Uwchraddio'r Grid
Pentir i Drawsfynydd

The Great Grid Upgrade
Pentir to Trawsfynydd

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Prosiect i Atgyfnerthu'r cysylltiad rhwng Pentir a Thrawsfynydd

Pentir to Trawsfynydd Reinforcement Project

Environmental Statement Volume 0: Non-Technical Summary

September 2025

nationalgrid

Contents

1. Introduction

1.1 Introduction

1.1.1 This document is a summary, in non-technical language, of the Environmental Statement (ES) that accompanies applications for planning consent by National Grid Electricity Transmission (plc) ('NGET') to construct, operate and maintain parts of the Pentir to Trawsfynydd Reinforcement Project (the 'Project') in North West Wales.

1.2 NGET

1.2.1 NGET operates the electricity transmission system in Great Britain and owns the system in England and Wales. The system operates at 400 kilovolts (kV) and 275 kV network. It connects electricity generators to substations where higher voltages are transformed to lower voltages, enabling the power to be distributed to homes and businesses.

1.2.2 NGET is legally required to develop and maintain an efficient, coordinated and economical system of electricity transmission and to allow competition in the supply and generation of electricity. NGET is also legally required to do what it reasonably can to reduce their effects on the environment when putting together new proposals to transmit electricity.

1.3 The Current Situation

1.3.1 The existing transmission line between the Pentir and Trawsfynydd substations, known as the '4ZC circuit', is primarily overhead, suspended from towers, except for underground cables between the Wern and Garth Cable Sealing End Compounds (CSECs), also referred to as 'the Glaslyn Cables'.

1.3.2 One circuit of the existing line operates at 400 kV between Pentir and Trawsfynydd substations. Part of the other circuit (between Trawsfynydd substation and Tower 4ZC070) currently operates at 132 kV, although it could be operated at 400 kV with different cables. It is operated at 132 kV in this area because a power supply is taken off the 4ZC overhead line circuit to a separate 132 kV overhead line, known as the 'DB Route', owned and operated by Scottish Power Energy Networks (SPEN). There is a section of the 4ZC overhead line circuit that is currently not in use between Tower 4ZC070 and Tower 4ZC140 near Penisa'r Waun.

1.4 Need for the Project

1.4.1 The National Energy System Operator (NESO) is responsible for identifying how the national electricity transmission system needs to be adapted to meet challenges of connecting new electricity infrastructure, reducing carbon emissions and improving energy security. NESO's analysis demonstrates that there is not enough transmission capacity in the existing network in North Wales to connect additional large scale power

generation developments that are anticipated, notably from offshore renewable energy projects in the Irish Sea.

1.4.2 Increasing capacity on the existing transmission line between Pentir and Trawsfynydd substations has been identified as an urgently required action to provide more transmission capacity. This is recognised by Ofgem (the energy regulator for Great Britain), who have identified the necessary works as Accelerated Strategic Transmission Investment (ASTI).

1.4.3 The Welsh and United Kingdom (UK) Governments have set ambitious targets for developing new homegrown sources of renewable energy over the next decade. The Welsh Government wants to meet the equivalent of 70% of Wales' electricity demand from renewable energy sources by 2030.

1.5 Project Overview

1.5.1 The Project ES has been separated into eight (8) volumes to support the various consent applications required, as summarised below. The location of works for each of the Project components (Volumes 2-6) are shown in **Plate 1**.

1.5.2 **Project Introduction (Volume 1).**

1.5.3 **Pentir Works** (**Volume 2**) – Underground cabling works in the existing Pentir substation.

1.5.4 **Bryncir Works** (**Volume 3**) – A new substation, replacement of tower 4ZC067 and new cables from the replaced tower down into the substation (downleads). A new 132 kV cable to connect the existing SPEN DB route to the new substation, which will be partly underground cable and partly overhead line, and removal of a section of the SPEN DB route that will no longer be required.

1.5.5 **Glaslyn Cables Works** (**Volume 4**) – An extension to the existing Wern Cable sealing End Compound (CSEC), replacement of the Glaslyn Cables, including the removal of some redundant sections of cable and making safe other redundant sections that will be left buried, a new CSEC at Minffordd and raising the floor level of a new Tunnel Head House (THH), previously consented as part of the Eryri (previously Snowdonia) Visual Impact Provision (EVIP) project, and the removal of the existing Garth CSEC.

1.5.6 **Trawsfynydd Works** (**Volume 5**) – Replacement of downleads from tower 4ZC005, underground cabling works, installation of new equipment, including a shunt reactor, and amendments to the substation compound fence line.

1.5.7 **Wider Works** (**Volume 6**) – Replacement of cables and fittings ("reconductoring") on the 4ZC overhead line between towers 4ZC005 and 4ZC027, and then between towers 4ZC044 and 4ZC070 as well as replacement of the earthwire with an Optical Ground Wire (OPGW). Installation of fibre optic cables along the earthwire between towers 4ZC070 and 4ZC140.

1.5.8 **The Project and Cumulative Effects** (**Volume 7**) – This volume assesses the impact of all the works in Volumes 2 to 6 when considered as a whole, single project and against other existing and/or planned projects in the vicinity of the works. This volume considers where different parts of the scheme affect the same 'receptor' (e.g. a 'part of the environment' that is impacted by the different work components, such as a specific species or an historic monument affected by noise from two (2) different sets of works

i.e. works at Bryncir and works at Pentir), and where different types of impacts affect the same receptor “in-combination” (e.g. noise and dust from the same works affected a specific species or historic monument). It also looks at the potential “cumulative” effect on receptors from the Project in the context of other existing and/or planned projects.

1.5.9 **Appendices (Volume 8)** – This contains technical appendices to ES Volumes 1-7.

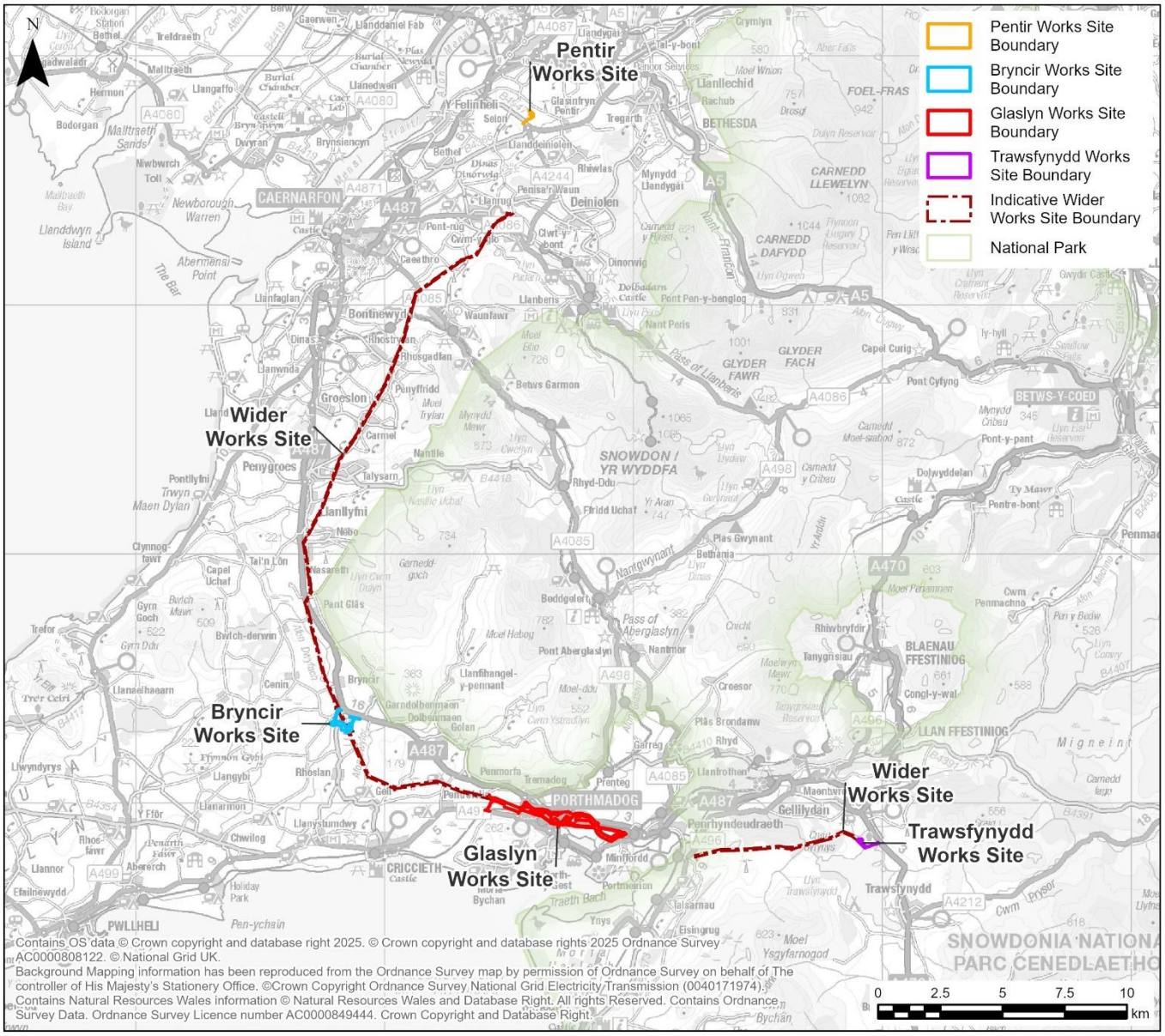

Plate 1: The Project Location

1.6 What is Environmental Impact Assessment?

1.6.1 An Environmental Impact Assessment (EIA) is the process of identifying, evaluating and mitigating, where possible, likely significant environmental effects of a project. It promotes the early identification and evaluation of likely significant effects on the environment. It enables appropriate mitigation (i.e. measures to avoid, reduce or offset negative effects or increase positive effects) to be identified and included in the design of a project, or commitments to be made to other mitigation, such as environmentally

sensitive construction methods and practices. The results of an EIA are presented in a document referred to as an Environmental Statement (ES), as described in **Section 1.7**.

1.6.2 The EIA for the Project was undertaken at the same time as the design process to maximise opportunities to reduce likely significant effects as they were identified. This approach has ensured that mitigation is included in the design of the Project and forms an important part of it. The result of the EIA also makes decision-makers aware of the Project's likely environmental effects and whether these may be significant or not, so that they may be considered in the determination of the applications.

1.7 The Environmental Statement

1.7.1 The ES consists of several documents that accompany applications for planning permission made by NGET under the Town and Country Planning Act, 1990 to seek powers to construct, operate and maintain components of Project.

1.7.2 The ES provides an overview of the Project, the main alternatives considered when developing the Project (where applicable), information about the existing environment, and an assessment of the likely significant effects of the Project. Where appropriate, mitigation measures have been identified to avoid, reduce or remedy significant adverse environmental effects.

1.7.3 The ES has been prepared in consultation with relevant stakeholders, including Gwynedd Council, Eryri National Park Authority, Natural Resources Wales (NRW), Heneb, the Trust for Welsh Archaeology, Cadw, landowners and members of the public.

1.8 The Non-Technical Summary

1.8.1 Although the ES is written to be as clear and understandable as possible, it is a large document. It includes some detailed technical information and often requires the use of technical language. This Non-Technical Summary provides a summary of the content of the ES in a way that is intended to be readily accessible to all readers by avoiding, where possible, the use of overly technical language.

1.8.2 The remainder of the Non-Technical Summary is structured as follows:

- **Section 2: The Project.** This section provides a description of each component of the Project, including how it would be constructed.
- **Section 3: Project History and Alternatives.** This section describes the evolution of the design of the Project.
- **Section 4: Results of the EIA.** This section describes the results of the assessments for each environmental topic.

2. The Project

2.1 Pentir Works – Volume 2

Description of the proposed works

2.1.1 Pentir substation is an existing substation in North West Wales, approximately 4.5 kilometres (km) south-west of Bangor. It is in the administrative boundary of Gwynedd Council.

2.1.2 The proposed works would be in the existing Pentir substation compound and would comprise replacement of existing underground cables; installation of new cross-site underground cables; and related works.

Construction

2.1.3 Temporary construction lighting will be required for safety.

2.1.4 Foundations for the new structures and relocated equipment would be constructed from reinforced concrete delivered by truck mixer from the nearest supplier. Other materials would be delivered as required.

2.1.5 Steel structures and electrical infrastructure would be put up using mobile cranes, mobile elevated work platforms (MEWPs) and telehandlers.

2.1.6 The proposed works are planned to be undertaken in stages over approximately three (3) years in Q1 2027 to Q2 2029.

2.1.7 The existing access road from the B4547 will be used for construction and no works are needed to it.

2.1.8 There would be around 8 – 12 staff members for construction.

2.1.9 Staff would work between 7:30 am – 5:30 pm Monday to Friday. Bank holiday and weekend work, if required, along with extended hours would be agreed with the Local Planning Authority (LPA).

Operation

2.1.10 No change in the current frequency of attendance, inspection or maintenance to the substation is expected. Maintenance would be required through issues arising from inspection. All operational works would use the existing access.

2.2 Bryncir Works – Volume 3

Description of the proposed works

2.2.1 The proposed works would be on open fields approximately 1.4 km south of Bryncir and 1.4 km west of Garndolbenmaen in North West Wales, in the administrative boundary of Gwynedd Council.

2.2.2 The proposed works would comprise the following:

- New substation, including a new permanent access road.
- New section of underground cable.
- Relocation of existing Tower 4ZC067 80 m north-west of its current position.
- Realignment of the DB 132 kV route and decommissioning and removal of a redundant section.
- Permanent diversion of the Dolbenmaen No 18 footpath.
- New landowner access track.
- Reinstatement of working areas.

Construction

2.2.3 General low-level lighting for access will be required at the temporary construction compounds and task lighting as needed for the general works.

2.2.4 The foundation installation for the replacement tower will be constructed at the same time as the proposed Bryncir substation. The replacement Tower 4ZC067 will then be erected.

2.2.5 The existing SPEN DB route will connect to the proposed Bryncir substation using part underground cables and part overhead line. The underground cables would be approximately 600 metres (m) long passing north through two (2) fields before turning west to meet the terminal structure. Access would be via a temporary haul road or steel trackway running alongside the cable route. An overhead line of approximately 250 m would cross the B4411 and the Afon Dwyfach. Scaffolding would be required to support netting strung to protect the B4411 and the Afon Dwyfach. The redundant part of the DB route, approximately 625 m long, between the new connection and Tower 4ZC070 would be removed.

