



Uwchraddio'r Grid

Pentir i Drawsfynydd

Ppendix

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Pentir to Trawsfynydd Reinforcement Project

Environmental Statement Volume 4: Glaslyn Cables Works

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Contents

Executive Summary	7
1. Introduction	19
1.1 Introduction	19
1.2 Structure of the Volume	19
1.3 Figures and Appendices	19
2. Glaslyn Cables Works	21
2.1 Introduction	21
2.2 Background	21
2.3 Proposed Glaslyn Works	23
2.4 Construction	39
2.5 Operation	45
3. Assessment of Alternatives	47
3.1 Introduction	47
3.2 Requirement for the Consideration of Alternatives	47
3.3 Design Alternatives	47
4. Landscape and Visual Amenity	54
4.1 Introduction	54
4.2 Legislation and Planning Policy	55
4.3 Study Area	56
4.4 Assumptions and Limitations	56
4.5 Baseline	56
4.6 Consultation and Scope of Assessment	65
4.7 Methodology	69
4.8 Potential Effects	70
4.9 Mitigation and Residual Effects	78
4.10 Summary	91
5. Ecology and Nature Conservation	92
5.1 Introduction	92
5.2 Legislation and Planning Policy	93

5.3	Study Area	95
5.4	Assumptions, Limitations and Uncertainties	96
5.5	Net Benefit for Biodiversity	97
5.6	Baseline	99
5.7	Consultation and Scope of Assessment	148
5.8	Methodology	160
5.9	Potential Effects	160
5.10	Mitigation and Residual Effects	216
5.11	Summary	233
6.	Historic Environment	234
6.1	Introduction	234
6.2	Legislation and Planning Policy	234
6.3	Study Area	235
6.4	Assumptions and Limitations	236
6.5	Baseline	236
6.6	Consultation and Scope of Assessment	241
6.7	Methodology	244
6.8	Potential Effects	244
6.9	Mitigation and Residual Effects	257
6.10	Summary	257
7.	Geology, Hydrogeology, Land Use and Agriculture (Soils)	259
7.1	Introduction	259
7.2	Legislation and Planning Policy	259
7.3	Study Area	262
7.4	Assumptions and Limitations	263
7.5	Baseline	263
7.6	Scope of Assessment	284
7.7	Methodology	287
7.8	Potential Effects	287
7.9	Mitigation and Residual Effects	291
7.10	Summary	307
8.	Water Quality, Resources and Flood Risk	308
8.1	Introduction	308
8.2	Legislation and Planning Policy	309
8.3	Study Area	310
8.4	Assumptions and Limitations	311

8.5	Baseline	312
8.6	Scope of Assessment	320
8.7	Methodology	326
8.8	Potential Effects	326
8.9	Mitigation and Residual Effects	327
8.10	Summary	350
9.	Traffic and Transport	351
9.1	Introduction	351
9.2	Legislation and Planning Policy	351
9.3	Study Area	352
9.4	Assumptions and Limitations	353
9.5	Baseline	354
9.6	Scope of Assessment	365
9.7	Methodology	366
9.8	Potential Effects	374
9.9	Mitigation and Residual Effects	384
9.10	Summary	389
10.	Air Quality and Emissions	390
10.1	Introduction	390
10.2	Legislation and Planning Policy	390
10.3	Study Area	391
10.4	Assumptions and Limitations	393
10.5	Baseline	393
10.6	Scope of Assessment	394
10.7	Methodology	395
10.8	Potential Effects	396
10.9	Mitigation and Residual Effects	400
10.10	Summary	404
11.	Noise and Vibration	405
11.1	Introduction	405
11.2	Legislation and Planning Policy	405
11.3	Study Area	406
11.4	Assumptions and Limitations	406
11.5	Baseline	406
11.6	Scope of Assessment	407
11.7	Methodology	408

11.8	Potential Effects	408
11.9	Mitigation and Residual Effects	419
11.10	Summary	422
12.	Socio-Economics	423
12.1	Introduction	423
12.2	Legislation and Planning Policy	423
12.3	Study Area	424
12.4	Assumptions and Limitations	425
12.5	Baseline	426
12.6	Scope of Assessment	434
12.7	Methodology	435
12.8	Potential Effects	436
12.9	Mitigation and Residual Effects	445
12.10	Summary	445
13.	Climate Change	446
13.1	Introduction	446
13.2	Legislation and Planning Policy	446
13.3	Study Area	447
13.4	Assumptions and Limitations	448
13.5	Baseline	449
13.6	Scope of Assessment	457
13.7	Methodology	458
13.8	Potential Effects	458
13.9	Mitigation and Residual Effects	474
13.10	Summary	476
14.	Materials and Waste	477
14.1	Introduction	477
14.2	Legislation and Planning Policy	477
14.3	Study Area	478
14.4	Assumptions and Limitations	479
14.5	Baseline	479
14.6	Scope of Assessment	479
14.7	Methodology	481
14.8	Potential Effects	482
14.9	Mitigation and Residual Effects	483
14.10	Summary	484

15.	In-combination Effects	487
15.1	Introduction	487
15.2	Legislation and Planning Policy	487
15.3	Methodology	487
15.4	Assessment	487
16.	Cumulative Effects	488
16.1	Introduction	488
16.2	Legislation and Planning Policy	488
16.3	Study Area	488
16.4	Methodology	488
16.5	Potential Effects	489
16.6	Summary	489
17.	Bibliography	490

Executive Summary

Background

Introduction

- i. This document (Volume 4 – Glaslyn Cables) forms part of the Environmental Statement which accompanies applications by National Grid Electricity Transmission plc to construct and operate developments which comprise parts of the Pentir to Trawsfynydd Reinforcement Project (the 'Project'). Volume 4 focuses on the works at the Glaslyn Cables. It provides an assessment of likely significant effects that could arise from the replacement of the Glaslyn Cables, including decommissioning of existing infrastructure and the construction, operation and maintenance works for the Glaslyn works.

Glaslyn Cables Location

- ii. The proposed works would run between the existing Wern cable sealing end compound and the existing Garth cable sealing end compound, Porthmadog (the 'Glaslyn works site'). The Glaslyn works site would run through undulating land and is characterised by predominantly rural land uses with scattered woodland. A large proportion of the Glaslyn works site is on agricultural land, which the Agricultural Land Classification data identifies as Grade 5 (very poor quality) with small patches of Grade 3a (good to moderate). The Glaslyn works site crosses through the Glaslyn Site of Special Scientific Interest, Coedydd Derw, a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods, and Bat Sites Special Area of Conservation and a small area of Ysbyty Bron y Garth Site of Special Scientific Interest.

Glaslyn Cables Works Site and the Proposed Works

- iii. The existing 400 kilovolt (kV) cables are near the end of their operational life and as installed could not operate at the capacity now required. These cables need replacing. The existing 132 kilovolt cables cannot be upgraded to operate at 400 kV nor meet the capacity now required by the circuit. These cables will be replaced with new 400 kV cables.
- iv. The Glaslyn works site covers an area approximately 106.4 hectares. The land within the Glaslyn works site comprises access roads, turning areas, construction compounds and laydown areas required for the construction and operation of the works.
- v. Works would include the extension to the existing Wern Cable Sealing End Compound (CSEC); the replacement of the 400 kV cables and associated infrastructure i.e. joint bays, link pillars, link boxes; draining, decommissioning and removal of the redundant 132 and 400 kV cables, with some sections being left *in situ* due to social and ecological sensitivities; removal of the existing Garth CSEC and installation of the proposed Minffordd cable sealing end compound. The proposed works include the Minffordd Tunnel Head House (THH), similar to that already consented under the Eryri Visual Improvement Provision (EVIP) project, to bring the floor level in line with the Minffordd cable sealing end compound.
- vi. New infrastructure at the cable sealing end compounds includes high voltage electrical equipment including foundations and support steelwork, a surge arrestor, earth switches, cable sealing ends, security fencing and access roads.
- vii. The replacement cables would be installed in ducts via either open cut or trenchless technology. The proposed open cut technique would be trenching and backfill, which would

be employed for approximately half of the cable route. The proposed trenchless technology would be Horizontal Directional Drill (HDD) used for the other half of the cable route where it crosses major roads, railway lines and rivers. Small sections of cable in the joint bays at Wern and Minffordd cable sealing end compounds would be installed through direct burial of the cable. Generally, the construction works would be completed from Monday to Friday between 7 am – 7 pm and 8 am – 6 pm on Saturdays. 24-hour working will be required for critical activities such as the horizontal directional drilling, cable pulling, jointing and terminating. The construction works would take place over a three year period between Quarter 2, 2026 and Quarter 2, 2029.

Alternatives

- viii. In accordance with the Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017, design alternatives have been considered for the proposed works. Design alternatives were considered for the Glaslyn cable route, A487 crossing, Minffordd CSEC and Bodawen playground.
- ix. An Options Appraisal Report divided the Glaslyn cable route into five sections. After considering multiple options for each section, the preferred route was determined based on fewer complexities, reduced environmental impacts and cost efficiency.
- x. The Glaslyn cable route intersects the A487 Porthmadog Bypass in three locations: Porthmadog Roundabout; west of the Welsh Highway Heritage Railways; and north of the Afon Glaslyn. At each location multiple options were appraised. For Porthmadog Roundabout an open cut trench approach was preferred due to its minimal impact on the nearby high-pressure gas main. The preferred Welsh Highland Heritage Railway option follows the A487, passes south of the Welsh Highland Heritage Railway and Ffestiniog Railway before intersecting the Clwb Chwaraeon Madog, it was preferred as it avoided the train station, offered more space for horizontal directional drilling activities and was less impactful on trees and hedgerows. Four options were considered for the Afon Glaslyn. The chosen option was technically preferred as it had the potential to be completed with a single cable drum with joint bays on either side of the crossing, avoids direct impact on the A487, projected low costs and from a health and safety perspective due to the need for less temporary works.
- xi. Three options were considered for the Minffordd CSEC. The preferred option comprised an air insulated switchgear CSEC. This was preferred as it gave good cost efficiency whilst enabling a cable connection to be achieved, was consistent with high voltage equipment at the Pentir and Trawsfynydd Substations and allowed a connection to the EVIP project.
- xii. Bodawen playground is immediately west of Porthmadog Roundabout. Two alternative locations, both south-east of the current location, were considered to mitigate the effects of the temporary two-year closure. These were not taken forward due to overlooking, security and accessibility issues. To minimise impacts, the playground would be occupied for a maximum of two years and the playground would be refitted with new equipment on completion.
- xiii. Five options were considered for the Minffordd THH. West THH (Alternative 4) was preferred due to its relationship of new built form with the existing settlement pattern and it could accommodate landscape works. West THH and West THH (Alternative 1) were both rejected based on the proximity of the high-pressure gas pipeline and buried high voltage cables. Although West THH (Alternative 2) was similar to Alternative 4, it was in a less favourable location, was less able to provide screening and would create a build form closer to existing settlement. West THH (Alternative 3) was rejected as there was more potential for impacts on visual amenity.

Key Findings of the Environmental Impact Assessment

Landscape and Visual Amenity

- xiv. The Study Area for Landscape and Visual Amenity encompasses land within a 3 km radius of the Glaslyn works site. The Glaslyn works site is not covered by any statutory landscape designations; however, part of the Study Area is in h Eryri National Park which is 300 m east of the Glaslyn works site at its closest point. There are recognised sites that cover parts the Glaslyn works site and Study Area, including two Special Landscape Area including three Historic Landscapes, three Registered Historic Parks and Gardens and part of the Slate Landscape of Northwest Wales - Ffestiniog: its Slate mines and Quarries, 'city of slates' and Railway to Porthmadog is a World Heritage Site. The landform of the Glaslyn works site is largely flat and low-lying with the two CSECs lying at either end and the route corridor passing through the broad, flat valley floor of the Glaslyn Estuary. Settlement within the Study Area comprises the town of Porthmadog and villages generally in lower lying areas and villages and caravan sites along the coast. On higher land, settlements are limited to scattered farms and individual properties. There are numerous public rights of way (PRoW) in the Study Area linking settlements and providing recreational routes. The Study Area includes some common land and open access land in Eryri National Park, but none is in the Glaslyn works site.
- xv. The proposed works would introduce some new elements into the landscape, creating the potential for landscape and visual effects. The effects from the following activities could occur simultaneously or in isolation: vegetation clearance, utility diversions, temporary compounds, construction activities, temporary access tracks, temporary diversion of PRoWs, erection of temporary scaffolding infrastructure, construction lighting and new permanent infrastructure. During operation, the proposed works have potential to create landscape or visual effects due to the introduction of new infrastructure. During operation the proposed works would add new elements into the landscape, creating the potential for landscape and visual effects. These effects may arise at either the Wern CSEC and the Minffordd THH and CSEC from the following activities: new infrastructure and new planting.
- xvi. Embedded mitigation measures include minimising the extent of the proposed works, incorporation of new and additional planting such as hedgerows and trees, reinstating land used temporarily, confining lighting to locations where safety is a priority, minimising the use of tall equipment, designing permanent structures to minimise their visual impact and minimising construction duration.
- xvii. During construction, significant residual impacts as a result of the Glaslyn Cables have been identified on Landscape Character Area 09 Porthmadog, Seascape Character Area 20 Porthmadog and Glaslyn Estuary, Viewpoint 9: Wales Coast Path – The Cob (eastern end), Porthmadog and Viewpoint 10: Ffordd Tan-y-Glannau, Minffordd. No significant residual operational impacts are anticipated.

Ecology and Nature Conservation

- xviii. The Study Area or Zone of Influence for the proposed works was defined to assess potential ecological risks from direct and indirect impacts. The Zone of Influence considers the nature of the proposed works, nearby land use, habitats, watercourses, species behaviours, and duration of effects. It incorporates designated sites, sensitive habitats, and protected and notable species at varying distances from the Glaslyn works site, considering professional good practice and guidance.
- xix. A desk study was carried out to identify sites designated for nature conservation and records of protected or notable habitats and species (important ecology features) and Invasive Non-

Native Species (INNS) that are relevant to the Glaslyn works site. The desk study also identified the status of water bodies covered by the Water Framework Directive (WFD) to identify those likely to be impacted from an ecological perspective. Cofnod, the local biological records centre, was contacted in June 2023 to gain information on pre-existing ecological data (i.e. locations of locally designated sites, habitats of principal importance (HoPI), ancient woodland and existing records of protected and notable species, and INNS within 2 km of the Glaslyn works site). A series of field surveys has been undertaken including an extended Phase 1 habitat survey, targeted habitat survey, aquatic scoping surveys, hedgerow, aquatic macrophyte, aquatic macroinvertebrate, fish, breeding birds, non-breeding birds, bats (ground level tree, potential roost features, roost, foraging/commuting), badger, riparian mammals, great crested newt and INNS surveys.

- xx. The Glaslyn works site comprises various types of woodland, scrub, grassland, hedgerows, marginal and inundation vegetation, buildings, standing water and running water. There are six international statutory sites for nature conservation (Special Areas of Conservation (SAC), Special Protection Areas and Ramsar sites) within 10 km of the Glaslyn works site and a further two SACs designated for bats within 30 km of the Glaslyn works site. Twenty-two other statutory designated sites (Site of Special Scientific Interest, National Nature Reserve and Local Nature Reserves) are present within 5 km of the Glaslyn works site.
- xxi. There are 41 non-statutory sites designated for nature conservation within 2 km of the Glaslyn works site, two of which are partially in the Glaslyn works site. There are two North Wales Wildlife Trust sites in the Study Area, one of which is wholly in the Glaslyn works site. There are 80 areas of ancient semi-natural woodland, 38 site of restored ancient woodland, seven plantations on ancient woodland sites and one site of ancient woodland of unknown category in the Study Area.
- xxii. Habitats of Principal Importance identified within 1 km of the Glaslyn works site include coastal and floodplain grazing marsh, lowland fen and reedbed, saltmarsh, lowland dry acid grassland, purple moor grass and rush pastures, traditional orchards, lowland heathland, lowland meadow, maritime cliff and slope, blanket bog, hedgerows, rivers, standing water or ponds and deciduous woodland.
- xxiii. The following protected and notable species were identified within 2 km of the Glaslyn works site: terrestrial invertebrates, aquatic macroinvertebrates, fish, breeding and non-breeding birds, bats, badger, otter, water vole, pine marten, reptiles, hedgehog, brown hare, polecat, flora, lichen, fungi and invasive non-native species (INNS).
- xxiv. The proposed works have the potential to affect ecology and nature conservation through habitat loss (temporary and permanent), disturbance (light, noise, vibration and human activity), habitat degradation, species mortality and spread of INNS during construction. During operation, no effects are anticipated. However, should maintenance works be intrusive and require refurbishment or replacement the sources of potential effects include species mortality, disturbance (light, noise, vibration and human activity) and spread of INNS.
- xxv. Embedded mitigation measures have been integrated into the proposed works to minimise potential ecological impacts on construction, operation and maintenance. The design of the proposed works has evolved to avoid statutory designated sites and ancient woodland as far as practicable. Minimum buffers from key habitat features will be applied to reduce the likelihood of significant environmental effects, this will apply to woodlands, hedgerows, individual trees, watercourses and the Afon Glaslyn bankside (in the Glaslyn SSSI).
- xxvi. The Construction Environmental Management Plan (CEMP) will outline measures to address construction dust, pollution, water quality, light, noise and vibration. Vegetation

clearance would be carried out in advance of the construction works commencing and would avoid the besting bird period, precautionary working methods will be adhered to in areas of habitat suitable for reptiles, common amphibians and common mammals. Statutory and non-statutory sides would be protected from incursion through security and protection fencing. Watercourses crossed by the proposed works will be reinstated hedgerow removal will be kept to a minimum, where removal is required, new sections will be planted. Lighting during construction will be minimal and comply with best practice guidelines to prevent disturbance to wildlife. Where grassland vegetation removal is required, underlying topsoil and subsoil will be stripped and stored appropriately, omitting the use of glyphosate. Once the works are completed, the topsoil and subsoil will be backfilled promptly, retaining the original soil profile and seed bank. Temporary noise attenuation fencing will be installed within the Glaslyn works site, including around HDD working areas, to minimise potential disturbance to sensitive receptors. Pre-construction surveys will ensure the latest data on protected species and INNS are used to inform mitigation measures, including wildlife protection and reasonable avoidance measures for badgers, otters and bats.

- xxvii. Additional mitigation will apply for hedgerows, ancient and veteran trees, protected and notable flora, aquatic macroinvertebrates, aquatic macrophytes, fish, badger, bats and otters to minimise any potential adverse effects. Enhancements in the form of new bat boxes will be provided (with landowner consent) on retained trees within the Glaslyn works site.
- xxviii. With the implementation of suitable embedded mitigation and additional mitigation the assessment has concluded that the construction, operation and maintenance of the proposed works are unlikely to result in significant adverse effects to identified species, habitats and designated sites.

Historic Environment

- xxix. Two Study Areas were used for the Historic Environment assessment: a Study Area of 3 km from the Glaslyn works site for designated historic assets and a 500 m Study Area for non-designated heritage assets. The settings of designated assets of the highest value (i.e. World Heritage Sites, scheduled monuments, Grade I and II* listed buildings, registered parks and gardens, conservation areas containing a number of assets of the highest value and registered historic landscapes) have been considered, up to 3 km from the Glaslyn works site, guided by the proposed works ZTV prepared as part of **Chapter 4: Landscape and Visual Amenity**.
- xxx. Most historic assets were scoped out of further assessment in the baseline study (**Volume 8, Appendix 4.6.A: Historic Environment Desk-based Assessment**) however, the proposed works could result in physical impacts or impacts on the setting of one World Heritage Site, one scheduled monument, two Grade II* listed buildings, 17 Grade II listed buildings, two registered park and gardens, one registered historic landscape and 27 non-designated historic assets.
- xxxi. The potential construction impacts associated with the proposed works include temporary short-term impacts or permanent impacts to assets as a result of change to their setting and permanent physical impacts to below ground archaeological remains.
- xxxii. Potential impacts to these 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. 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.

- xxxiii. Apart from Wern Manor (Cadw 4626) (Grade II*) (PGW(Gd)19(GWY)) (Grade II*) where a moderate adverse significant effect has been identified, no other significant effect has been identified during the construction or operation of the proposed works. Considerations of size, materials, distribution, lighting and screening in the final designs of the alterations to the existing Wern CSEC, the construction of the new Minffordd CSEC, the Minffordd EVIP tunnel head house (at a greater height than presently consented) and the removal of the Garth CSEC will ensure that impact on the setting of designated historic assets will be kept to a minimum.

