of Future Generations (Wales) Act 2015 (Ref 12.2).
- Health and Well-being Impact Assessment for the Planning (Wales) Bill (Ref 12.3).

National Policy

12.2.3 The following national policy is relevant to Socio-Economics:

- PPW – Edition 12 (Ref 4.4).
- Build Back Better (Ref 12.4).
- Building Better Places (Ref 12.5).
- Ten Point Plan for a Green Industrial Revolution (Ref 12.6).

- Future Wales: The National Plan 2040 (Ref 4.3).
- Stronger, Fairer, Greener Wales - Net Zero Skills Action Plan (Ref 12.7).
- Net Zero Wales Carbon Budget 2 (2021-25) (Ref 12.8).
- Welcome to Wales - Priorities for the Visitor Economy 2020-25 (Ref 12.9).
- Welsh Government Economic Resilience and Reconstruction Mission (Ref 12.10).
- UK's Integrated National Energy and Climate Plan (Ref 12.11).

Regional Policy

12.2.4 The following regional policy is relevant to Socio-Economics:

- North Wales Regional Economic Framework (Ref 12.12).
- A Growth Vision for the Economy of North Wales (Ref 12.13).
- North Wales Energy Strategy (Ref 12.14).

Local Policy

12.2.5 The following local policy is relevant to Socio-Economics:

- Anglesey and Gwynedd Joint Local Development Plan 2011 – 2026 (Ref 4.9).
- Anglesey and Gwynedd Well-being Plan 2023-28 (Ref 12.15).

Guidance

12.2.6 The following national guidance is also relevant to Socio-Economics:

- TAN 23: Economic Development (Ref 12.16).
- Additionality Guide (4th Edition) (Ref 12.17).
- The Green Book – Appraisal and Evaluation in Central Government (Ref 12.18).

12.3 Study Area

12.3.1 The impacts of the proposed works with respect to Socio-Economics are considered at varying spatial levels according to the likely extent of the effect under consideration. This approach is consistent with the Homes and Communities Agency (HCA), now known as Homes England, guidance entitled 'Additionality Guide, A Standard Approach to Assessing the Additional Impact of Projects, 4th Edition' (Ref 12.17). **Table 12-1** presents the different components of the Socio-Economics assessment of effects, the geographical scale at which each component is assessed, and the rationale behind these geographical scales.

Table 12-1 – Assessment of effects Study Areas

Impact	Geographic Study Area	Rationale for Study Area
Employment generation during construction phase, (direct, indirect and induced impacts)	60-minute drive area (Principal Economic Impact Area).	Research by Chartered Institute of Personnel and Development (CIPD) found that 90% of national employees commuted for 60 minutes or less each

Impact	Geographic Study Area	Rationale for Study Area
Skills and training Gross Value Added		way. This was reported by CIPD in the 2018 Employee outlook 'Employee views on working life'. The 60-minute drive area represents the principal labour market catchment area for the proposed works.
Temporary accommodation services	30-minute and 60-minute drive area.	Professional judgement and experience from other proposed developments in the UK.
PRoW and Recreational Routes	Up to 500 m radius from, the Pentir works site.	Professional judgement and experience from other proposed developments in the UK.
Community facilities	1 km radius from the Pentir works site.	Professional judgement and location of sensitive receptors for impacts arising from the proposed works as informed by other assessments. Community facilities are likely to be accessed by residents from a wider catchment, especially in rural areas, owing to a tendency for provision to be sparse. A wider radius has been considered for this receptor to fully appreciate the effect of severance on access to these facilities.
Other private and community assets (residential properties, business premises, visitor attractions, development land)	500 m radius from the Pentir works site.	Professional judgement and experience from other proposed developments in the UK.

12.4 Assumptions and Limitations

12.4.1 The assessment has been carried out against a benchmark of current Socio-Economic baseline conditions prevailing around the proposed works, as far as possible within the limitations of such a dataset. The most recently available data sources have been used in this chapter, although it should be noted that baseline data can be subject to a time lag between collection and publication.

12.5 Baseline

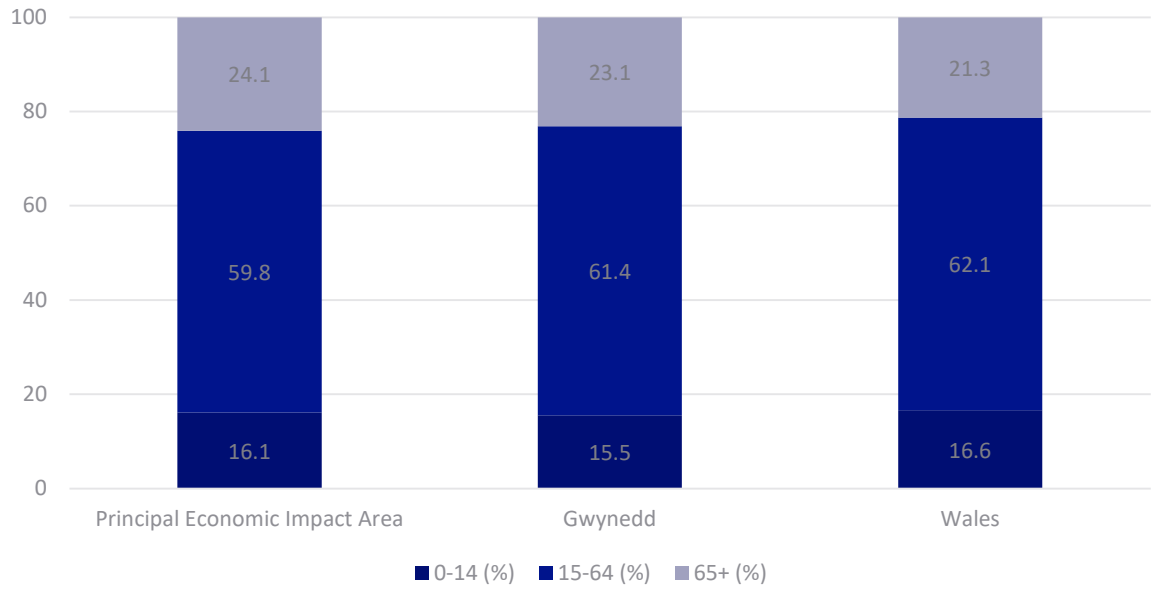
12.5.1 This section first describes the population and the economy local to the Pentir works site (**Figure 2.12.1**). The baseline is described relative to three geographies. The Principal Economic Impact Area is defined as a 60 minute drive time from the Pentir works site; this consists of 292 Lower Layer Super Output Areas (LSOAs) and as shown in **Figure 2.12.2** this takes in the north-eastern part of Gwynedd, the Isle of Anglesey,

most of Conwy, and the northern part of Flintshire. Data is also provided for Gwynedd local authority and for the national comparator, Wales.

12.5.2 The section goes on to identify Socio-Economic assets and resources local to the Pentir works site (in a 500 m or 1 km radius as appropriate) which could be affected by the proposed works either directly (i.e. via land take) or indirectly (i.e. via severance or amenity impacts). The land use receptors identified include PRoW, open spaces, community facilities, residential properties, visitor attractions, business premises, agricultural land holdings, and development land.

Population Demographics

12.5.3 The 2021 Census provides data on the population of the Principal Economic Impact Area and the comparator geographies (Ref 12.19). The Principal Economic Impact Area had a population of 488,708 in 2021, while Gwynedd's population was smaller (117,393). The Principal Economic Impact Area constituted approximately 15.7% of Wales' population (3,107,494) (Ref 12.20). In the Principal Economic Impact Area, 24.1% of the population were aged over 65, a higher proportion than Gwynedd (23.1%) and Wales (21.3%). The Principal Economic Impact Area had a smaller proportion of working age residents (59.8%) than Gwynedd (61.4%) and Wales (62.1%). Error! Reference source not found. displays the population age profile across the three



geographies.

Plate 12-1 – Population age profile

Economic Activity

12.5.4 **Table 12-2** displays economic activity rates across the three geographies using Census 2021 data (Ref 12.21). The Principal Economic Impact Area has the same proportion of economically active individuals (56.1%) as Gwynedd (56.1%), however the national average (56.6%) is slightly higher. Of those who are economically active, the Principal Economic Impact Area has the lowest proportion of unemployed individuals (3.0%), compared to 3.2% in Gwynedd and 3.1% in Wales. 30.8% of the Principal Economic

Impact Area's population worked full-time (30.8%), compared to 28.0% in Gwynedd and 32.2% in Wales.

Table 12-2 – Economic activity

Economic Activity Level	Principal Economic Impact Area	Gwynedd	Wales
Economically Active (%)	56.1	56.1	56.6
Employee: Part-time (%)	13.2	13.5	13.0
Employee: Full-time (%)	30.8	28.0	32.2
Self-employed (%)	9.1	11.2	8.3
Unemployed (%)	3.0	3.2	3.1
Economically inactive (%)	43.9	43.9	43.5

*Source: Office for National Statistics, (2022); Census 2021. * Economic activity rate is the proportion of working aged people (i.e., people aged 16-64) who are active or potentially active members of the labour market (i.e., people who are employed or unemployed). Examples of people who may not count as economically active include students, early retirees, carers and people with a long-term sickness or disability. Note: some columns on the table may not add up due to rounding.*

Qualifications

12.5.5 **Table 12-3** categorises the over 16 population of the Principal Economic Impact Area and the comparator geographies according to the highest level of qualification they have achieved, using 2021 Census data (Ref 12.22). 31.5% of the Principal Economic Impact Area are qualified to level 4+, equal to the average across Wales (31.5%) but less than that in Gwynedd (34.5%). Of the three geographies, the Principal Economic Impact Area had the highest proportion of individuals with apprenticeships (6.4%). Generally, the Principal Economic Impact Area is less qualified than Gwynedd, but more qualified than Wales as a whole.

Table 12-3 – Highest level of qualification

Qualification Level	Principal Economic Impact Area	Gwynedd	Wales
No qualifications (%)	18.3	16.3	19.9
Level 1 and entry level qualifications (%)	8.8	7.6	8.7
Level 2 qualifications (%)	14.8	14.6	14.4
Apprenticeship (%)	6.4	5.8	5.6
Level 3 qualifications (%)	17.5	18.8	17.2
Level 4 qualifications+ (%)	31.5	34.5	31.5
Other qualifications (%)	2.8	2.5	2.7

Note: Some columns on the table may not add up to 100% due to rounding.

Employment by Industry

12.5.6 The 2021 Census provides data on employment by industry, classifying industries by their Standard Industrial Classification (Ref 12.23). In the Principal Economic Impact Area, the largest industry is Q: human health and social activities (17.3% of

employment); this is also the largest industry in Gwynedd (16.6%) and Wales (17.0%). Industry G: Wholesale and retail trade; repair of motor vehicles and motorcycles is the second largest industry in all three geographies. Industry P: Education is the third largest industry in all three geographies. In general, the distribution of employment across industries is relatively similar between all three geographies. Industry I: Accommodation and food service activities has a greater proportion of employment in Gwynedd (8.5%) compared to the Principal Economic Impact Area (6.6%); Wales has the lowest proportion of all three geographies (5.2%).

Table 12-4 – Employment by industry

Industry	Principal Economic Impact Area	Gwynedd	Wales
A Agriculture, forestry and fishing (%)	2.3	3.9	1.8
B Mining and quarrying (%)	0.3	0.3	0.2
C Manufacturing (%)	8.4	5.2	8.7
D Electricity, gas, steam and air conditioning supply (%)	0.8	0.9	0.7
E Water supply; sewerage, waste management and remediation activities (%)	1.1	1.3	1.0
F Construction (%)	8.9	9.7	8.6
G Wholesale and retail trade; repair of motor vehicles and motorcycles (%)	14.9	13.3	14.5
H Transport and storage (%)	3.7	2.9	3.8
I Accommodation and food service activities (%)	6.6	8.5	5.2
J Information and communication (%)	2.2	2.3	2.7
K Financial and insurance activities (%)	1.7	0.8	2.9
L Real estate activities (%)	1.4	1.5	1.3
M Professional, scientific and technical activities (%)	4.0	3.6	4.4
N Administrative and support service activities (%)	4.4	4.3	4.2
O Public administration and defence; compulsory social security (%)	8.1	8.4	9.2
P Education (%)	9.5	11.4	9.6
Q Human health and social work activities (%)	17.3	16.6	17.0
R, S, T, U Other (%)	4.4	5.2	4.2

Gross Value Added (GVA)

12.5.7 The Office for National Statistics published data on GVA in 2024 for the year 2022 (Ref 12.24). Gwynedd's GVA per person (£22,206) was lower than the average across Wales (£23,804)[6]. **Table 12-5** – presents the composition of GVA by industry in Gwynedd and Wales (Ref 12.25). The largest industry by GVA in Gwynedd was Industry Q: Human health and social work activities (14.4%), followed by Industry L: Real estate activities (marginally lower at 14.3%). Wales had a notably larger industry by GVA in industry C manufacturing (15.4%) compared to Gwynedd (3.5%). Gwynedd however had a much larger industry I accommodation and food services (8.4%) compared to Wales (3.7%).

Table 12-5 – GVA by industry

Industry	Gwynedd	Wales
A Agriculture, forestry and fishing (%)	4.3	1.6
B Mining and quarrying (%)	N/A	0.3
C Manufacturing (%)	7.5	15.4
D Electricity, gas, steam and air conditioning supply (%)	3.5	1.4
E Water supply; sewerage, waste management and remediation activities (%)	N/A	1.8
F Construction %)	7.7	6.4
G Wholesale and retail trade; repair of motor vehicles and motorcycles (%)	8.8	10.0
H Transport and storage (%)	1.2	2.9
I Accommodation and food service activities (%)	8.4	3.7
J Information and communication (%)	3.1	2.9
K Financial and insurance activities (%)	0.5	6.1
L Real estate activities (%)	14.3	11.2
M Professional, scientific and technical activities (%)	2.0	4.1
N Administrative and support service activities (%)	1.4	3.2
O Public administration and defence; compulsory social security (%)	10.1	8.7
P Education (%)	9.0	6.3
Q Human health and social work activities (%)	14.4	11.1
R Arts, entertainment and recreation (%)	2.2	1.2

[6] Data presented at local authority level as this is the most granular data available.