2.2.6 During construction, the part of the Dolbenmaen No 18 footpath running through the Bryncir works site will be temporarily closed. Stiles and gates for the permanent footpath diversion would be constructed and the diverted footpath will be reopened after construction. The diverted footpath would be approximately 955 m longer than the current route.

2.2.7 Construction equipment required includes a range of heavy vehicles and plant.

2.2.8 The proposed works are planned to be undertaken in stages over approximately 18 – 20 months from Q1 2026 to Q3 2027.

2.2.9 Access will be via a new access road off the A487. Partial road closures at off-peak times will be used to make the access to site. Aluminium trackway or ‘bog mats’ would be used to avoid or minimise ground disturbance from vehicles.

2.2.10 A 4 m wide temporary stone road will be built around the northern perimeter of the new Bryncir substation, which will provide access to the new Tower 4ZC067 and a 40 m x 40 m working area with a stone base immediately east of the new tower.

2.2.11 A temporary hardstanding just off the A487 will be established for construction facilities including site offices, welfare, laydown and plant storage for the earthworks phase of activities.

2.2.12 There would be around eight (8) – 24 staff members for construction.

2.2.13 Staff would work between 7:00 am – 7:00 pm Monday to Friday. Bank holiday and weekend work, if required, along with extended hours would be agreed with the Local Planning Authority.

Operation

2.2.14 The substation would typically be unmanned. Maintenance of the substation would be undertaken approximately every three (3) years. Visual checks would be undertaken on a monthly inspection visit to the site. If the substation required refurbishment or replacement works, vehicles would be used to carry workers in and out of the site and suitable vehicles would be used to bring new materials and equipment to site and remove old equipment.

2.2.15 Permanent lighting will be installed at the proposed Bryncir substation but will only be used for emergency maintenance works.

2.3 Glaslyn Cables Works – Volume 4

Description of the proposed works

2.3.1 The proposed works would take place between the existing Wern CSEC and the proposed Garth CSEC, near Porthmadog in North West Wales, in the administrative boundary of Gwynedd Council.

2.3.2 The proposed works would comprise the following:

- An extension to the Wern CSEC, including a permanent new access road.
- Installation of replacement underground cable by open cut trenching and trenchless (Horizontal Directional Drilling (HDD)) techniques.
- Installation of the Minffordd CSEC and a new THH, previously consented as part of the Eryri Visual Impact Provision (EVIP) project with an increased floor height.
- Decommissioning of the existing 132 kV and 400 kV cable circuits as well as the Garth CSEC.
- Reinstatement of working areas.

Construction

2.3.3 Temporary task lighting and security and safety lighting will be required at construction and HDD compounds and along worker access routes to work sites.

2.3.4 Wern CSEC would be extended from approximately 50 m by 23 m, to 52 m by 49 m to accommodate the 12 replacement cables. Works at Wern include new foundations and support steelwork for high voltage electrical equipment. A new permanent access road would be built from the west of the A498, approximately 1.26 km long and 5 m wide.

2.3.5 The existing 132 kV and 400 kV cables and associated infrastructure would be replaced. This would include joint bays, link pillars, link boxes, including draining, decommissioning and removal of redundant cables, with some sections being left in the ground due to social and ecological sensitivities. The replacement cables would be installed in ducts through either open cut or trenchless technology. The proposed open cut technique would be trenching and backfilling, which would be employed for approximately half of the cable route. The proposed trenchless technology would be HDD, and would be used for crossing of major roads, railway lines and rivers.

2.3.6 The Minffordd THH, which forms part of the EVIP project, will be accessed from an unnamed road to the west of the Quarry Land and Osmond Terrace junction. The Minffordd CSEC works will include new foundations and high voltage plant and equipment. The proposed Minffordd CSEC will be constructed on land of which part was previously identified for landscape works to the north of the consented EVIP Minffordd THH. This means that the landscaping as part of the existing planning permission for the Minffordd THH cannot be implemented as approved. A revised landscape proposal has been included in the Planning Application for the Glaslyn Cables works. Adjustments to the previously approved fencing and drainage have been made to accommodate the Minffordd CSEC adjacent the EVIP Minffordd THH.

2.3.7 All the infrastructure in the Garth CSEC compound would be removed to a depth of 1 m, including underground services, foundations and platform material, and the area would be reinstated. Landscaping works would include woodland, woodland edge, scrub and grassland planting.

2.3.8 The construction works are planned to be carried out in stages over approximately three (3) years from Q2 2026 – Q2 2029.

2.3.9 The main construction compound would be west of the A498 and each section of HDD would require two (2) compounds, one (1) for the drilling site and the other for the exit site.

2.3.10 The average number of staff on the Glaslyn works site will be between seven (7) and 28 at its peak.

2.3.11 Generally, construction activities would be carried out from Monday to Friday 7:00 am – 7:00 pm and 8:00 am – 6:00 pm on Saturdays. Prior agreement will be required from the Local Planning Authority for any works on a Sunday. 24-hour working will be required for critical activities such as HDD, cable pulling, jointing and terminating.

Operation

2.3.12 The CSECs and THH would be unmanned but monitored remotely. Visual checks would be carried out on a monthly inspection visit. Maintenance inspections of the CSECs would take place following any issues identified during inspection.

2.3.13 For the cables left buried in the ground, periodic monitoring will be undertaken. The frequency of these visits will initially be every four (4) months, reducing to six (6) months and then yearly. The results of the initial monitoring will establish the monitoring regime for approximately 10 years.

2.3.14 Additional permanent lighting will be installed at the proposed Minffordd and Wern CSECs but will only be used for emergency maintenance works.

2.4 Trawsfynydd Works – Volume 5

Description of the Proposed Works

2.4.1 Trawsfynydd substation is an existing substation in North Wales, approximately 3.2 km north of Trawsfynydd village in the Eryri National Park and in the administrative boundary of Eryri National Park Authority.

2.4.2 The proposed works would be in the existing Trawsfynydd substation compound, including:

- Removal of redundant cables.
- Installation of new 400 kV cables, a shunt reactor and gantry.
- Replacement downleads from Tower 4ZC005.
- Alterations to the fence alignment.
- Reinstatement of working areas in the substation.

Construction

2.4.3 Temporary task lighting and security and safety lighting may be required.

2.4.4 Foundations installed for the shunt reactor. Steel structures and associated electrical equipment would be erected using mobile cranes, mobile elevation working platforms and telehandlers.

2.4.5 Access to the Trawsfynydd works site would be gained via the existing Trawsfynydd substation access road off the A470.

2.4.6 The proposed works are planned to be undertaken over approximately three (3) years from Q2 2026 – Q2 2029. Construction will happen in stages.

2.4.7 There would be around six (6) – 16 staff members for construction.

2.4.8 Generally, construction activities would be undertaken during daytime periods only, from Monday to Friday 7:30 am – 5:30 pm. No bank holiday or weekend working will be undertaken, unless agreed with the Local Planning Authority.

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

Operation

2.4.10 No change in the current frequency of attendance, inspection or maintenance to the substation is expected. Maintenance would be required through issues arising from inspection. All operational works would use the existing access.

2.5 Wider Works – Volume 6

Description of the Proposed Works

2.5.1 As part of the Project, NGET will replace the wires on 15.2 km of the existing 4ZC circuit between Towers 4ZC005 – 4ZC027 and Towers TZC044 to 4ZC070.

2.5.2 Operational telecoms are required via a 23 km length of wrapped fibre. An Optical Ground Wire (OPGW) will be installed between Tower 4ZC070 and Tower 4ZC140, to connect the proposed Bryncir substation with NGET telecommunications. A section of OPGW would also be required to connect between Tower 4ZC070 and Tower 4C044 turning into the Bryncir substation via Tower 4ZC067. The OPGW would be installed in approximate 2 km sections.

The Proposed Works

Reconductoring

2.5.3 Works will be carried out in sequence by sections. For example, replacing wires will be started in one section while access and enabling works are carried out in subsequent sections. The general sequence of works in each section will be:

- Access and enabling works.
- Scaffolding and crossing protection.
- Overhead line tower steelwork and foundation surveys and strengthening.
- Overhead line tension stringing.
- Removal of scaffolds and track matting, and reinstatement works.

Optical Fibre Wire Installation

2.5.4 The optical wire will be installed using a specially designed spinning machine to wrap the wire around the cables under controlled conditions. No crossing protection measures are required, although significant crossings (i.e. A and B roads, and rivers) will be monitored.

2.5.5 Access and enabling works will be minimal. The equipment will be delivered by lorry loader or pick-up, with tractor and all-terrain vehicle (ATV) support, where required. There will be optical joint towers every four or five towers. These are where the specially designed spinning machine (“tug unit”) would be launched. There will be a need for access for larger vehicles (i.e. tractors and 3.5 tonne pick-ups) at these towers. Access will be required to all other towers between 4ZC44 and 4ZC140 with tractor or ATV to “jump” the tug unit past the earth peak.

2.5.6 Temporary task lighting and security and safety lighting may be required.

2.5.7 The Wider Works are planned to be undertaken over approximately 50 months from Q2 2026 – Q3 2029 to coordinate with the wider Project.

2.5.8 The number of staff on the Wider Works site would vary according to the activities being undertaken but would peak between 20 and 50 workers.

2.5.9 Generally, construction activities will be undertaken during daytime periods only, from Monday to Friday 7.00 am – 7.00 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.

2.5.10 There may be some periods of extended or 24-hour working.

Operation and Maintenance

2.5.11 No change in the current frequency of inspection or maintenance to the line is expected. Maintenance would be required through issues arising from inspection.

2.6 Electric and Magnetic Fields

2.6.1 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 Project and how it complies with EMF exposure guidelines. This report is in **Volume 8, Appendix 7.1.A: Electric and Magnetic Field Assessment**.

3. Project Alternatives

3.1 Assessment of Alternatives

3.1.1 The project is reinforcement of an existing transmission network which limits the alternatives available. However, a number of technology, location and route alternatives were evaluated.

3.1.2 For Pentir and Trawsfynydd, where works are to be carried out in the existing substations, options considered were limited to the alignment of cable replacements through each respective site. The options chosen presenting low risks to the continued operation of the substation.

3.1.3 At Bryncir, NGET has previously assessed 12 potential locations for the Bryncir substation in 2012, shortlisting three (3) options: Northern, Central, and Southern. The Southern site emerged as the preferred option due to advantages in terms of ecology and cultural heritage impacts. The Southern location received public and NRW support during consultation.

3.1.4 Two (2) broad indicative routes were considered for the new 132 kV supply to the existing SPEN DB route at Bryncir, each with three (3) options included buried, overhead, and a combination of buried and overhead sub-options. Route A, heading directly west from the proposed Bryncir substation crossing agricultural fields and crossing the B4411 and Afon Dwyfach before connecting into the DB route, with a combination of underground cables and overhead lines was preferred for its cost-effectiveness and reduced ecological and agricultural impacts.

3.1.5 The Glaslyn Cables route was split into five (5) sections (A to E), with multiple routeing options assessed in each section. Factors considered include technical feasibility, safety, environmental impact and socio-economic impact

3.1.6 The Glaslyn cable route intersects the A487 in three (3) locations. At all three (3) locations potential open-cut and HDD options were reviewed to identify options that balanced technical feasibility, safety and environmental impact.

3.1.7 Three (3) options were considered for the technology and equipment used to connect the cables at the Minffordd CSEC component of the Glaslyn works, with the selected option chosen for its technical feasibility.

3.1.8 The Bodawen playground, owned and managed by Porthmadog Town Council, is immediately west of the Porthmadog Roundabout. The existing 400 kV cables run in a south-east/north-west direction beneath the Bodawen Playground and need to be removed to facilitate the proposed works.

3.1.9 NGET has liaised with the Town Council on the required playground closure and mitigation. It investigated alternative sites for temporary relocation of the playground to mitigate effects of its temporary closure (anticipated to be for two (2) years). It was agreed that NGET would refit the playground with new equipment, including seating in addition to play equipment, and appropriate safety surfacing when it reinstates the land.

4. Results of the EIA

4.1 Pentir Works

Landscape and Visual Amenity

Existing Environment

4.1.1 The nearest National Landscape is 3.5 km away but extends for many more kilometres. The nearest National Park is Eryri National Park approximately 6 km to the east at its closest part.

4.1.2 The Pentir works site and Study Area lie in the National Landscape Character Area (NLCA) 03 Arfon.

4.1.3 The Pentir works site is in the Dinorwig Registered Historic Landscape.

4.1.4 The Pentir works site and Study Area are in Landscape Character Area (LCA) 04 Caernarfon-Coast and Plateau identified in the Gwynedd Landscape Strategy Update 2012.

4.1.5 Residential settlement is limited to a small number of scattered farms and individual properties close to the Pentir works site. The main transport routes close to 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. There are no long-distance walking route or national cycle network routes close to the Pentir works site. There are few Public Rights of Way (PRoW) close to 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.

Assessment of Impacts and Likely Significant Effects

4.1.6 An assessment of landscape and visual effects was scoped out due to the limited and temporary nature of potential change, with no likely significant effects predicted to occur.

Ecology and Nature Conservation

Existing Environment

4.1.7 The closest watercourse is an unnamed stream that passes below the Pentir substation access road flowing in an east to west direction. Another ditch is west of this and also runs beneath the Pentir substation access road. There is a recently created balancing pond present approximately 27 m east of the Pentir works site.

4.1.8 There are four (4) international statutory sites for nature conservation (i.e., Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Ramsar sites) in 10 km of the Pentir works site. There are two (2) further SACs designated for bats in 30 km of the Pentir works site.

4.1.9 Nine (9) other statutory designated sites for nature conservation (Site of Special Scientific Interest (SSSIs), National Nature Reserves (NNRs), Local Nature Reserves (LNRs)) are present in 5 km of the Pentir works site.

4.1.10 There are 35 non-statutory sites designated for nature conservation identified in the Study Area. Five (5) of these are within 500 m of the Pentir works site.

4.1.11 There are 47 areas of Ancient Woodland in the Study Area, the nearest is approximately 30 m from the Pentir works site. There are no ancient or veteran trees in the Study Area.