Geology, Hydrogeology, Land Use and Agriculture (Soils)

- xxxiv. The Study Area comprises the Glaslyn works site plus a 250 m buffer extending to 1 km for water abstractions.
- xxxv. The Study Area is underlain with Alluvium and Till Superficial deposits, and Mawddach Group, Tremadoc Series and Ogwen Group Bedrock. There are two faults which cross the proposed works east of Porthmadog harbour. They are both unnamed and trend in a north-south direction with downthrows to the west. There are 80 historic borehole logs within the Study Area, 16 of which are within the Glaslyn works site. Ground stability across the Glaslyn works site varies, with potential issues including collapsible ground in several localised areas, probably compressibility and uneven settlement hazards, possible slope instability especially at the western extent of the Glaslyn works site and the presence of running sand. Three soil types were identified within the Study Area: Saline 1 soils of variable texture flooded by high tides; well drained fine loamy or fine silty Manod soils; and deep stoneless silty and fine sandy Rockcliffe soils. There are two geological SSSIs close to the west of the Glaslyn works site, The Ty'n Llan SSSI lies approximately 50 m north-west and Wern Road Section SSSI is approximately 120 m south. Sandstone, slate and igneous rocks have been identified across the Glaslyn works site. One Category 1 Aggregate Safeguarding Area for high specification aggregate (sandstone and igneous rock), one Category 2 Aggregate Safeguarding Area for slate and one Category 2 Aggregate Safeguarding area for igneous rock have been identified within 250 m of the Glaslyn works site. One historical mineral planning area was identified within 250m of the Glaslyn works site. There are five locations within the Study Area which are noted as known to have underground mining or considered likely within or very close to the Glaslyn works site. There are several areas of surface ground workings in and adjacent to the Glaslyn works site. In the Study Area there are eight private water supplies. There is one historical landfill site for household waste and one historical waste site (recycling facility) within 250 m of the Glaslyn works site. There are 20 Licensed Discharge Consents to Controlled Waters within the Study Area, 13 are current and effective, five are expired, and two have been revoked. There are no source protection zones, groundwater abstractions, active or recent landfill sites, sources of ground gas within the Study Area.
- xxxvi. Construction activities have the potential to result in groundwater and ground pollution due to chemical spillages and leaks including from oil-filled cables, disturbance of potentially contaminated soils, sediments and waters posing a risk to construction workers, groundwater, and geology, importation of contaminated aggregates posing a potential risk to human health and underlying geology and groundwater quality, requirement to remove/reinstate spoil from construction of the buried cables posing a potential risk to human health and the environment, partial loss or damage to geological receptors during construction and temporary disturbance and permanent loss of soil resources. During maintenance works there is the potential for the foundations of structures and cables to provide a preferential pathway for contaminants to migrate to non-contaminated soils, geology and groundwater and for aggressive ground contaminants posing a risk to foundations or cable infrastructure.

- xxxvii. Mitigation measures include a CEMP, targeted ground investigations, a method statement, discovery strategy and materials management plan, waste management plan. Following the implementation of mitigation measures, no significant impacts on Geology, Hydrogeology, Land Use and Agriculture are anticipated.

Water Quality, Resources and Flood Risk

- xxxviii. The Study Area for this assessment has been defined through setting a Zone of Influence (Zol). In this instance the ZOI has been set to include the fluvial and tidal flood zone associated with the Afon Glaslyn and Y Cyt water bodies as this is well defined by local topography. No water environment impacts are expected to occur further upstream or downstream than this, and the topography restricts the flood zone from changing extent significantly as a result of proposed works.
- xxxix. The topography varies between 0 m AOD and 345 m AOD across the Glaslyn works site. There are two Main Rivers in the Glaslyn works site: the Afon Glaslyn and Y Cyt/Nabt Yr Afon Oer, both in Porthmadog. There are different soil types across the Zol, including loamy and clayey soils of coastal flats with naturally high groundwater, freely draining acid loamy soils over rock and naturally wet saltmarsh soils. There is once licensed surface water abstraction (abstracting from two points) in the Zol, on the left bank of the Afon Glaslyn, 210 m upstream of the Glaslyn works site. The abstraction is associated with mining related activities at Minffordd Quarry. There are no groundwater abstractions in the Zol. There are five conservation sites with potential water designations including Coedydd Beddgelert a Cheunant Aberglaslyn SSSI, Coedydd Nanmor SSSI, Glaslyn SSSI, Meirionnydd Oakwoods and Bat Sites SAC and Hafod Garregog NNR. There are seven Water Framework Directive (WFD) river water bodies within the Zol.
- xl. The potential Water Quality, Resources and Flood Risk effects during construction include: deterioration in the water quality of surface water bodies from sediment laden run-off; effects on hydromorphology and flow regime of surface water bodies as a result of increased run-off, dewatering of excavations and sediment inputs from working areas or direct watercourse disturbance; deterioration in the water quality of surface and groundwater bodies affected by disturbance of contaminated land or accidental spillage of pollutants; deterioration in water quality due to permitted discharges from construction; impacts on groundwater levels from dewatering activities and the effects of underground infrastructure; changes to fluvial or tidal flood risk associated with raised structures in the floodplain; and changes to surface water flood risk due to changes in run-off rates and flow pathways resulting from ground disturbance and creation of new impermeable surfaces. The potential effects during operation include: potential for accidental contamination entering watercourses associated with spillage or leakages; ground disturbance and mobilisation of sediments or contaminants leading to silt laden or otherwise contaminated run-off entering watercourses; physical disruption to existing infrastructure from isolated repairs of joint bay link pillars or cable circuits; changes in channel morphology and fluvial geomorphological processes, should cables become exposed at watercourse crossings; changes to fluvial or tidal flood risk associated with loss of floodplain storage and change in floodplain flow conveyance, where permanent above ground infrastructure is in tidal or fluvial flood zones; changes to surface water flood risk due to changes in flow pathways and runoff rates resulting from changed ground levels and creation of new impermeable surfaces for permanent above ground infrastructure; and changes to groundwater flood risk due to presence of underground infrastructure.
- xli. Mitigation measures including an Environmental Management Plan, Flood Evacuation Plan, Pollution Prevention Plan and a Pollution Incident Response Plan will be applied. Construction works will take place during periods of normal to low flow conditions and

floodplain compensation will be implemented to account for the volumetric displacement of flood water from the proposed works.

- xlii. The WFD Assessment concludes that the Glaslyn Cable Works would not impact on the WFD status or objectives of any associated surface water or groundwater bodies near the Glaslyn Cable Works. The assessment also concludes no adverse impacts on Protected Areas in hydrological connection with the scheme. The Glaslyn Cable Works would not prevent the achievement of the wider WFD objectives in the Western Wales River Basin District (RBD) and is not predicted to have an impact on any other water body within the Western Wales RBD or mitigation measures developed to achieve good status.
- xliii. The assessment has demonstrated that the construction, operation and maintenance of the proposed works, in combination with the identified mitigation measures, is mostly not anticipated to have significant impacts on the aquatic environment or water resources in the ZOI.
- xliv. There is however potential for significant effects on flood risk during the construction, operation and maintenance of the proposed works. The flood risk impact on residential receptors in Tremadog is currently assessed as being potentially significant. However, additional mitigations are being prepared to address this and will be submitted as supplementary environmental information. When this information is submitted, it is anticipated that it will be possible to conclude that there will be no significant impacts on flood risk during the construction, operation and maintenance of the proposed works.

Traffic and Transport

- xlv. Several roads on the local and strategic highway network could be used by traffic associated with the proposed works and could be subject to increases in traffic. The roads identified cover likely routes to the Glaslyn works site from the Strategic Road Network (SRN) and from local and regional population centres between a 30–45-minute drive time of the Glaslyn works site. This is the likely catchment area for construction traffic. The roads in the Study Area included the A487 west of A498, A498 south of A487, A498 north of A487, A497 south of A498, Penamser Road, Britannia Terrace/A497, A487 west of Minffordd Roundabout, Church Street, A498 east of Church Street Junction, Porthmadog High Street, A487 west of Porthmadog High Street Junction, A487 east of Porthmadog High Street Junction and an unnamed Road (north of Porthmadog Roundabout). Automatic Traffic Counts (ATCs) have been carried out at specific locations on the roads above which, collectively, form the Study Area.
- xlvi. The roads in the Study Area form part of the SRN, local highway network and unclassified roads. There are four footpaths, two bridleways and one NCR that intersect the Glaslyn works site. The Study Area is served by several bus routes and two passenger rail stations: Porthmadog Railway Station and Minffordd Railway Station. There is a station in Porthmadog for the Ffestiniog and Welsh Highland Heritage Railway. Between 2016 – 2022, there were 41 collisions in the Study Area, 15 serious and 26 slight. The ATCs were carried out at 13 locations between 26 September – 02 October 2024 (due to a sensor failure during this period, the survey along Penamser Road was completed between 09 October – 15 October 2024) concluded the 24-hour annual average daily traffic was 76,407, 2,004 of which were heavy duty vehicles.
- xlvi. The potential construction impacts associated with the proposed works include severance of communities, driver delay, non-motorised user amenity, fear and intimidation, road safety and accidents, total traffic increase, heavy goods vehicles (HGVs) increase. No operational effects are anticipated as operational traffic levels are expected to be no different from the baseline.

- xlvi. Embedded mitigation measures include establishing appropriate access points to facilitate vehicle movements, designing bell mouth junctions to accord with relevant standards and carrying out swept path analysis for abnormal indivisible loads (AILs) and HGVs. AILs and HGVs would follow designated routes, internal routes would be unitised where practicable to avoid using the existing road network, traffic management would be employed where construction vehicles need to interact with the public road network, a Delivery Management System would apply to control deliveries, construction staff would be directed to take the most direct route to the proposed works and would be encouraged to car share.
- xlix. No significant adverse effects are anticipated at any of the assessed links. Despite HGV traffic levels at some links being expected to increase by more than 30%, none of the links will experience increases substantial enough to result in significant impacts.

Air Quality and Emissions

- I. An area within 10 km of the Glaslyn works site has been considered with respect to published baseline information on existing air quality, however specific Study Areas were used to assess dust emissions generated during construction activities: dust emissions from construction activities include amenity or human health receptors in 250 m of the construction site and 50 m of the construction route; and ecological receptors in 50 m of the site or construction route, up to 250 m from the Glaslyn works site entrances.
- ii. There are 2,575 receptors which are sensitive to dust spoiling i.e. residential properties, car show rooms, long stay car parks, playing fields and farmland, within the Study Area. 2,575 receptors have been identified within the Study Area which will have sensitivity to human health impacts of increased PM₁₀ caused by the construction dust. Receptors include residential properties, schools, parks, shops and bus shelters. In addition, there are four nationally designated sites within the Study Area which are potentially sensitive to the impacts of dust settling either directly or indirectly through increased stresses on plant life. These are the Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites Special Area of Conservation, Glaslyn Site of Special Scientific Interest, Ysbyty Bron y Garth Site of Special Scientific Interest and Tyn-Llan Site of Special Scientific Interest.
- lii. The source of potential Air Quality and Emissions during construction includes construction dust emissions and site plant emissions. Dust emissions are assessed using Institute of Air Quality Management guidelines and considers demolition earthworks, construction activities and trackout, all of which were classed as having a large magnitude. The area surrounding the Glaslyn works site is deemed to have medium to high sensitivity to dust soiling, human health impacts, and nature conservation impacts. The large dust emissions magnitude and the medium to high sensitivity of the area equates to a medium to high impact of dust soiling, human health and nature conservation receptors. The impact of operational and maintenance emissions has been scoped out of this assessment.
- liii. A series of mitigation measures recommended by the Institute of Air Quality Management would be adopted during construction and regular site visits would be conducted to monitor compliance with the CEMP. By applying dust mitigation throughout the Glaslyn works the residual effects from the proposed works are anticipated to be low or negligible and not significant.

Noise and Vibration

- liv. The Study Area has been defined as 300 m from the Glaslyn works for construction noise site and 100 m for construction vibration. Baseline monitoring surveys were undertaken at five locations to establish the ambient noise levels. There are 943 sensitive receptors within the Study Area which were all defined as of medium sensitivity to noise.

- iv. During construction there are seven Noise Generating Activities (NGA) that may result in potential adverse noise and vibration effects: NGA1 – preliminary works; NGA2 – CSEC enabling works; NGA3 – Glaslyn cables installation and decommissioning (open cut cable laying); NGA4 – Glaslyn cables installation and decommissioning (HDD crossings); NGA5 – Garth CSEC removal; NGA6 – land reinstatement and NGA7 – demobilisation. It is predicted that the daytime construction noise levels would be highest during the NGA1, NGA2 and NGA6. During NGA1, major adverse effects have been identified at two receptors and moderate adverse effects at four receptors; during NGA2, moderate adverse effects have been identified at seven receptors; during NGA4, major adverse effects have been identified at three receptors; during NGA6, moderate adverse effects have been identified at 10 receptors; and during NGA7, moderate adverse effects have been identified at two receptors. The remaining receptors at each NGA would, at worst, experience minor adverse effects. Vibratory rollers may generate significant levels of vibration at receptors within 25 m and two receptors are identified within 25 m of a haul road where vibratory rollers may be used. Both receptors may experience a moderate adverse effect. Significant vibration effects are not anticipated at any other receptor.
- lvi. Mitigation measures include Section 61 prior consent, measures to control noise as defined in Annex B of BS 5228-1 and measures to control vibration as defined in Section 8 of BS 5228-2 adopted where reasonably practicable. A Communication Strategy would be produced, and temporary barriers used to screen receptors experiencing significant effects.
- lvii. Given the application of mitigation measures to be secured in the CEMP, proposed works would not result in any significant noise and vibration effects.

Socio-Economics

- lviii. Various Study Areas were used for the Socio-Economics assessment: a 60-minute drive area (Principal Economic Impact Area) which applies to employment generation, skills and training and gross value added; a 30-minute and 60-minute drive area for temporary accommodation services; up to 500 m radius from the Glaslyn works site for PRoW and agricultural land holdings, residential properties, business premises, visitor attractions and development land; and a 1 km radius from the Glaslyn works site for community facilities.
- lix. The baseline outlines the population, economy and local resources in the various Study Areas. The Principal Economic Impact Area had a population of 297,517 in 2021, with 25.3% of the population aged over 65. Employment rates in the Principal Economic Impact Area show a smaller proportion of economically active individuals. Employment by industry is similar to Gwynedd and Wales, the largest industries include human health and social activities; wholesale and retail trade; and repair of motor vehicles and motorcycles. Gwynedd is relatively less deprived on average compared to Wales. Accommodation capacity in a 30-minute and 60-minute drive of the Glaslyn works site is sufficient, although it varies seasonally. There are six PRoW within the Glaslyn works site, four footpaths and two bridleways. NCR 8 partially falls in the Glaslyn works site and the Gwynedd long distance trail coastal path and an informal recreational route fall within 500 m of the Glaslyn works site. There are a further 32 PRoW within 500 m. There are 38 community facility within 1 km; 18 dedicated open spaces, two visitor attractions, 169 business premises and several residential properties within 500 m of the Bryncir works site. There are 14 agricultural land holdings within the Glaslyn works site. There is no development land in 500 m of the Glaslyn works site.
- lx. During construction, the proposed works will support, on average, seven total net jobs per day. Of those, two jobs will be expected to be taken up by residents within the Study Area. Murphy, an engineering and construction company, who will be supplying 100% of the construction workforce aims to have a minimum of 10% of employees being emerging talent

(apprenticeships, graduates and university placement students). There will be a beneficial impact on the local workforce relating to training and skills uplift. The proposed works will generate approximately £560,000 to the national economy, of which approximately £140,000 would likely be in the Study Area. During peak workforce employment and typical seasonal occupancy levels, 100% of the construction workforce could be accommodated within a 30 and 60-minute drive time of the Glaslyn works site. Where the PRowS cross the Glaslyn works site, it will be fenced to create a designated crossing point. To install ducts, there may be a temporary requirement to create a diversion for a short duration. There will be nine receptors which would experience temporary land take to facilitate construction works. There is potential for permanent impacts on agricultural land holdings for the installation of raised link boxes and construction of the Wern CSEC extension and proposed Minffordd CSEC.

- Ixi. No additional mitigation or enhancement measures are required, due to no significant adverse effects associated with Socio-Economics being identified. No likely significant residual effects of the proposed works on Socio-Economics receptors are found.

Climate Change

- Ixii. The Study Area for the greenhouse gas (GHG) assessment includes direct greenhouse gas emissions (arising through works on the Glaslyn works site) and indirect greenhouse gas emissions (occurring outside the Glaslyn works site). The Climate Change Risk Assessment Study Area encompasses the temporary and completed works that make up the proposed works. The In-combination Climate Change Impact Assessment is determined by the other topic assessments.
- Ixiii. The GHG assessment uses the current condition of the Glaslyn works site, which consists of the carbon stock and sources of greenhouse gas emissions as the baseline. Greenhouse gas emissions are reported in line with the life cycle stages (pre-construction, product, construction process and operation). It is estimated the 90% of all emissions from the proposed work will arise from the pre-product, product and construction process stages. Based on a qualitative assessment, the impact of greenhouse gas emissions associated with the proposed works is minor adverse and not significant. No additional mitigation is required.
- Ixiv. The GHG assessment is consistent with the ruling of the UK Supreme Court in the case of *Finch v Surrey County Council*. That ruling requires that planning authorities take account of the indirect as well as the direct environmental effects of a proposed development. The qualitative GHG assessment for the proposed works includes all relevant direct and indirect environmental impacts.
- Ixv. The Climate Change Risk Assessment considers how resilient the proposed works and surrounding environment are to current and projected climate hazards. The climate risks were assessed as moderate, unlikely, or rare. While the event is possible, its occurrence is infrequent, with some evidence suggesting a potential shift from business as usual. The likelihood of the event is estimated to be between 0% and 50%. Fourteen of the 27 initial risk ratings risks were deemed to have a 'significant' impact on the proposed works: 12 occurring in the 2070 – 2099 period, and the remaining two in the 2010 – 2039 and 2040 – 2069 periods.
- Ixvi. Mitigation measures include weather monitoring, flood contingency planning, flood defence measures, vegetation and land management and underground cable protection. Following the implementation of these mitigation measures, the CCRA identified nine significant residual effects across the operational phase of the proposed works.
- Ixvii. Overall, the GHG impact of the proposed works will be minor adverse and not significant. The CCRA identified 11 significant climate risks during the operational phase of the

proposed works. The control measures and embedded adaptations have resulted in seven significant residual climate risks being identified.

Materials and Waste

- lxviii. Two Study Areas were used for the Materials and Waste assessment: a Glaslyn works site Study Area in which waste associated with the proposed works is generated, and an expansive Study Area within which landfills and other waste facilities that manage waste generated by the proposed works are likely to be located.
- lxix. The non-hazardous and inert landfill void capacity for Wales (8.3 million cubic metres (m³) and 1.8 million m³ respectively). Waste will be generated from the following construction activities: decommissioning of the existing cables (redundant cables, waste oil, vegetation clearance, concrete, steel, thermos coupler bays, cable markers and cable bridges), decommissioning of the Garth CSEC (redundant underground services, foundations, earthing and platform granular material) and Minffordd and Wern CSEC construction and cables installation (vegetation clearance, excess construction materials, surplus excavated material, waste drilling fluid and cuttings from HDD work, material packaging, construction worker waste, waste oils from construction plants, aggregates, geotextile, geomembrane, fencing, paints and coatings).
- lxx. The proposed works have been designed as far as possible to avoid and minimise the impacts and effects on Materials and Waste. The following embedded mitigation measures have been implemented: design for reuse and recovery (using materials that already exist on-site), design for materials optimisation (simplifying layout and form to minimise material use) and design for off-site construction (maximising the use of prefabricated structure and components).
- lxxi. There are no significant residual effects associated with construction of the proposed works and an assessment of the operation and decommissioning is scoped out of the assessment on the basis the effects would be of a similar or lower magnitude to those identified for construction.

In-combination Effects

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

Cumulative Effects

- lxxiii. Cumulative effects occur when two or more planned developments impact the same receptor leading to an increase in the effect, and possibly an effect of greater significance. A 2 km buffer from the Glaslyn works site has been implemented to assess the cumulative effects.
- lxxiv. One proposed development was identified for potential cumulative effects. This comprised the erection of eight new flexible business/industrial units (Use class B1, B2, B8) with associated parking and landscaping.
- lxxv. The cumulative effects have been assessed in **Volume 7: The Project and Cumulative Effects**.

1. Introduction

1.1 Introduction

- 1.1.1 Volume 4 (this document) forms part of the Environmental Statement (ES) that accompanies applications by National Grid Electricity Transmission plc (NGET) to construct and operate developments that comprise parts of the Pentir to Trawsfynydd Reinforcement Project (the 'Project').
- 1.1.2 This volume focuses on the Glaslyn Cables. It provides an assessment of likely effects that could arise from the construction, operation and maintenance of this aspect of the Project. A description of the Glaslyn Cables works is provided in **Chapter 2: Glaslyn Cables Works**.

1.2 Structure of the Volume

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

1.3 Figures and Appendices

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

- 1.3.2 The figure numbering system is as follows: Volume number, chapter number then 1, 2, 3 etc. For example, **Figure 4.1.1**.
- 1.3.3 The appendix numbering system is as follows: Volume number, chapter number, then A, B, C etc. For example, **Appendix 4.1.A**. All figures associated with a given appendix will follow the same system, followed by the figure number, for example, a figure to Appendix 1.1.A would be Figure 1.1.A.1, 2, 3 etc.

2. Glaslyn Cables Works

2.1 Introduction

- 2.1.1 This chapter provides a description of the works required to replace the existing 400 kilovolt (kV) and 132 kV cables in the Glaslyn Cables section of the Project (the 'proposed works'). The proposed works include new proposed infrastructure, construction, removing some redundant infrastructure, measures to retain other redundant infrastructure and operation details. The proposed works would take place between the existing Wern cable sealing end compound (CSEC) (SH 543401) and the existing Garth CSEC (SH 595387) (**Figure 4.2.1**), Porthmadog (the 'Glaslyn works site').