Industry	Gwynedd	Wales
S Other service activities (%)	1.7	1.6
T Activities of Households (%)	0.1	0.1

Note: Columns may not add up to 100% due to rounding. Data for Gwynedd is published with industries A and B combined, as well as industries D and E combined. Therefore, the proportions of these industries are represented together under industry A and industry D.

Deprivation

12.5.8 The 2019 Welsh Index of Multiple Deprivation presents deprivation data at LSOA level (Ref 12.26). There are 1,909 LSOAs across Wales; the average rank of the LSOAs comprising Gwynedd was 1,080 (with 1 being the most deprived). Scores are also given for each LSOA, with 0 being the least deprived and 100 the most deprived. The average score across the Gwynedd LSOAs was 16.8. Furthermore, the median deprivation decile for Gwynedd's LSOAs was 6; this indicates that the average LSOA in Gwynedd is less deprived than 60% of LSOAs in Wales. Overall therefore, Gwynedd is relatively less deprived on average.

Accommodation Capacity

12.5.9 Analysis of the hotel, bed and breakfast and inns accommodation sector has been undertaken to consider the likely capacity in the context of potential demand from the construction workforce. Data on the number of rooms available in a 30 and 60-minute drive area in the hotel, bed and breakfast and inns accommodation sector has been sourced from CoStar, a property resource website (Ref 12.27). Typical room occupancy is sourced from the Welsh Government's accommodation occupancy survey for 2023 (Ref 12.28). As of 2024, there are approximately 1,111 rooms in local hotel, bed and breakfast and inns accommodation in a 30-minute drive of the Pentir works site, as well as 6,955 rooms in a 60-minute drive of the Pentir works site. This number has been adjusted in **Table 12-6** and **Table 12-7** to reflect the typical availability based on seasonal occupancy rates.

Table 12-6 – Accommodation capacity in a 30-minute drive

Month	Typical room occupancy (%)	Inventory rooms	Rooms available after existing demand
January	47	1,111	589
February	56	1,111	489
March	59	1,111	456
April	63	1,111	411
May	69	1,111	344
June	71	1,111	322
July	76	1,111	267
August	80	1,111	222
September	75	1,111	278

Month	Typical room occupancy (%)	Inventory rooms	Rooms available after existing demand
October	66	1,111	378
November	56	1,111	489
December	60	1,111	444

Source: CoStar (2024), VisitWales (2024)

Table 12-7 – Accommodation capacity in a 60-minute drive

Month	Typical room occupancy (%)	Inventory rooms	Rooms available after existing demand
January	47	6,955	3,686
February	56	6,955	3,060
March	59	6,955	2,852
April	63	6,955	2,573
May	69	6,955	2,156
June	71	6,955	2,017
July	76	6,955	1,669
August	80	6,955	1,391
September	75	6,955	1,739
October	66	6,955	2,365
November	56	6,955	3,060
December	60	6,955	2,782

Source: CoStar (2024), VisitWales (2024)

Public Rights of Way and Recreational Routes

12.5.10 There are no PRoW or recreational routes within 500 m of the Pentir works site (**Figure 2.12.3**).

Open Space

12.5.11 There are no open space areas which are publicly accessible for community use in 500 m of the Pentir works site.

Community Facilities

12.5.12 There are no community facilities in 1 km of the Pentir works site.

Residential Properties

12.5.13 There are a few sparsely distributed residential properties in 500 m of the Pentir works site, predominantly on the unnamed roads surrounding the B4547 road.

Visitor Attractions

12.5.14 There are no visitor attractions in 500 m of the Pentir works site.

Business Premises

12.5.15 The Groeslon Tŷ Mawr hotel and restaurant is the only business receptor in 500 m of the Pentir works site.

Agricultural Land Holdings

12.5.16 There are three agricultural land holdings supporting pastoral farming in 500 m of the Pentir works site:

- Parcel holding NWW230: Glanrhyd Farm.
- Parcel holding NWW232: Tyddyn Forgan.
- Parcel holding NWW231: Unnamed.

Development Land

12.5.17 Development land refers to sites on which there are planning applications and planning permissions. The assessment considers the potential for the proposed works to conflict with, hinder or otherwise adversely affect development land in or nearby to the Pentir works site.

12.5.18 Two additional developments were identified in the 2 km Study Area. These are a proposed Energy Storage facility with related access, landscaping, infrastructure, ancillary equipment, and proposed underground 132 kV grid connection cables between the Glyn Rhonwy Storage Facility and the Pentir substation. Both of these developments are taking place on Land at Pentir substation and have been approved with conditions.

12.5.19 There are no MSAs or Mineral Buffer Zones in the Pentir works site.

Future Baseline

12.5.20 2030 is considered as the baseline year, as it represents a practical timeframe for planning and decision-making while maintaining reasonable degree of accuracy and reliability. The future baseline is anticipated to be largely the same as the existing baseline for Socio-Economics and land use. However, it would be reasonable to expect that the population will increase. According to ONS population projections (Ref 12.29), the population of Gwynedd is forecasted to increase from 124,936 in 2021 to 128,250 in 2030, representing a 2.7% increase. The overall population of Wales is forecasted to grow at a higher rate of 3.9%, from 3,107,494 in 2021 to 3,229,297 in 2030. These projections were last updated in 2021 and are based off 2018 data which use assumed levels of future fertility, mortality and migration. The projections did not consider the findings of the Census 2021.

12.5.21 In terms of the local economy, it would be reasonable to expect that employment and GVA would increase, associated with the expected increase in population. It is expected

that PRoWs will continue to be used. Businesses and community facilities may open and close however it is not expected that there will be any significant changes to the local baseline and the proposed works should be assessed against current baseline conditions and policies.

12.6 Scope of Assessment

12.6.1 This section describes the scope of the assessment of effects on Socio-Economics.

12.6.2 The baseline presented in **Section 12.5** does not identify any receptors on which the proposed works has the potential to cause significant effects. Therefore, an assessment of Socio-Economic potential effects has been scoped out. **Table 12-8** below details the reasons for each impact being scoped out.

Table 12-8 – Scope of the Socio-Economics assessment

Receptor	Scoped in/out	Justification
Employment generation during construction phase (direct, indirect and induced impacts)	Out	The proposed works are likely to generate a limited number of construction, relative to the existing workforce in the Principal Economic Impact Area. Therefore, employment impacts are likely to be beneficial but not significant.
Skills and training	Out	Due to the limited size of the construction workforce, effects on skill levels and training are unlikely to be significant.
Gross Value Added	Out	GVA generated is proportionate to the size of the construction workforce; therefore, as for employment impacts any effects in this context are anticipated to be not significant relative to the size of the Principal Economic Impact Area.
Temporary accommodation services	Out	Due to the limited size of the construction workforce, there is unlikely to be pressure on the local temporary accommodation sector. Furthermore, as identified in **Section 12.5**, there is considerable capacity in a 30-minute and 60-minute drive time to accommodate workers.
PRoW and Recreational Routes	Out	No PRoW or recreational routes are within the Pentir works site or in 500 m of the Pentir works site and therefore significant effects are unlikely.
Agricultural land holdings	Out	Land take including access tracks, turning areas, compounds and laydown areas are likely to be in the Pentir works site and therefore effects on farms in proximity to the Pentir works site are unlikely to be significant.
Residential properties	Out	There are few residential properties in 500 m of the Pentir works site. Furthermore, no land take outside

Receptor	Scoped in/out	Justification
		the Pentir works site is required, therefore effects on residential properties are likely to be not significant.
Business premises	Out	There is only one business premises in 500 m of the Pentir works site. Furthermore, no land take outside the Pentir works site is required, therefore effects on business premises are likely to be not significant.
Community facilities	Out	There are no community facilities in 1 km of the Pentir works site. Furthermore, no land take outside the Pentir works site is required, therefore effects on community facilities are likely to be not significant.
Visitor attractions	Out	There are no visitor attractions in 500 m of the Pentir works site and therefore effects are unlikely to be significant.
Development land	Out	The Pentir works site is currently owned by NGET and no land take outside of the Pentir works site is required. Therefore, impacts on development land are likely to be not significant.

12.7 Summary

12.7.1 Assessment of Socio-Economics effects have been scoped out of this Volume of the ES as the proposed development is not anticipated to have significant impacts on Socio-Economics in the immediate or local area.

13. Climate Change

13.1 Introduction

13.1.1 This chapter presents an assessment of the likely Climate effects that could arise from the construction of the proposed works as described in **Chapter 2: Pentir Substation Works**.

13.1.2 This chapter describes the baseline conditions currently existing in the Study Area (as defined in **Section** Error! Reference source not found.), the scope of the assessment, the potential effects, the mitigation measures required to prevent, reduce or offset any significant negative effects, and the likely residual effects after these mitigation measures have been adopted.

13.1.3 The assessment is consistent with the ruling by the Supreme Court in the Finch case (Ref 13.1), in that it addresses all relevant direct and indirect environmental impacts, whether these are upstream or downstream of the proposed works.

13.1.4 This chapter is supported by the appendices listed below:

- **Volume 8, Appendix 1.1.A: Legislation, Guidance and Policy.**
- **Volume 8, Appendix 1.4.A: Topic Assessment Methodology.**
- **Volume 8, Appendix 2.13.A: Climate Change Risk Assessment.**

13.1.5 Other chapters that are useful to review in association with this chapter are as follows:

- **Chapter 5: Ecology and Nature Conservation.**
- **Chapter 7: Geology, Hydrogeology, Land Use and Agriculture (Soils).**
- **Chapter 8: Water Quality, Resources and Flood Risk.**
- **Chapter 9: Traffic and Transport.**
- **Chapter 10: Air Quality and Emissions.**

13.2 Legislation and Planning Policy

13.2.1 This section summarises the legislation and planning policy framework that is relevant to the Climate assessment. Details are in **Volume 8, Appendix 1.1.A: Legislation, Policy and Guidance**.

Legislation

13.2.2 The following legislation is relevant to Climate Change:

- United Nations Framework Convention on Climate Change Paris Agreement (Ref 13.2).
- UK Nationally Determined Contribution (Ref 13.3).
- Climate Change Act 2008 (as amended) (Ref 13.4).

- The Climate Change (Interim Emissions Targets) (Wales) (Amendment) Regulations 2021 (Ref 13.5).
- Environment (Wales) Act 2016 (Ref 5.5).
- Well-being of Future Generations (Wales) Act 2015 (Ref 12.2)

13.2.3 To align with the requirements of 2017 TCP EIA Regulations (Ref 3.1), the climate assessment is required to consider the following aspects:

- Greenhouse Gas (GHG) Assessment – considers the impact on the climate of GHG emissions arising from the proposed works during its lifetime. This considers the proposed works in the context of the UK and Welsh carbon budgets and how it would affect the ability of the Government to meet its carbon reduction targets.
- Climate Change Risk Assessment (CCRA) – considers the resilience of the proposed works to climate change impacts, including how the proposed works is designed to reduce its vulnerability to the projected impacts of climate change.
- In-combination Climate Change Impact (ICCI) Assessment – the combined impact of the proposed works and future climate change on receptors in the surrounding environment.

National Policy

13.2.4 The following national policy is relevant to Climate Change:

- Working Together to Reach Net Zero: All-Wales Plan April 2022 Update (Ref 13.6).
- PPW – Edition 12 (Ref 4.4).
- Future Wales: The National Plan 2040 (Ref 4.3).

Guidance

13.2.5 The following guidance is relevant to Climate Change:

- IEMA – Environmental Impact Assessment Guide to: Climate Change Resilience and Adaption (Ref 13.7).
- IEMA – Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance – 2nd Edition (Ref 13.7).

13.3 Study Area

GHG Assessment

13.3.1 The Study Area for the GHG assessment includes:

- Direct GHG emissions arising through works on the Pentir works site as a result of the site clearance and remediation, construction, operation and maintenance activities.
- Indirect GHG emissions occurring outside the Pentir works site, including embodied carbon in materials, transportation, and the processing and disposal of waste.

CCRA

13.3.2 The CCRA Study Area encompasses the temporary and completed works that make up the proposed works.

ICCI

13.3.3 The Study Area for the ICCI assessment is determined by the EIA topic assessments, as described in other chapters of this ES and will be reported accordingly. Relevant topic chapters may include:

- **Chapter 4: Landscape and Visual Amenity.**
- **Chapter 5: Ecology and Nature Conservation.**
- **Chapter 6: Historic Environment.**
- **Chapter 7: Geology, Hydrogeology, Land Use and Agriculture (Soils).**
- **Chapter 8: Water Quality, Resources and Flood Risk.**
- **Chapter 9: Traffic and Transport.**
- **Chapter 10: Air Quality and Emissions.**
- **Chapter 11: Noise and Vibration.**
- **Chapter 12: Socio-Economics.**
- **Chapter 14: Materials and Waste.**

13.4 Assumptions and Limitations

GHG Assessment

13.4.1 Granular activity data required for a quantitative GHG assessment was not available to inform the assessment. Consequently, a qualitative approach was adopted to identify GHG emission sources. Further details on the approach taken for the qualitative GHG Assessment are provided in **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**.

CCRA

13.4.2 The start date of the CCRA will be the start of the construction period. In line with the construction programme, the construction phase of the proposed works is assumed to be from Q1 2027 – Q2 2029.

13.4.3 For the purposes of the CCRA a reference operational period of 40 years was assumed, in accordance with asset lifespans.

13.4.4 The CCRA has been carried out using the most up to date, reliable and publicly available climate data. Information has also been taken from internal documents provided by the client and wider ES chapters.

13.4.5 Climate change projections, by their very nature, are associated with a range of assumptions and limitations. There are inherent uncertainties associated with climate projections. Climate projections are not predictions of the future but are rather a projection based on the best available data and science.

13.4.6 For climate projections, UK Climate Projection 2018 (UKCP18) data was collected for periods between 2020 – 2049, 2040 – 2069, and 2070 – 2099 to adequately account for both short-term construction phase and long-term operational period.