4.1.12 There are various areas of Habitats of Principal Importance (HoPI) and various protected species have been identified as present or potentially present in the Pentir works site and surrounding Study Area.

4.1.13 Records of 14 Invasive Non-Native Species (INNS) have been identified.

Assessment of Impacts and Likely Significant Effects

4.1.14 Disturbance, habitat degradation, killing of wildlife and the spread of INNS are potential construction effects.

4.1.15 Mitigation measures have been applied to reduce and where possible avoid, ecology and biodiversity effects of the Pentir Works. This includes avoiding direct and indirect impacts to statutory designated sites for nature conservation and will avoid key nature conservation and ecological features by applying buffer zones and timing works to avoid wildlife activity. Lights will be positioned correctly for task and safety and to minimise light spill.

4.1.16 Construction of the proposed works is not likely to cause any significant effects. There are minor adverse impacts expected on various receptors, including breeding and non-breeding birds, bats, otter, fish and insects.

4.1.17 Surveys will be carried out pre-construction to update the status of protected species that require mitigation. During construction, ongoing monitoring of habitats and species will be carried out.

Historic Environment

Existing Environment

4.1.18 There are no designated historic assets in the site. There is one (1) World Heritage Site, the Slate Landscape of North West Wales (UNESCO 1633), approximately 2.9 km east of the Site.

4.1.19 There are 15 Scheduled Monuments and 104 listed buildings within 3 km of the site. These include three (3) Grade I, six (6) Grade II* and 95 Grade II listed buildings.

4.1.20 There is one (1) registered historic park and garden within 3 km of the Site – Vaynol (Grade I) approximately 1.8 km north-west of the site.

4.1.21 There are three (3) conservation areas within 3 km of the site.

4.1.22 There are no known non-designated historic assets in the site.

4.1.23 A site visit and visual appraisal in the site did not identify any areas with the potential to contain any previously unidentified archaeological or historical remains.

4.1.24 A further 13 non-designated archaeological assets have been identified in the 500 m Study Area. These non-designated assets comprise archaeological sites and findspots dating to the prehistoric and Roman, as well as of unknown date.

Assessment of Impacts and Likely Significant Effects

4.1.25 An assessment of historic environment effects was scoped out due to there being no intervisibility between the World Heritage Site, Scheduled Monuments, Listed Buildings and the proposed works, and a negligible potential to impact unknown archaeological remains. No likely significant effects would occur.

Geology, Hydrogeology, Land Use and Agriculture (Soils)

Existing Environment

4.1.26 No geological SSSIs, Geological Conservation Review (GCR) sites or Regionally Important Geodiversity Sites (RIGS) are in the Pentir Works site or the 250 m Study Area.

4.1.27 There is a Mineral Safeguarding Area (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.

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

4.1.29 There are a number of aquifers with varying designations in the Pentir Works site and within 250 m of the boundary of the Pentir Works site.

4.1.30 The Study Area is in a ‘low risk’ category for Unexploded Ordnance (UXO).

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

4.1.32 No recent or historic landfill sites are within 250 m of the Pentir works site.

4.1.33 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.

4.1.34 The Study Area is in a predominately rural setting, however, potentially contaminative land uses have been identified.

Assessment of Impacts and Likely Significant Effects

4.1.35 Ground breaking activities, such as site clearance and preparation work, trenches and excavation for foundations could result in loss or damage to the bedrock geology and may affect groundwater flow, levels and quality.

4.1.36 Land contamination may occur through spillages, leaks or plant breakdown. There are also risks from existing potential contamination, including disturbance of contaminated soils.

4.1.37 Mitigation, including using good site practice and management, will be implemented during the construction. There would be a negligible effect once the proposed works are complete and occupied.

4.1.38 The proposed works are not anticipated to have significant impacts on Geology, Hydrogeology, Land Use and Agriculture (Soils) in the Study Area.

Water Quality, Resources and Flood Risk

Existing Environment

4.1.39 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 of the Pentir works site.

4.1.40 The Pentir works site is in the Nant-y-Garth River Waterbody Catchment, although the Nant-y-Garth waterbody is 1.5 km to the west of the Pentir works site. The closest recorded Water Framework Directive (WFD) river waterbody is the Afon Cegin approximately 1 km to the east of the Pentir works site.

4.1.41 There are no ponds, lakes, canals or other waterbodies sufficiently close to be affected or influenced by the proposed works, except for an attenuation basin for the existing substation.

4.1.42 The Pentir works site and surrounding area lie above the Llyn and Eryri WFD groundwater body.

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

4.1.44 For flood risk, the Pentir works site is:

- Not near a main river.
- Outside of the mapped areas of fluvial or tidal flooding.
- Outside of the mapped areas of flooding from small watercourses and surface water flooding.
- Outside of any mapped reservoir flood extents.
- Not shown to be impacted by any historic flood events (according to Flood Map for Planning).

Assessment of Impacts and Likely Significant Effects

4.1.45 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 (set out in **Volume 8, Appendix 2.2.A: Outline Construction Environmental Management Plan**) are expected to be sufficient in preventing effects on the water environment.

Traffic and Transport

Existing Environment

4.1.46 The roads in the Study Area are:

- 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.

4.1.47 An unclassified road, which runs north to south from the B4547, provides access to Pentir substation.

4.1.48 A487 south of B4547 had the highest number of recorded vehicles at 20,138 and B4409 east of A4244 had the lowest at 1,351. These are expected to grow slightly by the peak construction traffic period.

4.1.49 The three (3) nearest PRoWs 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).

4.1.50 Public transport facilities in the area include a variety of bus routes and the nearest rail facility is Llanfairpwll, which is 7.4 km away from the Pentir works site.

4.1.51 Personal Injury Collision (PIC) statistics for the local highway network for the most recent seven-year period available highlighted 39 collisions occurred in the accident Study Area.

Assessment of Impacts and Likely Significant Effects

4.1.52 None of the assessed road links are predicted to experience either a medium or high magnitude of impact in any of the assessment criteria categories.

4.1.53 No road links in the Study Area are predicted to experience a 30% or higher increase in total traffic along the network

4.1.54 Identified PRoWs are not expected to be impacted by the proposed works.

4.1.55 The embedded mitigation measures for Traffic and Transport during construction include:

- Designated and suitable routeing.
- Appropriate access points.
- Traffic management.
- Encouraging construction workers to car share.

4.1.56 No road links are predicted to experience a significant effect.

Air Quality and Emissions

Existing Environment

4.1.57 A background level of dust exists in all urban and rural locations in the UK. Ambient dust deposition rates are not monitored extensively in the UK so there is currently no measured baseline information for dust deposition.

4.1.58 The UK-AIR website provides data for background concentrations of nitrogen oxides (NO_X), nitrogen dioxide (NO_2), particulate matter of ten (10) micrometres or less (PM_{10}) and particulate matter of 2.5 micrometres or less ($PM_{2.5}$). The background concentrations for the Study Area are low due to its rural nature.

4.1.59 There are three (3) monitoring sites for air quality within 2 km of the Pentir works site. These sites are next to busy roads so are not particularly representative of the Pentir works site.

Assessment of Impacts and Likely Significant Effects

4.1.60 Potential sources of effect during the construction phase include construction dust and emissions from site plant.

4.1.61 There are patches of ancient woodland and candidate Local Wildlife Sites adjacent to the Pentir works site. These are potentially sensitive to emissions to air, although providing all construction activities apply mitigation measures listed in the Construction Environmental Management Plan (CEMP), no significant impacts are predicted.

4.1.62 Various mitigation measures highly recommended by the Institute for Air Quality Management (IAQM) will be included in the CEMP and used during the works, including:

- Locating dust causing machinery and activity away from receptors and using dust minimising techniques.

- Having an accountable person for air quality and dust issues who will deal with complaints and queries.
- Undertaking inspection on-site and off-site.
- Switching off machinery and vehicles when not in use where it is appropriate.
- Using sustainable power sources including solar panel where appropriate.
- Avoiding site run-off of water or mud.

Noise and Vibration

Existing Environment

4.1.63 Sensitive receptors that may be affected by noise include residential properties, educational centres, places of worship, hospitals and hotels. There is one (1) sensitive receptor within 300 m of the Pentir works site - Gamekeepers Cottage, Rhos Fawr.

Assessment of Impacts and Likely Significant Effects

4.1.64 Construction works involve replacing and laying new underground cables. The activities that would generate the highest levels of noise are:

- Enabling works.
- Trench digging.
- Reinstatement.

4.1.65 A minor adverse impact is predicted from enabling works, with negligible impacts predicted during trench digging and reinstatement.

4.1.66 Mitigation measures have been applied to reduce, and where possible avoid, noise and vibration effects, these include:

- Quiet plant and low vibration equipment will be used where possible and maintained to manufacturer's specification.
- Equipment not in use will be switched off where possible.
- Equipment and vehicles will be started up one after another rather than all at once and will be silenced where possible.
- Drop heights of materials will be minimised.

4.1.67 No significant effects are anticipated for noise and vibration for Pentir Works.

Socio-Economics

Existing Environment

4.1.68 Within a 60-minute drive time from Pentir:

- The population was 488,708 in 2021, 24.1% of the population were aged over 65 and 59.8% were of working age.
- 56.1% of individuals were economically active.
- 18.3% had no qualifications, while 31.5% had Level 4 qualifications.

- Human health and social work activities had the highest percentage of people working in that industry, while mining and quarrying had the lowest percentage of 0.3%. Gwynedd is relatively less deprived on average.

4.1.69 The largest industry by Gross Value Added (the value generated by any unit engaged in the production of goods or services) in Gwynedd was human health and social work activities (14.4%).

4.1.70 Accommodation occupancy within a 30-minute drive of Pentir is at its lowest in January at 47% and highest in August at 80%, with similar figures for a 60-minute drive.

4.1.71 There are no PRoW, open space areas or visitor attractions within 500 m of the Pentir works site and no community facilities within 1 km. There are a few sparsely distributed residential properties within 500 m of the Pentir works site.

4.1.72 There is one (1) business receptor in 500 m of the Pentir works site: the Groesion Tŷ Mawr hotel and restaurant.

4.1.73 There are three (3) agricultural land holdings within 500 m of the Pentir works site.

4.1.74 Two (2) 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.

4.1.75 There are no MSAs or Mineral Buffer Zones in the Pentir works site.

Assessment of Likely Significant Effects

4.1.76 The proposed works are not anticipated to have significant impacts on Socio-Economics in the immediate or local area and were scoped out of the assessment.

Climate Change

Existing Environment

4.1.77 Historical climate data for the Pentir works site is summarised below.

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

Climatic variable	Baseline data 1981-2010
Coldest Month on Average (Month)	February
Frost days per annum	14.5
Mean annual rainfall levels (millimetres (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

4.1.78 There is an upward trend predicted in the following:

- Mean annual maximum daily temperature (°C).
- Mean summer maximum daily temperature (°C).
- Mean winter minimum daily temperature (°C).
- Highest temperature for baseline period (°C).
- Lowest temperature for baseline period (°C).
- Mean annual rainfall (mm).
- Mean winter rainfall (mm)
- Wettest month on average (mm).
- Droughts.
- Storms.
- Wildfires.

4.1.79 There is a downward trend predicted in the following:

- Driest month on average (mm).
- Mean summer rainfall (mm).
- Number of days of air frost per annum.

Assessment of Impacts and Likely Significant Effects

4.1.80 The product stage (the extraction, transport, and manufacturing of raw materials) is estimated to have the highest percentage of greenhouse gas emissions at ~70%, construction is ~20% with operation ~10% and pre-construction <1%.

4.1.81 The proposed works will be designed and operated in accordance with the risks and mitigation measures outlined in NGETs Climate Resilience Strategy.

4.1.82 Overall, the Greenhouse Gas (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.

4.1.83 The Climate Change Risk Assessment (CCRA) did not identify any significant climate risks. The risk posed to Climate Change by the proposed works is Not Significant.

Materials and Waste

Assessment of Impacts and Likely Significant Effects

4.1.84 An assessment was not completed for Materials and Waste for the Pentir substation as all receptors were scoped out of the assessment and there were no likely significant effects identified.

4.2 Bryncir Works

Landscape and Visual Amenity

Existing Environment

4.2.1 The landform of the Bryncir works site is relatively flat with a slight slope to the west. The surrounding area's landform gently rises and falls and is typical of the Llyn peninsula. Two (2) rivers pass through the Study Area from north to south. The Afon Dwyfach passes through the Bryncir works site, while the Afon Dwyfor is to the east of the site.

4.2.2 Settlements in the area comprise scattered farms and individual properties. The landscape of the Bryncir works site is rural comprising small agricultural fields bound by hedgerows.

4.2.3 There are many PRoW in the area linking settlements and providing recreational routes. National Cycle Route (NCR) 8 (Lôn Las Cymru) passes along the western extent of the Bryncir works site.

4.2.4 There is no common land or open access land in the Bryncir works site.

4.2.5 The Bryncir works site and surrounding area are in the National Landscape Character Area 05 Tremadoc Bay.

4.2.6 The Bryncir works site and surrounding area are in the Landscape Character Area LCA 10 Central Llyn. LCA 5 Snowdon Massif lies to the north-east of the Bryncir works site and LCA 8 Pwllheli-Criccieth Coast lies to the south of the site.

4.2.7 There are no statutory or non-statutory landscape designations covering the Bryncir works site.

4.2.8 Visual receptors of the Bryncir works are people with the potential for views of either the construction or operation of the proposed works. Five (5) representative viewpoint locations were selected to form the basis of the visual assessment.

Assessment of Impacts and Likely Significant Effects

4.2.9 Landscape or visual impacts could be caused by various elements of the Bryncir works, including:

- Removal of vegetation.
- Temporary compounds.
- Construction activity.
- Utility diversions.
- New permanent structures.

4.2.10 Embedded mitigation includes:

- Returning and reinstating land used temporarily to its former condition and profiles, where appropriate.
- Confining lighting on the Bryncir works site and construction compounds to locations where safety is a priority to minimise the potential for light spill in night-time views.
- Keeping the use of tall cranes and plant machinery to the minimum practicable time to reduce the duration of any landscape and visual impacts.
- Minimising the extents of the proposed works as far as possible to reduce land take and allow greater retention of existing vegetation and other landscape features.