2.2 Background

- 2.2.1 When the Central Electricity Generating Board applied to the Ministry of Power, Electricity Division for permission to build and operate the overhead line between Pentir and Trawsfynydd in a series of applications during 1963 and 1964, permission was not granted for the then proposed section of overhead line between the current Wern and Garth CSECs. This section of the electricity line route was installed as underground cables as two circuits; an 'inland' 400 kV circuit (circuit A) and a 'coastal' 132 kV circuit (circuit B). The CSECs at Wern and at Garth connect the underground cables and the overhead lines.

Existing Cables and CSECs

400 kV Cables

- 2.2.2 The 'inland' A circuit of the 4ZC operates at 400 kV between Pentir and Trawsfynydd. The existing cables between Wern and Garth CSECs are installed and operate at 400 kV. There is one cable per phase, meaning that there are three underground cables comprising this circuit. The route of these existing cables, approximately 6 kilometres (km), is shown in **Figure 4.2.2**. The existing 400 kV cables exit the Wern CSEC to the north and immediately turn south-east, running in parallel to the south of the Nant yr Afon-oer. The cables cross beneath the A498 and continue east, intersecting Y Cyt. As the cables approach the A487 Porthmadog Bypass, the cables turn south-east, passing south of the Porthmadog Roundabout, north of Ysgol Eifionydd, and beneath the Welsh Highland Heritage Railway and Ffestiniog Railway and a caravan park off Snowdon Street. Approximately 20 metres (m) east of the caravan park, the cables turn south, intersecting the Cambrian Railway Line before continuing in an east to south-east direction. The cables broadly follow the Cambrian Railway Line, crossing the Afon Glaslyn before reaching the Garth CSEC.
- 2.2.3 The existing 400 kV cables are nearing the end of their operational life and as installed could not operate at the capacity now required for the Pentir-Trawsfynydd circuits. The existing 400 kV cables need replacing with two new cables per phase.

132 kV Cables

- 2.2.4 The 'coastal' B circuit of the 4ZC operates at 132 kV between Trawsfynydd and Tower 4ZC070 south of Bryncir. At Tower 4ZC070, a feed is taken to provide a supply to the 132 kV SP Energy Networks (SPEN) DB route overhead line which feeds electricity into the Llŷn Peninsula.
- 2.2.5 The route of the existing 132 kV underground cables, approximately 5.6 km, is shown on **Figure 4.2.2**. The existing 132 kV cables exit the Wern CSEC to the east and immediately head south-east, running in parallel to the south of the existing 400 kV cables and Nant yr Afon-oer. The cables cross beneath the A498 and continue south-east to Pensyflog, the cables follow Pensyflog and intersects the A4971 High Street. The cables then head east, over Y Cyt, to the north of Cambrian Railway Line. Approximately 215 m east of High Street, the cables turn south, intersecting the Cambrian Railway Line before continuing in an east direction. The existing 132 kV cables broadly follow the Cambrian Railway Line, crossing the route of the existing 400 kV cables 340 m east of Snowdon Street. The 132 kV cables cross the Afon Glaslyn before terminating at the Garth CSEC.
- 2.2.6 The existing 132 kV cables between Wern and Garth CSECs on this circuit cannot be upgraded to operate at 400 kV, nor to meet the capacity now required on the circuit. The existing 132 kV cables with two cables per phase, need replacing by 400 kV cables with two cables per phase.

Wern CSEC

- 2.2.7 Wern CSEC is between Pentrefelin and Porthmadog (SH 543401), north of Wern Manor, and is accessed via a single lane road from the A497. The existing CSEC is approximately 50 m by 23 m and accommodates six 132 kV cable sealing ends, three 132 kV post insulators, three 400 kV post insulators, three unused 400 kV cable sealing ends, a gantry with 132 kV conductors that supports the overhead line downloads from Tower 4ZC044, busbars, pressure tanks, a Lucy Pillar for high voltage cables and earthing infrastructure within security fencing.
- 2.2.8 The compound will be extended to accommodate the new 400 kV double circuit cable connection (two cables per phase).

Garth CSEC

- 2.2.9 The existing cables connect to the 4ZC overhead line at Garth CSEC and the existing overhead line heads east, entering Eryri National Park. Garth CSEC is in Minffordd (SH 595387) and is accessed from Syenite Terrace. The existing CSEC is approximately 50 m by 23 m and accommodates six 132 kV cable sealing ends, three 132 kV post insulators, three 400 kV cable sealing ends, three post insulators, a gantry that supports the overhead line downloads from Tower 4ZC037, busbars, pressure tanks, a Lucy Pillar for high voltage cables, earthing infrastructure and a compound concrete slab within security fencing.
- 2.2.10 The Garth CSEC will become redundant when the Eryri Visual Impact Provision (EVIP) project cables connect to the replacement cables at Minffordd CSEC (described later in this chapter). In the absence of this Project, the EVIP project would include the removal of the tall gantry at Garth CSEC but the CSEC would be retained.

2.3 Proposed Glaslyn Works

- 2.3.1 The Glaslyn works include the installation of replacement 400 kV cables, the Minffordd CSEC, the Tunnel Head House (THH) similar to that consented under the EVIP project, and the extension of the Wern CSEC, as well as the decommissioning of the existing 132 kV and 400 kV cable circuits including the Garth CSEC. The Glaslyn works site, shown on **Figure 4.2.3**, covers an area approximately 106.4 hectares (ha). The land within the Glaslyn works site comprises access roads, turning areas, construction compounds and laydown areas required for the construction and operation of the works.

Proposed Glaslyn Works Site

- 2.3.2 Between the existing Wern and proposed Minffordd CSECs, the Glaslyn works site would comprise approximately 6 km of works of variable widths.
- 2.3.3 The Glaslyn works site comprises undulating land. The Wern CSEC lies at approximately 10 m Above Ordnance Datum (AOD) and moving east the land reaches a low point of 3 m AOD before rising to 5 m at the A498. Continuing east, the land fluctuates between 1 m and 5 m AOD as the replacement cables pass beneath the Porthmadog Roundabout, A487 Porthmadog Bypass, Welsh Highland Heritage Railway, Ffestiniog Railway, north of the Clwb Chwaraeon Madog before turning south and beneath the A487 Porthmadog Bypass again. As the replacement cables pass through the Glaslyn Site of Special Scientific Interest (SSSI), the land rises from 0 m AOD to a peak of 7.5 m AOD immediately west of the Afon Glaslyn. To the east of the Afon Glaslyn, the land gradually increases from 0 m AOD to 3 m AOD at the proposed Minffordd CSEC.
- 2.3.4 The Glaslyn works site is characterised by predominantly rural land uses with scattered woodland. A large proportion of the Glaslyn works site is on agricultural land, which the Agricultural Land Classification (ALC) data identifies as Grade 5 (very poor quality) with small patches of Grade 3a (good to moderate) west of Porthmadog Roundabout and surrounding the proposed Minffordd CSEC (Ref 2.1).
- 2.3.5 The eastern extent of the Glaslyn works site would cross the Glaslyn SSSI, which is designated for its biological interest including floodplain grassland, riverine habitat, vascular plant and breeding bird assemblage and broadleaved woodland, particularly alluvial wet woodland. The Glaslyn works site also intersects part of the Coedydd Derw, a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods, and Bat Sites Special Area of Conservation (SAC) which is designated for a variety of habitats including woodland, heath and rivers, and the lesser horseshoe bat. A very small area of Ysbyty Bron y Garth SSSI is crossed by the existing 400 kV and 132 kV cables and Glaslyn works site, the existing cables would be left in-situ.
- 2.3.6 The Glaslyn works site crosses several Public Rights of Way (PRoW) including the Dolbenmaen No 107, Porthmadog No 6, 8 and 11 footpaths and Porthmadog No 10 and 37 bridleways (Ref 2.2). There are numerous other PRoWs in the wider area. Generally, access will be maintained, with temporary local diversions for short durations during duct installation.
- 2.3.7 The Glaslyn works site intersects National Cycle Route (NCR) Route 8, which runs through the centre of Porthmadog (Ref 2.3). A temporary surfaced track to the west of the current location will be provided during the works.

- 2.3.8 The proposed works are described in the following sections sequentially from Wern CSEC to Minffordd CSEC.

Wern CSEC

- 2.3.9 The existing CSEC would be modified to accommodate 12 replacement cables comprising two cable circuits each containing three phases, with two cables per phase. Works include new foundations and support steelwork, high voltage electrical equipment, a surge arrestor, earth switches and cable sealing ends. This work would require an extension to the existing Wern CSEC, including an extension to the earth mat (a mesh of metallic conductors shallowly buried). Drainage, access and hard standings would also form part of the works. The compound would be extended to the east, increasing the size from approximately 50 m by 23 m to 52 m by 49 m. The existing fence would be removed and 2.4 m high fencing would be reinstalled around the larger footprint (see **Figure 4.2.4**). Some trees would need to be removed to the east of the current CSEC to accommodate the extension.
- 2.3.10 A new permanent access road would be built from the west of the A498, approximately 1.26 km long and 5 m wide. The current access is restricted and would not be able to support the delivery of equipment and plant needed for the works. The access road would cross three ditches via permanent short span beam bridges. The new road would provide access to the CSEC along the eastern boundary via a 6 m wide, manually operated gate. The access road would also pass around the northern boundary of the CSEC, to the west of the CSEC where it splits into two short sections creating a 'hammerhead', allowing for vehicle turning. Four gates would be erected along the access road, one near the entrance from the A498, one after the first ditch crossing and two further gates after the second ditch crossing. The new access road would connect with two existing accesses, 180 m and 280 m east of the extended CSEC, that provide access to the fields north of the Nant yr Afon-oer. A filter trench would run in parallel to the access road from the CSEC to the A498 and would comprise headwalls at ditch crossings and periodic 450 millimetres (mm) inspection chambers.
- 2.3.11 To provide a low voltage electricity supply, SPEN would relocate the existing 11 kV overhead line, which is 25 m east of the existing Wern CSEC, adjacent to the 4ZC overhead line.

Glaslyn Cables

- 2.3.12 The redundant 132 kV cables and 400 kV cables would be removed in part with some sections being left *in situ* due to amenity and ecological sensitivities detailed below and shown on **Figure 4.2.2**.
- 2.3.13 The existing cables use oil-impregnated paper as thermal and electrical insulation and the oil is kept under pressure from tanks installed along the route. Removing redundant cables requires full excavation of the cables in the ground and so is avoided in areas where this could cause damage to sensitive habitats, such as in designated sites, or would cause disturbance to protected species where this can be reasonably avoided. Where existing cables are to be left *in situ*, they will be cut at predetermined locations (low points and joint bays), drained of oil and purged by flushing with nitrogen to extract as much oil as possible before being capped. These cut and capped cables are then housed in monitoring pits. Monitoring pits will be installed at low points and joint bays with sumps to collect any oil that escapes. Periodic visits will be made to remove oil that has collected, initially at six-months' intervals.

- 2.3.14 Where the existing cables are being removed there is a risk of oil leaking from the cables. This risk needs to be managed by the same process of draining and capping the cables, prior to removal from the ground, to minimise the likelihood of leaks during cables removal.
- 2.3.15 The replacement 400 kV cables will be cross-linked polyethylene (XLPE) cables which do not contain oil-impregnated paper or oil. They do not require oil tanks and there is no risk of oil escape during installation, operation or when they are redundant.
- 2.3.16 The lengths of replacement cables that can be installed beneath land depend on the extent of cable that can fit on a drum which can be transported to the installation sites. Each section of cable needs to be 'jointed' to the next. Cable jointing is a carefully controlled work activity which requires very clean conditions to avoid contaminating the cable and risking failure and compromising operation. Cable jointing is carried out in joint bays in which the joints are sealed on completion and then buried. The design has taken cable length, accesses and transportation restrictions into consideration in the placing of joint bays along the route.
- 2.3.17 The cables may have induced currents on their metallic sheaths which can give rise to losses and difficulties during operation. This risk is greatly reduced by making a cross bonding of the cable sheaths, the cables are cross bonded using copper bonding leads joining the differing phases of the cable joints at the joint bay location.
- 2.3.18 The temperature of cables is monitored by thermocouples installed at joint bays. The information is relayed by the fibre optic cable installed with the electricity cables and which connects to the fibre optic carried along the earthwire of the 4ZC overhead line.
- 2.3.19 Link pillars would be installed above ground at each joint bay to allow monitoring of the replacement cables. Due to the flood risk in the area some link pillars would be installed above the existing ground level, by creating a 'mound' approximately 2.9 m AOD, using existing material which has been excavated from the joint bay. The link pillars will be light grey (RAL 7032). On the existing cables these are kiosks which are visible at intervals.
- 2.3.20 The position of the cables at road crossings and at other locations along the route is indicated by occasional cable markers which typically are concrete and approximately 16 centimetres (cm) wide x 7.5 cm deep and 77 cm high with the majority visible above ground. **Plate 2-1** shows a cable marker.
- 2.3.21 Each of the existing cables is marked below ground with warning tape and with cable protection tiles below the tape and above the cable. Any excavation above a cable would disturb first the warning tape and then, below the tape, the solid warning tiles.
- 2.3.22 The replacement cables would be installed in plastic polyvinyl chloride (PVC) ducts which would be pre-installed prior to sections of cables being pulled through between joint bays. To place the PVC ducts, the ground is first excavated to the required dimensions and then cement bound sand (CBS) is installed as duct bedding. The PVC ducts are then installed onto the bedding and connected together in 6 m lengths via push-fit connections. Above the ducts a layer of CBS is installed as 'surround' material.

The plastic marker tiles are then placed above the CBS, with the warning tape above this as the backfill process is completed.



Plate 2-1 – An example concrete marker post

Cable Decommissioning Works

- 2.3.23 The following two sections describe the specific decommissioning works associated with the existing 400 kV and 132 kV cables. Sub-sections have been used which split the cable route according to sections of cable that would be removed and left *in situ* from west to east. Each sub-section describes the proposed works that would be undertaken.
- 2.3.24 All redundant sections of the Glaslyn Cables will be made safe before being left *in situ*. The oil would be drained from the cables and a monitoring pits installed. Monitoring would initially be quarterly, reducing every six months, then yearly. The results of the monitoring will serve to establish the monitoring regime for a period of approximately 10 years.

400 kV Cables

Wern CSEC – Porthmadog Roundabout

- 2.3.25 A 2.6 km section of the existing 400 kV cables between the Wern CSEC and a point 140 m south-east of the Porthmadog Roundabout would be removed (**Figure 4.2.2, pages 1 – 3**). A monitoring pit would be installed at the end of this section. The following works would be required:
- Eighteen cable markers¹ would be removed.
 - Fourteen joint bays² would be decommissioned and removed.
 - Four cable bridges³ that cross four ditches would be decommissioned and removed. Another cable bridge than comprises nine precast beams spanning approximately 14.1 m across the Y Cyt would also be decommissioned and removed The bridge

¹ Cable markers provide a clear, visual indication of the presence of live underground cables.

² A joint bay is an excavated area to allow for joining different sections of cables.

³ A cable bridge is a bridge used to carry electric cables over watercourses.

foundations will be cut 1 m below the surface and left in place to ensure ground stability.

- The existing cables crossing the A498 are inside 12-inch PVC pipes filled with bentonite and encased in concrete below the tarmac. The cables would be cut, oil extracted, and the pipe capped at one of the sides. Then the cables would be pulled out from the other side. The ducts crossing the trench and the concrete mix encasement would be left *in situ* unless there is a benefit from removing them at the time the new corridor section closes the road for construction works.
- Four thermo coupler pits⁴ would be decommissioned and removed.
- Vegetation clearance would be required in multiple areas within this section.

Porthmadog Roundabout – 355 m east of the Afon Glaslyn

2.3.26

A 2.6 km section of the existing 400 kV cables between the point 140 m south-east of the Porthmadog Roundabout and point 355 m east of the Afon Glaslyn will be left *in situ* due to amenity and ecological sensitivities (**Figure 4.2.2, pages 3 – 5**). A monitoring pit would be installed at the end of this section. The following work in this section would be required:

- A 20 m section of existing 400 kV cables which crosses a north-south running watercourse, east of Ysgol Eifionydd would be decommissioned and removed. The cables would be cut and plumbed into the monitoring pits that would be installed on both sides of the watercourse. The cable bridge would be decommissioned and removed.
- Of the 14 joint bays in this section:
 - One would be left *in situ*, the buried link box frame would be removed.
 - One would be decommissioned and replaced with a monitoring pit. There is also a buried oil tank at this location which will be decommissioned and removed.
 - Five would be left *in situ* and the link box would be removed, two would require additional preparation to reduce pollution risk.
 - Five would be left *in situ* and the link box and cable joining fittings would be removed, all would require the installation of a new monitoring pit and additional planning to reduce pollution risk.
 - Two joint bays would be left *in situ* and the cable joining fittings would be removed, both would require additional planning to minimise risk to the Coedydd Derw, a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods, and Bat Sites SAC.
- Two thermo coupler pits would be decommissioned and removed, a third would be decommissioned and left *in situ* due to its location within the Glaslyn SSSI.
- Of the 18 cable markers in this section:
 - Seventeen would be replaced for a decommissioned high voltage cable marker (i.e. a marker showing that there is a decommissioned high voltage cable); seven

⁴ A thermo coupler pit comprises a sensor used for measuring the temperature of the underground cables.

of the existing cable markers would be left *in situ* if easy access cannot be gained.

- One would be left *in situ*.

355 m east of the Afon Glaslyn – 105 m west of the Garth CSEC

- 2.3.27 A 255 m section of existing 400 kV cables beneath agricultural fields 105 m west of the Garth CSEC would be removed (**Figure 4.2.2, page 5**). Within this section one cable marker, two joint bays and two thermo coupler pits would be decommissioned and removed. The decommissioned cables would be cut and plumbed into the monitoring pit at the end of the section.

105 m west of the Garth CSEC – Garth CSEC

- 2.3.28 A 75 m section of the existing 400 kV cables beneath an agricultural field, a block of woodland which forms part of the Ysbyty Bron y Garth SSSI and the Garth CSEC access road, 30 m west of Garth CSEC, would be left *in situ* (**Figure 4.2.2, page 5**). In this section three cable markers would be replaced for decommissioned high voltage cable markers if access could be easily gained; if not the cable markers would be left *in situ*. The decommissioned cables would be cut and plumbed into the monitoring pit at the end of the section.⁶

- 2.3.29 A 60 m section of the existing 400 kV cables between the Garth CSEC access road and the Garth CSEC will be removed (**Figure 4.2.2, page 5**). The following works would be required in this section:

- Two cable markers would be removed and one would be replaced for a decommissioned high voltage cable marker if access could be easily gained; if not the cable marker would be left *in situ*.
- One thermo coupler pit would be decommissioned and removed if access could be easily gained; if not it would be left *in situ*.

132 kV Cables

Wern CSEC – A498

- 2.3.30 A 1.2 km section of existing 132 kV cables between the Wern CSEC and 20 m west of the A498, would be decommissioned and removed (**Figure 4.2.2, pages 1 – 2**). A monitoring pit⁵ would be installed at the end of the section. The following works would be required:

- Six cable markers would be removed.
- One joint bay marker would be removed.
- Three joint bays would be decommissioned and removed.
- Four thermo coupler pits, containing moisture sensitive elements, would be decommissioned and removed.

⁵ A monitoring pit is an underground concrete pit, approximately 1.2 m wide, with a bitumen coating for waterproofing. The monitoring pits would ensure that any remaining oil can be captured in the future without impact to the surrounding environment.

- Where the existing cables cross three ditches, the ducts and cables would be cut, the cables capped on both ends, the cables pulled out of the ducts. The ducts will be grouted and remain *in situ*.
- The existing 132 kV cables crossing the A498 are encased in ducts. The ducts and cables would be cut, the cables capped at both ends, drained and pulled out of the ducts. The ducts will then be grouted. These ducts may remain as redundant infrastructure, providing minimal decommissioning works within the road sections. Considerations for additional enabling works shall be in place in case the ducts sections do not reach the fence or wall sections at each side of the road. In which case, temporary removal and reinstatement works will be required.
- Vegetation clearance would be required to the north, east and south of the Wern CSEC for its extension.

A498 – 210 m north-west of the proposed Minffordd CSEC

2.3.31

A 3.9 km section of the existing 132 kV cables between a point 20 m west of the A498, through Porthmadog, to a point 210 m north-west of the proposed Minffordd CSEC would be left *in situ* (**Figure 4.2.2, pages 2 – 5**). At the end of this section the decommissioned cables would be cut and capped and a monitoring pit would be installed. The following works would be required:

- The stop joints, north of the Rhandiroedd Cae Rawb Allotments, would be cut out and removed.
- Five joint bays would be left *in situ*. A further two joint bays in the Glaslyn SSSI, one of which also fall within in the Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC, would be decommissioned and removed. The existing cables would be cut and capped and a monitoring pit would be installed at the joint bay locations within the Glaslyn SSSI and Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC.
- There are four thermo coupler pits containing moisture sensitive elements in this section. The one north of the Cambrian Railway Line would be decommissioned and left *in situ*; the other three would be decommissioned and removed if access can be gained or left *in situ*.
- At the two ditch crossings, the ducts and cables would be cut, the cables drained and capped at each end. Cables will be pulled out of the ducts at one end. The ducts would then be grouted and left *in situ*.
- A 20 m section of existing cables beneath Y Cyt would be left *in situ* due the presence of Japanese knotweed.
- The crossing beneath the A4971 High Street and the ditch crossing to the east of Ysgol Eifionydd would be left *in situ*.
- Additional monitoring pits would be installed at the following locations where the cable would be cut and capped:
 - Immediately south of Y Cyt, between Maes Gerddi and Pensyflog.
 - 55 m west of Chapel Street.
 - 55 m west of Snowdon Street.