13.4.7 A 'high' emissions scenario, Representative Concentration Pathway 8.5 has been used in the assessment. This is to reflect a high level of GHG emissions at the 10th, 50%, 90% probability levels to assess the impact of climate change of the proposed works.

13.5 Baseline

Existing Baseline

GHG Impact Assessment

13.5.1 For the GHG assessment, the existing baseline is the current conditions at the Pentir works site. The current baseline consists of the carbon stock and sources of GHG emissions within the boundary of existing on-site activities.

13.5.2 The proposed works will be situated in the existing Pentir substation compound, meaning the current land use in the area is primarily associated with the operation and maintenance of the existing Pentir substation.

CCRA and ICCI Assessment

13.5.3 The CCRA and ICCI consider how resilient the proposed works and surrounding environment are to the current and projected future climate hazards over the lifecycle of the proposed works. The receptor for the CCRA is the proposed works, including its assets and associated users. For the ICCI assessment receptors will be defined in the applicable technical chapters of this ES.

13.5.4 The current baseline for the CCRA and ICCI is based on the climate data obtained from the Met Office website recorded at the closest meteorological station to the Pentir works site. This data was sourced from historical climate data obtained from the closest weather station (Llanfairfechan) (Ref 13.9), approximately 13 km south-west from the Pentir works site. The climate data, which covers the 30-year historical period of 1981 to 2010 (the standard baseline for climate data), is detailed in **Table 13-1**.

Table 13-1 – Historical climate data for the Pentir works site

Climatic variable	Baseline data 1981-2010
Mean Annual Max Temp (°C)	14.0
Mean Annual Min Temp (°C)	7.8
Mean summer maximum daily temp (°C)	19.0
Mean winter minimum daily temp (°C)	3.8
Warmest Month on Average (°C)	19.6
Warmest Month on Average (Month)	July
Coldest Month on Average (°C)	3.5
Coldest Month on Average (Month)	February
Frost days per annum	14.5

Climatic variable	Baseline data 1981-2010
Mean annual rainfall levels (mm)	1114.7
Mean summer rainfall (mm)	72.2
Mean winter rainfall (mm)	115.1
Wettest Month on Average (mm)	140.0
Wettest Month on Average (Month)	December
Driest Month on Average (mm)	59.4
Driest Month on Average (Month)	April

Future Baseline

GHG Assessment

13.5.5 The future baseline for assessing the impact of the proposed works on climate change is based on a projected 'business as usual' scenario, where the proposed works are not built. In this scenario, the future baseline assumes the continued operation and maintenance of the existing Pentir substation.

CCRA and ICCI Assessment

13.5.6 The future baseline for the CCRA and ICCI assessments is based on UKCP18 data from the Met Office (Ref 13.10) for the 25 km grid squares in which the Pentir works site is located.

13.5.7 This projection data provides probabilistic indications of how global climate change is likely to affect areas of the UK using pre-defined climate variables and time periods. Projected climate data is presented in **Table 13-2**. Climate parameters considered in the CCRA include the following:

- Mean annual temperature.
- Mean summer temperature.
- Mean winter temperature.
- Number of frost days per annum.
- Maximum summer temperature.
- Minimum winter temperature.
- Mean annual precipitation.
- Mean summer precipitation.
- Mean winter precipitation.
- Extreme weather events (e.g. storms).

13.5.8 The historic and future baseline for the site location is presented within **Table 13-2** below.

Table 13-2 – Climate change baseline and projection

Climatic variable	Baseline data	Projection (change)				Projected trend	Source
	1981 - 2010	2020 - 2049	2040 - 2069	2070 - 2099	Beyond 2100		
Temperature							
Mean annual maximum daily temperature (°C)	14.0	+0.9 (+0.4 to +1.5)	+1.6 (+0.8 to +2.5)	+3.3 (+1.8 to +4.8)	No projection data is available beyond 2100, trend towards increasing temperatures is expected to continue.	↑	UKCP18
Mean summer maximum daily temperature (°C)	19.0	+0.9 (+0.1 to +1.7)	+1.7 (+0.5 to +3.0)	+3.8 (+1.5 to +6.2)		↑	UKCP18
Mean winter minimum daily temperature (°C)	3.8	+0.8 (+0.7 to +1.6)	+1.5 (+0.4 to +2.6)	+2.7 (+1.0 to +4.6)		↑	UKCP18
Number of days of air frost per annum	14.5	Reports have shown that the number of frost air and ground frost days has decreased since the 1960s. Combined with detailed studies, these long-term trends point to a long-term warming trend of the UK's climate and a reduction in cold events.				↓	Met Office
Highest temperature for baseline period (°C)	19.6 (July)	+1.0 (+0.0 to +2.0)	+1.8 (+0.3 to +3.4)	+4.2 (+1.5 to +7.2)	No projection data is available beyond 2100, trend towards increasing temperatures is expected to continue.	↑	UKCP18
Lowest temperature for baseline period (°C)	3.5 (February)	+0.8 (-0.1 to +1.8)	+1.5 (+0.2 to +2.7)	+2.7 (+0.7 to +4.8)		↑	UKCP18
Precipitation							

Climatic variable	Baseline data	Projection (change)				Projected trend	Source
	1981 - 2010	2020 - 2049	2040 - 2069	2070 - 2099	Beyond 2100		
Mean annual rainfall (mm)	1114.7	+0.7% (-4.5% to +6.4%)	+1.5% (-5.1% to +8.5%)	+3.2% (-7.0% to +13.8%)	No projection data is available beyond 2100. However, there is potential for a continued slight increase in rainfall overall.	↑	UKCP18
Mean summer rainfall (mm)	72.2	-6.8% (-22.1% to +8.6%)	-15.5% (-35.5% to +4.3%)	-30.8% (-53.9% to -4.6%)	No projection data is available beyond 2100, but the decreasing trend in summer rainfall could potentially continue beyond this period.	↓	UKCP18
Mean winter rainfall (mm)	115.1	+2.4% (-7.3% to +13.5%)	+9.1% (-3.4% to +24.1%)	+18.7% (-2.1% to +43.2%)	No projection data is available beyond 2100, but it is possible that the trend of increasing winter rainfall could persist beyond this period.	↑	UKCP18
Wettest month on average (mm)	140.0 (December)	+2.5% (-11.8% to +17.2%)	+6.6% (-13.0% to +27.9%)	+16.0% (-13.0% to +48.8%)	No projection data is available beyond 2100. An increase in rainfall during the month of December is possible.	↑	UKCP18
Driest month on average (mm)	59.4 (April)	+1.4% (-17.9% to +20.9%)	+0.6% (-22.7% to +26.0%)	-2.3% (-33.8% to +34.7%)	Data shows a slight increase in rainfall between the baseline period and 2020-2049. No projection data is available beyond 2100. However, the trend between the 2020 to 2049 period and 2100 is showing a decline in rainfall during the driest month.	↓↑	UKCP18
Other							
Droughts	The Met Office has projected a trend towards drier summers on average. However, the distribution of rainfall throughout the seasons will determine UK drought risk (Ref 13.11).					↑	Met Office

Climatic variable	Baseline data	Projection (change)				Projected trend	Source
	1981 - 2010	2020 - 2049	2040 - 2069	2070 - 2099	Beyond 2100		
Storms	The Met Office projects that climate change will likely lead to more frequent and intense winter storms in the UK, driven by factors such as rising sea surface temperatures and changes in the jet stream. While past data shows no clear trend in storm frequency or intensity, future projections indicate an increase in severe storms, particularly during winter, with stronger winds and heavier rainfall, which could also worsen coastal flooding due to rising sea levels (Ref 13.12).					↑	Met Office
Wildfires	The wildfire hazard is classified as high according to the information that is currently available to the Think Hazard tool (Ref 13.13). This means that there is greater than 50% chance of experiencing weather that could support a hazardous wildfire that may pose some risk of life and property loss in any given year.					↑	Think Hazard

13.6 Scope of Assessment

13.6.1 This section describes the scope of the assessment of effects on Climate Change.

13.6.2 **Table 13-3** summarises the potential Climate Change receptors that have been reviewed and states whether they have been included or excluded from the climate assessment. Justifications are provided where receptors have been both included and excluded from the assessment.

Table 13-3 – Scope of Climate Change assessment

Receptor	Scoped in/out	Justification
Global atmosphere (GHG Assessment)	In	A GHG Assessment has been scoped into the climate assessment to evaluate the potential GHG emissions associated with the proposed works.
The proposed works (CCRA)	In	A CCRA has been scoped to assess the potential climate risks associated with the proposed works.
As identified by each discipline in their assessment (ICCI Assessment)	Out	It is not anticipated there will be any ICCIs on the receptors in the surrounding environments. Therefore, an ICCI Assessment has been scoped out of the climate assessment.

13.7 Methodology

13.7.1 The purpose of the Climate assessment is to assess the potential effects of the proposed works on Climate Change.

13.7.2 Full details of the technical methods used to determine the baseline conditions, sensitivity of the receptors, magnitude of effects and the significance criteria that have been used for the climate assessment can be found in **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**.

13.8 Potential Effects

GHG Impact Assessment

13.8.1 The GHG emissions are reported in line with the life cycle stages of the civil engineering works assessment, as outlined in the Publicly Available Guidance 2080:2023 Guidance (Ref 13.14). Additionally, the Royal Institution of Chartered Surveyors Guidance for whole life GHG assessments (Ref 13.15) have been integrated to inform the scope and reporting framework of the GHG assessment.

13.8.2

13.8.3 **Table** 13-4 qualitatively summarises the GHG emissions associated with the proposed works.

Table 13-4 – Qualitative life cycle GHG assessment of the proposed works

Lifecycle stage	Qualitative assessment	Estimated GHG % contribution to the proposed works
Pre-construction stage (A0)	The pre-construction stage (A0) includes planning, design, and site investigations. GHG emissions during this stage primarily arise from office energy consumption and occasional employee travel. As these activities involve minimal energy use, the resulting emissions are expected to constitute only a minor share of the total emissions associated with the proposed works.	<1%
Product stage (A1 – A3)	Based on previous life cycle GHG assessments, embodied GHG emissions from the product stage are anticipated to be the largest source of GHG emissions over the life of the proposed works. This stage focuses on the extraction, transport, and manufacturing of raw materials. Due to the scale of the proposed works, the magnitude of emissions from Stage A1 to A3 are not considered to be substantial when considered in the context of Wales and UK carbon budgets. Furthermore, GHG emissions relating to the product stage of the proposed works are likely to be controlled and reduced through various control mechanisms through the NGET's internal climate policies and national policy, as discussed below.	~70%
Construction process stage (A4 – A5)	Based on similar-scale projects, GHG emissions from the construction phase are expected to be the second largest contributor of GHG emissions. A CEMP will be produced before construction and include mitigation measures to reduce GHG emissions from construction.	~20%
Operation stage (B1 – B7)	The operation stage of the proposed works is likely to be the third largest contributor of GHG emissions. GHG emission sources are anticipated to include periodic maintenance activities, such as inspections, servicing, and minor repairs. Additional sources include the replacement of on-site equipment, transmission losses, and other operational activities. While these direct GHG emissions are unlikely to impact the UK's and Wales's net-zero targets, the proposed works will have wider, indirect effects on emissions through the enabling of a greater expansion of on- and offshore renewables that will increase the generation of low-carbon electricity and support the ongoing decarbonisation of the Great Britain power grid.	~10%

Lifecycle stage	Qualitative assessment	Estimated GHG % contribution to the proposed works
	Operational efficiencies will be managed through regular equipment inspections to identify deterioration of components, which will be replaced where necessary.	

13.8.4 As detailed in

13.8.5 **Table** 13-4, it is estimated that the bulk of emissions (estimated around 90%) from the proposed works will come from the A0 – A5 life cycle stages.

13.8.6 NGET is committed to achieving carbon neutrality across all its construction projects by 2025/26 (Ref 13.16), focusing on reducing the carbon intensity of construction materials and the phasing out of diesel-powered construction plant. The Transport Decarbonisation Plan (TDP) (Ref 13.17) aligns with the UK's carbon targets by placing a commitment to reduce transport GHG emissions in line with the 2050 net-zero target. In line with commitments in the TDP, GHG emissions associated with the transportation of workers are expected to decrease due to the continued rollout of electric vehicles. These commitments will help manage the proposed works construction GHG emissions in line with UK and Welsh net-zero targets.

13.8.7 The UK Government has published a Net Zero Strategy (Ref 13.18), which outlines plans to reduce GHG emissions across all sectors of the economy to meet the net zero targets. The TDP outlines measures to support a shift towards low-carbon transportation, such as increasing the use of electric vehicles. GHG emissions from worker and materials transportation are anticipated to decrease in line with government policy in the TDP.

13.8.8 The proposed works will support the ongoing expansion of renewable energy generation in the UK energy system by providing the necessary infrastructure to support the increased transmission of low carbon electricity. This will contribute to the decarbonisation of the power sector as renewables increasingly replace higher-carbon energy sources. This aligns with the UK Government's goal of achieving a fossil fuel-independent electricity system by 2035.

13.8.9 IEMA GHG Assessment guidance (Ref 13.7), states that assessing the significance of a projects impact on the climate should not just be based on the magnitude of emissions arising but on how these emissions align with national policies and the path towards net zero. The assessment must therefore determine whether the proposed works could negatively affect Wales and the UK's ability to meet legislated carbon budgets and net-zero targets.

13.8.10 Based on a qualitative assessment, the magnitude of GHG emissions is low in the context of the UK and Welsh carbon budgets. The proposed works are consistent with applicable UK and Welsh Government climate change policy and legislation. In accordance with the IEMA GHG Guidance (see **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**), the effect of GHG emissions associated with the proposed works is deemed Minor Adverse and Not Significant.

13.8.11 While not legally binding, NGET has also demonstrated a commitment to reduce GHG emissions through the setting of validated Science-Based Targets (Ref 13.19), aligning NGET with the Paris Climate Commitment (Ref 13.2). There targets are as follows:

- Scope 1[7] and 2[8] GHG emissions: Reduce absolute scope 1 and 2 emissions by 60% by 2030 from a 2018 base year.
  - Scope 1 emissions from power generation: Reduce scope 1 GHG emissions by 90% per Megawatt hour (MWh) by 2030 and 92% per MWh by 2033, both from a 2018 base year.