4.2.11 No significant effects have been identified for landscape receptors during construction or operation. During construction, significant impacts are identified on views from Garndolbenmaen local road and the A487 near Glan Dwyfach. No additional mitigation has been identified and these effects would remain significant. However, impacts on these visual receptors would reduce during operation, resulting in no significant effects.

Ecology and Nature Conservation

Existing Environment

4.2.12 There are five (5) international statutory sites for nature conservation (i.e. SACs, SPAs and Ramsar sites) within 10 km of the Bryncir works site and one (1) further SAC designated for bats within 30 km.

4.2.13 Nine (9) other statutory designated sites for nature conservation (SSSIs, NNRs, LNRs) are present within 5 km of the Bryncir works site.

4.2.14 There are 39 non-statutory sites designated for nature conservation within 2 km of the Bryncir works site, all of which are cWS.

4.2.15 There are six (6) areas of ancient semi-natural woodland, one (1) site of restored ancient woodland and one (1) site of ancient woodland of unknown category in the Study Area.

4.2.16 Various HoPI and broad terrestrial habitats are in the Study Area.

4.2.17 Various protected and notable species have been identified as present or potentially present within 2 km of the Bryncir works site.

Assessment of Impacts and Likely Significant Effects

4.2.18 Disturbance, habitat loss or degradation, killing of wildlife and the spread of INNS are potential construction effects.

4.2.19 Mitigation includes:

- Applying buffer zones.
- Timing works to avoid wildlife activity.
- Setting lighting to minimum brightness, with light fittings positioned correctly to minimise light spill.

4.2.20 Additional mitigation is required for impacts to various receptors. This includes:

- The use of appropriate temporary ground protection matting, to limit damage to existing habitat and to ensure that vehicles use the same route through the Bryncir works site due to the presence of marsh fritillary butterflies.
- One (1) veteran tree will be suitably translocated to another location outside of the proposed working area.

4.2.21 The assessment concludes that, with the incorporation of the mitigation measures, significant effects are unlikely for statutory and non-statutory nature conservation sites, ancient woodlands, and HoPI in the Study Area. Similarly, significant effects are unlikely for protected and notable species and habitats in the area.

Historic Environment

Existing Environment

4.2.22 The Bryncir works site is approximately 1 km south of the small village of Bryncir. The A487 is approximately 340 m to the north, and the B4411 and the Afon Dwyfach intersects the Survey Boundary.

4.2.23 The existing 4ZC overhead line runs to the east of the Bryncir works site and intersects the Bryncir works site at two (2) locations. The pylons are visible from many views in the vicinity of the Bryncir works site due to the relatively flat topography.

4.2.24 There have been no previous archaeological investigations in the Bryncir works site. Thirteen (13) previously recorded archaeological investigations have been undertaken in a 500 m Study Area.

4.2.25 There are no designated historic assets in the Bryncir works site. There are no World Heritage Sites or Registered Parks & Gardens in the 3 km Study Area. There are 10 Scheduled Monuments and 23 Listed Buildings in the 3 km Study Area. These Listed Buildings include one (1) Grade II* and 22 Grade II listed buildings. There is one (1) conservation area within 3 km of the Bryncir works site.

4.2.26 There is one (1) non-designated historic asset in the Bryncir works site. A further 23 non-designated archaeological assets of Bronze Age, Roman, post-medieval, modern as well as of unknown date are in 500 m of the Bryncir work site.

Assessment of Impacts and Likely Significant Effects

4.2.27 The sources of potential Historic Environment effects during the construction phase include:

- Temporary short-term impacts to assets from change to their setting.
- Permanent physical impacts to below ground archaeological remains.

4.2.28 The source of potential Historic Environment effects during the operation phase includes permanent impacts to assets from change to their setting.

4.2.29 Embedded mitigation includes design and avoidance measures.

4.2.30 While no significant effects have been identified on potential below ground archaeological remains, ground-breaking works will impact a non-designated historic asset of unknown date: the route of an old road (PRN 62128) from Garn Dolbenmaen.

4.2.31 Additional mitigation includes:

- An archaeological watching brief.
- Archaeological recording, reporting and excavation.

4.2.32 The potential further mitigation measures would not minimise the physical impact but it would compensate for the loss by preserving them on record. This would reduce the magnitude of impact, resulting in no significant residual effects.

4.2.33 No significant effects have been identified on the setting of designated historic assets during the construction or operation of the proposed works.

Geology, Hydrogeology, Land Use and Agriculture (Soils)

Existing Environment

4.2.34 No geological SSSI, GCR sites or RIGS are recorded in the Bryncir works site or the 250 m Study Area. The overall valuation of the Geological Landscape Aspect Area which includes the Bryncir works site is ‘Outstanding’.

4.2.35 A very small section of the south-western-most extent of the Bryncir works site is in an MSA for sand and gravel.

4.2.36 The Bryncir works site and 250 m Study Area are in an area where underground mine workings may have occurred in the past. Approximately 15 m west of the Bryncir works site, there are underground and surface ground workings, including gravel pits, refuse heaps and a disused tip.

4.2.37 Various aquifer designations are present in the Study Area.

4.2.38 The superficial deposits and bedrock beneath the majority of the Bryncir works site are of low vulnerability, which means they provide the greatest protection to groundwater from pollution.

4.2.39 There is one historical borehole log in the south-eastern end of the Bryncir works site. Soils are moderate quality and very poor quality agricultural land (Agricultural Land Classification (ALC) subgrade 3b and grade 5, respectively).

4.2.40 There is a “Low Risk” for the whole Bryncir works site and Study Area for UXO.

4.2.41 No significant potential sources of ground gas have been identified except for an area of former surface ground workings approximately 15 m to the west of the Bryncir works site.

4.2.42 There are no active, recent or historical landfills in the Bryncir works site or Study Area.

4.2.43 The following are in the Study Area:

- Corn Mill (1888) – 20 m west of the western spur.
- Smithy (1899 – 1949) – 150 m east of the western spur.
- Historical railway (1888 – still present on the 1962 map) – 85 m west at its closest point. Ran in a north to north-east to south-west direction.
- Gravel pits (in the area identified by the Groundsure data as surface ground workings) (1948 – still present on 1962 map).

Assessment of Impacts and Likely Significant Effects

4.2.44 Ground breaking activities, such as site clearance and preparation work, trenches and excavation for foundations could result in loss or damage to the bedrock geology and may affect groundwater flow, levels and quality.

4.2.45 Land contamination may occur through spillages, leaks or plant breakdown during both construction and operation. There are also risks from existing potential contamination, including disturbance of contaminated soils.

4.2.46 Construction activity can result in a temporary disturbance and permanent loss of soil resources.

4.2.47 Mitigation, including using good site practice and management, will be implemented during the construction phase of the proposed works. The proposed works are not anticipated to have significant effects on Geology, Hydrogeology, Land Use and Agriculture (Soils) in the Study Area.

Water Quality, Resources and Flood Risk

Existing Environment

4.2.48 Average annual rainfall of 1,988 millimetres per annum (mm/a) was recorded for the Cwmystradllyn climate station 6 km east of the Bryncir works site.

4.2.49 The Afon Dwyfach is an NRW Main River in the Bryncir works site. The watercourse will be crossed via an overhead line, with new trident poles approximately 65 m to 70 m from the right and left bank tops. The Dwyfor, an NRW Main River, is approximately 800 m south-east of the Bryncir works site. There are no proposed works close to or crossing the watercourse.

4.2.50 There are multiple unnamed ordinary watercourses in the Study Area, which are tributaries of the Afon Dwyfach and the Dwyfor. There are no notable ponds, lakes, canals or other surface waterbodies in the Study Area. Bryncir works site is shown to overlie freely draining slightly acid loamy soils.

4.2.51 The underlying bedrock and superficial deposits are both Secondary aquifers with low aquifer vulnerability.

4.2.52 There is one (1) water-dependant designated site in the Study Area, the Llystyn Isaf SSSI, approximately 320 m upstream of the Bryncir works site.

4.2.53 There are several areas at risk of flooding from surface water and small watercourses:

- Surface water flow path (low risk) along a field boundary in a field to the west of the substation (which crosses the route of the proposed trenched cable).

- Surface water flow path (high, medium and low risk) in the south-east area of the Bryncir works site, where the Bryncir substation is proposed.
- Surface water flow path (high, medium and low risk) across the north-western section of the Bryncir works site, west of the A487.
- Two (2) small areas (high, medium and low risk) to the west of the Afon Dwyfach, which flow across Bryncir works site and beneath the existing DB route, and into the river channel.

4.2.54 The Bryncir works site is outside of any NRW mapped reservoir flood extents and at a very low risk from this source.

4.2.55 The only permanent above ground infrastructure in Flood Zone 3 is a trident pole to the west of the Afon Dwyfach.

4.2.56 The Bryncir works site is predominantly in the Dwyfach river waterbody catchment, with the WFD river waterbody (and NRW Main River) Afon Dwyfach (GB110065053730) in the Bryncir works site. Under the WFD (Cycle 3) the Afon Dwyfach has achieved a 'Good' overall status.

4.2.57 The Bryncir works site and Study Area lie in the Llyn and Eryri WFD groundwater body (GB41002G204600) which retains a 'Poor' overall status under the WFD.

Assessment of Impacts and Likely Significant Effects

4.2.58 There are several areas at risk of flooding from surface water and small watercourses in the Bryncir works site. Additionally, there will be an increase to the impermeable area of the Bryncir works site due to the proposed works which will lead to an increase in runoff and could lead to an increase in offsite flood risk. However, the inclusion of an attenuation basin will ensure that the post development runoff is the same as pre-development up to the design event for the operational lifetime of the development.

4.2.59 For all other construction activities the embedded mitigation measures would prevent any effects during construction and operation.

4.2.60 The proposed works at the Bryncir works site are not anticipated to have a significant effect on water quality or water resources receptors during construction or operation. For flood risk during construction and operation, the mitigations associated with surface water flood risk are outlined in the Flood Consequence Assessment (FCA). Their successful implementation will ensure that there is no significant impact to any flood risk receptors.

Traffic and Transport

Existing Environment

4.2.61 Roads in the Study Area are:

- A487 north of B4411.
- A487 east of B4411.
- B4411 south of A487.

4.2.62 The three (3) nearest PRoWs to the site are:

- Dolbenmaen 18 footpath, which falls partially in the Bryncir works site.
- NCR 8 (0.1 km north of the Bryncir works site).
- Dolbenmaen 86 footpath, which provides a connection between two (2) unnamed minor roads (0.2 km north of the Bryncir works site).

4.2.63 There are two (2) bus services that may be affected by the proposed works. The nearest rail facilities to the site include Criccieth (7.1 km), Porthmadog (10.3 km) and Penychain (10.8 km), to the south, south-east, and south-west, respectively.

4.2.64 Over the most recent period available (seven (7) years), nine (9) collisions occurred in the accident Study Area.

4.2.65 The A487 north of B4411 has the highest daily traffic flow recorded at 7,693, the B4411 south of A487 has the lowest at 2,285.

4.2.66 The 2026 predicted baseline flows have the same highest and lowest roads, A487 north of B4411 increases to 7,915 and the B4411 south of A487 increases to 2,351.

Assessment of Impacts and Likely Significant Effects

4.2.67 The peak construction traffic generated by the proposed works is anticipated to be between Months 12 and 16, with Month 12 likely around Q1 2027. This is expected to increase traffic.

4.2.68 Embedded mitigation includes:

- Restricting Heavy Goods Vehicles (HGV) movements.
- Encouraging construction workers to car share to reduce single occupancy car trips would promote the benefits of car sharing.
- Providing limited (but sufficient) on-site car and cycle parking to accommodate the expected parking demand of workers at the Bryncir works site.

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

Air Quality and Emissions

Existing Environment

4.2.70 A background level of dust exists in all urban and rural locations in the UK. However, ambient dust deposition rates are not monitored extensively in the UK.

4.2.71 Background concentrations for pollutants (NO_X, NO_2, PM_{10} and $PM_{2.5}$.) in the Study Area are low, due to the predominantly rural nature of the area.

4.2.72 No Gwynedd Council monitoring sites are within 10 km of the Bryncir works site. The closest monitoring sites are 015 and 040, both approximately 14 km from the Bryncir works site.

Assessment of Impacts and Likely Significant Effects

4.2.73 The sources of potential effects during the construction phase include:

- Construction dust emissions.
- Site plant emissions.

4.2.74 Operation was scoped out of the assessment with limited emissions from the permanent infrastructure expected.

4.2.75 Embedded mitigation includes:

- Planning site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
- Ensuring all vehicles switch off engines when stationary - no idling vehicles.
- Using sustainable power sources (solar panels etc.) where practicable. Where available, generators are to be low emission with hybrid battery systems (or to current best practice).
- Avoiding the use of diesel or petrol powered generators and using mains electricity or battery powered equipment where practicable.

4.2.76 There are cWSs within 50 m of the Bryncir works site. These locations are potentially sensitive to emissions to air but, applying the mitigation measures to be listed in the CEMP, the potential impacts are not significant.

4.2.77 The impact of construction equipment and machinery emissions would not be significant. This is due to the good standard of existing air quality and the limited duration of time in which such machinery will be operational, and the effectiveness of standard practice emissions control measures.

4.2.78 Construction road traffic emissions and operation road traffic emissions impacts were screened out of the assessment. There would be no change during operation and the increase in traffic during construction would not contribute to a significant effect on local air quality.

Noise and Vibration

Existing Environment

4.2.79 There are seven (7) medium sensitivity receptors in the 300 m Study Area, comprising a mix of residential properties and farms.

Assessment of Impacts and Likely Significant Effects

4.2.80 Construction works that may result in potential adverse effects at sensitive receptors include:

- Enabling works.
- Substation construction and access routes construction.
- Cable installation (underground and overhead) and removal of redundant overhead sections.
- Landscaping works for reinstatement.
- Demobilisation (removal of construction compounds).

4.2.81 Embedded mitigation measures include:

- Using quiet plant and low vibration equipment where possible, maintained to manufacturer's specification.
- Switching off equipment not in use where possible.
- Starting up equipment and vehicles one after another rather than all at once and silenced where possible.
- Minimising drop heights of materials.