- 20 m east of Snowdon Street.
- 540 m east of Snowdon Street.
- 90 m west of the Afon Glaslyn.
- 70 m east of the Afon Glaslyn.
- Of the 26 cable markers in this section:
 - Four would be removed.
 - Five would be removed and replaced with an abandoned cable marker.
 - Five would be left *in situ*.
 - Thirteen would be removed if easy access can be gained i.e. due to dense vegetation or proximity to the Cambrian Railway Line; if not the markers would be left *in situ*.

210 m north-west of the proposed Minffordd CSEC – 105 m west of the Garth CSEC

2.3.32 A 255 m section of the existing 132 kV cables beneath agricultural fields 105 m west of the Garth CSEC would be removed (**Figure 4.2.2, page 5**). At the end of this section the decommissioned cables would be cut and capped and a monitoring pit would be installed. The following works would be required:

- Three cable markers would be removed.
- One joint bay would be decommissioned and removed.
- One thermo coupler pit containing moisture sensitive elements, would be decommissioned and removed.
- Vegetation clearance would be required in the centre of the section.

105 m west of the Garth CSEC – Garth CSEC access road

2.3.33 An 80 m section of the existing 132 kV cables beneath an agricultural field, a block of woodland which forms part of the Ysbyty Bron y Garth SSSI and the Garth CSEC access road, 30 m west of Garth CSEC, would be left *in situ* (**Figure 4.2.2, page 5**). Three cable markers would be removed if easy access can be gained i.e. due to dense vegetation; if not the markers would be left *in situ*. At the end of this section the decommissioned cables would be cut and capped and monitoring pits would be installed at either end.

Garth CSEC access road – Garth CSEC

2.3.34 A 115 m section of the existing 132 kV cables between the Garth CSEC access road and the Garth CSEC itself would be removed (**Figure 4.2.2, page 5**). A thermo coupler pit would also be decommissioned and removed.

Cable Installation Works

New 400 kV Cables

- 2.3.35 The replacement cables route is illustrated on **Figure 4.2.3**; it is approximately 6 km long and is as direct as possible taking into account environmental and technical constraints. For the most part the cable route is in agricultural fields although it crosses roads, railway and watercourses.
- 2.3.36 The replacement cables would be installed in ducts via either open cut or trenchless technology. The proposed open cut technique would be trenching and backfill, which would be employed for approximately half of the cable route. The proposed trenchless technology would be Horizontal Directional Drill (HDD), would be used in for the other half of the cable route where it crosses roads, railway lines and rivers (**Figure 4.2.4**). Small sections of cable within the joint bays at Wern and Minffordd CSEC's would be installed through direct burial of the cable.
- 2.3.37 The route exits Wern CSEC in a south-easterly direction and runs parallel to the existing cable alignment and Nant yr Afon-oer to the north and the A497 to the south, approximately 1.2 km from the Wern CSEC, until it reaches the A498, crossing the Afon Bontfaen along the route. The route briefly turns north-east, crossing the A498, near Pont Pen-amser.
- 2.3.38 Following the A498 crossing the route continues in a north-easterly direction towards the A487. The route crosses the Y Cyt and then Porthmadog No 6 footpath and NCR 8 between Tremadog and Porthmadog. The route then turns in a south-easterly direction and runs in parallel to the existing cables to the south for approximately 320 m. It then turns north-east to cross the existing cable route and gas main before continuing south-east towards the Porthmadog Roundabout, which connects the A487 Porthmadog Bypass and High Street.
- 2.3.39 After the Porthmadog Roundabout the route continues south-east towards Ysgol Eifionydd and its associated playground. At this location the replacement cables split into two sections, one set of cables turns north-east immediately north of Ysgol Eifionydd, crossing the existing cable route and A487 Porthmadog Bypass. The second set of cables also crosses the existing cable route and A486 Porthmadog Bypass but from a location 110 m east of Ysgol Eifionydd. The two sets of replacement cables cross the route of the gas main and then reconverge at a location immediately south of the Porthmadog No 37 bridleway.
- 2.3.40 The route continues east crossing the Welsh Highland Heritage Railway and Ffestiniog Railway south of the Pen-y-Mount Junction Station, Porthmadog No 11 footpath, Porthmadog No 37 bridleway for a second time and Porthmadog No 10 footpath. The route passes along the northern boundary of Clwb Chawaraeon Madog Sports Club and fields before turning in a south-easterly direction towards the A487 Porthmadog Bypass.
- 2.3.41 The route then crosses the A487 Porthmadog Bypass, Cambrian Railway Line, and the Afon Glaslyn on a curve over a distance of approximately 850 m. This section of the route would intersect the Glaslyn SSSI and Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC. At the end of the curved section of route, the route would continue in a north-east direction before terminating at the new Minffordd CSEC, north-west of Minffordd.

Crossings

2.3.42 **Table 2-1** details some of the features that would be crossed by the cables, their location, the method used to cross the feature, the length of time it would take to cross the feature and any additional information regarding the crossing. **Table 2-1** does not provide an exhaustive list of all crossings.

Table 2-1 – Crossing details

Feature	Location	Method	Approximate duration	Other
18 drainage ditches/watercourses	Various locations.	Open cut and HDD.	12 months	Works will be completed in phases during this time.
PRoW	Porthmadog No 6 footpath and NCR 8.	Open cut.	3 months	A temporary surfaced track to the west of its current location will be provided
Bodawen Playground	Immediately west of the Porthmadog Roundabout.	Open cut.	2 years.	The playground would be closed and reinstated post construction.
School playing field	Ysgol Eifionydd Secondary School, south-east of the Porthmadog Roundabout.	HDD.	2 years	The school playing field would be closed and fenced off from the school grounds; however, the playing field would be reinstated post construction.
Railway	Welsh Highland Heritage Railway and Ffestiniog Railway.	Open cut.	4 months	None
PRoW	Porthmadog No 11 footpath.	Open cut.	2 months	Access would remain along the footpath, with temporary local closures during the duct installation across the path
PRoW	Porthmadog No 37 and No 10 bridleways.	Open cut.	2 months	Access would remain along the footpath, with temporary local closures during the duct installation across the path

Cable Characteristics

2.3.43 **Table 2-2** provides a summary of the physical characteristics of the underground cables.

Table 2-2 – Replacement cable characteristics

Parameter	Description
Cable type	XLPE
Nominal voltage	400 kV
Number of cables	12
Approximate cable diameter	145 mm
Approximate weight of cable	37 kilograms per m
Cable trench width	1.55 m (generally)
Cable burial depth	Up to 1 m for trenching Up to 18 m for HDD depth
Ducts (trenching)	237/250 mm internal diameter/outer diameter, unplasticised PVC (uPVC) ducts
Ducts (HDD)	229/280 mm internal diameter/outer diameter, HDPE ducts

Cable Configuration

Open Cut

2.3.44 In the open cut areas three replacement cable phases would be laid in a single cable trench separated by approximately 500 mm (centre to centre), with varying separation between the trenches containing each cable group along the length of the route due to varying constraints and the cable system design requirements. Where space allows, the total width would be up to 23 m, **Plate 2-2** shows a typical cross section of the trenches, cable groups and phases. The proposed separation distances are required due to the cable system design and are also intended to ensure easier access during maintenance activities, and to provide additional space near joint bays to allow link pillars to be installed.

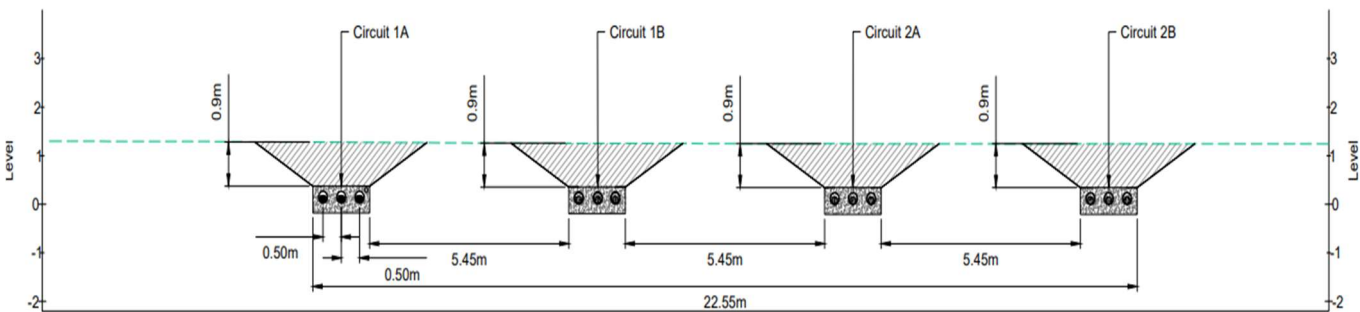


Plate 2-2 – A typical cross section of the cable configuration through trenching

- 2.3.45 The trench would be backfilled with a combination of cement-bound sand and excavated soils and the ground surface reinstated as appropriate. All backfill materials must be carefully compacted around the cables to ensure no air pockets exist.

HDD

- 2.3.46 Where the replacement cables are buried a depth greater than 1 m, for example where cables would be drilled beneath roads, railways and rivers, the cables would be separated and installed in separate ducts. A greater separation is required at increased depth to minimise the effects of heating between the cable phases. Through the HDD sections of the route the spacing would vary from 4 – 10 m, however the spacing would be equal between each duct. A typical cross section of an HDD configuration is shown in **Plate 2-3**.

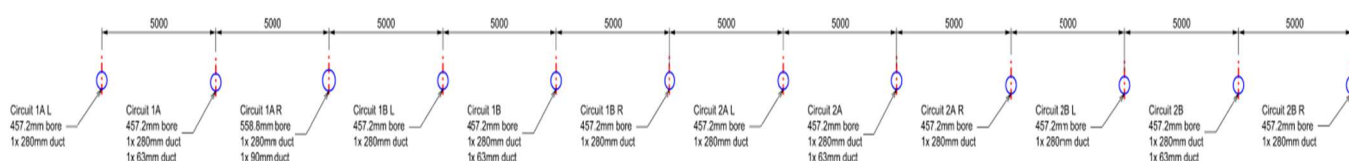


Plate 2-3 – A typical cross section of the cable configuration through HDD

Joint Bays

- 2.3.47 Six joint bays would be required along each phase. Joint bays would be positioned underground in the following locations:
- 250 m west of the A498.
 - 620 m west of Porthmadog Roundabout, bound by the A487 Porthmadog Bypass to the north and Y Cyt to the south.
 - 100 m south-east of Porthmadog Roundabout.
 - 100 m east of the Welsh Heritage Railway Line and Ffestiniog Railway Line.
 - 350 m south-east of the Clwb Chwaraeon Madog grounds, immediately north of the A487 Porthmadog Bypass.
 - 290 m south-west of Minffordd CSEC.

Link Pillars

- 2.3.48 Each joint bay would require a link pillar, which would be 1 m wide, 0.6 m deep and 1.2 m high. The link pillars would be used to monitor and occasionally test the replacement cables. The link pillars need to be accessed for maintenance using an off-road vehicle and do not require an access track.
- 2.3.49 At Wern CSEC, one way gantry mounted link boxes would be installed on each phase to provide solid bonding at one end of the cross-bonded section for each cable group. The cable sheath will be solidly grounded via the link box at the cable sealing end.
- 2.3.50 At Minffordd CSEC, one way gantry mounted link boxes with sheath voltage limiters would be installed on each phase at the single-point bonded cable section.

Garth CSEC

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

Minffordd THH and CSEC

Minffordd THH

- 2.3.52 The Minffordd THH, which forms part of the EVIP project, will be in north Minffordd (SH 593387) and accessed from an unnamed road to the west of the Quarry Lane and Osmond Terrace junction. The Minffordd THH would be 15.18 m x 12.17 m x 6.09 m high and will contain the tunnel shaft. When the EVIP project was commenced, the EVIP cables were proposed to connect to the existing Glaslyn Cables at Garth CSEC described earlier. Planning permission was granted by Gwynedd Council for the Minffordd THH and its access road in December 2020 (Permission Reference C20/0244/08/LL (Ref 2.4)).
- 2.3.53 The Project presents an opportunity to rationalise and reduce the amount of electricity infrastructure in the locale of Minffordd and Garth. The EVIP project envisaged underground cables connecting its Minffordd THH to the existing Garth CSEC where the existing Glaslyn Cables terminate. However, replacing the Glaslyn Cables allows the new cables to connect to the EVIP underground cables close to the Minffordd THH. When compared to a proposal to replicate the existing Glaslyn Cables' connection at Garth CSEC, the following benefits can be secured:
- The replacement Glaslyn Cables can terminate close to Minffordd THH meaning that a shorter overall length of underground cables is required between Wern and the connection with the EVIP underground cables.
 - The EVIP cables can connect to the replacement Glaslyn Cables close to Minffordd THH meaning that a shorter overall length of EVIP underground cables is required from the THH and Garth CSEC becomes redundant and can be removed.
- 2.3.54 The selection of the cables type to be used on each project is made considering factors including operational suitability, availability and cost-effectiveness. The underground cables that are being used for the EVIP project are a different proprietary type to those to be used for the Glaslyn Cables. The two types of cables are fully compatible in electrical performance and characteristics but cannot be connected (jointed) underground in the way described for sections of the replacement Glaslyn Cables. The replacement Glaslyn Cables would connect to the EVIP underground cables via a new CSEC close to the Minffordd THH. This will be part of a single National Grid installation comprising the CSEC and the Minffordd THH.
- 2.3.55 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 with the Planning Application for the Glaslyn Cables works. Adjustments to the previously consented fencing and drainage have also been made to accommodate the Minffordd CSEC adjacent the EVIP Minffordd THH.

- 2.3.56 There are two main design differences between the now proposed Minffordd THH and that previously consented. The first is that the now proposed ground level is 1m higher, which corresponds with the ground level for the proposed Minffordd CSEC to account for changes in flood levels following more recent flood modelling.
- 2.3.57 The second design change is that the tunnel shaft head design shown on the approved drawing PDD-33494-ARC-206 in the Minffordd THH planning application (Ref 2.4) was circular, but now is proposed to be square. The tunnel and shaft comprise permitted development but the tunnel shaft cover and an access to the shaft is shown on the Minffordd THH planning drawings.
- 2.3.58 The initial design was to build a circular shaft at Garth up to 35 m deep from which the tunnel boring machine (TBM) would be launched. In detailed design, after the planning permission for the Minffordd THH, a shallower rectangular launch pit (approximately 13 m deep) was shown to offer advantages. These include improved safety during construction, improved access during operation, a reduction in programme and cost, an improved carbon footprint and the ability for an easier launch for the TBM.
- 2.3.59 This change means that the top of the shaft will be rectangular with a smaller above ground surface cover slab. The previously proposed cover slab was a semi-circle of approximately 15 m diameter. The cover slab now proposed will be 16 m x 3 m with a surface area of approximately 48 metres squared (m²). There will be an access hatch of approximately 2.25 m x 1.0 m.
- 2.3.60 The changes outlined from the proposals when the EVIP project commenced mean that the Glaslyn Cables planning application includes a revised Minffordd EVIP THH. A description of the Minffordd THH and CSE proposals is set out below.
- 2.3.61 Other than the ground level and top of tunnel shaft, the design of the Minffordd THH remains as the previously approved proposal. The design emerged from an appraisal of architectural options including input from stakeholders and from two consultation events in 2018. The design uses the typology of the local village vernacular: scaling down the building mass by using two pitched roofs and enclosing the building in local stone walls.
- 2.3.62 The dimensions of the THH are 15.18 m x 12.17 m x 6.09 m high. The size of the THH is determined by the requirement for mechanical and electrical equipment to ventilate and access the tunnel and tunnel shaft. The layout plan for the Minffordd THH is shown on drawing GLAS-ARUP-71-XX-DR-X-9240. The THH will provide maintenance access to the shafts and tunnel and contain ventilation equipment to regulate the temperature in the tunnel. The Minffordd THH will accommodate:
- Ventilation plant for the tunnel, shaft and dedicated access staircase.
 - Accommodation for operational services such as a control room.
 - Shaft access.
 - Uninterrupted Power Supplies (UPS).
 - Limited Welfare facilities.
- 2.3.63 Small ventilation fans will be installed in the Minffordd THH to provide air to the sealed staircase. These will be used only when the tunnel is accessed for maintenance.
- 2.3.64 The external appearance of the Minffordd THH will be in pre-cast stone with a dressed slate grey finish. At the front of the Minffordd THH (southern elevation) there will be

silver anodised aluminium louvre cladding with painted steel goalpost frame. A slate ashlar wall will surround the Minffordd THH structure. A timber or steel framed roof will be installed with a zinc standing seam roof finish. External doors are to be louvre clad (in accordance with National Grid's security specification) and will match the external finish of the THH.

Minford CSEC

- 2.3.65 The Minffordd CSEC works will include new foundations, cable sealing end structures, high voltage plant and steelworks and earth mat. Elevations of the CSEC are shown on drawing GLAS-ARUP-71-XX-DR-X-9241.

General Layout

- 2.3.66 The general layout is shown at **Figure 4.2.5**.
- 2.3.67 All equipment and structures, including the Minffordd THH, would be contained within a raised compound (for flood protection) with ground level at 4.2 m AOD.
- 2.3.68 The Minffordd site will be accessed via a new permanent access road, from the unnamed road west of the Quarry Lane and Osmond Terrace junction. The access will be approximately 30 m long and oriented in a general north-west direction. Farm style gates installed 6 m back from the access entrance will provide security. The access road to the Minffordd site will be ramped from a low point at its junction with the unnamed road to the established site levels at the automatic gates.
- 2.3.69 The operational area will be fenced by a 2.4 m high steel black/brown colour, palisade fence with an electric fence inside it extending a further 1.0 m above the palisade fence. The access into the operational area will be via automatic gates with access controls for use by authorised National Grid persons. There will be three parking bays close to the access gate into the operational area.
- 2.3.70 Cables troughs will run from the THH to the eastern side of the CSEC to allow installation of the EVIP cables. Cables troughs also will run from inside the western boundary fence to the western side of the CSEC to allow installation of the Glaslyn Cables.

Drainage and Site Surfacing

- 2.3.71 The Minffordd site drainage will use a Sustainable Drainage System (SuDS) to ensure that the rate of discharge into the existing ditch to the south remains at 'greenfield' rates. This will be achieved by using an attenuation pond to the north of the ditch into which the CSEC area, the Minffordd THH and its surrounds will drain.
- 2.3.72 The existing ditch will be temporarily culverted during the Minffordd THH and CSEC construction works. As part of Minffordd site completion, the culvert will be opened, pipework removed and the ditch profile reinstated. The access road will bridge the ditch.
- 2.3.73 There will be a sealed surface to the access road, the road in the Minffordd site and the parking bays. The majority of the Minffordd site surface finish will be loose, free-draining aggregate above drainage collection pipes. A level verge for pedestrian access is required around the perimeter fence and this will be finished in grasscrete to ensure safe access is always available. The levels will be formed to fall at slopes of 1 in 3 to

existing grade beyond the grasscrete path. The slopes will be sown with a low maintenance grass seed.

- 2.3.74 An exception to this sloped finish will be a short length of the eastern boundary where a retaining wall will be installed to allow retention of an existing cathodic protection cabinet serving the nearby Wales and West Utilities gas pipeline.

Landscape

- 2.3.75 The landscape proposals round the Minffordd THH and CSEC installation have sought to integrate the infrastructure into the landscape, similar to the way that nearby buildings are nestled in pockets of tree cover associated with the well-treed Minffordd peninsula.
- 2.3.76 The Minffordd THH and CSEC would be screened using woodland planting, broadleaved scattered trees, scrub planting and neutral grassland. Native tree and shrub planting will comprise an approximate mix of species to complement and enhance the local landscape.

2.4 Construction

General Construction Information

- 2.4.1 The initial pre-construction and mobilisation works would comprise site vegetation clearance, bell mouth construction, compound set up, erection of fencing, pre-construction drainage, topsoil stripping, haul road construction and temporary crossing construction, including culvert installation.
- 2.4.2 During installation, the Contractor would operate under a detailed site-specific Construction Environmental Management Plan (CEMP) (**Volume 8, Appendix 4.2.A: Outline Construction Environmental Management Plan**). It would, as a minimum, implement the mitigation measures identified within this ES. The CEMP would set out a variety of control measures for managing the potential environmental effects of installation works including control and management of noise, dust, surface water runoff, waste and pollution control.

Lighting

- 2.4.3 Works outside of daylight hours are not expected other than at the HDD compound, construction compound, and during cable pulling, jointing, terminating and testing. Where lighting is required it would be temporary task lighting with security and safety lighting required at construction compounds and along worker access routes to work sites. Where night time working in the HDD compound is required, care will be taken to minimise light spill from task lighting in the SSSI. No other designated sites or ancient woodlands will be impacted by night working.

Construction Waste and Soil

- 2.4.4 Subject to geotechnical testing, excavated materials would be re-used on site wherever possible. Where waste materials are to be disposed of off-site this would be at licensed waste disposal facilities in accordance with a Site Waste Management Plan (SWMP).