[7] Scope 1: Direct emissions from sources that are owned or controlled by the organisation.

[8] Scope 2: Indirect emissions from the generation of purchased electricity, steam, heating, and cooling consumed by the reporting organisation.

  - Other Scope 1 and 2 emissions: Reduce all other absolute Scope 1 and 2 GHG emissions by 50% by 2030 from the 2018 base year.
- Scope 3[9] emissions: Reduce Scope 3 category 3 GHG emissions from all generated and sold electricity by 86% per MWh by 2033 from a 2018 base year and reduce all absolute scope 3 GHG emissions by 37.5% by 2033 from a 2018 base year.

CCRA

13.8.12 This section summarises the climate risks identified for the proposed works. **Volume 8, Appendix 2.13.A: Climate Change Risk Assessment** contains further details on each climate risk identified in the CCRA.

13.8.13 The proposed works will be designed and operated in accordance with the risks and mitigation measures outlined in NGET's Climate Resilience Strategy (Ref 13.20). This approach enables the proposed works to withstand the climatic conditions projected for the end of its design life. Additionally, a CEMP will be developed to incorporate measures aimed at reducing the impact of climate-related risks during the construction phase.

13.8.14 In accordance with IEMA CCRA Guidance (Ref 13.8) (see **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**), the climate risks were assessed as moderate, unlikely, or rare. While the event is possible, its occurrence is infrequent, with some evidence suggesting a potential shift from business as usual. The likelihood of the event is estimated to be between 0% and 50%. The consequence of climate change impacts were identified as insignificant and minor in terms of their impact on the proposed works. As a result, risks identified are Not Significant. Further details on the selected likelihood and consequence ratings are detailed in **Volume 8, Appendix 2.13.A: Climate Change Risk Assessment.**

13.9 Mitigation and Residual Effects

13.9.1 As no significant impacts have been identified in the GHG Assessment, no additional mitigation is required. A CEMP will be produced before construction and include mitigation measures to reduce GHG emissions during construction. The standard measures typically implemented by the applicant to reduce GHG emissions of the proposed works are considered sufficient.

13.9.2 As no significant climate risks have been identified in the CCRA, no specific mitigation measures are required.

13.9.3 The GHG Assessment and CCRA have identified no residual effects.

13.10 Summary

13.10.1 Overall, the GHG impact of the proposed works will be Minor Adverse and Not Significant. The proposed works will bring long-term benefits to the UK and Wales by upgrading energy-related infrastructure. This is essential for integrating new sources of renewable power and upgrading NGETs capacity to facilitate the electrification of the

[9] Scope 3: All other indirect emissions that occur in the value chain of the reporting company, both upstream and downstream.

broader economy. This, in turn, will support the transition away from fossil fuels and help achieve net-zero emissions across Wales and the UK.

13.10.2 The CCRA did not identify any significant climate risks. Therefore, it can be concluded that the risk posed by Climate Change to the proposed work is Not Significant.

14. Materials and Waste

14.1 Introduction

14.1.1 This chapter presents an assessment of the likely Waste and Materials effects that could arise from the construction of the proposed works as described in **Chapter 2: Pentir Substation Works.**

14.1.2 The assessment has been made in accordance with current best practice guidance and is based on the methodology set out in the Institute of Environmental Management and Assessment (IEMA) Guide to Materials and Waste in Environmental Impact Assessment, Guidance for a Proportionate Approach (referred to herein as the 'IEMA Guidance') (Ref 14.1).

14.1.3 This chapter is supported by the following appendix listed below:

- **Volume 8, Appendix 1.1.A: Legislation, Policy and Guidance.**

14.2 Legislation and Planning Policy

14.2.1 This section summarises the legislation and planning policy framework that is relevant to the Waste and Materials assessment. Details are in **Volume 8, Appendix 1.1.A: Legislation, Policy and Guidance**.

Legislation

14.2.2 The following legislation is relevant to Materials and Waste:

- EU Waste Framework Directive 2008 (Ref 14.2).
- Environmental Protection Act 1990 (as amended) (Ref 7.1).
- The Hazardous Waste (England and Wales) Regulations 2005 (as amended) (Ref 14.3).
- The Waste (England and Wales) Regulations 2011 (as amended) (Ref 14.4).
- The Environmental Permitting (England and Wales) Regulations 2016 (as amended) (Ref 7.9).
- Environment Act 2021 (Ref 4.2).
- Environment (Wales) Act 2016 (Ref 5.5).
- The Waste Separation Requirements (Wales) Regulations 2023 (Ref 14.5).

National Policy

14.2.3 The following national policy is relevant to Materials and Waste:

- PPW – Edition 12 (Ref 4.4).
- Beyond Recycling: A Strategy to Make the Circular Economy in Wales a Reality (Ref 14.6).

- Towards Zero Waste, One Wales: One Planet – The Overarching Waste Strategy Document for Wales (Ref 14.7).
- Towards Zero Waste, One Wales: One Planet – The Waste Prevention Programme for Wales (Ref 14.8).
- Future Wales: The National Plan 2040 (Ref 4.3).

Local Policy

14.2.4 The following local policy is relevant to Materials and Waste:

- Joint Anglesey and Gwynedd Local Development Plan 2011 – 2026 (Ref 4.9).

Guidance

14.2.5 The following guidance is relevant to Materials and Waste:

- IEMA Guidance (Ref 14.1).
- Contaminated Land: Applications in Real Environments (CL:AIRE) Definition of Waste: Development Industry Code of Practice (DoW CoP), v2 (2011) (Ref 7.30).
- Separate Collection of Waste Materials for Recycling – A Code of Practice for Wales (Ref 14.9).

14.3 Scope of Assessment

14.3.1 This section describes the scope of the assessment of effects on Materials and Waste.

14.3.2 For the purposes of this assessment, Materials and Waste comprise:

- The consumption of materials (key construction materials only).
- The generation and management of waste during construction.

14.3.3 Materials are defined in the IEMA Guidance (Ref 14.1) to be:

"physical resources that are used across the lifecycle of a development. Examples include key construction materials such as concrete, aggregate, asphalt, and steel".

14.3.4 Other material assets considered include built assets such as landfill void capacity and allocated/safeguarded mineral sites (e.g. quarries, wharves, rail depots, concrete plants) and waste sites.

14.3.5 Waste is defined, as per the Waste Framework Directive (2008/98/EC) (Ref 14.2), as:

"any substance or object which the holder discards or intends or is required to discard".

14.3.6 Impacts upon Mineral Safeguarding Areas (MSAs) are not assessed in this Materials and Waste assessment in accordance with the IEMA Guidance (Ref 14.1).

14.3.7 The assessment of Materials and Waste takes into account the following:

- Waste producers have a legal duty of care to manage their waste in accordance with regulations and to ensure that any waste leaving the site where it is generated is transferred to a suitably licensed facility for further treatment or disposal;
- Facilities transferring, treating or disposing of waste must be either licensed or apply for an exemption from a licence, and impacts arising from the operation of

waste management facilities are considered as part of the planning and permitting process for these facilities themselves;

- As part of their planning function, Waste Planning Authorities (WPAs) are required to ensure that sufficient land is available to accommodate facilities for the treatment of all waste arising in the area, either within the WPA area, or through export to suitable facilities in other areas; and
- Mineral Planning Authorities (MPAs) are similarly required to ensure an adequate supply of minerals, sufficient to meet the needs of national and regional supply policies, and local development needs.

14.3.8 **Table 14-1** describes the potential environmental effects of the proposed works with respect to Materials and Waste, and the justification for scoping them out from detailed assessment.

Table 14-1 – Scope of the Materials and Waste assessment

Receptor	Scoped in/out	Justification
Waste arising from extraction, processing and manufacture of construction components and products	Out	This assumes that these products and materials are being developed in a manufacturing environment with their own waste management plans, facilities, and supply chain, which are potentially in different regions of the UK or the world and therefore outside of the geographical scope of this study.
Other environmental impacts associated with the management of waste from the proposed works on-site (e.g. on water resources, air quality, noise) and off-site transport of materials and waste	Out	Assessed in other relevant chapters (e.g. Water Quality, Resources and Flood Risk, Air Quality, Noise or Traffic)
Changes to MSAs	Out	Impacts upon MSAs are not assessed in this Materials and Waste assessment in accordance with the IEMA Guidance (Ref 14.1).
Changes to allocated/safeguarded mineral site	Out	Review of the Local Plan (Ref 4.9) indicates no allocated/safeguarded mineral or waste sites are located within the Pentir works site.
Changes to allocated/safeguarded waste site	Out	Review of the Local Plan (Ref 4.9) indicates no allocated/safeguarded mineral or waste sites are located within the Pentir works site.
Changes in demand for materials	Out	The scale of the proposed works (in terms of material demand) is considered to be very small when compared with the overall UK construction sector. Forecast effects are

Receptor	Scoped in/out	Justification
		therefore (using professional judgement) considered negligible.

14.4 Summary

14.4.1 Materials and Waste has been scoped out of the assessment and has not been considered further.

15. In-combination Effects

15.1 Introduction

15.1.1 This chapter introduces the likely in-combination effects that could arise from the construction of the proposed works as described in **Chapter 2: Pentir Substation Works** and how it is assessed in this ES.

15.1.2 In-combination effects occur where a single receptor is affected by more than one type of effect arising from different aspects of the proposed works. An example of an in-combination effect would be where a local resident is affected by temporary visual effects of construction works, noise and traffic disruption during the construction of a scheme, with the resulting effect being greater than each individual effect alone.

15.2 Legislation and Planning Policy

15.2.1 This section summarises the legislation and planning policy framework that is relevant to the In-combination Effects assessment. Details are in **Volume 8, Appendix 1.1.A: Legislation, Policy and Guidance.**

Legislation

15.2.2 The following legislation is relevant to In-combination Effects:

- 2017 TCP EIA Regulations (Ref 3.1).

National Policy

15.2.3 The national policy is relevant to In-combination Effects:

- PPW – Edition 12 (Ref 4.4).
- Future Wales: The National Plan 2040 (Ref 4.3).

15.3 Methodology

15.3.1 There is no established EIA methodology for assessing and quantifying the effects of a number of individual impacts on the same sensitive receptors. The methodology used to undertake the in-combination effects assessment is based on previous experience and professional judgement. A full description of the methodology used for in-combination effects is outlined in **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**.

15.4 Assessment

15.4.1 A full assessment of the potential in-combination effects is undertaken at a Project level and is discussed in **Volume 7: The Project and Cumulative Effects.**

16. Cumulative Effects

16.1 Introduction

16.1.1 This chapter introduces the likely cumulative effects that could arise from the construction of the proposed works as described in **Chapter 2: Pentir Substation Works** and how it is assessed in this ES.

16.1.2 Cumulative effects occur when two or more planned developments have an effect on the same receptor leading to an increase in the effect, and possibly an effect of greater significance. It is possible that individually the developments might not result in significant effects, but when considered together they could create significant effects on a shared receptor; this would typically result from an overall increase in the magnitude (scale, duration, etc.) of effects.

16.2 Legislation and Planning Policy

16.2.1 This section summarises the legislation and planning policy framework that is relevant to the Cumulative Effects assessment. Full details are in **Volume 8, Appendix 1.1.A: Legislation, Policy and Guidance.**

Legislation

16.2.2 The following legislation is relevant to Cumulative Effects:

- 2017 TCP EIA Regulations (Ref 3.1).

National Policy

16.2.3 The national policy is relevant to Cumulative Effects:

- PPW – Edition 12 (Ref 4.4).
- Future Wales: The National Plan 2040 (Ref 4.3).

16.3 Study Area

16.3.1 A 2 km Study Area from the Pentir works site has been implemented to assess the cumulative effects. A 2 km Study Area was deemed appropriate given the nature of the proposed works and its predominantly rural setting.

16.4 Methodology

16.4.1 A range of public sector and industry-led guidance is available on the approach to assessing in-combination effects but at present there is no single, agreed industry standard method. Whilst the proposed works or the wider Project as a whole are not classed as a Nationally Significant Infrastructure Project, the approach to the assessment of in-combination effects broadly follows the Nationally Significant.

16.4.2 Infrastructure Projects: Advice on Cumulative Effects Assessment guidance (Ref 16.1). A full description of the methodology used for in-combination effects is outlined in **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**.

16.5 Potential Effects

16.5.1 **Table 16-1** below presents other approved developments to be taken forward in the assessment of cumulative effects.

Table 16-1 – Short list of other approved developments in 2 km of the Pentir works site

Application reference	Development description	Location	Status	Distance from the Pentir works site
C24/0532/25/LL	Proposed Energy Storage facility, related access, landscaping, infrastructure, ancillary equipment, with a grid connection import and export capacity of 57MWac.	Land At Pentir substation, Pentir, Bangor, LL57 4ED	Approved with conditions	0 m
C16/0886/15/LL	Application for the installation of underground 132KV grid connection cables between the Glyn Rhonwy Storage Facility and the Pentir substation. Two applications to extend the commencement period have been submitted: C21/0934/15/AC and C23/0959/15/AC.	Land At Pentir substation, Pentir, Bangor, LL57 4ED	Approved with conditions	0 m

16.6 Summary

16.6.1 Two other approved developments were found in 2 km of the Pentir works site. These other developments have been assessed against the Project in **Volume 7: The Project and Cumulative Effects**.