4.2.82 The assessment does not identify any significant residual noise and vibration effects.

Socio-Economics

Existing Environment

4.2.83 Within a 60-minute drive time from Bryncir:

- The population was 315,251 in 2021, of those, 25.6% of were aged over 65 and 54.9% are economically active.
- 17.5% of the population have no qualifications and 33.4% have Level 4 or higher.
- The largest industry is human health and social work activities (17.8%) and the lowest is mining and quarrying. Human health and social work activities also has the highest GVA. Gwynedd is relatively less deprived on average.

4.2.84 Within a 30-minute and a 60-minute drive time, January has the lowest room occupancy rates for hotels at 47% and August has the highest at 80%.

4.2.85 There are two (2) PRoWs in the Bryncir works site, with National Cycle Route (NCR) 8 running within 100 m north-west of the Bryncir works site.

4.2.86 There are no dedicated open space sites in the Bryncir works site or within 500 m of the Bryncir works site.

4.2.87 There are no residential properties in the Bryncir works site. Within 500 m, residential properties are sparsely located with small clusters on the B4411 and Station Road. There is a large cluster of residential properties approximately 1 km north-east in the village of Garndolbenmaen.

4.2.88 There are two (2) visitor accommodation sites within 500 m of the Bryncir works site, the Eiddior cottage holiday rental and the Hafod Llecheiddior holiday home.

4.2.89 The closest part of Snowdonia National Park is 1.1 km east of the Bryncir works site; visitors may use accommodation near the Bryncir works site as a base location to visit the national park.

4.2.90 There are no business premises in the Bryncir works site. Within 500 m of the Bryncir works site, there are four (4) business premises.

4.2.91 There are four (4) landowners and one (1) tenant in the Bryncir works site.

4.2.92 There are no housing allocations or employment allocations within 500 m of the Bryncir works site.

Assessment of Impacts and Likely Significant Effects

4.2.93 Beneficial impacts are predicted for various Socio-Economic categories.

4.2.94 Minor adverse impacts are predicted to occur for PRoWs, land take and severance (reduced accessibility).

4.2.95 Embedded mitigation includes:

- Constructing access tracks to minimise disruption to landowners.
- Providing compensation for affected landowners.

4.2.96 Construction impacts range from minor beneficial for skills uplift to minor adverse in relation to temporary and permanent land take of open spaces.

4.2.97 All potential Socio-Economic impacts associated with operation have been scoped out and no additional mitigation is required.

Climate Change

Existing Environment

4.2.98 Historical climate data for the Bryncir works site is summarised below.

Historical climate data for the Bryncir works site

Climatic variable	Baseline data 1981-2010
Mean Annual Max Temp (°C)	12.4
Mean Annual Min Temp (°C)	6.3
Mean summer maximum daily temp (°C)	18.0
Mean winter minimum daily temp (°C)	2.2
Warmest Month on Average (°C)	18.7
Warmest Month on Average (Month)	August
Coldest Month on Average (°C)	1.8
Coldest Month on Average (Month)	February
Frost days per annum	No data recorded
Mean annual rainfall levels (mm)	1944.5
Mean summer rainfall (mm)	143.5
Mean winter rainfall (mm)	176.4
Wettest Month on Average (mm)	220.0
Wettest Month on Average (Month)	October
Driest Month on Average (mm)	104.7
Driest Month on Average (Month)	May

4.2.99 The upward and downward trends set out in paragraphs 4.1.79 and 4.1.80 apply.

Assessment of Likely Significant Effects

4.2.100 The ‘product’ stage emissions of the Bryncir works (i.e. emissions from extraction, transport and manufacturing of raw materials) are the highest percentage contributed of the four stages (~70%) of the Bryncir works lifecycle, with construction the next highest (~20%), then operation (~10%) and finally pre-construction (<1%).

4.2.101 The Bryncir 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.

4.2.102 Based on a qualitative assessment, the magnitude of GHG emissions is low in the context of the UK and Welsh carbon budgets (a carbon budget places a restriction on the total amount of greenhouse gases the UK can emit over a 5-year period).

4.2.103 The proposed works will be designed and operated in accordance with the risks and mitigation measures outlined in NGET’s Climate Resilience Strategy.

4.2.104 No significant impacts have been identified, no additional mitigation is required.

Materials and Waste

Assessment of Likely Significant Effects

4.2.105 Various waste types are predicted to be generated by the proposed works.

4.2.106 It is estimated that the overall quantities of non-hazardous waste generated are likely to fall well below the threshold of significance. The largest waste stream is expected to be surplus excavated soil (15,500 m^3), which is well below the threshold for a significant effect.

4.2.107 Embedded mitigation measures include:

- Implementation of a ‘just-in-time’ material delivery system to avoid materials being stockpiled where possible, which increases the risk of their damage and disposal as waste.
- Attention to material quantity requirements to avoid over-ordering and generation of waste materials.
- Segregation of waste at source where practical.
- Design for reuse and recovery: identifying, securing and using materials that already exist on-site, or can be sourced from other projects (e.g. reuse of excavated soil for landscaping).

4.2.108 No significant effects were identified in relation to Materials and Waste and no additional mitigation is required.

4.3 Glaslyn Cables Works

Landscape and Visual Amenity

Existing Environment

4.3.1 The landform of the Glaslyn works site is largely flat and low-lying. In the Study Area, the Glaslyn estuary is prominent as are the steep uplands of the Llŷn peninsula, and the mountains of Snowdonia.

4.3.2 The Glaslyn works site is not covered by any statutory landscape designations; however, part of the Study Area is in the Eryri National Park.

4.3.3 The Glaslyn work site and Study Area lie in NLCA 05 Tremadog and a small part of the outer extents of the Study Area lies in NCLA 06 Eryri. In addition, a small part of the outer extents of the Study Area lies in National Seascape Character Area (NSCA) 14 Tremadog Bay and Dwyryd Estuary.

4.3.4 The Glaslyn works site and Study Area covers LCA 09 Porthmadog and a small part of the eastern extents of the Study Area is in LCA 10 Central Llyn. The Glaslyn works site also falls in Seascape Character Area (SCA) 20 Porthmadog and Glaslyn Estuary, SCA 21 Dwyryd Estuary and Morfa Harlech and LCA 10 Morfa Harlech.

4.3.5 There are non-statutory landscape designations covering the Glaslyn works site. These include Special Landscape Area (SLA), Historic Landscape, Registered Historic Parks and Gardens, and a World Heritage site designation. In the Study Area there are two (2) SLAs, two (2) historic landscapes, three (3) Registered Historic Parks and Gardens, and part of the Slate Landscape of North West Wales World Heritage Site.

4.3.6 Settlements in the Study Area comprise the town of Porthmadog, as well as villages and caravan sites in low lying areas or along the coast. On higher land, settlements are limited to scattered farms and individual properties. There are numerous PRoWs in the Study Area linking settlements and providing recreational routes. Six (6) PRoWs and NCR 8 are in the Glaslyn works site.

4.3.7 A series of 10 representative viewpoint locations from across the Glaslyn works site was selected to form the basis of the visual assessment.

Assessment of Impacts and Likely Significant Effects

4.3.8 During construction, landscape or visual impacts could be caused by the Glaslyn Cables works, including site clearance, utility diversions, temporary compounds, construction activity, new planting and new infrastructure. During operation, landscape and visual impacts could be caused by new infrastructure and new planting.

4.3.9 Embedded mitigation measures include minimising land take, allowing retention of existing vegetation and other landscape features, incorporating new and additional planting, reinstating land used during construction, confining lighting and minimising use of tall cranes and plant machinery.

4.3.10 During construction, significant impacts on LCA 09 Porthmadog, SCA 20 Porthmadog and Glaslyn Estuary, Views from the Wales Coastal Path (eastern end) and Views from ffordd Tan-y-Glannau near Minffordd have been identified. No additional mitigation has been identified and these effects would remain significant. However, impacts on

landscape and visual receptors would reduce during operation, resulting in no significant effects.

Ecology and Nature Conservation

Existing Environment

4.3.11 There are six (6) international statutory sites for nature conservation (i.e., SACs, SPAs and Ramsar sites) in the 10 km Study Area and two (2) further SACs designated for bats within 30 km of the Glaslyn works site.

4.3.12 There are 22 other statutory designated sites for nature conservation (national designations: SSSIs, NNRs, LNRs) in the Study Area.

4.3.13 There are 41 non-statutory sites designated for nature conservation in the Study Area. In addition, there are two (2) North Wales Wildlife Trust (NWWT) sites are in the Study Area.

4.3.14 There are 80 sites of Ancient Semi Natural Woodland, 38 sites of Restored Ancient Woodland, seven (7) Plantations on Ancient Woodland sites and one (1) site of Ancient Woodland of unknown category in the Study Area. There are no ancient or veteran trees in the Study Area.

4.3.15 Various broad terrestrial habitats and HoPI have been identified in the Study Area and various protected species have been identified as present or potentially present in the Glaslyn works site and their respective Survey Areas.

Assessment of Impacts and Likely Significant Effects

4.3.16 During construction, the sources of potential effects on important ecological features (IEFs) include habitat loss, habitat degradation, species mortality, disturbance. During operation (where maintenance comprises monthly inspections) potential effect on IEFs include species mortality, disturbance and spread of INNS.

4.3.17 Embedded mitigation measures include avoiding designated sites as much as practicable, applying minimum buffers to key habitat features, implementing a CEMP and LEMP, avoiding wildlife activity during vegetation clearance, and setting lighting to minimum brightness, with light fittings positioned correctly to minimise light spill.

4.3.18 Additional mitigation includes the enhancement of hedgerows, carrying out a detailed botanical survey of working areas in the Glaslyn SSSI to identify any protected or notable plant species and undertaking pre-commencement checks for bluebell, freshwater mussel, dwarf spikerush specimens, fish, badger, bats and otter. As a form of enhancement, new roost structures (bat boxes) will be provided with landowner consent on retained trees in the Glaslyn works site where possible.

4.3.19 With the incorporation of embedded and additional mitigation measures, significant effects are unlikely for most statutory and non-statutory nature conservation sites, ancient woodlands, and HoPI in the Study Area. Significant effects are also unlikely for protected and notable species in the Study Area.

Historic Environment

Existing Environment

4.3.20 There is one (1) World Heritage Site, the Slate Landscape of North West Wales World Heritage Site (**UNESCO 1633**), approximately 70 m south-east of the Glaslyn works site.

4.3.21 There is one (1) Grade II listed building, one (1) Registered Park and Gardens (Wern Garden) and one Registered Historic Landscape (Aberglaslyn), as well as 18 non-designated assets in the Glaslyn works site. There are a further nine (9) non-designated assets in the 500 m Study Area and one (1) scheduled monument, two Grade II* listed buildings, 16 Grade II listed buildings and one Registered Park and Garden (Tan-yr-Allt) in the 3 km Study Area that were included in the assessment.

Assessment of Impacts and Likely Significant Effects

4.3.22 The source of potential Historic Environment effects during construction includes temporary short-term impacts to assets from change to their setting and permanent physical impacts to below ground archaeological remains. Operational impacts were scoped out of the assessment.

4.3.23 While no significant effect has been identified on potential below ground archaeological remains, ground-breaking works will impact non-designated assets of post-medieval date. Mitigation in the form of archaeological watching brief on selected ground works may be required to determine the value and spatial extent of these remains.

4.3.24 Potential impacts to historic landscape features that cannot be avoided by design can be mitigated through a proportionate programme of archaeological investigation, recording and reporting, such as archaeological excavation in advance of construction, which would form additional mitigation measures.

4.3.25 Apart from Wern Manor (Grade II* listed building and a Grade II* registered historic park and garden), no significant effect has been identified on the setting of designated historic assets during the construction or operation of the proposed works. Due to the nature of the development of the proposed works, there will be no additional impacts on the setting of assets during operation.

Geology, Hydrogeology, Land Use and Agriculture (Soils)

Existing Environment

4.3.26 There are four (4) geological SSSIs and one (1) RIGS in the Glaslyn works site and the Study Area.

4.3.27 There are three aggregate safeguarding areas (one for sandstone and igneous rock, once for slate and one for igneous rock) in the Study Area. There is one historical mineral planning area in the Study Area, at Breedon Minffordd Quarry and Asphalt Plant.

4.3.28 Across the Glaslyn works site, underground mine workings may have occurred in the past or current mines. There are five locations in or close to the proposed works area where it is known, or considered very likely, that underground mining has taken place. In addition, there are two known mineral veins that could be mined in future in the Study Area.

4.3.29 There are no source protection zones or groundwater abstractions within 1 km of the Glaslyn works site.

4.3.30 The Study Area is in a ‘low risk’ category for UXO.

4.3.31 There are no active or recent landfill sites in the Study Area. There is one (1) historical landfill site approximately 250 m north of Clwb Chwaraeon Madog, which accepted household waste. No significant potential sources of ground gas have been identified.

Assessment of Impacts and Likely Significant Effects

4.3.32 The sources of potential effects during construction include groundwater and ground pollution due to chemical spillages and leaks (including from oil-filled cables); disturbance of potentially contaminated soils, sediments and waters; importation of contaminated aggregates; management of excavated spoil; and partial loss or damage of geological receptors during construction. The permanent and temporary loss of agricultural land during construction is also a potential source of effect.

4.3.33 During operation, the foundations of structures and cables form a potential pathway for pollutants to travel from potentially contaminated areas to non-contaminated soils, geology or groundwater. If contamination is present, there is also the potential for aggressive ground contaminants to pose a risk to foundations or cable infrastructure.

4.3.34 Mitigation measures include a CEMP which will include materials management, soil management, waste management and pollution prevention measures; targeted ground investigation; and the preparation of a method statement and discovery strategy to deal with potential contamination.

4.3.35 With the proposed mitigation measures, the proposed works are not anticipated to have significant impacts on Geology, Hydrogeology, Land Use and Agriculture (Soils) in the Study Area of Glaslyn works site.

Water Quality, Resources and Flood Risk

Existing Environment

4.3.36 The Afon Glaslyn is an NRW Main River in the Glaslyn works site that has a catchment of 151 square kilometres (km^2). The Wern, Garth and Minffordd CSESs are on the western and south-eastern edges of the Afon Glaslyn’s floodplain. The Y Cyt/Nant Yr Afon Oer is another NRW Main River in the Glaslyn works site.