Elevated Working Areas

- 2.4.5 The joint bay compounds and the HDD compounds between Wern CSEC and Tremadog would have surface levels approximately 20 cm above existing ground level. The HDD compounds between Ysgol Eifionydd and Minffordd CSEC would be raised by a minimum of 3.2 m AOD for flood protection. Material will be sourced from local quarries and when working areas are reinstated will either be returned to the quarry or provided for other projects in the area.

Installation Activities

- 2.4.6 Ducts would be installed through a combination of open cut and trenchless technology described below. The areas where each technique would be used are illustrated on **Figure 4.2.2**.

Open Cut Techniques

Trenching

- 2.4.7 Underground cable construction activities begin with the establishment and preparation of the working area along the replacement cable route and any temporary access tracks required to connect with the local road network. This construction corridor would be approximately 65 m wide to accommodate the cable trenches, haul road, storage areas for stripped topsoil and subsoil from the cable trench excavation, post and wire fencing and inclusion of any temporary and permanent land drainage requirements. The width of the construction corridor would be narrower through constrained areas. A temporary haul road would continue along the length of the underground cables as far as possible so that construction traffic can run on dedicated routes and avoid public highways. The topsoil would be stored along the working area and would be reinstated once the installation of the ducts is complete.
- 2.4.8 The replacement cables would be delivered to the working areas using articulated lorries of approximately 38 tonnes; the cables being wrapped around drums and transported on the trailer. The cables would be pulled off the drums onto rollers within the joint bays and then into the PVC ducts.
- 2.4.9 The trenches would be excavated up to approximately 1.5 m deep and 1.5 m wide in standard formation. Where the ground conditions dictate, trench support will be installed in the trenches to maintain stability. Up to three cables would be laid in each of the trenches at a depth of approximately 1 m on a bed of CBS and then surrounded by an additional layer of CBS, which would be delivered to Glaslyn works site in tipper lorries or by tractor and trailers. Fibre optic cables would be placed in the trenches with the cables to ensure the connection can be monitored from above ground. Above the CBS, protective tiles would be laid to protect the cables from any future excavation works. As an additional warning, marker tape would be placed into each trench to indicate that cables lay beneath.
- 2.4.10 The cable joints would be connected on-site in controlled and clean conditions. The finished joints are protected by a glass fibre box filled with resin or bitumen before being backfilled.

Direct Burial

- 2.4.11 Direct burial would follow the same technique as trenching, however the replacement cables would not be within ducts allowing easier manipulation of the cables at specific locations such as joint bays and terminations (in the CSECs).

Horizontal Directional Drill (HDD)

- 2.4.12 HDD is a steerable trenchless method of installing underground pipes, conduits and cables. HDD can be used to install under major crossings such as rivers and roads. A drill rig drills a hole in an arc along a prescribed path. Entry and exit pits would be dug at either end of the HDD route and within the compound areas using an excavator.
- 2.4.13 The drill rig would be set-up in the drilling compound which would drill to the exit. A reaming tool would then be used to clear spoil and widen the hole. Spoil would be placed in temporary storage areas within the compounds. Having formed the bored holes, polyethylene pipes would be pulled back through the hole by the drilling rig in one continuous length to form permanent ducts within which the replacement cables would be installed.
- 2.4.14 Drill fluid would be required throughout the HDD process. The fluid would be mixed on the surface and delivered to an enclosed storage tank at the drilling compound. The fluid would be pumped into the borehole at high pressure to aid the forming and opening of the hole and to reduce friction when pulling the duct into place.
- 2.4.15 The major component of the drill fluid would return to the surface at the exit point and would be captured and stored in the mud lagoon for re-use or off-site treatment. A mud processing plant, which is a multi-screened cleaning system to separate the cuttings from the fluid, enables the fluid to be re-used. Solids removed from the mud returns would be collected in the holding pit and would be disposed to an approved disposal site.
- 2.4.16 Following the installation the HDD equipment would be removed from Glaslyn works site and the working areas reinstated.

Minffordd THH and CSEC Site

- 2.4.17 Access to the Minffordd THH and CSEC site will be via the established EVIP site works access. The EVIP tunnel works are currently being carried out as permitted development and construction access will be from this site. The permitted development comprises the tunnel and cables installation.

CSECs

- 2.4.18 The replacement cables would be channelled via ducts to a location adjacent to the cable sealing ends. The cable sealing end terminations, line gantries and other electrical equipment, such as earth switches, would be lowered onto their foundations and support structures by a mobile crane equipment. The cable sealing ends require a clean and controlled environment whilst the connections to the cables are being installed. To create a clean environment, a scaffold structure is erected over the installation area and covered with weather-proof material. The electrical installation would be completed with connections of the overhead line to the underground electrical

cables via downloads. Downloads bring the conductors down to join on to where the ends of the underground cables come out of the ground.

Construction Programme

- 2.4.19 The construction works are planned to be carried out over a period of approximately three years from Q2 2026 – Q2 2029 to coordinate with the wider Project. Construction will occur in phases.

	2026			2027			2028				2029			
	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	
Construction														
Commissioning														
Cable Decommissioning														
Demobilisation														

- 2.4.20 In the phases outlined above a number of activities will be carried out including:
- Construction – compounds (main and construction), temporary and permanent accesses, haul roads, HDD compounds, crossings, duct and cable installation, Wern and Minffordd CSECs.
 - Commissioning of the proposed cables.
 - Cable decommissioning – removal of the existing 132 kV and 400 kV cables.
 - Demobilisation - removal of all temporary structures, construction compounds, fencing and equipment, reinstatement of topsoil and landscape.

Construction Access

Haul Roads

- 2.4.21 The Glaslyn works site, temporary access roads, site access points, compound access points, access point bell mouths and turning areas are shown on **Figure 4.2.3**.
- 2.4.22 During construction a range of vehicles would be accessing the Glaslyn works site including excavators, large mobile cranes, large tippers, long and low loader vehicles, abnormal indivisible loads (AILs) for the delivery of large cable drums, cranes (for material handling along with the installation of the crossing points and the removal of the existing cable bridges), concrete lorries, drill rigs, slurry tankers, and pipe welding equipment.
- 2.4.23 On completion of the construction works, the temporary access roads would be removed, any stone walls, wildlife fencing and kerbing would be reinstalled, and any construction road markings or traffic signs would be removed.

Construction Site Layout

Compounds

- 2.4.24 The main construction compound would be to the west of the A498. It would be approximately 1.9 ha and would be split into two sections. The western section would comprise a laydown area and stockpiles; the eastern section would contain office buildings, health and welfare facilities, and vehicle parking. The compound would be secured through open mesh fencing with timber posts and three gate houses, one at each end of the compound and one in the centre. The western section of the compound would be accessed via two 10 m double mesh fence gates, one at the western extent and one in the centre of the compound. Two 7 m double mesh gates would be installed for the eastern section. A one-way system would be implemented where staff would enter via the eastern gate and exit via the central gate.
- 2.4.25 The two gates into the laydown area would be used by Heavy Goods Vehicle (HGVs), articulated lorries and AILs for the delivery of materials and equipment. Both would gain access via a temporary road from the A498.
- 2.4.26 The compound hardstanding would be created by stripping and storing topsoil in various bunds around the extremities of the compound area, before importing and compacting aggregates. The aggregates will be laid on a geotextile membrane and geogrid later for structural support. **Plate 2-4** provides an example of the construction compound set up.



Plate 2-4 – Example Construction Compound Set Up

- 2.4.27 Each section of HDD would require a hardstanding area compound at each end. One compound would be the drilling site and would comprise a launch pit, and the other would be an exit site and would comprise a reception pit. Drilling would commence from the launch pit and would follow a pre-planned path creating a pilot hole, once the drill reaches the reception pit a reamer (a tool used to enlarge the pilot hole) is attached and pulled back through the hole to create the required size for the duct. The duct is then attached to a pulling device in the drilling site and pulled through to the exit site. The works need 13 HDD compounds. An odd number of compounds is required as the cables split into two groups at Ysgol Eifionydd with two separate drilling sites but a shared exit site north of the A487 Porthmadog Bypass (see **Figure 4.2.3**).
- 2.4.28 The drilling compound would accommodate a drilling rig, generator, site office, welfare facilities, plant and equipment storage and a temporary mud storage lagoon. The exit

compound would comprise a generator, excavator, pipe rack and a temporary mud lagoon. An example HDD compound layout is shown on **Plate 2-5**.



Plate 2-5 – Example HDD Compound Layout

Joint Bay Work Areas

2.4.29 Six joint bay working areas are required for the proposed works. These would generally be in or adjacent to the HDD compounds at the following locations (see **Figure 4.2.3**):

- Immediately north of the main construction compound between the compound access roads.
- South of the A487 Porthmadog Bypass and north of Y Cyt.
- South-east of the Porthmadog Roundabout.
- Between the Welsh Highland Railway and Clwb Chwaraeon Madog.
- North of the A487 Porthmadog Bypass and east of the Clwb Chwaraeon Madog.
- South-east of Minffordd CSEC.



Plate 2-6 – A Typical Joint Cable Set Up

2.4.30 The joint bay would be excavated to the required depth and would have battered sides. Excavated material would be stored near the joint bay, to avoid impeding the jointing works or plant or overloading the battered sides of the pit. Heras fencing would be

installed around the excavation. A typical joint bay set up during construction is shown on Error! Reference source not found..

Staffing and Employment

- 2.4.31 The number of staff on the Glaslyn works site will vary according to the construction phase and activities being carried out. The average number of staff on the Glaslyn works site will be seven Full Time Equivalent (FTE) positions, with 28 FTE positions at its peak.

Hours of Working

- 2.4.32 Generally, construction activities would be carried out from Monday to Friday 7am-7pm (including an hour set up and hour shut down) and 8am-6pm on Saturdays. Prior agreement will be required from the Local Planning Authority for any works on a Sunday. During the summer months maximum advantage of day light hours will be used, however during the winter months working hours may be reduced to suit available daylight, for certain activities.
- 2.4.33 24-hour working will be required for critical activities such as HDD, cable pulling, jointing and terminating.

2.5 Operation

- 2.5.1 The CSECs would be unmanned but monitored remotely. Visual checks would be carried out on a monthly inspection visit to the site. Maintenance inspections of the CSECs would take place following any issues identified during inspection, involving electrical isolation of equipment before it is worked on. If the CSEC 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.
- 2.5.2 For the cables left in situ, periodic monitoring will be undertaken. The frequency of these visits will initially be every four months, reducing to six months and then yearly. The results of the monitoring will serve to establish the monitoring regime for a period of approximately 10 years.
- 2.5.3 Access to the Wern CSEC would be gained from the east via a new, permanent access road from the A498.
- 2.5.4 Access to the Minffordd THH and CSEC will be via an unnamed road west of the Quarry Lane and Osmond Terrace junction.
- 2.5.5 Maintenance checks will be carried out at weekly intervals of the THH and would cover elements including the fans, lighting, pumps and gas detection. The THH will not require day to day access and will not be open to the public.

Electric and Magnetic Fields

- 2.5.6 All equipment that generates, distributes or uses electricity produces electric and magnetic fields (EMFs). An EMF report has been produced which sets out the technical specifications of the proposed works and how the works would comply with EMF

exposure guidelines. This report is in **Volume 8, Appendix 7.1.A: Electric and Magnetic Field Assessment**.

3. Assessment of Alternatives

3.1 Introduction

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

3.2 Requirement for the Consideration of Alternatives

- 3.2.1 There is both a policy and legal need to report the main alternatives considered during the development of a project.
- 3.2.2 Part 5, 17 (3)(d) of the Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017 (the ‘2017 TCP EIA Regulations’) (Ref 3.1) and paragraph 4 of The Electricity Works (Environmental Impact Assessment) (England and Wales) Regulations 2017 (Ref 3.2) states that an ES should include:
- 3.2.3 *“a description of the reasonable alternatives studied by the applicant or appellant, which are relevant to the proposed development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the significant effects of the development on the environment.”*

3.3 Design Alternatives

Glaslyn Cable Route

- 3.3.1 In December 2023 an Options Appraisal Report was produced by Arup (see **Volume 8, Appendix 4.3.A: Options Appraisal Report**) which analysed options for the route of the Glaslyn cables within the area. The route was split into five sections:
- Section A – Wern CSEC to A498.
 - Section B – A498 to Trunk Road Island.
 - Section C – Trunk Road Island to Heritage Railways.
 - Section D – Heritage Railway to East of Afon Glaslyn.
 - Section E – East of Aon Glaslyn to Minffordd.
- 3.3.2 Within each section, multiple options were considered as shown on **Plate 3-1** and **Plate 3-2**.

Section A – Wern CSEC to A498

- 3.3.3 Option A1 follows the existing cable alignment south of Nant-yr Afon-oer. Option A2 stays north and runs under the overhead line. Option A3, deviates farther north. Option A1 was preferred as the shortest and least complex route, with fewer crossings and less tree removal. It was also the least expensive and safest option, offering better construction flexibility. Option A2 ranked lower due to its proximity to the overhead line,

impacting several criteria negatively, while Option A3 was less favourable due to its longer cable length and Socio-Economic concerns.



Plate 3-1 – The route options within Section A and B



Plate 3-2 – The route options within Section C, D and E

Section B – A498 to Trunk Road Island

- 3.3.4 Three options were considered in Section B: Option B1, which aligns with the end of Options A2 and A3; and Options B2 and B3, which align with Option A1. Option B1 runs along the northern plots, while B2 and B3 take different routes along the southern plots, joining halfway into Section B. At the eastern end, the cables were confined to a corridor between the highway and high-pressure gas main to the north and the existing 400 kV cables to the south. Option B3 was the preferred route, being the shortest, least disruptive, and least expensive, crossing closer to the existing 400 kV cables. It required fewer tree removals and provided greater flexibility. Option B1 ranked lower due to its separation from the existing cables and the need to cross the 400 kV line twice. Option B2 was similar to B3 but ranked lower due to its impact on the former driving range, despite offering greater flexibility at the A498 highway crossing.

Section C – Trunk Road Island to Heritage Railways

- 3.3.5 Four options were considered in Section C: Option C1, which routed south of the existing 400 kV cables before heading north; Option C2, which followed the A487 and crossed the Welsh Highland Heritage Railway and Ffestiniog Railway; Option C3, which closely followed the 400 kV route; and Option C4, which was similar to Option C2 but crossed the A487 farther east. Option C4 was the preferred route due to its shorter length, better space for equipment, and favourable angle for crossing the high-pressure gas main. It also intersected fewer hedgerows and land parcels and was more cost-effective with minimal disruption. However, upon review of the typical construction swathe and space constraints between the highway and 400 kV cables, it is decided to use the western portion of Option C1 (where the alignment meanders south) to achieve an improved alignment of cables in the approach to the trenchless crossing under the highway. Option C3 was not preferred due to its heritage rail crossing constraints.

Section D – Heritage Railway to East of Afon Glaslyn

- 3.3.6 Nine options were considered for Section D, with routes starting north of Clwb Chwaraeon Madog and continuing toward the A487 and Glaslyn SSSI. Option D1 was the preferred route due to its shorter length, requiring only one HDD and minimal disruption to the Glaslyn SSSI, traffic corridors, and construction. It was also the most cost-effective and safest option, with fewer crossings and a simpler construction process. Options D2, D3, D4, and D9 ranked lower due to the need for two HDDs and open cut construction within the SSSI, and Option D4 and D9 also faced challenges due to pinch points at the Section C connection. Options D5, D6, D7, and D8 were not taken forward due to technical constraints.

Section E – East of Aon Glaslyn to Minffordd

- 3.3.7 Four options were considered in Section E. After crossing the woodlands in the Coedydd Derw, a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods SAC and Glaslyn SSSI region, Option E1 aligns with the end of Options D1, D2, D3, D4 and D9 at the south most of Section E. Similarly, Option E3 aligns with the end of Option D7 and Option E4 aligns with the end of Option D6. In contrast, Option E2 starts from the Afon Glaslyn and aligns with the end of Option D5 and D8, running from west to east between the A487 and Garth Quarry. It meanders south after reaching the Garth Quarry entrance and crosses perpendicular to the A487 and Cambrian Railway Line until it arrives the Minffordd CSEC.
- 3.3.8 Options D5 and D8 were not taken forward and Option E1 was adopted.

Summary

- 3.3.9 A preferred route comprising Options A1, B3, C4, D1 and E1 was taken forward. Details are in **Volume 8, Appendix 4.3.A: Options Appraisal Report**.

A487 Crossing

- 3.3.10 In December 2023 a technical note was produced by Arup (**Volume 8, Appendix 4.3.B: A487 Highway Crossing Options Appraisal**) which summarised how the A487 crossing options were selected. The Glaslyn cable route intersects the A487 in three locations:

- At the Porthmadog Roundabout.
- West of the Welsh Highland Heritage Railway and Ffestiniog Railway.
- North of the Afon Glaslyn.

Porthmadog Roundabout

- 3.3.11 Four options were considered for crossing the Porthmadog Roundabout: Option 1A uses an open cut trench to approach from the west, turning south-east at the Porthmadog Roundabout; Option 1B used HDD to cross the Porthmadog Roundabout; Option 2 avoids the Porthmadog Roundabout, crossing the A487 to the west via HDD; and Option 3 crosses beneath the town of Porthmadog using HDD, south of the Porthmadog Roundabout. Option 1A was preferred for its minimal impact on the high-pressure gas main, structural integrity of nearby infrastructure, and ancient woodland. It also offered flexibility to preserve the stone circle and was expected to be the least expensive option.

West of the Welsh Highland Heritage Railway

- 3.3.12 Four options were considered for crossing the Welsh Highland Heritage Railway and Ffestiniog Railway: Option C1 heads south of the 400 kV cables, crosses the A487, and avoids the Clwb Chwaraeon Madog grounds; Option C2 follows the A487, crossing it early and passing south of the Welsh Highland Heritage Railway and Ffestiniog Railway before intersecting the Clwb Chwaraeon Madog; Option C3 closely follows the existing 400 kV route, crossing the A487 and passing the Welsh Highland Heritage Railway and Ffestiniog Railway; and Option C4, similar to C2, crosses the A487 farther east. Option C4 was preferred for being the second shortest route, crossing the railways at the ideal location to avoid the train station, offering more space for HDD, and being less impactful on trees and hedgerows.

North of the Afon Glaslyn

- 3.3.13 All route options use HDD to cross the A487, with open-cut construction used for other sections of route. Option D1 starts north of Clwb Chwaraeon Madog, passing the sports ground, then crosses the A487, Cambrian Railway Line, and the Glaslyn SSSI in one drive. Option D2 also starts north but deviates south, crossing the A487 and Cambrian Railway Line at a perpendicular angle, taking a longer route through the Glaslyn SSSI. Option D3 is similar to D1 but deviates further south, requiring two HDD drives. Option D5 stays north of the A487 and is not considered for the highway crossing. Option D6 crosses the A487 and Cambrian Railway Line at an acute angle but was not considered due to Network Rail's rejection. Option D7 is technically complex, requiring two HDD crossings near existing infrastructure, so it was not taken forward. Option D8 runs along

the A487 but was dismissed due to traffic management issues and potential congestion. Option D9 starts south, crossing the A487 and Cambrian Railway Line early, and continues through the Glaslyn SSSI. Option D1 was selected as it was technically preferred, had the potential to be completed with a single cable drum with joint bays on either side of the crossing, avoids direct impact on the A487, expected to have the lowest cost and is preferred in terms of health and safety due to the need for less temporary works.

Minffordd CSEC

- 3.3.14 Three options were considered for the Minffordd CSEC. Option 1 was an air insulated switchgear (AIS) CSEC which would be consistent the rest of the network from an operational standpoint as the existing Wern and Garth CSECs are also AIS. Option 2 used a cable-to-cable solution which would enable a seamless connection between the Glaslyn cables and the EVIP cables. Option 3 comprised a gas insulated switchgear or gas insulated busbar (GIB) solution. Option 1 was preferred as it gave good cost-efficiency for the development whilst enabling a cable connection to be achieved; it was consistent with high voltage equipment at the Pentir and Trawsfynydd Substations; allowed for a connection to the EVIP tunnel cables immediately adjacent to the Head house removing the need to install new cables to the existing Garth CSEC and allowed for earth switches to be installed .
- 3.3.15 Details are in **Volume 8, Appendix 4.3.C: Minffordd CSEC Options Appraisal.**

Bodawen Playground

- 3.3.16 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 would need to be removed to facilitate the proposed works.
- 3.3.17 National Grid 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 years). It was agreed that National Grid would reinstate the playground, including seating in addition to play equipment, and appropriate safety surfacing when it reinstates the land.

Alternative Sites

- 3.3.18 In June 2024, two alternative sites were considered to relocate the playground:
- On a parcel of land south-west of the playground, behind residential houses on Maes Gerddi. This land has poor 'overlooking' and a temporary playground would not be in general sight of persons passing, giving security concerns, and would be close to the rear of properties where nuisance could occur from misuse. This potential temporary relocation was not taken forward.
 - On a parcel of land south-west of the playground, south of Pensyflog. Concerns that this would not be accessible for works to install, manage and remove the temporary playground meant it was not taken forward.

Minimising Required Playground Closure

- 3.3.19 National Grid investigated ways of working to minimise the playground closure and to avoid future disturbance including possible further temporary closures. By occupying the playground land for a maximum period of two years, it can install replacement cables

and remove the existing cables entirely from the playground land, avoiding the need for monitoring and possible removal of oil from cables drain pits. This time period allows for reinstatement of the playground with new replacement equipment.