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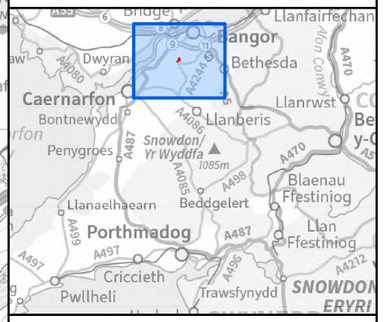
Figures

PENTIR SUBSTATION WORKS ROUTE LEGEND



Legend

Pentir Works Site Boundary

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Kilometres

Rev	Date	Description	GIS	Chk	App
A	25/07/2025	Environmental Statement	AG	RD	NL

nationalgrid

Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 2: PENTIR SUBSTATION WORKS

Document Title: FIGURE 2.2.1 LOCATION OF THE PROPOSED WORKS

Creator:	Date:	Checker:	Date:	Approver:	Date:
AG	25/07/2025	RD	25/07/2025	NL	25/07/2025

Document Type:	Scale:	Format:	Sheets:	Rev:
FIGURE	1:40,000	A3	1 OF 1	A

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N

106.4m

112.2m

Coed Tyddyn-Forgan

Coed Ty'n-llwyn

Spring

Drain

Issues

PENTIR SUBSTATION WORKS ROUTE LEGEND

Legend

- Pentir Works Site Boundary

Existing Transmission System

- Existing Pentir Substation
- Tower
- 400kV OHL
- 132kV Cable
- 400kV Cable

Proposed Works

- New Equipment
- Compound, Laydown and Storage Area
- Car Parking Area

0 50 100 150 200 250

Metres

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Rev	Date	Description	GIS	Chk	App
A	18/08/2025	Environmental Statement	LP	RD	NL

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Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 2: PENTIR SUBSTATION WORKS

Document Title: FIGURE 2.2.2 PENTIR WORKS SITE

Creator:	Date:	Checker:	Date:	Approver:	Date:
LP	18/08/2025	RD	18/08/2025	NL	18/08/2025

Document Type:	Scale:	Format:	Sheets:	Rev:
FIGURE	1:2,750	A3	1 OF 1	A

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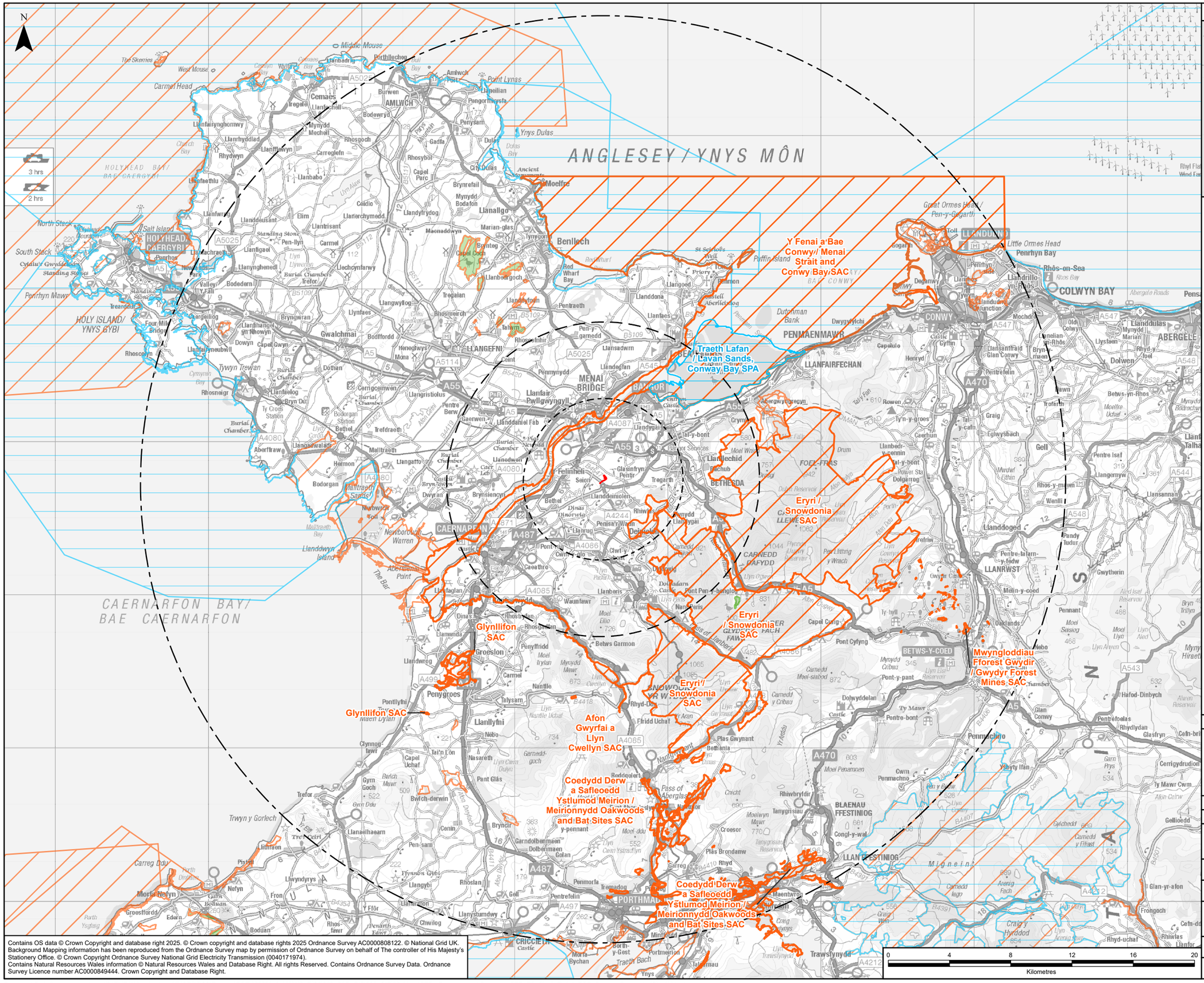

Legend

- Pentir Works Site Boundary
- 5km Buffer of Pentir Works Site Boundary
- 10km Buffer of Pentir Works Site Boundary
- 30km Buffer of Pentir Works Site Boundary

Statutory Designated Sites for Nature Conservation[1]

- Ramsar
- Special Protection Area (SPA)
- Special Area of Conservation (SAC)

NOTES

1: Only Statutory Designated Sites within 10km of the Pentir works site boundary and relevant sites within 30km have been labelled. Those which are outside 10km and are not relevant are still displayed on the figure, but have a transparency applied to the layer.

Rev	Date	Description	GIS	Chk	App
A	18/08/2025	Environmental Statement	AB	RR	NL

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Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 2: PENTIR SUBSTATION WORKS

Document Title: FIGURE 2.5.1 STATUTORY DESIGNATED SITES FOR NATURE CONSERVATION IN THE WIDER AREA

Creator:	Date:	Checker:	Date:	Approver:	Date:
AB	18/08/2025	RR	18/08/2025	NL	18/08/2025

Document Type:	Scale:	Format:	Sheets:	Rev:
FIGURE	1:230,000	A3	1 OF 1	A

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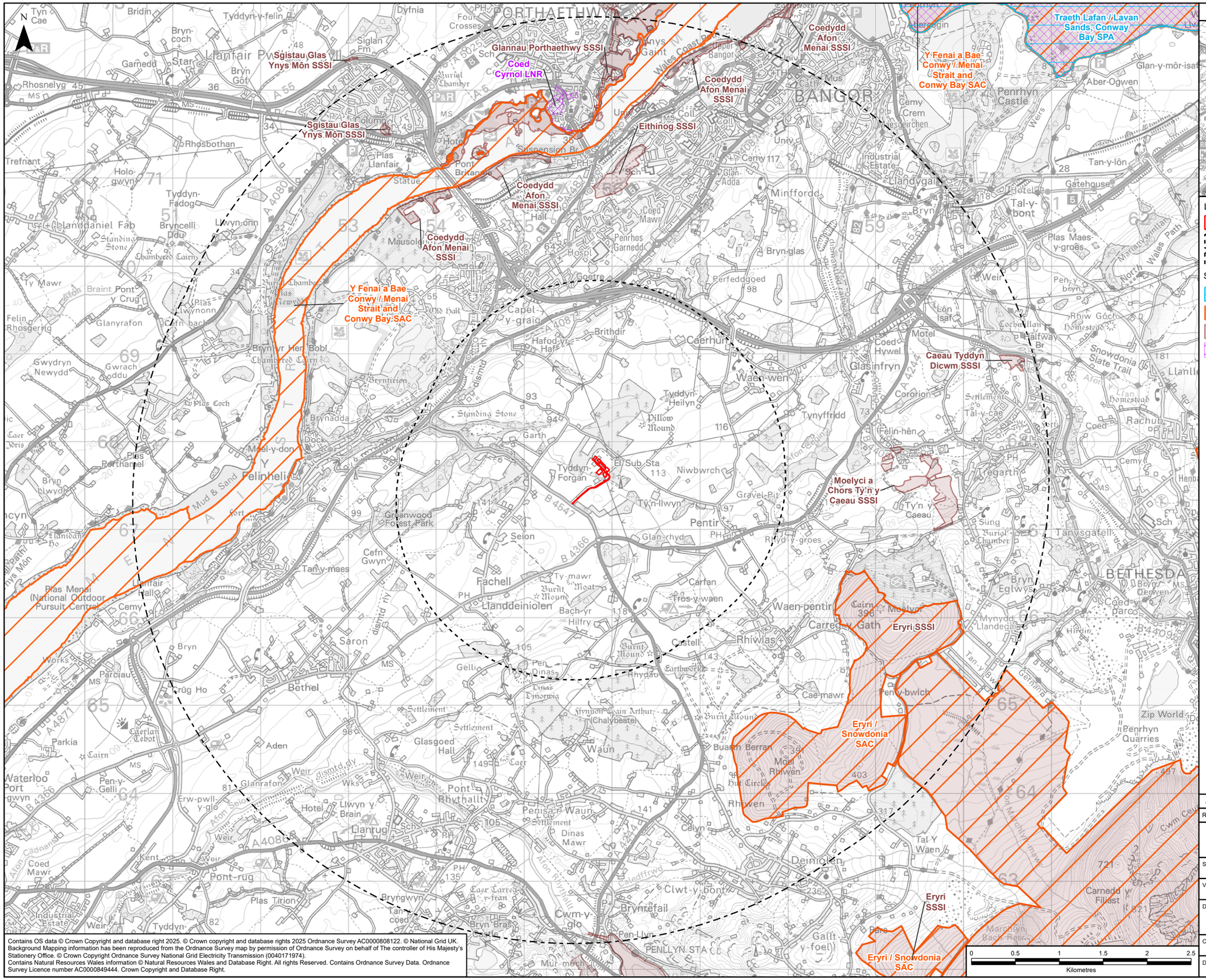
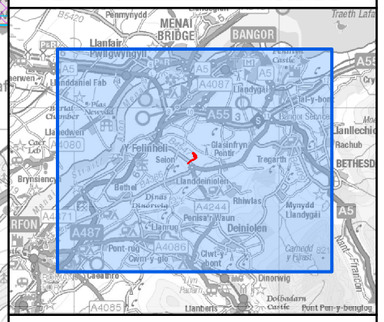


PENTIR SUBSTATION WORKS ROUTE LEGEND



Legend

- Pentir Works Site Boundary
- 2km Buffer of Pentir Works Site Boundary
- 5km Buffer of Pentir Works Site Boundary

Statutory Designated Sites for Nature Conservation

- Special Protection Area (SPA)
- Special Area of Conservation (SAC)
- Site of Special Scientific Interest (SSSI)
- Local Nature Reserve (LNR)

Rev	Date	Description	GIS	Chk	App
A	19/08/2025	Environmental Statement	MH	RR	NL

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Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 2: PENTIR SUBSTATION WORKS

Document Title: FIGURE 2.5.2 STATUTORY DESIGNATED SITES FOR NATURE CONSERVATION

Creator:	Date:	Checker:	Date:	Approver:	Date:
MH	19/08/2025	RR	19/08/2025	NL	19/08/2025

Document Type:	Scale:	Format:	Sheets:	Rev:
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Wildlife Sites data supplied by Cofnod.

PENTIR SUBSTATION WORKS ROUTE LEGEND

Legend

- 🟥 Pentir Works Site Boundary
- ▭ 2km Buffer of Pentir Works Site Boundary

Non-Statutory Designated Sites for Nature Conservation

- ▨ Wildlife Site - Confirmed (WS)[1]
- ▨ Wildlife Site - Candidate (cWS)[1]

NOTES

1. Wildlife Sites data supplied by Cofnod, and are only shown within 2km of the Pentir works site boundary, however composite wildlife sites, where part of the site intersects the buffer, may extend beyond 2km.

Rev	Date	Description	GIS	Chk	App
A	19/08/2025	Environmental Statement	CA	RR	NL

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Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 2: PENTIR SUBSTATION WORKS

Document Title: FIGURE 2.5.3
NON STATUTORY DESIGNATED SITES
FOR NATURE CONSERVATION

Creator:	Date:	Checker:	Date:	Approver:	Date:
CA	19/08/2025	RR	19/08/2025	NL	19/08/2025

Document Type:	Scale:	Format:	Sheets:	Rev:
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PENTIR SUBSTATION WORKS ROUTE LEGEND

Legend

- Pentir Works Site Boundary
- 2km Buffer of Pentir Works Site Boundary

Habitats of Principal Importance (HoPI)[1]

- Ancient woodland
- Lowland dry acid grassland
- Lowland fens and reedbeds
- Lowland meadows
- Purple moor grass and rush pastures
- Upland heathland
- Wood-pasture and parkland
- Traditional orchard

NOTES

1. Due to availability of Habitat of Principal Importance (HoPI) data from Data Map Wales, not all HoPI types are shown on the figure.