4.3.37 There is one licensed surface water abstraction that has been identified at Minffordd Quarry. No groundwater abstractions were identified. A range of licensed discharge points were also identified.

4.3.38 There are five (5) conservation areas (three (3) SSSIs, one (1) SAC and one (1) NNR) with water dependencies in the Study Area.

4.3.39 There are seven (7) Water Framework Directive (WFD) river water bodies and one groundwater WFD water body in the Study Area. There are no WFD canal, lake or costal water bodies in the Study Area.

4.3.40 The Glaslyn works site is in fluvial Flood Zones 2 and 3, defended tidal Flood Zone 3, and surface water and small watercourses Flood Zones 2 and 3.

Assessment of Impacts and Likely Significant Effects

4.3.41 The potential sources of effect during construction include:

- The washing of sediment or contaminants into surface water bodies (or being directly discharged), reducing water quality.
- Increased surface runoff, dewatering of excavations, increased sediment, or direct watercourse disturbance (including from new watercourse crossings) resulting in changes in the way surface water features (e.g. watercourses) behave.
- Dewatering activities and the construction of underground infrastructure affecting groundwater levels.
- Introduction of raised structures with new impermeable surfaces in the floodplain, as well as associated ground disturbance, resulting in changes to fluvial or tidal flood risk and changes to surface water flood risk.

4.3.42 The potential sources of effect on receptors during operation include

- The introduction of sediment or contaminants into watercourses.
- Exposure of cables at watercourse crossings resulting in changes to the way in which waterflow in these locations behaves (e.g. scouring of sediment, increased erosion).
- Maintenance activities resulting in physical disruption to existing water resource management infrastructure (e.g. discharge outfalls).
- Introduction of permanent above and underground infrastructure in the flood plain.
- Associated changes to the rate and pathways for surface water to flow in this area, resulting in changes to fluvial, tidal and groundwater flood risk.

4.3.43 Mitigation will include the CEMP including pollution prevention measures and a pollution incident response plan; and a Flood Evacuation Plan. Construction works will take place during periods of normal to low flow conditions to avoid conveyance-related flood risk effects.

4.3.44 An assessment of flood risk has been undertaken. Following consultation with NRW (06 August 2025), mitigation approaches are being pursued. These mitigations are currently being modelled to confirm their effectiveness. While the modelling results are not available at the time of reporting, they will be included in the planning application accompanied by justification that the scheme is aligned with the acceptability criteria in TAN15 and Planning Policy Wales.

4.3.45 The assessment has demonstrated that the construction, operation and maintenance of the proposed works, in combination with the identified mitigation measures, is not anticipated to have significant impacts on the aquatic environment or water resources in the Study Area.

Traffic and Transport

Existing Environment

4.3.46 The roads in the Study Area are: A487, A498, Brittania Terrace/A497, Porthmadog High Street and several unclassified roads.

4.3.47 There are six (6) PRoWs and NCR 8 in the Glaslyn Works site. There are multiple bus routes in the Study Area and two (2) passenger railway stations.

4.3.48 Over the most recent available seven-year period (2016 – 2022), 41 collisions occurred in the Study Area, 15 serious and 26 minor. Ten (10) have occurred on Porthmadog High Street.

4.3.49 The highest daily traffic count recorded in 2024 was on the A487 west of Minffordd Roundabout (13,400), the lowest was Unnamed Road (north of Porthmadog Roundabout) (176).

Assessment of Impacts and Likely Significant Effects

4.3.50 The peak construction traffic generated by the proposed works is anticipated to be between **Months 1** and **40**, with Month 6 of construction potentially occurring as early as **2026**. During this period, it is expected that traffic will increase on the roads in the Study Area. The operation phase has been scoped out of the assessment.

4.3.51 Embedded mitigation measures include establishing appropriate access points to facilitate vehicle movements into the proposed works, use of traffic management where construction vehicles need to interact with the public road network, advanced signage to notify the public of works, and manned controls at crossing points (e.g. marshals). Construction traffic generally will give priority to other road and PRoW users, encouraging construction workers to car share to reduce single occupancy car trips and providing limited (but sufficient) on-site car and cycle parking to accommodate the expected parking demand of workers on the Glaslyn works site.

4.3.52 Following implementation of mitigation, impacts would not be significant at any of the assessed road links. None of the links are predicted to experience substantial increases in total traffic volumes that would lead to adverse effects.

Air Quality and Emissions

Existing Environment

4.3.53 Background level of dust exists in all urban and rural locations in the UK. However, ambient dust deposition rates are not monitored extensively in the UK.

4.3.54 Background concentrations for pollutants (nitrogen oxides (NO_X), NO_2, PM_{10} and $PM_{2.5}$) in the Study Area are low, due to the predominantly rural nature of the area.

4.3.55 There are no Gwynedd Council pollutant concentration monitoring sites within 10 km of the Glaslyn works site. The closest monitoring site is 040, approximately 17 km west from the Glaslyn works site.

Assessment of Impacts and Likely Significant Effects

4.3.56 The sources of potential effects during the construction phase include:

- Construction dust emissions.
- Site plant emissions.

4.3.57 Operation was scoped out of the assessment with limited emissions from the permanent infrastructure expected.

4.3.58 Embedded mitigation includes:

- Planning site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
- Ensuring all vehicles switch off engines when stationary - no idling vehicles.
- Using sustainable power sources (solar panels etc.) where practicable. Where available, generators are to be low emission with hybrid battery systems (or to current best practice).
- Avoiding the use of diesel or petrol powered generators and using mains electricity or battery powered equipment where practicable.
- Erecting solid screens or barriers around dusty activities.
- Covering, seeding or fencing stockpiles to prevent material being blown by the wind.

4.3.59 No significant effects have been predicted for the Glaslyn works following the implementation of mitigation.

Noise and Vibration

Existing Environment

4.3.60 Five (5) types of noise sensitive receptor are in the Study Area, including residential, educational, hotel, medical and places of worship. In total, 920 residential, four (4) educational, 13 hotels, two (2) medical and four (4) places of worship were identified in the Study Area.

Assessment of Impacts and Likely Significant Effects

4.3.61 Construction works that may result in potential adverse effects at sensitive receptors include:

- Preliminary and enabling works (e.g. establishment of compounds, construction of access roads).
- Minffordd CSEC and THH construction.
- Cable installation and decommissioning.
- Garth CSEC removal.
- Land reinstatement, removal of temporary haul access roads and reinstatement of topsoil.
- Demobilisation, removal of the construction compounds.

4.3.62 Operation effects were scoped out of the assessment.

4.3.63 Construction works are predicted to produce a range of adverse effects to various receptors, ranging from major to minor adverse. Adverse vibration impacts are also predicted.

4.3.64 Mitigation measures will be defined in a CEMP and will align with Best Practicable Means to reduce noise and vibration impacts. These measures for controlling noise and vibration effects will be presented to the Local Authority in an application for prior consent (“Section 61 application”) before commencing noisy activities. Mitigations will include:

- Controlling noise and vibration at source, with quiet plant and low vibration equipment will be used where possible and maintained to manufacturer's specification.
- Using hydraulic techniques for concrete breaking rather percussive techniques.
- Switching off equipment not in use where possible.
- Starting up equipment and vehicles one after another rather than all at once and using silencers where possible.
- Minimising drop heights of materials.

4.3.65 Where significant noise impacts have been identified, temporary noise barriers are proposed to provide screening to reduce noise impacts that have been identified.

4.3.66 Applying the mitigation would result in no significant noise and vibration effects from the works.

Socio-Economics

Existing Environment

4.3.67 Within a 60-minute drive from the Glaslyn works site:

- The population in 2021 was 297,517 - 25.3% of the population were aged over 65 and 59.3% were working age residents; 55.3% of the population were economically active.
- 17.1% had no qualifications, while 33.9% had Level 4 qualifications or higher.
- Human health and social work activities employed the highest percentage of people (17.3%).

4.3.68 As of 2024, there are approximately 815 rooms in local hotel, bed and breakfast, and inns accommodation within a 30-minute drive of the Glaslyn works site, as well as 4,965 rooms within a 60-minute drive of the Glaslyn works site.

4.3.69 There are six (6) PRoWs that cross and partially run in the Glaslyn works site; thirty-two (2) more PRoWs are within 500 m of the Glaslyn works site. The Gwynedd long distance trail coastal path is also within 500 m of the Glaslyn works site. There is one (1) informal recreational route within 500 m of the Glaslyn works site: the Cob Crwn hiking area. NCR 8 crosses and partially runs in the Glaslyn works site.

4.3.70 There is one (1) residential property and 14 agricultural land holdings in the Glaslyn works site. There are two (2) visitor attractions, 18 dedicated open spaces and 169 businesses within 500 m of the Glaslyn works site. There are 38 community facilities within 1 km of the Glaslyn works site.

4.3.71 There are no cumulative developments within 500 m of the Glaslyn works site, however, there is one (1) development 560 m south-east of the Glaslyn works site. This is the erection of eight (8) new flexible business/industrial units with associated parking and landscaping. This development has been approved with conditions.

4.3.72 There are no housing allocations within 500 m of the Glaslyn works site. There is one (1) safeguarded employment site in Minffordd, approximately 450 m south-east from the Glaslyn works site at the Snowdonia Business Park.

4.3.73 Mineral Safeguarding Areas cross the Glaslyn works site; however, this is where the existing cables are being decommissioned. One (1) mineral Buffer Zone crosses the Glaslyn works site near Minffordd. Two (2) more Mineral Safeguarding Areas are within 500 m of the Glaslyn works site.

Assessment of Impacts and Likely Significant Effects

4.3.74 Beneficial effects are predicted for various Socio-Economics categories.

4.3.75 Minor adverse impacts are predicted to occur for PRoW, temporary and permanent land take and severance (reduced accessibility).

4.3.76 Embedded mitigation includes:

- Providing compensation for affected landowners.
- Diverting PRoWs during construction.

4.3.77 Potential Socio-Economic impacts associated with operation have been scoped out.

4.3.78 No additional mitigation or enhancement measures are required. No likely significant residual effects of the proposed works on Socio-Economics receptors have been identified.

Climate Change

Existing Environment

4.3.79 Historical climate data for the Glaslyn works site is summarised below.

Historical climate data for the Glaslyn works site

Climatic Variable	Baseline Data 1981-2010
Mean annual maximum temperature (°C)	12.4
Mean annual minimum temperature (°C)	6.3
Mean summer maximum daily temperature (°C)	18
Mean winter minimum daily temperature (°C)	2.2
Warmest month on average (°C)	18.7
Warmest month on average (Month)	August
Coldest month on average (°C)	1.8
Coldest Month on average (Month)	February
Frost days per annum	No data recorded
Mean average rainfall levels (mm)	1,944.5
Mean summer rainfall (mm)	143.5
Mean winter rainfall (mm)	176.4
Wettest month on average (mm)	220.0
Wettest month on Average (month)	October

Climatic Variable	Baseline Data 1981-2010
Driest month on average (mm)	104.8
Driest month on average (month)	May

4.3.80 There is an upward predicted trend in the following:

- Mean annual maximum daily temperature (°C).
- Mean summer maximum daily temperature (°C).
- Mean winter minimum daily temperature (°C).
- Mean annual rainfall (mm).
- Mean winter rainfall (mm).
- Sea level rise (m).

4.3.81 Mean summer rainfall (mm) is the only downward predicted trend.

Assessment of Likely Significant Effects

4.3.82 The 'product' stage emissions of the Glaslyn works (i.e. emissions from extraction, refining and production of raw materials) are the highest percentage contributed of the four stages (~70%) of the Glaslyn works lifecycle, with construction the next highest (~20%), then transport of construction materials (~10%), operation (~10%) and finally pre-construction (<1%).

4.3.83 The Glaslyn works will support the ongoing UK transition to net zero by providing the necessary infrastructure to support the increased transmission of low carbon electricity.

4.3.84 Based on a qualitative assessment, the magnitude of GHG emissions is low in the context of the UK and Welsh carbon budgets.

4.3.85 Embedded mitigation includes:

- The Minffordd CSEC includes an attenuation pond to manage surface water runoff and reduce flood risk by temporarily storing and gradually releasing excess rainwater.
- A Dust Management Plan will be developed for the construction period.
- Toolbox Talks will be held by the contractor to highlight any potential conditions that could create health and safety hazards for workers and mitigation measures for extreme heat and heatwaves.

4.3.86 Additional mitigation measures include:

- Weather monitoring.
- Flood defence measures (e.g. flood doors, drainage systems).
- Tree and hedge planting to increase water absorption.

4.3.87 Overall, the GHG impact of the proposed works will be Minor Adverse and Not Significant.

4.3.88 The CCRA identified 11 significant climate risks during the operational phase of the proposed works.

Materials and Waste

Existing Environment

4.3.89 The non-hazardous and inert landfill void capacity for Wales is 8.3 million cubic metres (m^3) and 1.8 million m^3, respectively.

Assessment of Impacts and Likely Significant Effects

4.3.90 Various waste types are predicted to arise from construction.

4.3.91 Based on experience of a wide range of other projects of various types and scales, the overall quantities of non-hazardous waste generated are likely to fall well below the threshold of significance

4.3.92 Operation has been scoped out of the assessment.

4.3.93 Embedded mitigation measures include:

- Design for materials optimisation: simplifying layout and form to minimise material use, using standard design parameters, balancing cut and fill, maximising the use of renewable materials and materials with recycled content.
- Implementation of a ‘just-in-time’ material delivery system to avoid materials being stockpiled where possible, which increases the risk of their damage and disposal as waste.
- Attention to material quantity requirements to avoid over-ordering and generation of waste materials.

4.3.94 There are no significant residual effects associated with construction of the proposed works and an assessment of the operation (including maintenance) is scoped out of the assessment on the basis the effects would be of a similar or lower magnitude to those identified for construction.

4.3.95 No additional mitigation measures are required.

4.4 Trawsfynydd Works

Landscape and Visual Amenity

Existing Environment

4.4.1 The Trawsfynydd works site and Study Area are in the Eryri National Park and in the Snowdonia Dark Skies Reserve.

4.4.2 There is a Registered Historic Park and Garden in the Study Area, and several ecological and cultural heritage designations that contribute to landscape value and are of importance in terms of visitor destinations and visual amenity for the area.