Minffordd THH

3.3.20 Five options were considered for the Minffordd THH (**Plate 3-3**):

- West THH – close to existing infrastructure, required a short stretch of buried cable into the Garth cable sealing end (CSE), existing trees provided screening and the permanent access could utilise the existing access track. However, this option was adjacent to the Glaslyn SSSI, potential for tree loss and conflicted with a high-pressure gas pipeline.
- West THH (Alternative 1) – this option was the furthest away from the local community, had more scope for screening the THH and its compound through additional woodland planting which could tie into the adjacent woodland and the existing access track could potentially be used. However the option conflicted with a high-pressure gas pipeline.
- West THH (Alternative 2) – this option would be built closer for existing settlement than Alternative 1. However, there is less scope to screen this option compared to Alternative 4.
- West THH (Alternative 3) – this option is the closest to the road network and NCR 8, therefore there is greater potential to affect views from people using this route. There is more likelihood that this location would affect views to the east from the local community and users of NCR 8 travelling south.



Plate 3-3 – Minffordd THH options

- West THH (Alternative 4) – this option would keep the built form closer to existing settlement. It is considered that there is more scope to screen this option and tie in mitigation proposals with the existing pattern of land cover and built form.

- 3.3.21 West THH (Alternative 4) was considered a favourable location due to its potential ability to screen and its relationship of new build form with the existing settlement pattern. West THH and West THH (Alternative 1) were both rejected based on the proximity of the high-pressure gas pipeline and buried high voltage cables. Although West THH (Alternative 2) was similar to Alternative 4, it was in a less favourable location, was less able to provide screening and would create a build form closer to existing settlement. West THH (Alternative 3) was rejected as there was more potential for impacts on visual amenity.

4. Landscape and Visual Amenity

4.1 Introduction

- 4.1.1 This chapter presents an assessment of the likely Landscape and Visual Amenity effects that could arise from the construction, operation and maintenance of the proposed works at Glaslyn as described in **Chapter 2: Glaslyn Cables Works**.
- 4.1.2 This chapter describes the baseline conditions currently existing within the Study Area (as defined in **Section 4.3**), the scope of the assessment, the potential effects, the mitigation measures required to prevent, reduce or offset any significant negative effects, and the likely residual effects after these mitigation measures have been adopted.
- 4.1.3 This chapter is supported by figures and appendices as listed below:
- **Figure 4.4.1:** Landscape and Visual Impact Assessment Study Area.
 - **Figure 4.4.2:** National Landscape and National Seascape Character Areas.
 - **Figure 4.4.3:** Gwynedd Local Landscape Character Areas.
 - **Figure 4.4.4:** Eryri National Park Local Landscape and Seascape Character Areas.
 - **Figure 4.4.5:** LANDMAP Visual Sensory Landscape Character Areas.
 - **Figure 4.4.6:** Landscape Relevant Statutory Designations and Recreational Routes.
 - **Figure 4.4.7:** Landscape Relevant Non-Statutory Designations.
 - **Figure 4.4.8:** Zone of Theoretical Visibility (Wern).
 - **Figure 4.4.9:** Zone of Theoretical Visibility (Minffordd).
 - **Figure 4.4.10:** Zone of Theoretical Visibility (Glaslyn works site)
 - **Figure 4.4.11:** Representative Viewpoint and Visual Receptor Locations.
 - **Figure 4.4.12:** Baseline Photography.
 - **Volume 8, Appendix 1.1.A: Legislation, Policy and Guidance.**
 - **Volume 8, Appendix 1.4.A: Topic Assessment Methodology.**
 - **Volume 8, Appendix 4.4.A: Landscape Character Assessment Tables.**
 - **Volume 8, Appendix 4.4.B: Visual Assessment Tables.**
 - **Volume 8, Appendix 4.4.C: Landscape and Ecological Management Plan.**
- 4.1.4 Other chapters that are useful to review in association with this chapter are:
- **Chapter 5: Ecology and Nature Conservation.**
 - **Chapter 6: Historic Environment.**

4.2 Legislation and Planning Policy

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

Legislation

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

- European Landscape Convention (Ref 4.1).
- Environment Act 2021 (Ref 4.2).
- Wildlife and Countryside Act 1981 (Ref 4.3).

National Policy

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

- Future Wales: The National Plan 2040 (Ref 4.4).
- Planning Policy Wales (PPW) – Edition 12 (Ref 4.5).
- Welsh National Marine Plan (Ref 4.6)
- Technical Advice Notes (TAN):
 - TAN 5: Nature conservation and planning (Ref 4.7).
 - TAN 6: Planning for sustainable rural and communities (Ref 4.8).
 - TAN 12: Design (Ref 4.9).

Regional Policy

- 4.2.4 The following regional policy is relevant to Landscape and Visual Amenity:

- Strategic Development – North Wales (Ref 4.10).

Local Policy

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

- Anglesey and Gwynedd Joint Local Development Plan 2011 – 2026 (Ref 4.11).
- Gwynedd Council Supplementary Planning Guidance ‘Landscape Character’ (Ref 4.12).
- Eryri Local Development Plan 2016 – 2031 (Ref 4.13).
- Snowdonia National Park Authority Supplementary Planning Guidance - Landscapes and Seascapes of Eryri (Ref 4.14).
- Snowdonia National Park Authority Supplementary Planning Guidance – Landscape Sensitivity and Capacity Assessment (Ref 4.15).
- The Eryri National Park Partnership Plan 2020 (Ref 4.16).

4.3 Study Area

- 4.3.1 Guidelines for Landscape and Visual Impact Assessment (GLVIA3) Third Edition (Ref 4.17) suggest that the Study Area should be proportionate to the proposed works and may include refinement by professional judgement. GLVIA3 (Ref 4.17) recommends *“The level of detail provided should be that which is reasonably required to assess the likely significant effects”* (paragraph 3.16).
- 4.3.2 GLVIA3 (Ref 4.17) also states that *“The Study Area should include the site itself and the full extent of the wider landscape around it which the proposed development may influence in a significant manner”*.
- 4.3.3 In the case of the proposed works, the Study Area has been defined by a combination of the Zone of Theoretical Visibility (ZTV), (see **Section 4.5.56**), on-site appraisal and professional judgement.
- 4.3.4 The Study Area encompasses land within a 3 km radius of the Glaslyn works site (see **Figure 4.4.1**). Beyond this distance it is anticipated that the proposed works would be unlikely to give rise to significant landscape or visual effects.

4.4 Assumptions and Limitations

- 4.4.1 ZTV maps have been used as a tool to inform the assessments. ZTVs present theoretical visibility of the proposed works based largely on a bare earth topographical model and although areas of woodland and buildings have been included, the ZTV tends to overstate actual visibility.
- 4.4.2 The visual assessment is based on a series of representative viewpoints related to key receptor groups. The on-site evaluation of magnitude of impact and significance of effects has been carried out from the nearest publicly accessible location, and assumptions as to the orientation of the main views from receptor locations have been made. For all locations the evaluation is based on an assumed worst-case location within each receptor group and the significance of effects on individual receptors may differ locally from that stated.
- 4.4.3 The assessment of potential effects on receptors at these locations is made based on a worst-case approach of a clear bright day in winter as per best practice and to be consistent with the approach for other receptors in this assessment. The assessment of residual effects on these and all other receptors is based on summer at year 15 of operation. This approach is consistent with best practice and allows proposed mitigation planting to be taken into consideration in the assessment of long-term residual impacts.

4.5 Baseline

- 4.5.1 The following section provides a baseline description of the existing conditions of each of the landscape and visual receptors identified within the Study Area.

Landscape Character Overview

- 4.5.2 Landscape character is a composite of physical, cultural, perceptual and aesthetic elements. Landform, hydrology, vegetation, land cover, land use pattern, cultural and historic features and associations combine to create a common ‘sense of place’ and identity which can be used to categorise the landscape into definable types and areas.

The level of detail and size of the types and areas can be varied to reflect the scale of definition required. It can be applied at a national, regional, and local level.

- 4.5.3 The landscape baseline across the Study Area is summarised below and includes descriptions under a series of headings, based upon features and elements within the landscape. It also details the combination of elements, which make a particular contribution to distinctive character and includes a summary of published landscape character assessment work at the national, county, and local levels. These are used by local planning authorities as part of their planning policy evidence base and often provide specific guidance or recommendations on managing landscape change.
- 4.5.4 GLVIA3 (Ref 4.17) indicates that broad-scale character assessments, such as those produced at the national level, can be used to set the scene and indicate the key characteristics that may be apparent in the Study Area. It also suggests that local authority assessments provide more detail and that these can be mapped to show how the proposed works relates to them.

Landform and Hydrology

- 4.5.5 The landform of the Study Area varies from a low-lying estuary hinterland at approximately 0 – 10 m AOD to the contrasting steeply rising uplands of the Llŷn peninsula, and the mountains of Snowdonia, which reach approximately 1,085 m AOD.
- 4.5.6 The landform of the Glaslyn works site is largely flat and low-lying with the two CSECs lying at either end and the route corridor passing through the broad, flat valley floor of the Glaslyn Estuary at approximately 0 – 10 m AOD.
- 4.5.7 The Glaslyn estuary is a dominant and dynamic hydrological feature within the Study Area.

Settlement and Vegetation Patterns

- 4.5.8 Settlement within the Study Area comprises the town of Porthmadog and villages generally in lower lying areas and villages and caravan sites along the coast. On higher land, settlements are limited to scattered farms and individual properties.
- 4.5.9 The Glaslyn works site is between the settlements of Penmorfa in the west and Minffordd in the east. The Wern CSEC is south-west of isolated dwellings and to the south of Penmorfa. The route corridor passes to the south of the larger settlements of Tremadog, and to the north of Porthmadog. The Minffordd CSEC and THH site is north-west of Minffordd and to the west of Penrhyndeudraeth. The Garth CSEC is west of Penrhyndeudraeth and to the south of the A487.
- 4.5.10 The landscape of the Glaslyn works site is largely rural comprising a mixture of open grazing marsh and contained wetland pasture in small rectilinear field patterns divided by low hedgerows. Linear woodland belts are present on the steeply rising upland areas. This includes small woodland blocks around both existing CSECs at Wern and Garth. On higher ground there is limited tree cover, with largely open areas of grassland and low scrub on mountain summits and ridges with boundaries marked by stone walls.

Public Rights of Way and Access

- 4.5.11 There are numerous PRow in the Study Area linking settlements and providing recreational routes (see **Figure 4.4.6**). The Study Area includes some common land and open access land in Eryri National Park, but none is in the Glaslyn works site.

- 4.5.12 There are six PRoW in the Glaslyn works site. Porthmadog No 10 and No 11 pass through the Glaslyn works site to the north-east of Porthmadog. Porthmadog No 37 connects into Porthmadog No 10. Porthmadog No 6 and No 8 pass through the Glaslyn works site to the north-west of Porthmadog. PRoW Dolbenmaen No. 107 lies to the west of the Wern CSEC. The nearest PRoW to the existing Garth CSEC is Penrhyndeudraeth No 34 which is approximately 240 m to the south – south-east.
- 4.5.13 The Wales Coast Path passes through the southern part of the Study Area approximately 250 m from the route corridor at its closest point. NCR 8 Lôn Las Cymru, NCR 8 runs in sections down the whole length of Wales and passes through the Glaslyn works site near Porthmadog.

National Landscape Character

- 4.5.14 The Glaslyn cables, proposed Minffordd CSEC and THH, and the Wern CSEC sites lie within the National Landscape Character Area (NLCA) 05 Tremadog Bay (Ref 4.18) (see **Figure 4.4.2**) and exhibit some of the key characteristics of the NLCA as set out below:
- *“a lowland coastal region of exceptional interest and scenic beauty”.*
 - The NLCA *“forms the land between the sea and the mountains”.*
 - *“Hemmed in by steeply rising uplands of both Llŷn and Snowdonia”.*
 - Areas of *“Lowland pastoral and hill sheep grazing”* to the west where there is a *“more extensive lowland hinterland”.*
 - *“The fantasy Italianate village of Portmerion”* is a significant tourist destination near Minffordd.
- 4.5.15 A small part of the outer extents of the Study Area lies within NLCA 06 Eryri (Ref 4.19). The NLCA is a *“sublime, picturesque, iconic visual and sensory landscape of great drama”*. The rural upland areas include *“numerous high ridges and peaks offer wider ranging panoramas across much of north-west Wales”*. Equally, the *“directly fronting open sea”* location *“provide “an iconic and contrasting image”*.

National Seascape Character

- 4.5.16 A small part of the outer extents of the Study Area lies within National Seascape Character Area (NSCA) 14 Tremadog Bay and Dwyrdd Estuary (Ref 4.20) (see **Figure 4.4.2**). The NSCA is a *“relatively enclosed MCA with views of the Llŷn AONB (now referred to as National Landscape) to the north and the Gwynedd coastline (including the rising mountains of Snowdonia National Park) to the east”*. As a *“sweeping, shallow bay with wide sandy beaches”* recreational activities and tourism are important.
- 4.5.17 The proposed works would not have significant effects on seascape character at the NSCA scale and have not been assessed as part of this Landscape and Visual Amenity assessment.

Local Landscape Character – Gwynedd Council

- 4.5.18 At the Unitary authority level, the Glaslyn works site and Study Area covers the Landscape Character Area (LCA) LCA 09 Porthmadog. A smaller part of the eastern extents of the Study Area lies within LCA 10 Central Llŷn. Both LCAs are defined in the Gwynedd Landscape Strategy Update 2012 (Ref 4.21). These are shown on **Figure**

4.4.3. The Gwynedd Landscape Strategy (Ref 4.21) was developed using the Countryside Council for Wales LANDMAP methodology, refer to **Figure 4.4.5**.

4.5.19 LCA 9 Porthmadog is characterised by:

- *“The area directly abuts Snowdonia National Park and offers spectacular views of the mountain core”.*
- *Consider the “area as a ‘buffer zone’ to the National Park, and ensure all development proposals address this relationship”.*
- *The “flat, open character” around the Glaslyn estuary is visually prominent requiring “visual impacts are minimised by careful consideration of location and views from the wider landscape”.*

4.5.20 LCA 10 Central Llyn is characterised by:

- *“Generally homogenous area interspersed by prominent hills”.*
- *“Essentially agricultural in nature”.*
- *“forms an important buffer zone between the Llŷn Area of Outstanding Natural Beauty to the west and Snowdonia National Park to the east.”.*
- *“Views into and out from the area from the two protected landscapes are therefore very important”.*

Local Landscape and Seascape Character – Snowdonia National Park Authority

4.5.21 Seascape Character Area (SCA) and LCA as defined in the Snowdonia National Park Supplementary Planning Guidance 7 – Landscape and Seascapes of Eryri (Ref 4.14) consider the setting of the National Park. These are shown on **Figure 4.4.4**.

4.5.22 Some of the SCA and LCA areas overlap. They will be assessed individually as they form part of the setting of the National Park, but their significance has not been double counted.

4.5.23 The Glaslyn cables, Wern CSEC and the majority of the Study Area is incorporated into SCA 20 Porthmadog and Glaslyn Estuary.

4.5.24 SCA 20 Porthmadog and Glaslyn Estuary is characterised by:

- *“A broad, flat valley floor landform”.*
- *“Land use almost entirely grazing marsh”.*
- *“A large scale landscape, with views framed by surrounding hills, creating a sense of enclosure”.*
- *“a relatively inaccessible landscape with a sense of remoteness and tranquillity”.*
- *“views from surrounding hills, the visual and physical relationship between this SCA and the sea can be appreciated”.*

4.5.25 A smaller part of the Glaslyn cables, Minffordd CSEC and THH, and eastern extents of the Study Area lies within LCA 10 Morfa Harlech and SCA 21 Dwyrdd Estuary and Morfa Harlech.

4.5.26 SCA 21 Dwyrdd Estuary and Morfa Harlech is characterised by:

- *“Predominantly low-lying landform, comprising the broad estuary and its associated marshes and dunes”.*
- *“Views inland are picturesque, with attractive compositions of valley floor and surrounding hills”.*
- *“The SCA is also an important feature in views from the surrounding hills, where it appears in its coastal context”.*

4.5.27 LCA 10 Morfa Harlech is characterised by:

- *“Low-lying coastal landscape”.*
- *“Landscape dominated by the expanse of the Dwyryd Estuary”.*
- *“Extensive views across the broad open dunes and estuary of the Afon Glaslyn, backed by the mountains of the Snowdonia core and the distinctive outline of the Llŷn Peninsula”.*

4.5.28 Part of the south-western extents of the Study Area is in SCA 19 Criccieth to Mochhras.

4.5.29 SCA 19 Criccieth to Mochhras is characterised by:

- *“Open and large scale views of wide beaches and Tremadog bay”.*
- *“Sweeping bay focuses views along it”.*
- *“landscape setting creates a dramatic and relatively wild backdrop to views from the coast and from the sea”.*

4.5.30 Part of the Study Area to the north of the Wern CSEC and area adjacent to the Glaslyn works site is in LCA 04 Moel Hebog Uplands.

4.5.31 LCA 04 Moel Hebog Uplands is characterised by:

- *“Classic U-shaped valleys carving through the mountains”.*
- *“Unenclosed mountain summits surrounded by large-scale regular enclosures of ffridd”.*
- *“Rough common land grazing by sheep on the mountains, with semi-improved pastures and rough grassland fields on lower slopes”.*
- *“Valleys defined by a small-scale historic field pattern”.*

4.5.32 A small part of the Study Area to the north-east of the proposed Minffordd CSEC and THH and area adjacent to the Glaslyn works site is in LCA 08 Vale of Ffestiniog.

4.5.33 LCA 08 Vale of Ffestiniog is characterised by:

- *“Complex topography defined by the broad tidal form of the Afon Dwyryd and its tributaries”.*
- *“Steep valley sides cloaked in woodland”.*
- *“A strongly rural landscape framed by scenic views of the surrounding mountains”.*

4.5.34 A very small part of the Study Area to the east of the proposed Minffordd CSEC and THH, and adjacent Glaslyn works site is in LCA 12 Ardudwy Coastal Hinterland.

4.5.35 LCA 12 Ardudwy Coastal Hinterland is characterised by:

- *“A rolling landscape of seaward facing hills”.*

- “Extensive broadleaved woodland cover clothing valley sides”.

4.5.36 No part of the Glaslyn cables, the Wern CSEC or Minffordd CSEC and THH are in the boundary of the Eryri National Park.

Landscape Designations

Statutory Designations

- 4.5.37 The Glaslyn works site is not covered by any statutory landscape designations. Part of the Study Area is in the Eryri National Park described in more detail below. The boundary to the Eryri National Park is approximately 300 m east of the Glaslyn works site at its closest point and is shown on **Figure 4.4.6**.
- 4.5.38 The Eryri National Park covers a total of 823 square miles with 1,497 miles of routes to explore and is Wales’s largest National Park. The Snowdonia National Park Authority published Cynllun Eryri The Snowdonia National Park Partnership Plan 2020 (the Plan), a “partnership plan to identify and protect Eryri’s special qualities for the future” in September 2020 (Ref 4.16).
- 4.5.39 The Plan (Ref 4.16) sets out an approach to conserve and enhance the National Park’s natural beauty, wildlife and cultural heritage which is a statutory function of National Parks. The plan seeks to promote opportunities for the understanding and enjoyment of the special qualities of National Parks by the public.
- 4.5.40 The Plan (Ref 4.16) also sets out the special qualities of Eryri National Park. Those focused on landscape and visual elements are listed in **Table 4-1** below along with a summary description.

Table 4-1 – Special qualities of the Eryri National Park

Special quality	Summary
1. Diverse Landscapes	The special quality description in the plan sets out the “diverse mix of landscapes many of which are highly valued for their natural beauty and tranquillity” noting how this historically has, and continues to “inspire artists, scientists, residents and visitors”.
5. Tranquillity & Solitude	The special quality description in the plan sets out the perceptual qualities of “silence, tranquillity and solitude” afforded by the landscape that promote “vital aspects of health, well-being and personal reflection”.
6. Extensive Recreational Opportunities	The special quality description in the plan sets out the “Extensive opportunities for recreation, leisure and learning for people of all ages and abilities.” The plan also states how it will make activities in Eryri more accessible.
7. Historic Landscapes	The special quality description in the plan reinforces the cultural and perceptual benefits the National Park brings by connecting visitors to their historic identity and continuing to create a sense of place through our ongoing relationship and continued engagement with the landscape of the National Park.

4.5.41 There are a number of ecological and cultural heritage designations in the Glaslyn works site and Study Area. These contribute to landscape characteristics. These

include areas of ancient woodland at Pensyflog, and the Morfa Harlech SSSI within the Glaslyn works site and Study Area. There are numerous listed buildings within the Glaslyn works site and Study Area including the Grade II listed Bryn-y-wern approximately 125 m from the existing Wern CSEC, and the Grade II listed Rhos House approximately 60 m from the proposed Minffordd CSEC. Further details are in **Chapter 5: Ecology and Nature Conservation** and **Chapter 6: Historic Environment**.