Rev	Date	Description	GIS	Chk	App
A	29/08/2025	Environmental Statement	MH	RR	NL

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Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 2: PENTIR SUBSTATION WORKS

Document Title: FIGURE 2.5.4 HABITATS OF PRINCIPAL IMPORTANCE & ANCIENT WOODLAND

Creator:	Date:	Checker:	Date:	Approver:	Date:
MH	29/08/2025	RR	29/08/2025	NL	29/08/2025

Document Type:	Scale:	Format:	Sheets:	Rev:
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Figure 2.5.5 CONFIDENTIAL

N

Spring

Well

Coed Tyddyn-Forgan

106.4m

Issues

Drain

Coed Ty'n-llwyn

PENTIR SUBSTATION WORKS ROUTE LEGEND

Legend

- Pentir Works Site Boundary
- 50m Buffer of Pentir Works Site Boundary

Phase 1 Habitat Feature

- A2.2 - Scrub - scattered
- A3.1 - Broadleaved parkland/scattered tree
- A3.2 - Coniferous parkland/scattered trees
- A3.1 - Broadleaved parkland/scattered trees
- G2 - Running water
- J2.1.1 - Intact hedge - native species-rich
- J2.1.2 - Intact hedge - species-poor
- J2.4 - Fence
- J2.5 - Wall
- J2.6 - Dry ditch
- A1.1.1 - Broadleaved woodland - semi-natural
- A1.1.2 - Broadleaved woodland - plantation
- A1.2.2 - Coniferous woodland - plantation
- A1.3.1 - Mixed woodland - semi-natural
- A1.3.2 - Mixed woodland - plantation
- A2.1 - Scrub - dense/continuous
- A2.2 - Scrub - scattered
- A3.1 - Broadleaved parkland/scattered trees
- B2.2 - Neutral grassland - semi-improved
- B4 - Improved grassland
- B5 - Marsh/marshy grassland
- B6 - Poor semi-improved grassland
- C3.1 - Other tall herb and fern - ruderal
- D1.1 - Dry dwarf shrub heath - acid
- G1 - Standing water
- J1.2 - Cultivated/disturbed land - amenity grassland
- J1.3 - Cultivated/disturbed land - ephemeral/short perennial
- J3.6 - Buildings
- J4 - Bare ground
- Hardstanding

Rev	Date	Description	GIS	Chk	App
A	29/08/2025	Environmental Statement	AB	JM	NL

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Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 2: PENTIR SUBSTATION WORKS

Document Title: FIGURE 2.5.6 PHASE 1 HABITAT SURVEY

Creator:	Date:	Checker:	Date:	Approver:	Date:
AB	19/08/2025	JM	19/08/2025	NL	19/08/2025

Document Type:	Scale:	Format:	Sheets:	Rev:
FIGURE	1:2,600	A3	1 OF 1	A

0 50 100 150 200 250
Metres

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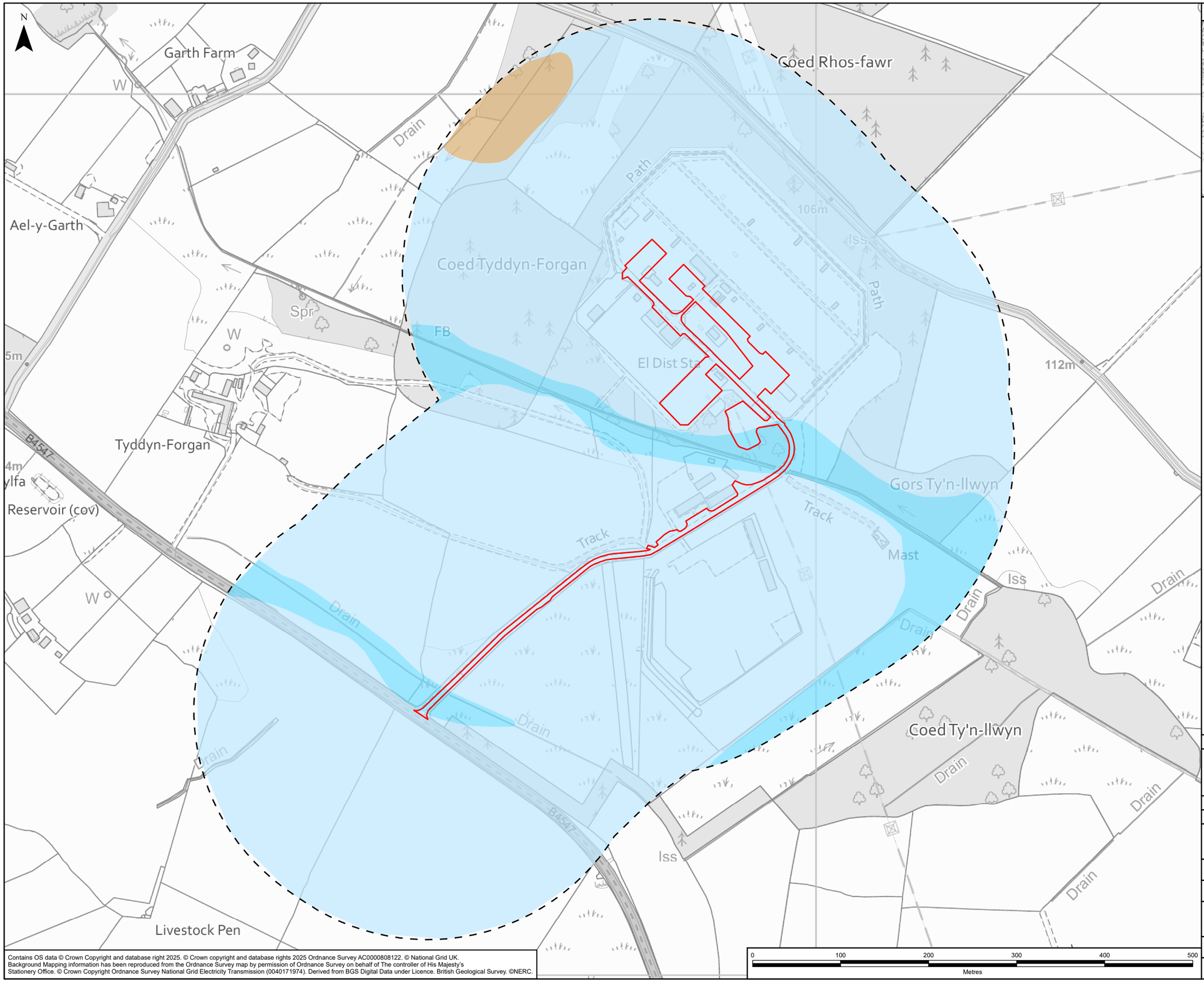

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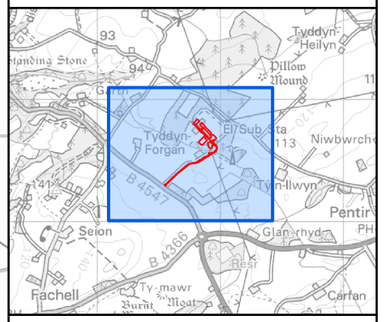
PENTIR SUBSTATION WORKS ROUTE LEGEND



Legend

- Pentir Works Site Boundary
- 250m Buffer of Pentir Works Site Boundary

BGS Superficial Geology 50k

- Alluvium - Clay, Silt, Sand And Gravel
- Peat - Peat
- Till, Devensian - Diamicton

NOTES

1. Artificial, made ground and superficial geology data supplied as part of the Groundsure data search request. The search area was 250m from the Works site boundary at the time of the search request.

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A	11/08/2025	Environmental Statement	LP	SB	NL

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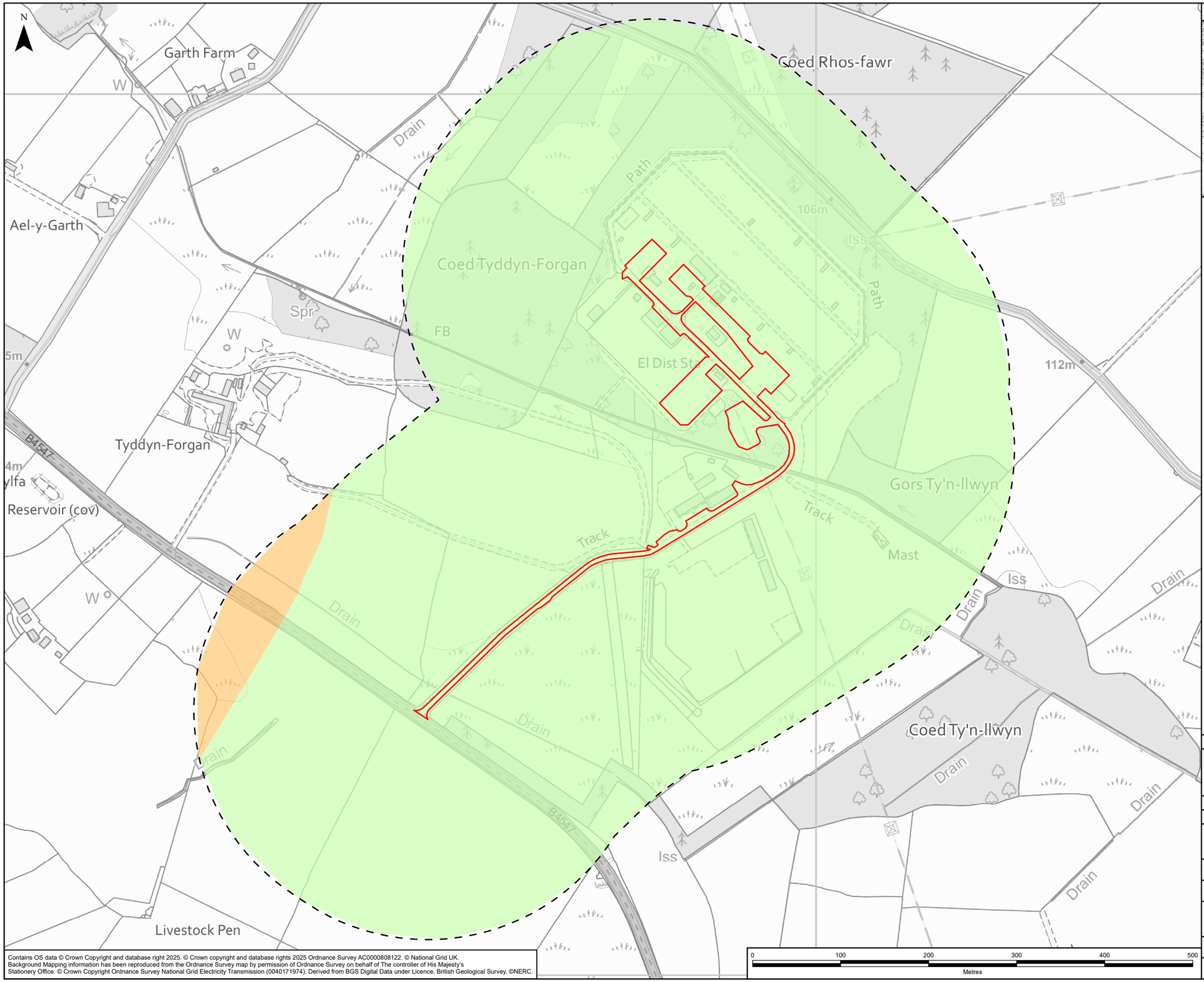
Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 2: PENTIR SUBSTATION WORKS

Document Title: FIGURE 2.7.1
MADE GROUND AND SUPERFICIAL GEOLOGY

Creator:	Date:	Checker:	Date:	Approver:	Date:
LP	11/08/2025	SB	11/08/2025	NL	11/08/2025

Document Type:	Scale:	Format:	Sheets:	Rev:
FIGURE	1:4,000	A3	1 OF 1	A



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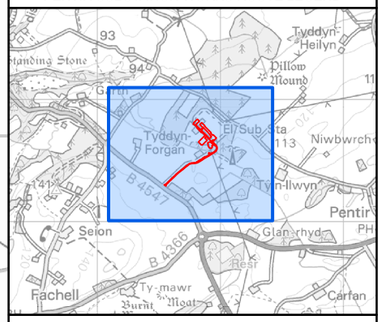
PENTIR SUBSTATION WORKS ROUTE LEGEND



Legend

- Pentir Works Site Boundary
- 250m Buffer of Pentir Works Site Boundary

BGS Bedrock Geology 50k

- Minffordd Formation - Sandstone And Conglomerate, Interbedded
- Padarn Tuff Formation - Tuff, Felsic

NOTES

1. Bedrock geology data supplied as part of the Groundsure data search request. The search area was 250m from the Works site boundary at the time of the search request.

Rev	Date	Description	GIS	Chk	App
A	11/08/2025	Environmental Statement	LP	SB	NL

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Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 2: PENTIR SUBSTATION WORKS

Document Title: FIGURE 2.7.2 BEDROCK GEOLOGY

Creator:	Date:	Checker:	Date:	Approver:	Date:
LP	11/08/2025	SB	11/08/2025	NL	11/08/2025

Document Type:	Scale:	Format:	Sheets:	Rev:
FIGURE	1:4,000	A3	1 OF 1	A

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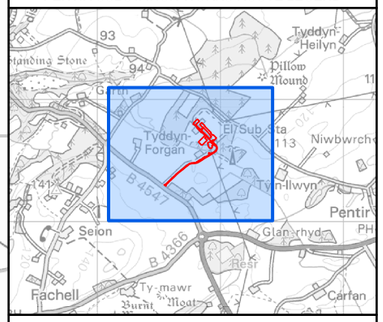
PENTIR SUBSTATION WORKS ROUTE LEGEND



Legend

- Pentir Works Site Boundary
- 250m Buffer of Pentir Works Site Boundary

BGS Hydrogeology

- Superficial Secondary A Aquifer
- Superficial Secondary Undifferentiated Aquifer
- Superficial Unproductive Aquifer
- Bedrock Secondary A Aquifer

NOTES

1. Hydrogeology data supplied as part of the Groundsure data search request. The search area was 250m from the Works site boundary at the time of the search request.