4.4.3 The landform of the Trawsfynydd works site is generally flat with land use outside the Trawsfynydd substation being a mixture of agricultural open fields and woodland, some of which is ancient woodland.

4.4.4 The Trawsfynydd works site and the Study Area are in the NLCA 06 Snowdonia and three (3) LCAs.

4.4.5 The Trawsfynydd works site is in the Trawsfynydd Basin and Cwm Prysor Registered Historic Landscape.

4.4.6 No long-distance walking routes lie in the Study Area but there are four (4) PRoWs within 500 m of the Trawsfynydd works site. The Trawsfynydd to Gellilydan cycle route is under development and will connect to NCR Route 82 Bangor to Fishguard when complete. The principal transport route in the vicinity of the works at Trawsfynydd is the A470.

4.4.7 Residential settlement is limited to a small number of properties and scattered farms.

Assessment of Impacts and Likely Significant Effects

4.4.8 An assessment of landscape and visual effects was scoped out due to the limited and temporary nature of potential change, with no likely significant effects predicted to occur.

Ecology and Nature Conservation

Existing Environment

4.4.9 There are six (6) international statutory sites for nature conservation (i.e., SACs, SPAs and Ramsar sites) in the 10 km Study Area. A further two (2) SACs are between 10 km and 30 km of the Trawsfynydd works site.

4.4.10 There are 15 other statutory designated sites for nature conservation present in the Study Area.

4.4.11 There are no non-statutory sites designated for nature conservation in the Study Area.

4.4.12 There are 45 areas of ancient woodland in the Study Area. One (1) veteran tree was identified during the site visit, 23 m south-west of the existing access road for the Trawsfynydd works site.

4.4.13 Various habitat types and HoPI are present in the Trawsfynydd works site and the wider area, with various protected and notable species identified in the 2 km Study Area based on the last 10 years of records. The desk study returned multiple records of INNS.

Assessment of Impacts and Likely Significant Effects

4.4.14 Disturbance, habitat degradation, killing of wildlife and the spread of INNS are potential construction effects. During operation, effects will be limited to disturbance, which is not significant in the context of the ongoing manned operations of the existing substation.

4.4.15 Mitigation measures include avoiding key nature conservation and ecological features present in or adjacent to the Trawsfynydd works site as far as practicable, with minimum buffers being applied to key habitat features. Measures in the CEMP will be implemented, and vegetation clearance will avoid the nesting bird period. Lighting will be restricted to task specific and general lighting and will only be used during times of low light and during operation. No additional lighting to the substation will be required, except for during maintenance and repair activities.

4.4.16 The works in the existing Trawsfynydd substation site will not give rise to significant effects on ecology and nature conservation.

Historic Environment

Existing Environment

4.4.17 There are no designated historic assets in the Trawsfynydd works site. There is one (1) Registered Park and Garden, one (1) Conservation Area, six (6) Scheduled Monuments and 26 Grade II Listed Buildings in the 3 km Study Area.

4.4.18 There are no known non-designated historic assets in the Trawsfynydd works site, with 17 non-designated archaeological assets in the 500 m Study Area.

4.4.19 Trawsfynydd substation is just inside the northern boundary of the Trawsfynydd Basin and Cwm Prysor Registered Historic Landscape HLW (Gw) 11.

4.4.20 The Gwynedd Historic Landscape Characterisation (GHLC) forms part of a national project to characterise the historic landscape. Three (3) GHLC types were identified within 500 m of the Trawsfynydd works site.

4.4.21 Notable features of this area are the exceptionally complete Roman military remains, centred on Tomen-y-mur, and also include Dolddinas practice camps and sections of Roman road and tile kilns at Pen-y-stryd.

Assessment of Impacts and Likely Significant Effects

4.4.22 An assessment of historic environment effects has been scoped out due to there being no intervisibility between designated assets identified and the Trawsfynydd works site, and a negligible potential to impact unknown archaeological remains, with likely significant effects unlikely to occur.

Geology, Hydrogeology, Land Use and Agriculture (Soils)

Existing Environment

4.4.23 No geological SSSIs, GCR sites, RIGS faults or linear features were found in the Trawsfynydd works site or in Study Area.

4.4.24 The NRW LANDMAP indicates the overall valuation of Geological Landscape Aspect Area for Trawsfynydd works site is “Outstanding”.

4.4.25 The Trawsfynydd works site is in a mineral resource area for sandstone but maps do not indicate igneous rocks or sand and gravel in the 250 m Study Area. There are multiple areas of surface ground workings but no underground workings in the Study Area.

4.4.26 A Historic Licensed Industrial Activity, the former Trawsfynydd Nuclear Power Station, is south-west of the Trawsfynydd works site in the 250 m Study Area, operating from 1965 to 1991. The site is classed as an historical Control of Major Accident Hazard (COMAH) site.

4.4.27 There are four (4) borehole logs in the Trawsfynydd works site. There are no Source Protection Zones in the Study Area.

4.4.28 The closest watercourses to the Trawsfynydd works site are unnamed tributaries of the Afon Tafarn-helyg.

4.4.29 The risk for UXO is “Low Risk” for the whole Study Area.

4.4.30 A historical landfill is indicated approximately 120 m west of the Trawsfynydd works site. There is a historical waste site approximately 190 m south-west of the Trawsfynydd works site. There is a potential source of ground gas from the historic landfill.

4.4.31 A historical tank is mapped in the Trawsfynydd works site and another tank is mapped in the south approximately 130 m north-west of the western edge of the Trawsfynydd works site.

4.4.32 There is a sewage works approximately 25 m from the western edge of the Trawsfynydd works site.

4.4.33 There are two (2) radioactive substance authorisations in the south of the Study Area and one (1) pollution incident recorded in this location. Three (3) areas are identified in the Study Area for List 2 Dangerous Substances. There are five (5) contaminated land records (historical potential contaminative land uses or current potential contaminative land uses) within 250 m of Trawsfynydd works site.

Assessment of Impacts and Likely Significant Effects

4.4.34 Ground breaking activities, such as site clearance and preparation work, trenches and excavation for foundations could result in loss or damage to the bedrock geology and may affect groundwater flow, levels and quality.

4.4.35 Land contamination may occur through spillages, leaks or plant breakdown. There are also risks from existing potential contamination, including disturbance of contaminated soils.

4.4.36 Mitigation measures include the implementation of a CEMP, targeted intrusive ground investigations, minimisation of waste and reuse of excavated material where possible. An inspection and discovery strategy will be implemented, with a site and task specific health and safety plan, materials management plan, soil management plan and dewatering scheme. Personal Protective Equipment will be used, dust generation will be minimised, adequate hygiene and clean welfare facilities will be provided and confined spaces will be monitored for potential ground gas accumulations.

4.4.37 The proposed works are not anticipated to have significant impacts on Geology, Hydrogeology, Land Use and Agriculture (Soils) in the Study Area.

Water Quality, Resources and Flood Risk

Existing Environment

4.4.38 The closest watercourses to the Trawsfynydd works site are unnamed tributaries of the Afon Tafarn-helyg. The Llyn Trawsfynydd, a reservoir, is south of the Trawsfynydd substation. The Afon Prysor is the nearest designated Main River, which flows through Llyn Trawsfynydd.

4.4.39 Trawsfynydd works site and surrounding area lie above the Llyn and Eryri WFD groundwater body, which retains a ‘Poor’ overall status under the WFD.

4.4.40 The Trawsfynydd works site is in Flood Zone 1, with a small area in Flood Zone 2. The Trawsfynydd works site is at low risk of flooding. The Trawsfynydd works site is in the mapped reservoir flood extents but is not shown to have been impacted by any historic flood events.

Assessment of Impacts and Likely Significant Effects

4.4.41 An assessment of Water Quality, Resources and Flood Risk was scoped out as no significant impacts in the immediate or local area were predicted to occur.

Traffic and Transport

Existing Environment

4.4.42 The roads in the Study Area were identified as follows: A487 north of A470, A470 east of A487, A487 south of A470, A487 south of Trawsfynydd substation access road and Trawsfynydd substation access road.

4.4.43 There are four (4) PRoWs, the NCR 82 and one bus route in the Study Area. The nearest rail facilities are Penrhyndeudraeth (11.5 km), Minffordd (12.6 km), and Llandecwyn (12.7 km).

4.4.44 Over the most recent seven year period (2016 – 2022), 13 collisions occurred in the Study Area, two (2) fatal, five (5) serious and (6) minor. Ten (10) of which have occurred on the A487 North of the A470.

4.4.45 The road with the highest daily traffic count was A487 South of A470 which had a count of 6,982, the lowest was the Trawsfynydd substation access road which had a count of 400. These are expected to increase to 7,174 and 411 respectively at peak construction.

Assessment of Impacts and Likely Significant Effects

4.4.46 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**. During this time, traffic is expected to increase.

4.4.47 Mitigation measures include:

- Existing access points will be used to facilitate vehicle movements into the Trawsfynydd works site.
- 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 generally would give priority to other road users.
- Construction workers would be encouraged to car share.
- Sufficient on-site car and cycle parking would be provided to accommodate the expected parking demand of workers on Trawsfynydd works site.

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

Air Quality and Emissions

Existing Environment

4.4.49 A background level of dust exists in all urban and rural locations in the UK. However, ambient dust deposition rates are not monitored extensively in the UK.

4.4.50 Background concentrations for pollutants (nitrogen oxides (NO_X), NO_2, PM_{10} and $PM_{2.5}$) in the Study Area are low, due to the predominantly rural nature of the area.

4.4.51 There are no LPA monitoring sites within 10 km of the Trawsfynydd works site. The closest monitoring sites are 044 and 045, approximately 25 km east from the Trawsfynydd works site and not representative of the Study Area.

Assessment of Impacts and Likely Significant Effects

4.4.52 The source of potential Air Quality and Emissions effects during the construction phase include construction dust emissions and site plant emissions. Operational phase emissions were scoped out of the assessment.

4.4.53 Embedded mitigation measures include:

- Ensuring all vehicles switch off engines when stationary – no idling vehicles.
- Using sustainable power sources (solar panels etc.) where practicable. Where available, generators are to be low emission with hybrid battery systems (or to current best practice).
- Ensuring vehicles entering and leaving sites are covered to prevent escape of materials during transport.
- Avoiding the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.

4.4.54 Ancient Woodland sites within 50 m of the Trawsfynydd works are potentially sensitive to emissions to air. However, applying mitigation during construction activities means the potential magnitude of impacts will be negligible and not significant.

4.4.55 The impact of construction equipment and machinery emissions would not be significant. This is due to the good nature 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 in operation, and the effectiveness of standard practice emissions control measures.

4.4.56 Construction road traffic emissions and operational road traffic emissions impacts were screened out of the assessment. The traffic during construction and operation would not contribute to a significant effect on local air quality.

Noise and Vibration

Existing Environment

4.4.57 No receptors that are sensitive to noise or vibration are identified within 300 m of the Trawsfynydd works site.

4.4.58 There are four PRoWs within 300 m of the Trawsfynydd works site. Llyn Trawsfynydd is 155 m south of the Trawsfynydd works site and is a popular tourist attraction for leisure uses such as walking, cycling, fishing, canoeing and kayaking.

Assessment of Impacts and Likely Significant Effects

4.4.59 The proposed works at Trawsfynydd substation are not anticipated to have any significant impacts on Noise and Vibration in the immediate or local area. Construction noise and vibration were scoped out of the assessment.

Socio-Economics

Existing Environment

4.4.60 Within a 60-minute drive time of Trawsfynydd works site:

- There was a population of 245,949 in 2021, 56.4% of those were economically active.
- 16.5% of the population had no qualifications, with 35.2% having Level 4 qualifications or above.
- The industry which employs the highest percentage of people is human health and social work activities, the lowest industry is mining and quarrying at 0.3%.

4.4.61 As of 2024, there are approximately 961 rooms in local hotel, bed and breakfast and inns accommodation within a 30-minute drive of the Trawsfynydd works site, as well as 6,454 rooms within a 60-minute drive of the Trawsfynydd works site.

4.4.62 There are no PRoWs in the Trawsfynydd works site, but four (4) PRoW within 500 m of the works site. NCR 82 runs within 500 m of the Trawsfynydd works site.

4.4.63 Within 500 m of the Trawsfynydd works site there is one (1) visitor attraction, two (2) business premises and six (6) agricultural land holdings supporting pastoral farming. Residential receptors are limited to the sparsely distributed properties north of the Trawsfynydd works site. There are no open space areas which are publicly accessible for community use within 500 m of the Trawsfynydd works site. Within 1 km of the Trawsfynydd works site, there is one (1) community facility.

Assessment of Impacts and Likely Significant Effects

4.4.64 The proposed works are not anticipated to have significant impacts on Socio-Economics in the immediate or local area and were scoped out of the assessment.

Climate Change

Existing Environment

4.4.65 Historical climate data for the Trawsfynydd works site is summarised below.

Historical climate data for the Trawsfynydd works site

Climatic Variable	Baseline data 1981-2010
Mean Annual Max Temp (°C)	12.4
Mean Annual Min Temp (°C)	6.3

Climatic Variable	Baseline data 1981-2010
Mean summer maximum daily temp (°C)	17.9
Mean winter minimum daily temp (°C)	2.2
Warmest Month on Average (°C)	18.7
Warmest Month on Average (Month)	August
Coldest Month on Average (°C)	1.8
Coldest Month on Average (Month)	February
Frost days per annum	No data recorded
Mean annual Rainfall levels (mm)	1284.6
Mean summer rainfall (mm)	143.3
Mean winter rainfall (mm)	175.2
Wettest Month on Average (mm)	218.1
Wettest Month on Average (Month)	November
Driest Month on Average (mm)	104.7
Driest Month on Average (Month)	May

4.4.66 The upward and downward trends set out in paragraphs 4.1.79 and 4.1.80 apply.

Assessment of Impacts and Likely Significant Effects

4.4.67 The product stage (extraction, transport and manufacturing of raw materials) is expected to be the highest contribution stage for greenhouse gas emissions at ~70%, construction the next highest at ~20%, then operation ~10% and the lowest being pre-construction at <1%.

4.4.68 The proposed works will be designed and operated in accordance with the risks and mitigation measures outlined in NGETs Climate Resilience Strategy.