Non-statutory Designations

- 4.5.42 There are non-statutory landscape designations covering the Glaslyn works site and Study Area. These include Special Landscape Area (SLA), Historic Landscape, Registered Historic Parks and Gardens, and a World Heritage site designation. These are shown on **Figure 4.4.7**.
- 4.5.43 PPW – Edition 12 (Ref 4.5) defines SLAs as *“non-statutory designations that define local areas of high landscape importance, which may be unique, exceptional or distinctive to the area. Planning authorities should apply these designations where there is good reason to believe that normal planning policies cannot provide the necessary protection.”*
- 4.5.44 There are two SLAs south of the Study Area, SLA 02: Porthmadog and Tremadog Bay and SLA 03: Glaslyn & Dwyryd Estuary. These SLAs are defined in the Review of Special Landscape Areas in Gwynedd and Anglesey commissioned by the Anglesey and Gwynedd Joint Planning Policy Unit (Ref 4.22).
- 4.5.45 SLA 02: Porthmadog and Tremadog Bay is considered *“a distinctive landscape which forms a transition from the mountains of Snowdonia to the coast”*. Its special qualities include:
- *“The rural and tranquil character of the landscape”.*
 - *“The long, sweeping views across the Afon Glaslyn estuary, Traeth Bach, the coast and the mountains of Snowdonia”.*
 - *“The landscape’s important role as a setting to Snowdonia National Park”.*
- 4.5.46 SLA 03: Glaslyn & Dwyryd Estuary Landscapes is considered *“a culturally and visually distinctive landscape”*. Its special qualities include:
- *“The peaceful, rural and generally open character of the landscape”.*
 - *“The strong cultural and visual relationship between the SLA and the National Park”.*
 - *“The historic and cultural significance of the landscape, entirely within the Aberglaslyn Landscape of Outstanding Historic Interest in Wales”.*
- 4.5.47 Cadw has compiled a register of landscapes of historic interest in Wales. There are two historic landscapes south-east of the Study Area.
- 4.5.48 HLW (Gw) 7: Aberglaslyn (Ref 4.23) comprises *“the former tidal estuary at the mouth of the River Glaslyn which flows south from Snowdonia into Tremadog Bay. The area represents probably one of the most ambitious 19th century land reclamation schemes, certainly in Wales, if not in Britain”*.
- 4.5.49 HLW (Gw) 2 Ardudwy (Ref 4.24) *“has retained a natural integrity as a territory, probably since prehistoric times, because topography has strongly constrained both access and settlement in the area”*.

- 4.5.50 There are three Registered Historic Parks and Gardens within the Study Area. Cadw considers registration to help *“manage change and protect the park or garden, its setting and its features from unsympathetic works that could damage its special interest”*. The existing Wern CSEC is in the Wern Registered Historic Park and Garden (Ref 4.25). The record notes significant views *“to the east viewed over a ha-ha, are two circular copses which were planted to enhance the outlook by breaking up the ridge of hills forming the distant view”*. Viewpoint 1 south of the existing Wern CSEC illustrates the view looking parallel to the Wern CSEC across part of the Glaslyn cables.
- 4.5.51 The Registered Historic Park and Garden at Tan-yr-Allt (Ref 4.26) is north of the Glaslyn works site with a viewpoint *“Situated on a steep hillside looking south over Porthmadog and Traeth Mawr, the site is afforded views to Harlech and beyond”*.
- 4.5.52 The Registered Historic Park and Garden at Portmeirion (Ref 4.27), approximately 1.3 km south of the existing Garth CSEC, *“represents the well-preserved garden designed in and around the village of Portmeirion”*. Views from this Registered Historic Park and Garden are focused away from the Glaslyn works site.
- 4.5.53 Part of the Slate Landscape of North West Wales - Ffestiniog: its Slate mines and Quarries, 'city of slates' and Railway to Porthmadog is a World Heritage Site of international importance to cultural or national heritage lies to the south of the Study Area (Ref 4.28). Cadw describe how *“Six areas together represent an exceptional example of an industrial landscape which was profoundly shaped by quarrying and mining slate, and transporting it for national and international markets”*.

Visual Amenity Overview

- 4.5.54 Visual impacts are defined in GLVIA3 (Ref 4.17) as *“impacts on specific views and on the general visual amenity experienced by people”*. Visual receptors are people with the potential for views of either the construction or operation of the proposed works.
- 4.5.55 The identification of visual receptors is a two-staged process, beginning with interrogation of baseline mapping and the preliminary ZTVs and then moving onto fieldwork to refine and ascertain the actual inter-visibility between the proposed works and potential visual receptors.

Zone of Theoretical Visibility Analysis

- 4.5.56 A computer generated ZTV was run for the Glaslyn works site generated using the 5 m Digital Terrain Model from Ordnance Survey (OS) MasterMap. The ZTV incorporates screening from vegetation based on woodland from the National Forestry Inventory using an assumed height of 10 m and screening from existing buildings from OS Open Map Local with an assumed height of 7.5 m. The ZTV is based upon a grid of points within the Wern and Minffordd CSEC boundaries at a height of 9 m AOD, the site at a height of 16 m Above Ground Level (AGL) (for scaffolding structures used during the construction phase of the proposed works), with an observer eye height of 1.6 m. All heights are above ground level. The ZTVs generated for the Study Area are shown on **Figure 4.4.8** and **Figure 4.4.9**.
- 4.5.57 The ZTV indicates areas from where it may be possible to view part of or the entire proposed works, however, the use of the ZTV needs to be qualified by the following considerations:
- The ZTV is limited by the detail of the Digital Terrain Model data used and does not take account of local topographic variations.

- Some areas of theoretical visibility may comprise woodland (not accounted for in the National Forestry Inventory) or agricultural land, where there is effectively no public access and the likelihood of views being experienced is consequently low.
- The ZTV does not take account of the likely orientation of a viewer, such as the direction of travel and there is no allowance for reduction of visibility with distance, weather, or light.

4.5.58 These limitations mean that the ZTV tends to overestimate the extent of visibility, both in terms of the areas from which the proposed works are visible and the extent of the particular site which is visible. Consequently, the ZTV should be considered as a tool to identify areas of potential visibility for further targeted survey and assessment, and not a measure of the visual effect.

4.5.59 The receptors identified have been selected on the basis that they fall within the ZTV **Figure 4.4.8** and **Figure 4.4.9**. As illustrated by the ZTV, the pattern of theoretical visibility is mostly concentrated around the flat lowland areas of farmland and the Afon Glaslyn estuary and Vale of Ffestiniog. There are areas of visibility from elevated upland areas from within the Eryri National Park.

Representative Viewpoints

4.5.60 A series of ten representative viewpoint locations were selected to form the basis of the visual assessment. These have been identified to provide a representative cross section of visual receptors within the Study Area and were selected in consultation with relevant local authorities as described in **Section 4.3**. Representative viewpoints have been included in the assessment with visual receptors covered by a representative viewpoint.

4.5.61 **Table 4-2** provides a list of the viewpoint locations and the receptors they have been selected to represent. The locations of the viewpoints are provided on **Figure 4.4.11** and details of each, including a description of the baseline view and its value are provided in **Volume 8, Appendix 4.4.B: Visual Assessment Tables** including a summary of effects.

4.5.62 **Figure 4.4.12** provides panoramic photography of the baseline view from each of the viewpoint locations.

Table 4-2 – Viewpoint location and representative visual receptors

Viewpoint	Representative visual receptors	Grid reference	Location
1	Representative of views for residential receptors at scattered farms and individual properties within the vicinity of the Wern CSEC and recreational receptors using Dolbenmaen No 107.	E: 254574 N: 340481	Dolbenmaen No 107, Ty' n-y-berllan.
2	Representative of views for residential receptors to the south-east of Porthmadog on the eastern foothills of Moel-y-Gest.	E: 256842 N: 338275	Garth Road, Porthmadog.
3	Representative of views for recreational receptors using Porthmadog No 31 on the eastern foothills of Moel-y-Gest.	E: 255871 N: 338760	Porthmadog No 31, Moel-y-Gest.

Viewpoint	Representative visual receptors	Grid reference	Location
4	Representative of views for recreational receptors using open access land at the Trig point summit of Moel-y-Gest.	E: 255537 N: 338856	Moel-y-Gest Trig point.
5	Representative of views from the western extent of Tremadog and recreational receptors using NCR 8 and Porthmadog No 6.	E: 255974 N: 340036	Porthmadog No 6.
6	Representative of views from the eastern extent of Porthmadog and recreational receptors using NCR 8, the Welsh Highland Heritage Railway and Ffestiniog Railway, the Wales Coast Path, and the Snowdon National Park Authority Key viewpoint 16.	E: 257258 N: 338404	Wales Coast Path – The Cob (western end), Porthmadog.
7	Representative of views for transport receptors from the A487 and the Cambrian Railway Line, and recreational receptors using local sports facilities at Y Traeth.	E: 257912 N: 339191	Eastbound layby on Porthmadog bypass.
8	Representative of views for recreational receptors using the Welsh Highland Heritage Railway and Ffestiniog Railway and Porthmadog No 11.	E: 257859 N: 339887	Porthmadog No 11.
9	Representative of views from the eastern extent of Porthmadog and recreational receptors using NCR 8, the Welsh Highland Heritage Railway and Ffestiniog Railway, the Wales Coast Path, and the Snowdon National Park Authority Key viewpoint 16.	E: 258379 N: 337889	Wales Coast Path – The Cob (eastern end), Porthmadog.
10	Representative of residential receptors in the vicinity of the Minffordd CSEC and recreational receptors using NCR 8.	E: 259211 N: 338539	Sustrans Route 8, Tan-y-Glannau, Minffordd.

Future Baseline

- 4.5.63 Landscape change is an ongoing and inevitable process and will continue across the Study Area irrespective of whether the proposed works proceed. Change could arise through natural processes (for example, the maturity of woodlands) and natural systems (for example, river erosion) or as a result of human activity including land use and land management.
- 4.5.64 The landscape contains a number of energy related developments and it is anticipated that the landscape will continue to host energy related developments including overhead lines and pylons.

4.6 Consultation and Scope of Assessment

- 4.6.1 This section describes the scope of the assessment of effects on Landscape and Visual Amenity. A Scoping Opinion was not sought as explained in **Volume 1, Chapter 3: EIA Process**.

Consultation

4.6.2 Consultation in relation to landscape and visual amenity has been carried out with stakeholders. **Table 4-3** below provides an overview of consultation responses and the actions taken to address these within the assessment.

Table 4-3 – Consultation and stakeholder engagement log

Consultee	Summary of comments	Actions
Eryri National Park Authority (emailed on the 3 October 2024).	The Eryri National Park Authority considers the location of the viewpoints to assess impacts on visual receptors within the Eryri National Park to be acceptable.	No action required.
Gwynedd Council (emailed on the 3 October 2024).	No response received.	No action required.

Activities or Receptors Scoped Out of the Assessment

4.6.3 The proposed works would not have significant effects on landscape character at the NLCA scale and these effects have not been assessed as part of this Landscape and Visual Amenity assessment.

4.6.4 There would be no direct change to the physical landscape elements within LCA 08 Vale of Ffestiniog, LCA 10 Central Llyn, LCA 12 Ardudwy Coastal Hinterland and potential effects would be limited to indirect perceptual or aesthetic effects. Based upon the extremely limited geographical extent, the distance from the proposed works and their size and scale, and the intervening vegetation that creates a sense of enclosure and minimises the potential for these indirect effects, these LCAs will not be assessed as part of this assessment.

4.6.5 It is anticipated that there would be long distance views from elevated ground and panoramic viewpoints in the Eryri National Park. However, the scale of the proposed works would form a distant barely perceptible element in the central background of the view set amongst the built form at Porthmadog, Tremadog and Penmorfa. The proposed works would only be observable in periods of exceptional or very good visibility and are unlikely to be significant. Eryri National Park panoramic views have been scoped out.

4.6.6

Table 4-4, Table 4-5 and Table 4-6 summarise the potential landscape and visual receptors that have been reviewed and state whether they have been included or excluded from the landscape and visual assessment and provides justifications.

Table 4-4 – Scope of Landscape and Visual assessment – Glaslyn Cables

Receptor	Scoped in/out per phase		Justification
	Construction	Operation	
Landscape Character	In	Out	There will be localised effects on the landscape character and amenity during construction, no effects are anticipated during operation as the permanent presence of four new link boxes that will be constructed on raised mounds will not give rise to significant effects. The land will be reinstated and the cables will not be visible.
Visual Amenity Receptors	In	Out	There will be temporary disruption to views from visual amenity receptors particularly from recreational routes, transport routes and a small number of scattered farms and individual properties in the vicinity of the Glaslyn works site. During operation the permanent presence of four new link boxes that will be constructed on raised mounds will not give rise to significant effects. The land will be reinstated and the cables will not be visible.

Table 4-5 – Scope of Landscape and Visual assessment – Wern CSEC

Receptor	Scoped in/out per phase		Justification
	Construction	Operation	
Landscape Character	In	In	There may be localised effects on the landscape character and amenity at operation due to the new infrastructure.
Visual Amenity Receptors	In	In	There may be views of the new infrastructure from visual amenity receptors particularly from recreational routes, transport routes and a small number of scattered farms and individual properties in the vicinity of the Wern CSEC works site.

Table 4-6 – Scope of Landscape and Visual assessment – Minffordd CSEC and THH

Receptor	Scoped in/out per phase		Justification
	Construction	Operation	
Landscape Character	In	In	There may be localised effects on the landscape character and amenity at operation due to the new infrastructure.
Visual Amenity Receptor	In	In	There may be views of the new infrastructure from visual amenity receptors particularly from recreational routes, transport routes and a small number of scattered farms and individual properties in the vicinity of the Minffordd site.

4.7 Methodology

- 4.7.1 The purpose of the Landscape and Visual Amenity assessment is the assessment of effects on landscape character and visual amenity during construction and also during operation. The scope and methodology of the Landscape and Visual Amenity assessment have been agreed with consultees during the EIA screening process and subsequent consultation as identified in **Section 4.6**.
- 4.7.2 Details of the technical methods used to determine the baseline conditions, sensitivity of the receptors, magnitude of effects and the significance criteria that have been used for the Landscape and Visual Amenity assessment can be found in **Volume 8, Appendix 1.1.A: Topic Assessment Methodology**. This section provides a summary.

Methodology Summary

- 4.7.3 The methodology for this assessment is based on guidance within GLVIA3 (Ref 4.17). This is the standard reference for undertaking landscape character and visual assessments in the UK.
- 4.7.4 Landscape and visual effects are related but distinct topics so have been considered and assessed separately. Landscape and visual effects can differ from one stage of the development to the next and change over time as mitigation planting establishes and matures. Residual effects as a result of the proposals on landscape character and visual amenity could include:
- Construction: temporary effects from the movement of construction plant, vehicle haul routes, excavations, temporary construction compounds, material stockpiles and the removal of vegetation.
 - Operational year 1 (winter): including consideration of potential medium to longer term effects associated with the proposed works following completion of construction and associated reinstatement. This stage is intended to represent the potential worst-case operational effects prior to establishment of mitigation planting.
 - Operation year 15 (summer): including consideration of potential longer-term effects of the proposed works 15 years after becoming operational. This stage is intended to help demonstrate how proposed mitigation planting will influence effects once established.

Study Area

- 4.7.5 The landscape and visual effects (and whether they are significant) is determined by an assessment of the sensitivity of each receptor or group of receptors and the nature of the effect or magnitude of change that will result from proposed works. The evaluation of sensitivity takes account of the value and susceptibility of the receptor to the proposed works. This is combined with an assessment of the magnitude of change which takes account of the size and scale of the proposed change from the proposed works and the geographical extent they cover. The duration and reversibility are stated separately in relation to the assessed effects. By combining assessments of sensitivity and magnitude of change, a level of landscape or visual effect can be evaluated and determined. The resulting level of effect is described in terms of whether it is significant or not significant and the type of effect is described as either direct or indirect; temporary or permanent (reversible); cumulative; and beneficial, neutral or adverse.
- 4.7.6 The scope of the assessment covers the construction of the proposed works; and the construction and subsequent operation of the Wern CSEC and Minffordd CSEC and THH. Embedded mitigation as described in **Section 4.8** is considered for the operation of the proposed works.
- 4.7.7 The identification of visual receptors is a two-staged process, beginning with interrogation of baseline mapping and the preliminary ZTVs and then moving onto fieldwork to refine and ascertain the actual inter-visibility between the proposed works and potential visual receptors.

4.8 Potential Effects

- 4.8.1 The following sections sets out a brief summary of the elements of the proposed works that may result in landscape and visual effects during the construction and operation.

General Overview

- 4.8.2 Permanent above-ground infrastructure including a new CSEC, high voltage plant, steelworks, and security fencing would be required at both the Wern CSEC and the Minffordd CSEC.

Construction

- 4.8.3 The proposed construction works would introduce some new elements into the landscape for a temporary period, creating the potential for landscape or visual effects. Potential construction phase effects may arise at the Wern CSEC, Garth CSEC, Minffordd CSEC (including the raised floor level of the THH), or along the Glaslyn cables. The effects from the following activities could occur simultaneously at each of the sites or in isolation:
- Site clearance of vegetation: to include tree and vegetation removal, soil stripping and mounding and erection of temporary security fencing.
 - Utility diversions: to include any temporary or permanent diversion of overhead lines for safe working, or underground services crossing the Glaslyn works site.
 - Temporary compounds: to be used for storage of large plant and equipment, office accommodation and welfare facilities, parking facilities, material storage, spoil handling and spoil storage.

- Construction activity: including on-site staff during construction. Movement of materials including HGVs accessing the site for delivery of cable and infrastructure elements.
- Temporary access tracks: to facilitate safe and efficient construction and reduce the impact of works upon the local area.
- Temporary diversion of PRow: including local and nationally promoted recreational routes.
- Erection of temporary scaffolding structures to facilitate works.
- Construction lighting including security lighting to works areas and construction compounds.
- Construction of new infrastructure: to include new Minffordd CSEC, high voltage plant, steelworks, and security fencing with the potential requirement for protection and screening panels.

Operation and Maintenance

4.8.4 The proposed works would introduce new elements into the landscape during operation creating the potential for landscape or visual effects. Potential operational phase effects may arise at either the Wern CSEC or the Minffordd CSEC from the following activities:

- New infrastructure: to include new Minffordd CSEC including high voltage plant, steelworks, and security fencing. Extension to Wern CSEC to include high voltage plant and security fencing.
- New planting: to include replacement planting and planting to mitigate the visual impact of the new cable sealing end compounds.

4.8.5 No effects are anticipated within the Glaslyn Cables works areas during operation as the land will be reinstated and the cables will not be visible.

Embedded Mitigation

4.8.6 The primary aims of the landscape design are to reduce the visual prominence of the proposed works and assimilate them into the landscape context. The mitigation will also provide biodiversity enhancement.

4.8.7 The following embedded mitigation has been taken into consideration when assessing the landscape and visual impacts of the proposed works:

- The extents of the proposed works have been minimised as far as possible to reduce land take and allow retention of existing vegetation and other landscape features.
- Incorporation of new and additional planting such as hedgerow and tree planting to help tie the proposed works at the Wern CSEC and Minffordd CSEC into the existing landscape character and provide localised screening.
- Optimising zones within construction compounds to minimise their temporary impact on the landscape and views, including at night.
- Returning and reinstating land used temporarily to its former condition and profiles, where appropriate.

- Confining lighting on the Glaslyn 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.
- Designing permanent structures, such as the CSEC, other infrastructure, and security fencing in a way that minimises their visual impact and achieves good visual appearance. This may include selection of a muted colour palette that appears recessive within views.
- Construction programme to be kept to the minimum practicable time to reduce the duration of any landscape and visual impacts and areas will be cleared for construction as close as possible to works commencing and top-soiling, reseeding and planting shall be carried out as soon as practicable after sections of work are complete.

4.8.8

The CEMP (**Volume 8, Appendix 4.2.A: Outline Construction Environmental Management Plan**) will set out the additional mitigation measures identified. This section summarises the types of mitigation measures that will be considered to mitigate against the effects on landscape and visual receptors where required. These measures will be adopted during construction:

- A Landscape and Ecological Management Plan (LEMP) (**Volume 8, Appendix 4.4.C: Landscape and Ecological Management Plan**) is to be produced prior to construction based on the Outline LEMP submitted with the planning application.
- A suitably experienced Environmental Manager will be appointed for the duration of construction. In addition, a qualified and experienced Environmental Clerk of Works (ECoW) will be available during construction to advise, supervise and report on the delivery of the mitigation methods and controls outlined in the CEMP. The ECoW will monitor that the works proceed in accordance with relevant environmental requirements and adhere to the required good practice and mitigation measures. The ECoW will be supported as necessary by appropriate specialists, including ecologists and arboriculturists.
- Land used temporarily will be reinstated where practicable to its pre-construction condition and use, unless agreed otherwise.
- Earthworks and stockpiled soil will be protected by covering, seeding or using water suppression where appropriate.
- Working areas will be appropriately fenced. The type of fencing installed may also serve to provide acoustic and visual screening of the work sites and reduce the potential for disturbance of users in the surrounding areas. Fencing will be regularly inspected and maintained and removed as part of the demobilisation unless otherwise specified.
- The contractor will retain vegetation where practicable. Where vegetation is lost and cannot be replaced due to restrictions associated with underground services or wayleaves, reinstatement in accordance with the outline LEMP and outline Landscape Design shall be followed.
- The contractor will apply the relevant protective principles set out in British Standard (BS) 5837:2012: Trees in relation to design, demolition and construction (Ref 4.29). This will be applied to trees within the works site which will be preserved through the

construction phase, and to trees outside where such measures do not hinder or prevent the use of the relevant working width for construction.