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A	11/08/2025	Environmental Statement	LP	SB	NL

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Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 2: PENTIR SUBSTATION WORKS

Document Title: FIGURE 2.7.3 HYDROGEOLOGY

Creator:	Date:	Checker:	Date:	Approver:	Date:
LP	11/08/2025	SB	11/08/2025	NL	11/08/2025

Document Type:	Scale:	Format:	Sheets:	Rev:
FIGURE	1:4,000	A3	1 OF 1	A

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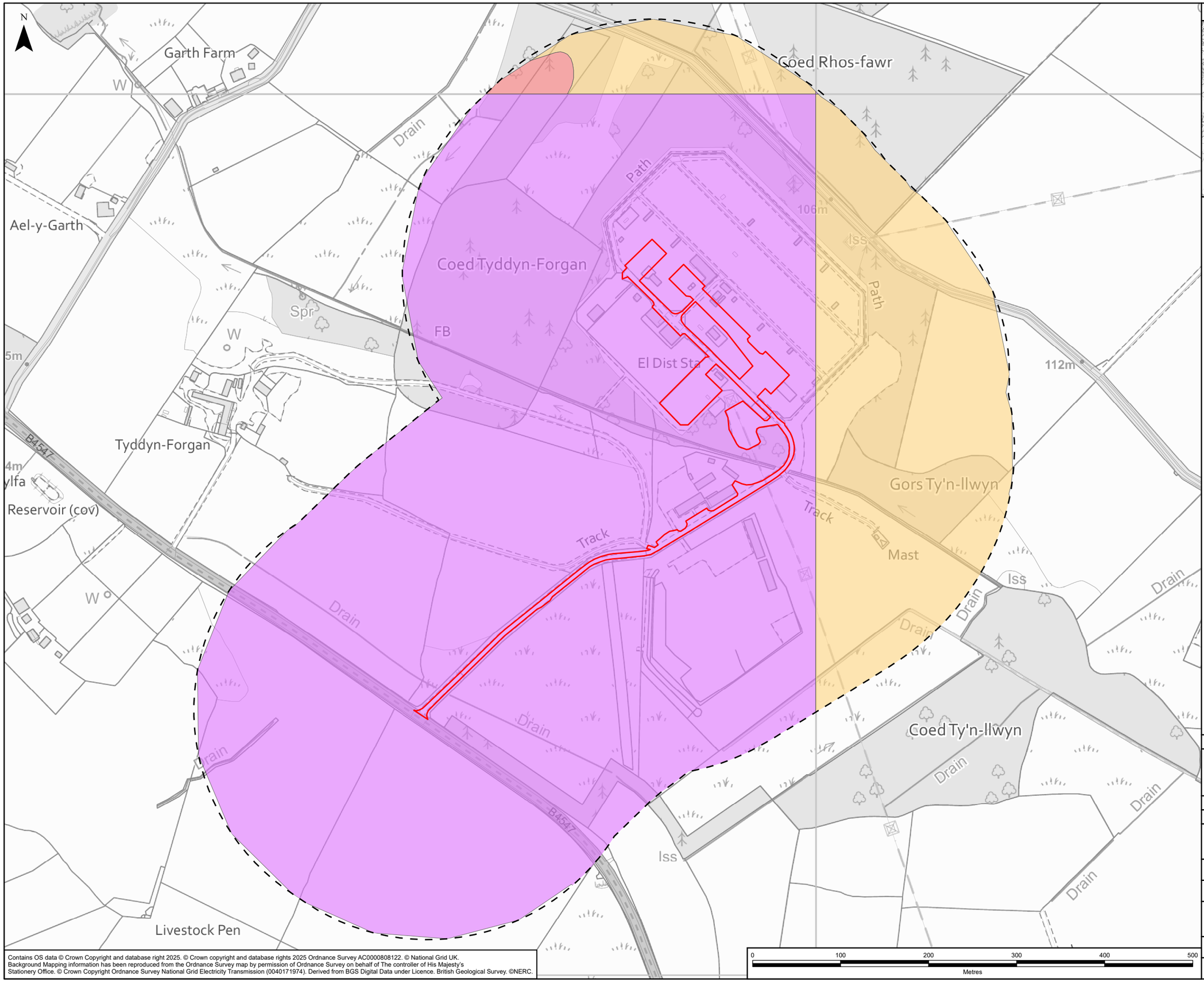
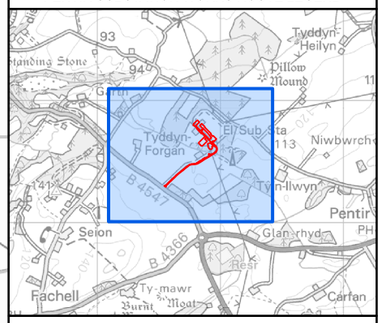


PENTIR SUBSTATION WORKS ROUTE LEGEND



Legend

- Pentir Works Site Boundary
- 250m Buffer of Pentir Works Site Boundary

BGS Groundwater Vulnerability

- Secondary Superficial Aquifer - High Vulnerability
- Secondary Bedrock Aquifer - High Vulnerability
- Secondary Bedrock Aquifer - Medium Vulnerability

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Metres

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NOTES

1. Groundwater vulnerability data supplied as part of the Groundsure data search request. The search area was 250m from the Works site boundary at the time of the search request.

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A	11/08/2025	Environmental Statement	LP	SB	NL

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Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 2: PENTIR SUBSTATION WORKS

Document Title: FIGURE 2.7.4 GROUNDWATER VULNERABILITY

Creator:	Date:	Checker:	Date:	Approver:	Date:
LP	11/08/2025	SB	11/08/2025	NL	11/08/2025

Document Type:	Scale:	Format:	Sheets:	Rev:
FIGURE	1:4,000	A3	1 OF 1	A

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N

Garth Farm

W

Drain

Coed Rhos-fawr

Path

106m

Ael-y-Garth

Coed Tyddyn-Forgan

Spr

FB

W

El Dist Sta

112m

Path

5m

Tyddyn-Forgan

B4547

4m

Ylfa

Reservoir (cov)

Gors Ty'n-llwyn

Track

Track

Mast

Iss

Drain

Drain

Drain

W

Drain

Drain

Drain

Coed Ty'n-llwyn

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Iss

Livestock Pen

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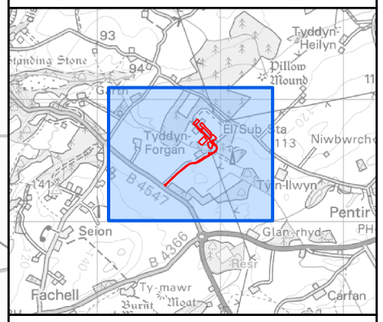
Metres

PENTIR SUBSTATION WORKS ROUTE LEGEND



Legend

- Pentir Works Site Boundary
- 250m Buffer of Pentir Works Site Boundary
- Licensed Discharge to Controlled Waters

Current Industrial Land Use

- Infrastructure and Facilities

Radon

- Less than 1%
- Between 1% and 3%

NOTES

1: All datasets shown in this figure were supplied as part of the Groundsure data search request. The search area was 250m from the Works site boundary at the time of the search request.

Rev	Date	Description	GIS	Chk	App
A	18/08/2025	Environmental Statement	LP	SB	NL

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Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 2: PENTIR SUBSTATION WORKS

Document Title: FIGURE 2.7.5 POTENTIAL SOURCES OF CONTAMINATION

Creator:	Date:	Checker:	Date:	Approver:	Date:
LP	18/08/2025	SB	18/08/2025	NL	18/08/2025

Document Type:	Scale:	Format:	Sheets:	Rev:
FIGURE	1:4,000	A3	1 OF 1	A

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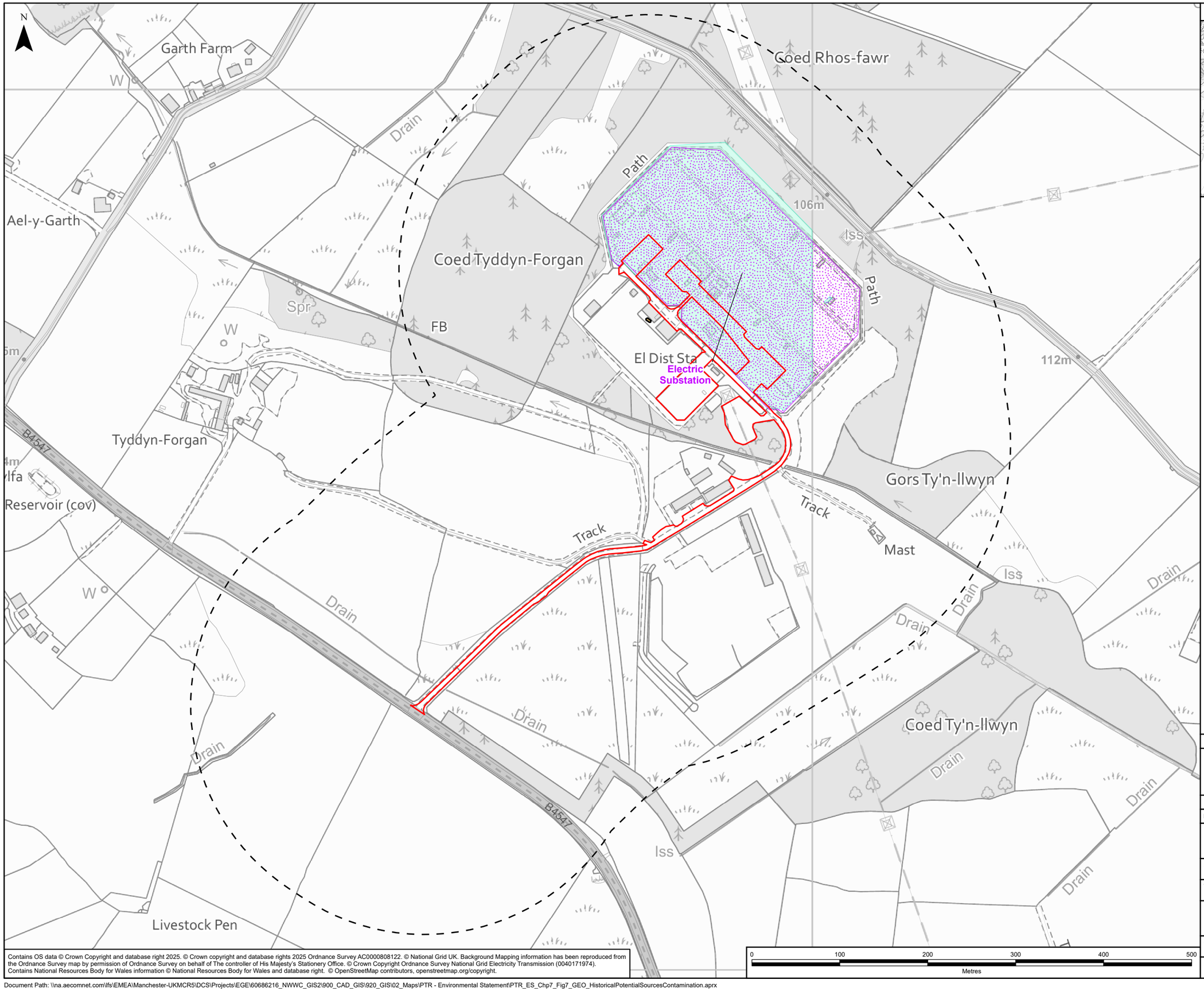
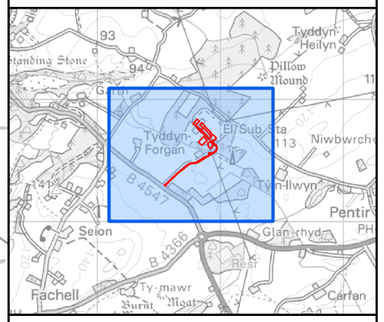


PENTIR SUBSTATION WORKS ROUTE LEGEND



Legend

- Pentir Works Site Boundary
- 250m Buffer of Pentir Works Site Boundary
- Historical Industrial Land Use
- Historical Tanks
- Historical Energy Feature

NOTES

1: All datasets shown in this figure were supplied as part of the Groundsure data search request. The search area was 250m from the Works site boundary at the time of the search request.

Rev	Date	Description	GIS	Chk	App
A	08/09/2025	Environmental Statement	LP	SB	NL

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Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 2: PENTIR SUBSTATION WORKS

Document Title: FIGURE 2.7.6 HISTORICAL POTENTIAL SOURCES OF CONTAMINATION

Creator:	Date:	Checker:	Date:	Approver:	Date:
LP	08/09/2025	SB	08/09/2025	NL	08/09/2025

Document Type:	Scale:	Format:	Sheets:	Rev:
FIGURE	1:4,000	A3	1 OF 1	A

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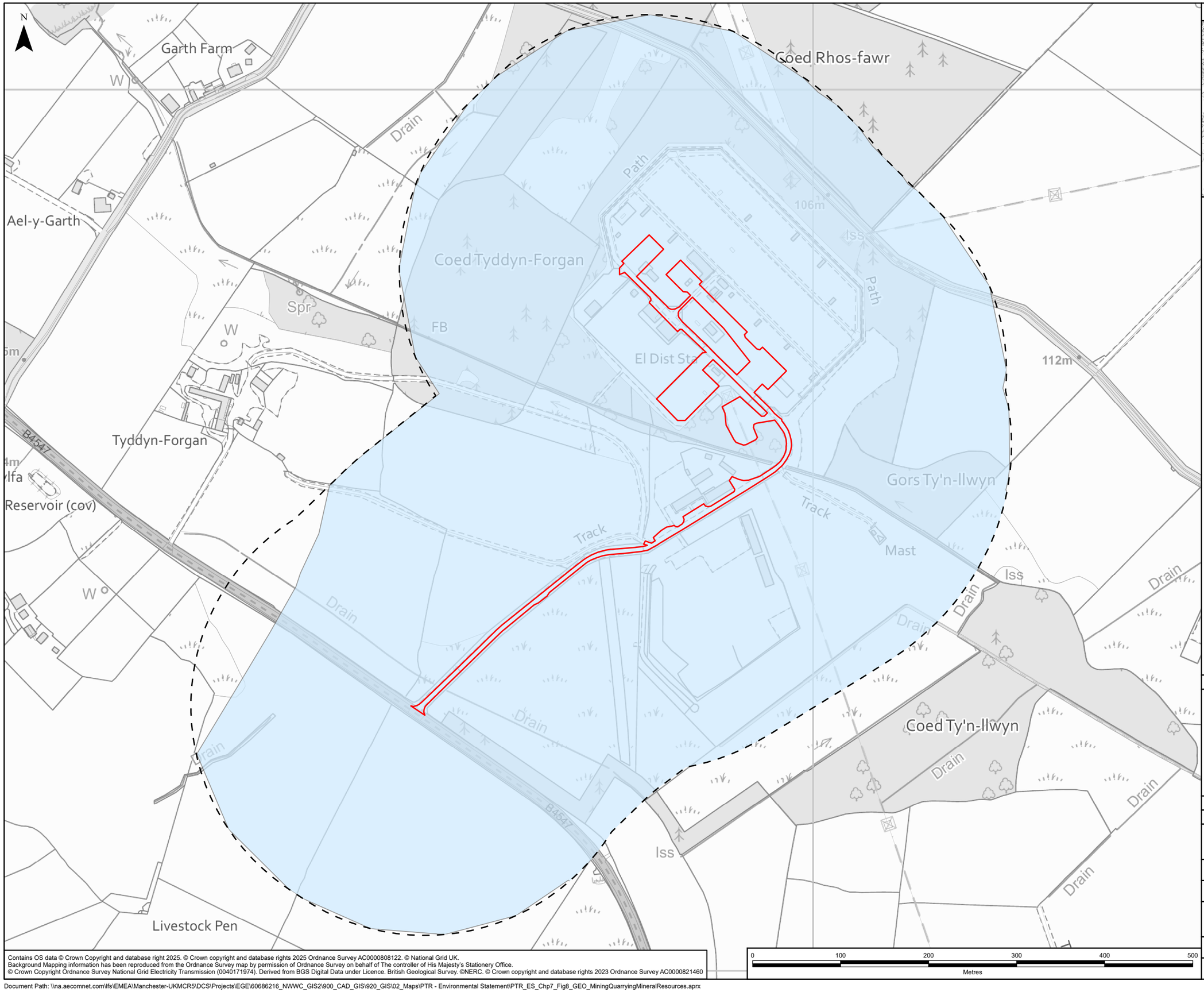
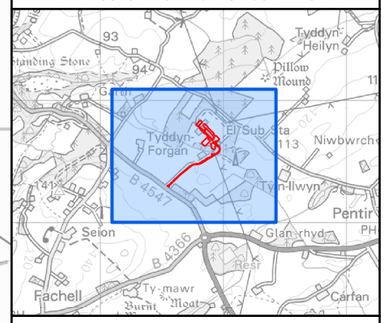