4.4.69 Overall, the GHG impact of the proposed works will be minor adverse and not significant.

4.4.70 The CCRA did not identify any significant climate risks.

Materials and Waste

Assessment of Impacts and Likely Significant Effects

4.4.71 Materials and Waste has been scoped out of the assessment and has not been considered further.

4.5 Wider Works

4.5.1 Potential effects could arise from the Wider Works on the following topics:

- Ecology and Nature Conservation.
- Historic Environment.
- Air Quality and Emissions.
- Climate Change.

4.5.2 All other topics were scoped out of the assessment.

Landscape and Visual Amenity

Existing Environment

4.5.3 The landform of the area is 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 in an otherwise open agricultural landscape.

4.5.4 The Project work site and the Study Area lie in the National Character Areas 03 Arfon, 05 Tremadoc Bay and 06 Eryri. Five (5) LCA and three (3) SCA lie in the Wider Works site and Study Area with one (1) MCA, three (3) historic landscape areas and three SLAs in the Study Area.

Assessment of Likely Significant Effects

4.5.5 Landscape and visual amenity was scoped out of the assessment.

Ecology and Nature Conservation

Existing Environment

4.5.6 There are 17 international statutory sites for nature conservation (i.e. SAC, SPA and Ramsar sites) in the 10 km Study Area and one (1) additional SAC designated for bats within 30 km of the Wider Works site. Thirty-eight other statutory designated sites for nature conservation (SSSI, NNR, LNR) are in the 5 km Study Area.

4.5.7 There are 324 non-statutory sites designated for nature conservation and two (2) NWWT sites in the 2 km Study Area. Of these, 45 are in the Wider Works site.

4.5.8 There are nine (9) sites of Ancient Semi Natural Woodland, eight (8) sites of Restored Ancient Woodland, six (6) Plantations On Ancient Woodland sites and two (2) sites of ancient woodland of unknown category in the Study Area.

4.5.9 There are two (2) ancient, and four (4) veteran trees in the Wider Works site.

4.5.10 Broad terrestrial habitat types and various HOPI were identified in the Study Area.

4.5.11 The desk study returned records of protected and notable species in the 2 km Study Area for the preceding 10 years.

4.5.12 Various protected and notable species are present or potentially present in the Study Areas.

Assessment of Likely Significant Effects

4.5.13 The proposed works associated with the Wider Works have the potential to affect important ecology features (positively or negatively), during construction.

- Habitat loss (temporary and permanent).
- Disturbance.
- Habitat degradation.
- Species mortality.
- Spread of INNS.

4.5.14 Embedded mitigation includes:

- Protecting root Protection Areas (RPA) of trees will be protected where practicable.
- Retaining hedgerows buffered by a minimum of 5 m where practicable.
- Avoiding vegetation clearance during the core nesting bird period.
- Protecting sensitive habitats with an appropriate temporary ground protection trackway or matting to limit damage to the existing habitat and to ensure that vehicles use the same route.

4.5.15 Additional mitigation measures will minimise any potential adverse effects on marsh fritillary butterflies, roosting bats, badgers, water vole, otter, great crested newt and fish, if they are in the Wider Works site, including completing a pre-construction check amongst other measures.

4.5.16 Applying embedded and additional mitigation measures, significant effects are unlikely for Ecology and Nature Conservation.

Historic Environment

Existing Environment

4.5.17 The Wider Works are proposed in a varied landscape ranging from mountainside heath, small river valleys, woodland, and farmland. The overall settlement pattern is that of substantial 19th-century farmhouses and outbuildings interspersed with hamlets and villages. Prehistoric settlements (hut groups and small forts) are dotted across the landscape, usually in the corners of fields.

4.5.18 There are three (3) Scheduled Monuments, one (1) Registered Historic Park and Garden (Grade II*) and 35 non-designated historic assets in the Wider Works site. A further 637 non-designated archaeological assets and 16 Scheduled Monuments have been identified in the 500 m Study Area.

4.5.19 There is one (1) World Heritage Site – the Slate Landscape of North West Wales (**UNESCO 1633**) in the 500 m Study Area.

4.5.20 There are two (2) Registered Historic Park and Gardens and 90 Listed Buildings in 500 m of the Wider Works site. These include five (5) Grade II* and 85 Grade II listed buildings.

4.5.21 The Gwynedd Historic Landscape Characterisation (GHLC) forms part of a national project to characterise the historic landscape. The GHLC is formed of an assessment of historic and current mapping that separated blocks of landscape into types based upon land forms and land use. There are several GHLC types in the Wider Works site.

4.5.22 The Wider Works site is in several registered historic landscapes.

Assessment of Likely Significant Effects

4.5.23 The sources of potential Historic Environment effects during the construction phase of the Project include:

- Temporary short-term impacts to historic assets from a change to their setting.
- Permanent impacts to historic assets from a change to their setting.
- Permanent physical impacts to below ground archaeological remains.

4.5.24 Embedded mitigation includes avoidance by design.

4.5.25 Potential impacts to below ground archaeological remains that cannot be avoided by design can be mitigated through a proportionate programme of archaeological investigation, recording and reporting, such as archaeological monitoring and/or excavation in advance of construction, which would form additional mitigation measures. This would not result in a reduction in the physical impacts to archaeological remains but would mitigate the impact by providing a greater understanding and appreciation of the evidential value of archaeological remains.

4.5.26 All identified impacts are limited to physical impacts during construction. No significant effect has been identified on potential below ground archaeological remains along the Wider Works component of the Project.

Traffic and Transport

Existing Environment

4.5.27 The Wider Works Study Area extends to capture the entire length of the 4ZC overhead line between Pentir and Trawsfynydd, including the smaller, dispersed sites where works are planned.

Assessment of Likely Significant Effects

4.5.28 Traffic and Transport was scoped out of the assessment.

Air Quality and Emissions

Existing Environment

4.5.29 A background level of dust exists in all urban and rural locations in the UK. Ambient dust deposition rates are not monitored extensively in the UK so there is currently no measured baseline information for dust deposition.

4.5.30 Fourteen Gwynedd Council monitoring sites are within 10 km of the Wider Works site as well as one (1) Isle of Anglesey County Council monitoring site.

4.5.31 The most recent publicly available data is from 2022 and shows that concentrations within 10 km of the Study Area are all below 50% of the Air Quality Objective.

4.5.32 The UK-AIR website provides data for background concentrations of NO_X, NO_2, PM_{10} and $PM_{2.5}$. As expected for all pollutants, background concentrations in the Study Area are low, due to the predominantly rural nature of the area.

Assessment of Likely Significant Effects

4.5.33 The sources of potential Air Quality and Emissions effects during the construction phase include:

- Construction dust emissions.
- Site plant emissions.

4.5.34 Embedded mitigation measures include:

- Ensuring all vehicles switch off engines when stationary - no idling vehicles.
- Using sustainable power sources (solar panels etc.) where practicable. Where available, generators are to be low emission with hybrid battery systems (or to current best practice).
- Using enclosed chutes and conveyors (if used) and covered skips.
- Ensuring vehicles entering and leaving sites are covered to prevent escape of materials during transport.

4.5.35 Due to the length of the Project works site, there are amenity, air quality and ecology receptors close enough to the Project works site that are sensitive to changes in air quality emissions. Applying mitigation measures in the Works Environmental Management Plan (WEMP), the potential magnitude of impacts will be negligible and not significant.

4.5.36 The impact of construction equipment and machinery emissions is anticipated to be not significant. This is due to the good standard of baseline air quality and the limited duration of time in which such machinery will be operation, and the effectiveness of standard practice emissions control measures.

4.5.37 Construction road traffic emissions and operational road traffic emissions impacts were screened out of the assessment.

Noise and Vibration

Existing Environment

4.5.38 The existing land use of the Site is primarily agricultural. Nearby recreational and residential receptors include:

- Isolated farms and rural properties.
- The villages of Llanrug, Talysarn, Penygroes, Llanllyfni, Carmel and Rhosgadfan.
- The PRoW network.
- Quiet rural lanes.

4.5.39 The main sources of noise in the area are:

- Traffic on minor roads and major roads.

- Existing overhead line infrastructure.
- Agricultural activities associated with farms and fields.

Assessment of Likely Significant Effects

4.5.40 Noise and Vibration was scoped out of the assessment.

Socio-Economics

Existing Environment

4.5.41 Within a 60-minute drive time from the Wider Works site:

- The population was 546,628 in 2021, 24.5% of which were aged over 65 and 56.2% of the population were economically active.
- 18.2% of the population have no qualifications, while 31.8% have Level 4 and above.
- Largest industry for employment is human health and social activities (17%) with the lowest being mining and quarrying (0.3%). Human health and social activities has the highest GVA at 14.4%.

4.5.42 Within a 60-minute and 30-minute drive time from the Wider Works site, typical room occupancy for accommodation is at the lowest in January (47%) and highest in august (80%).

4.5.43 There are 86 PRoWs that cross the Wider Works. Within 500 m of the Wider Works site, there are a substantial number of PRoWs. The NCR 8 and NCR 61 both cross the Wider Works site.

4.5.44 There is one (1) open space, the Llanrug United FC Eithin Duon Football Ground, in the Wider Works site. There are a further 23 open spaces within 500 m of the Wider Works site.

4.5.45 There are 46 community facilities within 1 km of the Wider Works site.

4.5.46 There are several towns and villages within 500 m of the Wider Works site, where residential properties are concentrated with several isolated properties within 500 m of the Wider Works site.

4.5.47 There are 67 hospitality facilities providing visitor accommodation within 500 m of the Wider Works site.

4.5.48 There are 32 business premises within 500 m of the Wider Works site.

4.5.49 Most of the land that the Wider Works site crosses is agricultural pastoral land or moor and heathland.

4.5.50 There are 280 land ownership parcels that overlap the Wider Works site, with a substantial additional number within 500 m.

4.5.51 Eleven (11) MSAs are within 500 m of the Wider Works site. There are also four (4) mineral buffer zones within 500 m, two (2) of which cross the Wider Works site.

4.5.52 Two (2) proposed developments are within 500 m of the Wider Works site.

Assessment of Likely Significant Effects

4.5.53 Socio-Economics was scoped out of the assessment.

Climate Change

Existing Environment

4.5.54 Historical climate data for the Wider works site is summarised below.

Climatic Variable	Baseline data 1981-2010
Mean Annual Max Temp (°C)	12.4
Mean Annual Min Temp (°C)	6.3
Mean summer maximum daily temp (°C)	17.9
Mean winter minimum daily temp (°C)	2.2
Warmest Month on Average (°C)	18.7
Warmest Month on Average (Month)	August
Coldest Month on Average (°C)	1.8
Coldest Month on Average (Month)	February
Frost days per annum	No data recorded
Mean annual Rainfall levels (mm)	1944.5
Mean summer rainfall (mm)	143.3
Mean winter rainfall (mm)	176.4
Wettest Month on Average (mm)	220
Wettest Month on Average (Month)	October
Driest Month on Average (mm)	104.7
Driest Month on Average (Month)	May

4.5.55 Qualitative information was obtained for other climate variables such as heatwaves, snowfall and storms.

4.5.56 In addition to historic climate data, information was gathered on extreme weather events at or near the Proposed Development in the past five (5) years (2019–2024).

Assessment of Likely Significant Effects

4.5.57 The Project will support the UK's transition to net zero by providing the necessary infrastructure to enable the increased transmission of low-carbon electricity. As renewable energy generation increasingly replaces higher-carbon energy sources, this aligns with the UK Government's goal of achieving an electricity system independent of fossil fuels by 2035.

4.5.58 The Wider Works will be designed and operated in accordance with the risks and mitigation measures outlined in NGETs Climate Resilience Strategy.

4.5.59 No significant effects were identified for greenhouse gases or in the CCRA, therefore no additional mitigation is required.

4.6 The Project

4.6.1 This section considers how the individual components of the proposed Project (as described in preceding sections) might affect the environment when considered together.

4.6.2 There are some shared receptors that could be affected by different parts of the Project (i.e. a receptor impacted by the works at both Bryncir and Glaslyn Cables).

4.6.3 There are common receptors between the Wider Works and the other four Project components (i.e. Bryncir, Glaslyn Cables, Pentir and Trawsfynydd). For the most part, impacts related to Wider Works, Pentir and Trawsfynydd works are not significant and, when considered at the project level as a whole, remain as not significant. Receptors that are shared across Project components include national and local landscape character areas, statutory ecological sites, and important habitats and wildlife receptors. Statutory ecological sites and important habitats in the Glaslyn Cables component of the Project, were identified where possible multiple Project impacts may occur. Impacts to these sensitive receptors include temporary damage to habitats, disturbance to wildlife from noise, lighting, or dust emissions, water quality issues from potential construction runoff or spills and reduced water flow due to trenching or temporary works.

4.6.4 Overall, the combined effects of all Project components are not greater than those assessed individually.

4.7 In-combination and Cumulative Effects

In-combination Effects

4.7.1 An in-combination effect occurs when a receptor is impacted by a combination of different sources of effect.

4.7.2 Some assessments consider in-combination effects as part of their assessment method (e.g. the assessment of impacts on the historic environment includes consideration of potential impacts to setting from air quality, noise and visual changes).

4.7.3 To capture any such impacts not already factored into the individual assessments, a review of receptors that could experience in-combination effects was conducted. This identified Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC, Glaslyn SSSI, running water (including wet ditches), residential properties, education and community facilities and business as six (6) receptors potentially being affected by more than one potential source of effect during construction. However, after applying mitigation measures these effects would not result in a greater combined effect. There would be a combined minor adverse effect.

4.7.4 No in-combination effects were identified for operation.

Cumulative Effects

4.7.5 Cumulative effects occur when the impacts of a project are considered in the context of other nearby proposed developments.

4.7.6 A 2 km area around the Project works site was chosen for reviewing other nearby developments that could have cumulative effects. Fourteen (14) other projects near the site were identified including energy storage systems, business units, underground

cables, and a holiday park. Eight (8) of these were selected based on location and potential to interact with the Project. The EVIP project was also considered in the assessment.

4.7.7 Three (3) areas, LCA 09 Porthmadog and two viewpoints, one on the Wales Coastal Path and one near Minffordd, could experience cumulative Moderate adverse landscape and visual impacts during construction. No significant cumulative effects were identified during operation.

4.7.8 No new or additional mitigation measures are proposed beyond what is already proposed for the Project and the other respective developments.

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