PENTIR SUBSTATION WORKS ROUTE LEGEND



Legend

- Pentir Works Site Boundary
- 250m Buffer of Pentir Works Site Boundary
- Non Coal Underground Mine Workings[1, 2]

NOTES

1. Non coal underground mine workings data supplied as part of the Groundsure data search request. The search area was 250m from the Works site boundary at the time of the search request.
2. Underground mine workings may have occurred in the past or current mines may be working at significant depth to modern engineering standards. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered

Rev	Date	Description	GIS	Chk	App
A	28/08/2025	Environmental Statement	LP	SB	NL

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Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 2: PENTIR SUBSTATION WORKS

Document Title: FIGURE 2.7.7
MINING, QUARRYING AND MINERAL RESOURCES

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LP	28/08/2025	SB	28/08/2025	NL	28/08/2025

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FIGURE	1:4,000	A3	1 OF 1	A

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ATC 2.12
ATC 2.13
ATC 2.14

Coed Mawr
Bryn-Llwyd
Penmos Garnedd
Capel-y-graig
Vaynol Park
Caernhun
Gasirfryn
Felin-hên
Tregarth
Aber-Pwll
Seion
Pentir
Sling
Llandeiniolen
Waen-pentir
Rhiwlas
Mynydd Llandegai

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Kilometres

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PENTIR SUBSTATION WORKS ROUTE LEGEND

Legend

- Pentir Works Site Boundary
- Study Area
- Automatic Traffic Count (ATC) Location

Rev	Date	Description	GIS	Chk	App
A	18/08/2025	Environmental Statement	LP	AB	MR

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Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 2: PENTIR SUBSTATION WORKS

Document Title: FIGURE 2.9.1
TRAFFIC AND TRANSPORT STUDY AREA AND TRAFFIC SURVEY LOCATIONS

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LP	18/08/2025	AB	18/08/2025	MR	18/08/2025

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FIGURE	1:22,000	A3	1 OF 1	A

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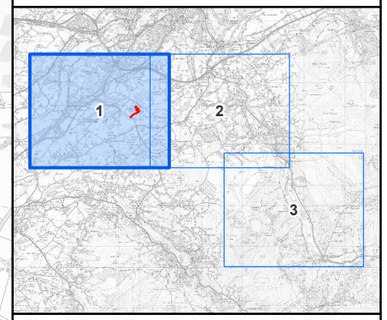
PENTIR SUBSTATION WORKS ROUTE LEGEND



Legend

- Pentir Works Site Boundary
- Study Area

Road Network

- Trunk
- Primary
- Primary - Link
- Secondary
- Tertiary

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Kilometres

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Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 2: PENTIR SUBSTATION WORKS

Document Title: FIGURE 2.9.2 STUDY AREA ROAD NETWORK

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LP	18/08/2025	AB	18/08/2025	MR	18/08/2025

Document Type:	Scale:	Format:	Sheets:	Rev:
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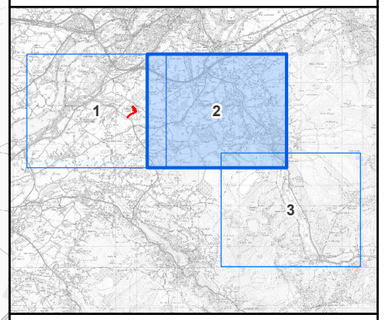

Legend

- Pentir Works Site Boundary
- Study Area

Road Network

- Trunk
- Primary
- Secondary
- Tertiary
- Service
- Track

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Rev	Date	Description	GIS	Chk	App
A	18/08/2025	Environmental Statement	LP	AB	MR

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Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 2: PENTIR SUBSTATION WORKS

Document Title: FIGURE 2.9.2 STUDY AREA ROAD NETWORK

Creator:	Date:	Checker:	Date:	Approver:	Date:
LP	18/08/2025	AB	18/08/2025	MR	18/08/2025

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FIGURE	1:20,000	A3	2 OF 3	A

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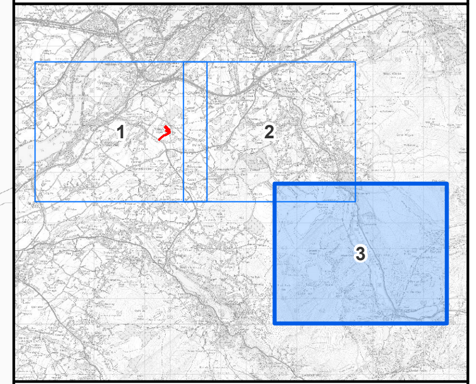
Kilometres

PENTIR SUBSTATION WORKS ROUTE LEGEND



Legend

Pentir Works Site Boundary

Road Network

Trunk

Rev	Date	Description	GIS	Chk	App
A	18/08/2025	Environmental Statement	LP	AB	MR

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Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 2: PENTIR SUBSTATION WORKS

Document Title: FIGURE 2.9.2
STUDY AREA ROAD NETWORK

Creator:	Date:	Checker:	Date:	Approver:	Date:
LP	18/08/2025	AB	18/08/2025	MR	18/08/2025

Document Type:	Scale:	Format:	Sheets:	Rev:
FIGURE	1:20,000	A3	3 OF 3	A

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A	18/08/2025	Environmental Statement	LP	AB	MR
Rev	Date	Description	GIS	Chk	App

nationalgrid

Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 2: PENTIR SUBSTATION WORKS

Document Title: FIGURE 2.9.3 TRAFFIC ACCIDENT LOCATIONS

Creator: LP	Date: 18/08/2025	Checker: AB	Date: 18/08/2025	Approver: MR	Date: 18/08/2025
Document Type: FIGURE	Scale: 1:22,000	Format: A3	Sheets: 1 OF 1	Rev: A	

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PENTIR SUBSTATION WORKS ROUTE LEGEND

Legend

- Pentir Works Site Boundary
- Study Area
- Site Access Point
- Indicative HGV Routeing

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Kilometres

Rev	Date	Description	GIS	Chk	App
A	04/09/2025	Environmental Statement	LP	AB	MR

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Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 2: PENTIR SUBSTATION WORKS

Document Title: FIGURE 2.9.4 INDICATIVE HEAVY GOODS VEHICLE (HGV) ROUTEING

Creator:	Date:	Checker:	Date:	Approver:	Date:
LP	04/09/2025	AB	04/09/2025	MR	04/09/2025

Document Type:	Scale:	Format:	Sheets:	Rev:
FIGURE	1:20,000	A3	1 OF 2	A

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PENTIR SUBSTATION WORKS ROUTE LEGEND

Legend

- Pentir Works Site Boundary
- Study Area
- Indicative HGV Routeing

A5

A4244

Caerhun
Waen-wen
Glasinfryn
Felin-hên
Waen-pentir
Pentir
Rhiwlas
Moelyci
Tregarth
Llanllechid
Rachub
Hên-dumpike
Bron Ogwen
Braich-talog
Sling
Afon Ogwen
Clifodan
Penybryn
Bontuchaf
Tanysgafell
Cil-geraint
BETHESDA
Pant
Gerlan
Coed-y-parc
Bryn Eglwys
Braichmelyn
Mynydd Llandegai

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Kilometres

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A	04/09/2025	Environmental Statement	LP	AB	MR

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Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 2: PENTIR SUBSTATION WORKS

Document Title: FIGURE 2.9.4
INDICATIVE HEAVY GOODS VEHICLE (HGV) ROUTEING

Creator:	Date:	Checker:	Date:	Approver:	Date:
LP	04/09/2025	AB	04/09/2025	MR	04/09/2025

Document Type:	Scale:	Format:	Sheets:	Rev:
FIGURE	1:20,000	A3	2 OF 2	A

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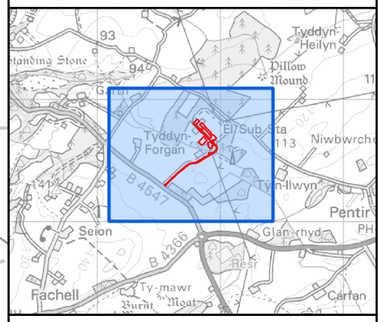
PENTIR SUBSTATION WORKS ROUTE LEGEND



Legend

- Pentir Works Site Boundary
- 20m Buffer of Pentir Works Site Boundary
- 50m Buffer of Pentir Works Site Boundary
- 100m Buffer of Pentir Works Site Boundary
- 250m Buffer of Pentir Works Site Boundary

Non-Statuatory Designated Sites for Nature Conservation

- Wildlife Site - Confirmed (WS)[1]
- Wildlife Site - Candidate (cWS)[1]

Habitats of Principal Importance (HoPI)

- Ancient Woodland

Receptor

- Residential Property

NOTES

1. Wildlife Sites data supplied by Cofnod

Rev	Date	Description	GIS	Chk	App
A	27/08/2025	Environmental Statement	ID	GH	AS

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Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 2: PENTIR SUBSTATION WORKS

Document Title: FIGURE 2.10.1 CONSTRUCTION DUST ASSESSMENT

Creator:	Date:	Checker:	Date:	Approver:	Date:
ID	27/08/2025	GH	27/08/2025	AS	27/08/2025

Document Type:	Scale:	Format:	Sheets:	Rev:
FIGURE	1:4,000	A3	1 OF 1	A

0 100 200 300 400 500
Metres

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PENTIR SUBSTATION WORKS ROUTE LEGEND

Legend

- Pentir Works Site Boundary
- 500m Buffer of Pentir Works Site Boundary
- 1km Buffer of Pentir Works Site Boundary
- Community Facility
- Residential Property
- Visitor Accomodation
- Business Premises
- Business Premises, Residential Property

Greenspace

- Cemetery
- Religious Grounds

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Kilometres

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A	05/09/2025	Environmental Statement	AG	AB	JH

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Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 2: PENTIR SUBSTATION WORKS

Document Title: FIGURE 2.12.1 SOCIO-ECONOMIC LAND USE RECEPTORS

Creator:	Date:	Checker:	Date:	Approver:	Date:
AG	05/09/2025	AB	05/09/2025	JH	05/09/2025

Document Type:	Scale:	Format:	Sheets:	Rev:
FIGURE	1:10,000	A3	1 OF 1	A

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N

ANGLESEY / YNYS MÔN

CAERNARFON BAY / BAE CAERNARFON

LIVERPOOL BAY

SNOWDONIA NATIONAL PARK / PARC CENEDLAETHOL ERYRI

BIRKENHEAD to Belfast 8 hrs

LIVERPOOL to Dublin 8 hrs

Douglas 3 hrs

Note: Boundary between Wirral, Cheshire West and Chester, and Flintshire adopted for the purposes of the Ordnance Survey

0 5 10 15 20 25

Kilometres

PENTIR SUBSTATION WORKS ROUTE LEGEND

Legend

- Pentir Works Site Boundary
- National Park
- Lower Super Output Area (LSOA)

Drive Time Analysis for an Average Wednesday Morning at 9.30am[1]

- 0 - 60 Minutes

NOTES

1: Figure shows 60 minute peak hour drive time from the Pentir works site access point.

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A	05/09/2025	Environmental Statement	AB	EH	JH

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Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 2: PENTIR SUBSTATION WORKS

Document Title: FIGURE 2.12.2
60 MINUTE PEAK HOUR DRIVE TIME
FROM PENTIR WORKS SITE

Creator:	Date:	Checker:	Date:	Approver:	Date:
AB	05/09/2025	EH	05/09/2025	JH	05/09/2025

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FIGURE	1:350,000	A3	1 OF 1	A

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PENTIR SUBSTATION WORKS ROUTE LEGEND

Legend

- Pentir Works Site Boundary
- 500m Buffer of Pentir Works Site Boundary
- 1km Buffer of Pentir Works Site Boundary

Public Right of Way (PRoW)

- Footpath
- Restricted Byway

Cycle Network

- National Cycle Network (NCN) Route

0 0.2 0.4 0.6 0.8 1

Kilometres

Rev	Date	Description	GIS	Chk	App
A	08/09/2025	Environmental Statement	AG	AB	JH

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Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 2: PENTIR SUBSTATION WORKS

Document Title: FIGURE 2.12.3 PUBLIC RIGHTS OF WAY

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AG	08/09/2025	AB	08/09/2025	JH	08/09/2025

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