- A five-year aftercare period will be established for all reinstatement and mitigation planting.
- Separation and storage of subsoil and topsoil to ensure no degradation in quality and reinstatement carried out as soon as possible after completion of construction of each section/area of works.
- Temporary and separate placement of topsoil and subsoil will be stored with the additional height of the subsoil storage used on whichever side of the Glaslyn works site requires greater screening benefit, where practicable.
- To control the spread of invasive weeds in accordance with the Wildlife and Countryside Act 1981 (Ref 4.3), any plant or machinery that has been used in areas infested with invasive species (both terrestrial and aquatic), such as Japanese knotweed, will be thoroughly cleaned. Water used to clean vehicles will be controlled to prevent the spread of the plant (through seeds, rhizomes, fragments, etc.). The area will be cordoned off to prevent any inadvertent spreading.

Assessment of Effects

- 4.8.9 This assessment of landscape and visual effects has been carried out after the implementation of embedded mitigation. A detailed assessment of potential impacts on each of the identified landscape and visual receptors is provided in **Volume 8, Appendix 4.4.A: Landscape Character Assessment Tables** and **Volume 8, Appendix 4.4.B: Visual Assessment Tables**. A summary of the results of the assessment are provided below, including further details of those which are anticipated to receive moderate or greater, and therefore significant, effects.

Landscape Character

Gwynedd Council Local Landscape Character

Glaslyn Cables

Construction

- 4.8.10 Construction activity within LCA 09 Porthmadog, would influence a medium area within the LCA. The presence of construction activity including removal of localised areas of vegetation, soil stripping, storage of materials, tall machinery and movement of plant would result in an impact to the rural landscape characteristics and would result in a loss of tranquillity over a localised area. Construction activity would be short-term with direct impacts resulting from vegetation clearance and the excavation and soil disturbance from HDD and open trenching of the Glaslyn cable route. The rural landscape characteristics are currently influenced by the presence of infrastructure, including built development and transport routes, which would slightly lessen the impact of construction activity across part of the LCA. As a result of the high sensitivity of LCA 09 Porthmadog, geographical extent of construction works and scale, construction effects would result in Moderate adverse impacts that are significant.

Operation

All operational effects have been scoped out of the assessment as summarised in **Section 4.6**.

Wern CSEC

Construction

Construction activity would be short term and would temporarily influence a localised part of LCA 09 Porthmadog. Direct impacts during construction would result from a very small change in land use from agricultural land as the Wern CSEC footprint is extended. The presence of construction activity including storage of materials, tall machinery and movement of plant would result in a slight alteration to the character which would be limited in extent due to the relative containment provided by landform, tall hedgerows and woodland. No landscape elements of value would be lost and the effects on the setting and perceptual characteristics of LCA 09 Porthmadog would be limited resulting in a Minor adverse effect that is not significant.

Operation

- 4.8.11 At operation year 1 (winter), the Wern CSEC would locally extend the influence of electrical infrastructure within LCA 09 Porthmadog. Due to the size and scale of the proposed works and small geographical extent, the effects on the landscape character would be negligible adverse for LCA 09 Porthmadog and not significant.
- 4.8.12 At operation year 15 (summer), the mitigation tree planting will have established resulting in the local landscape characteristic patterns returning to the baseline conditions. Shrub, hedgerow and grassland mitigation would have established prior to operation year 15, contributing to the reinstated landscape characteristic patterns. The change of land use would remain as a very slight deterioration to the existing landscape resource, not uncharacteristic within the receiving landscape. This would remain a negligible adverse for LCA 09 Porthmadog during operation and not significant.

Minffordd CSEC and THH

Construction

- 4.8.13 Construction activity would be short term and would temporarily influence a localised part of LCA 09 Porthmadog. Direct impacts during construction upon LCA 09 Porthmadog would result from the presence of construction activity, including storage of materials, tall machinery and movement of plant, which would result in a slight alteration to the character that would be limited in extent due to the relative containment provided by landform and vegetation.
- 4.8.14 No landscape elements of value would be lost and the effects on the setting and perceptual characteristics of the LCA would be limited.
- 4.8.15 Construction effects on landscape character would be Minor adverse for LCA 09 Porthmadog and not significant.

Operation

- 4.8.16 At operation year 1 (winter), the Minffordd CSEC and THH would locally extend the influence of electrical infrastructure within LCA 09 Porthmadog. Due to the size and scale of the proposed works and small geographical extent, the effects on the landscape character would be negligible adverse for LCA 09 Porthmadog and not significant.
- 4.8.17 At operation year 15 (summer) the mitigation tree planting would have established, resulting in the characteristic patterns of the local landscape being returned to the baseline conditions. Shrub, hedgerow and grassland mitigation would have established prior to operation year 15, contributing to the reinstated key landscape characteristics.

The change of land use would remain as a very slight deterioration to the existing landscape resource, not uncharacteristic within the receiving landscape. This would remain a negligible adverse for LCA 09 Porthmadog during operation and not significant.

A498 Crossing – HDD Option

Construction

- 4.8.18 If the HDD option was taken forward, the impact would be the same as stated above for landscape and visual receptors. Construction activity will still be visible, different equipment will be used but the nature of the works will remain short-term and temporary in nature.

Operation

- 4.8.19 During operation, the HDD working areas will be reinstated and the cables will not be visible. No impacts on landscape and visual receptors are anticipated.

Assessment of the Setting of the Eryri National Park

- 4.8.20 SCA and LCA as defined in the Snowdonia National Park Supplementary Planning Guidance 7 – Landscape and Seascapes of Eryri (Ref 4.14) consider the setting of the National Park. These are shown on **Figure 4.4.2**. As discussed in **Section 4.5**.

Glaslyn Cables

Construction

- 4.8.21 Construction activity within SCA 20 Porthmadog and Glaslyn Estuary, SCA 21 Dwyrdd Estuary and Morfa Harlech would represent an incongruous activity within the rural land and seascapes. Construction activity would be short-term with direct impacts resulting from vegetation clearance and the excavation and soil disturbance from HDD and open trenching of the Glaslyn cable route. Indirect effects on these LCA and SCA would result from the loss of tranquillity from the perception of increased urban influence. These rural and natural qualities are influenced by the presence of modern and urban interventions, and this would lessen the contrast in some places. The effects would be localised, temporary and reversible however would be Moderate adverse and significant for the duration of the works.
- 4.8.22 Construction activities within LCA 04 Moel Hebog Uplands and SCA 19 Criccieth to Mochhras would be Minor adverse and not significant.

Operation

- 4.8.23 All operational effects have been scoped out of the assessment as summarised in **Section 4.6**.

Wern CSEC

Construction

- 4.8.24 Construction activity at Wern CSEC would result in direct impacts on landscape characteristics to SCA 20 Porthmadog and Glaslyn Estuary. Construction activity including storage of materials, tall machinery and movement of plant would result in a very slight alteration to the character of the SCA, that would be limited in extent due to the relative containment provided by landform, tall hedgerows and woodland resulting a Minor adverse effect that is not significant.

- 4.8.25 Indirect impacts to SCA 19 Criccieth to Mochhras and LCA 04 Moel Hebog Uplands would be limited in extent due to the distance and small scale of the proposed works. Construction effects on landscape character would be Negligible adverse for SCA 19 Criccieth to Mochhras and LCA 04 Moel Hebog Uplands and neutral for SCA 21 Dwyrdd Estuary and Morfa Harlech that are not significant.

Operation

- 4.8.26 At operation Year 1 (winter), due to the size and scale of the proposed works and small geographical extent, the effects on the landscape character would be Negligible adverse for SCA 20 Porthmadog and Glaslyn Estuary, SCA 19 Criccieth to Mochhras and LCA 04 Moel Hebog Uplands. Effects on landscape character for SCA 21 Dwyrdd Estuary and Morfa Harlech during operation would be neutral and not significant.
- 4.8.27 At Operation Year 15 (summer) the mitigation tree planting would have established and the characteristic patterns of the local landscape would be returned to the baseline conditions. Shrub, hedgerow and grassland mitigation would have established prior to Operation Year 15, contributing to the reinstated key landscape characteristics. The increased footprint of the CSEC would result in a negligible adverse effect on landscape character for SCA 20 Porthmadog and Glaslyn Estuary, SCA 19 Criccieth to Mochhras and LCA 04 Moel Hebog Uplands. Impacts on SCA 21 Dwyrdd Estuary and Morfa Harlech during operation would be neutral and not significant.

Minffordd CSEC and THH

Construction

- 4.8.28 Construction activity would influence a localised part of SCA 21 Dwyrdd Estuary and Morfa Harlech. The presence of construction activity including storage of materials, tall machinery and movement of plant would result in a slight alteration to the character which would be limited in extent due to the relative containment provided by landform and vegetation. No landscape elements of value would be lost and the effects on the setting and perceptual characteristics of the SCA would be limited. Construction effects on landscape character for SCA 21 Dwyrdd Estuary and Morfa Harlech would be Minor adverse and not significant.
- 4.8.29 Indirect impacts during construction upon SCA 20 Porthmadog and Glaslyn Estuary would result from impacts to perceptual characteristics over a small geographical extent. Due to distance and limited intervisibility there would be Minor adverse effects that are not significant.

Operation

- 4.8.30 At operation Year 1 (winter), the Minffordd CSEC and THH would locally increase the influence of electrical infrastructure within SCA 21 Dwyrdd Estuary and Morfa Harlech where the presences of such elements are already noted characteristics of the landscape. Due to the size and scale of the proposed works and small geographical extent, the effects on the landscape character would be negligible adverse for SCA 21 Dwyrdd Estuary and Morfa Harlech and not significant.
- 4.8.31 During operation Year 1 (winter) indirect impacts on SCA 20 Porthmadog and Glaslyn Estuary would result in a neutral effect that is not significant.
- 4.8.32 At Operation Year 15 (summer) the mitigation planting would have established with the characteristic patterns of the local landscape being returned to the baseline conditions. Shrub, hedgerow and grassland mitigation would have established prior to Operation Year 15, contributing to the reinstated key landscape characteristics. The change of

land use would remain as a very slight deterioration to the existing landscape resource, not uncharacteristic within the receiving landscape. The effect would remain negligible adverse for SCA 21 Dwyrdd Estuary and Morfa Harlech, and neutral for SCA 20 Porthmadog and Glaslyn Estuary that is not significant.

Visual Amenity

Glaslyn Cables

Construction

- 4.8.33 Construction activity associated with the Glaslyn works site will be visible to varying degrees from the identified viewpoint locations depending on intervening landform and vegetation.
- 4.8.34 The majority of receptors within the Glaslyn works site would see the movement of construction machinery, including soil stripping, HDD machinery, temporary structures, temporary storage compounds across the majority of the view. Where receptors are at a distance to the works, the scale of the proposed work and the distance between to proposed works and the receptor would result in construction operations being a barely perceptible, small-scale addition within a large scale panoramic view. Effects would be short-term resulting in a Negligible adverse effect.
- 4.8.35 Receptors close to the Glaslyn cable route would experience clear views towards construction operations that would be the main focus of the view. Although for the majority of these receptors intervening vegetation and landform limits the amount of construction operations that would be visible across the panorama. Effects would be short-term resulting in a Minor to negligible adverse effect. For receptors at Viewpoint 10 nearby construction operations would be clearly visible resulting effects that are short-term and moderate adverse.

Operation

- 4.8.36 All operational effects have been scoped out of the assessment as summarised in **Section 4.6**.

Wern CSEC

Construction

- 4.8.37 Construction activity associated with the proposed works at the Wern CSEC whilst potentially visible from viewpoint locations in the eastern and central part of the Study Area would not result in a discernible change in the composition of the view with neutral effects resulting.
- 4.8.38 Receptors at viewpoint locations to the western part of the Study Area in the vicinity of Penmorfa would experience varying extents of visibility of construction plant and activity depending on their proximity to the Wern CSEC. The assessment identified that for the majority of receptors represented by the viewpoints, there would be an unobtrusive change in the view over a short-term construction period with Neutral effects resulting. Visual receptors using Dolbenmaen No 107 in the immediate vicinity of the Wern CSEC and recreational receptors at Moel-y-Gest trig point may experience more pronounced effects, but these would be highly localised, over a short duration and temporary resulting in Minor adverse effects that are not significant. Residential receptors in the immediate vicinity of the Wern CSEC are likely to have oblique views that are screened by intervening vegetation resulting in Negligible adverse effect that is not significant.

Operation

- 4.8.39 Once operational the Wern CSEC would result in no change in views for receptors at the representative viewpoints with Neutral effects during operation.

Minffordd CSEC and THH

Construction

- 4.8.40 Construction activity associated with the proposed works at Minffordd, whilst potentially visible from viewpoint locations in central parts of the Study Area, would not result in a discernible change in the composition of the view with neutral effects resulting. Intervening landform and vegetation would screen views of the proposed works at Minffordd and the western part of the Study Area. Where there is potential visibility, this would not result in a discernible change in the composition of the view with Neutral effects resulting.
- 4.8.41 Receptors at representative viewpoints in the eastern part of the Study Area would experience varying extents of visibility of construction plant and activity depending on their proximity to the Minffordd CSEC and THH. The assessment identified that for the majority of receptors represented by the viewpoints, there would be a barely perceptible change in the view with Minor Adverse effects resulting.

Operation

- 4.8.42 Once operational the Minffordd CSEC and THH would result in no change in views from most locations with Neutral effects during operation.

A498 Crossing – HDD Option

Construction

- 4.8.43 If the HDD option was taken forward, the impact would be the same as stated above for landscape and visual receptors. Construction activity will still be visible, different equipment will be used but the nature of the works will remain short-term and temporary in nature.

Operation

During operation the HDD working areas will be reinstated and the cables will not be visible. No impacts on landscape and visual receptors are anticipated.

4.9 Mitigation and Residual Effects

- 4.9.1 The residual effects on landscape character and visual amenity resulting from the proposed works would remain unchanged from those reported in **Section 4.9** above as all mitigation is embedded in the design of the proposed works.
- 4.9.2 The tables below provide a summary of the assessment and residual effects on landscape and visual receptors during construction and operation of the Glaslyn works site, Wern CSEC and Minffordd CSEC.

Table 4-7 – Summary of temporary residual Landscape and Visual effects during construction – Glaslyn Cables

Receptor	Sensitivity	Magnitude of effect	Significance of effect	Additional mitigation	Magnitude of effect	Residual effect
LCA 09 Porthmadog	High	Medium	Moderate Adverse	No additional mitigation is identified.	Medium	Moderate Adverse
SCA 20 Porthmadog and Glaslyn Estuary	High	Medium	Moderate Adverse		Medium	Moderate Adverse
SCA 21 Dwyrdd Estuary and Morfa Harlech and LCA 10 Morfa Harlech	High	Low	Minor Adverse		Low	Minor Adverse
SCA 19 Criccieth to Mochhras	Medium	Low	Minor Adverse		Low	Minor Adverse
LCA 04 Moel Hebog Uplands	High	Low	Minor Adverse		Low	Minor Adverse
Viewpoint 1: PRoW Dolbenmaen No 107, Ty' n-y-berllan	High	Low	Minor Adverse		Low	Minor Adverse
Viewpoint 2: Garth Road, Porthmadog	High	Low	Minor Adverse		Low	Minor Adverse
Viewpoint 3: PRoW Porthmadog No 31, Moel-y-Gest	High	Low	Minor Adverse		Low	Minor Adverse
Viewpoint 4: Moel-y-Gest Trig point	High	Low	Minor Adverse		Low	Minor Adverse

Receptor	Sensitivity	Magnitude of effect	Significance of effect	Additional mitigation	Magnitude of effect	Residual effect
Viewpoint 5: PRoW Porthmadog No 6	High	Very Low	Minor Adverse		Very Low	Minor Adverse
Viewpoint 6: Wales Coast Path – The Cob (western end), Porthmadog	High	Low	Minor Adverse		Low	Minor Adverse
Viewpoint 7: Eastbound layby on Porthmadog Bypass	Medium	Medium	Minor Adverse		Medium	Minor Adverse
Viewpoint 8: PRoW Porthmadog No 11	High	Low	Minor Adverse		Low	Minor Adverse
Viewpoint 9: Wales Coast Path – The Cob (eastern end), Porthmadog	High	Very low	Minor Adverse		Very low	Minor Adverse
Viewpoint 10: Tan-y-Glannau, Minffordd	High	Medium	Moderate Adverse		Medium	Moderate Adverse

Table 4-8 – Summary of temporary residual Landscape and Visual effects during construction – Wern CSEC

Receptor	Sensitivity	Magnitude of effect	Significance of effect	Additional mitigation	Magnitude of effect	Residual effect
LCA 09 Porthmadog	High	Low	Minor Adverse	No additional mitigation is identified.	Low	Minor Adverse
SCA 20 Porthmadog and Glaslyn Estuary	High	Low	Minor Adverse		Low	Minor Adverse
SCA 21 Dwyrdd Estuary and Morfa	High	None	Neutral		None	Neutral

Receptor	Sensitivity	Magnitude of effect	Significance of effect	Additional mitigation	Magnitude of effect	Residual effect
Harlech and LCA 10 Morfa Harlech						
SCA 19 Criccieth to Mochhras	Very Low	Very Low	Negligible Adverse		Very Low	Negligible Adverse
LCA 04 Moel Hebog Uplands	Very Low	Very Low	Negligible Adverse		Very Low	Negligible Adverse
Viewpoint 1: PRoW Dolbenmaen No 107, Ty' n-y-berllan.	High	Very Low	Minor Adverse		Very Low	Minor Adverse
Viewpoint 2: Garth Road, Porthmadog.	High	None	Neutral		None	Neutral
Viewpoint 3: PRoW Porthmadog No 31, Moel-y-Gest.	High	None	Neutral		None	Neutral
Viewpoint 4: Moel-y-Gest Trig point.	High	Very Low	Minor Adverse		Very Low	Minor Adverse
Viewpoint 5: PRoW Porthmadog No 6.	High	None	Neutral		None	Neutral
Viewpoint 6: Wales Coast Path – The Cob (western end), Porthmadog.	High	None	Neutral		None	Neutral

Receptor	Sensitivity	Magnitude of effect	Significance of effect	Additional mitigation	Magnitude of effect	Residual effect
Viewpoint 7: Eastbound layby on Porthmadog bypass.	Low	None	Neutral		None	Neutral
Viewpoint 8: PRow Porthmadog No 11.	High	None	Neutral		None	Neutral
Viewpoint 9: Wales Coast Path – The Cob (eastern end), Porthmadog.	High	Very Low	Minor Adverse		Very Low	Minor Adverse
Viewpoint 10: Tan-y-Glannau, Minffordd.	High	None	Neutral		None	Neutral

Table 4-9 – Summary of residual Landscape and Visual effects during operation year 1 (winter) – Wern CSEC

Receptor	Sensitivity	Magnitude of effect	Significance of effect	Additional mitigation	Magnitude of effect	Residual effect
LCA 09 Porthmadog	High	Very Low	Negligible Adverse	No additional mitigation is identified.	Very Low	Negligible Adverse
SCA 20 Porthmadog and Glaslyn Estuary	High	Very Low	Negligible Adverse		Very Low	Negligible Adverse
SCA 21 Dwyrdd Estuary and Morfa Harlech and LCA 10 Morfa Harlech	High	None	Neutral		None	Neutral

Receptor	Sensitivity	Magnitude of effect	Significance of effect	Additional mitigation	Magnitude of effect	Residual effect
SCA 19 Criccieth to Mochhras	Very Low	Very Low	Negligible Adverse		Very Low	Negligible Adverse
LCA 04 Moel Hebog Uplands	Very Low	Very Low	Negligible Adverse		Very Low	Negligible Adverse
Viewpoint 1: PRow Dolbenmaen No 107, Ty' n-y-berllan.	High	Very Low	Negligible Adverse		Very Low	Negligible Adverse
Viewpoint 2: Garth Road, Porthmadog.	High	None	Neutral		None	Neutral
Viewpoint 3: PRow Porthmadog No 31, Moel-y-Gest.	High	None	Neutral		None	Neutral
Viewpoint 4: Moel-y-Gest Trig point.	High	Very Low	Minor Adverse		Very Low	Minor Adverse
Viewpoint 5: PRow Porthmadog No 6.	High	None	Neutral		None	Neutral
Viewpoint 6: Wales Coast Path – The Cob (western end), Porthmadog.	High	None	Neutral		None	Neutral
Viewpoint 7: Eastbound layby on Porthmadog bypass.	Low	None	Neutral		None	Neutral
Viewpoint 8: PRow Porthmadog No 11.	High	None	Neutral		None	Neutral

Receptor	Sensitivity	Magnitude of effect	Significance of effect	Additional mitigation	Magnitude of effect	Residual effect
Viewpoint 9: Wales Coast Path – The Cob (eastern end), Porthmadog.	High	None	Neutral		None	Neutral
Viewpoint 10: Tan-y-Glannau, Minffordd.	High	None	Neutral		None	Neutral

Table 4-10 – Summary of residual Landscape and Visual Effects during operation year 15 (summer) – Wern CSEC

Receptor	Sensitivity	Magnitude of effect	Significance of effect	Additional mitigation	Magnitude of effect	Residual effect
LCA 09 Porthmadog	High	Very Low	Negligible Adverse	No additional mitigation is identified.	Very Low	Negligible Adverse
SCA 20 Porthmadog and Glaslyn Estuary	High	Very Low	Negligible Adverse		Very Low	Negligible Adverse
SCA 21 Dwyrdd Estuary and Morfa Harlech and LCA 10 Morfa Harlech	High	None	Neutral		None	Neutral
SCA 19 Criccieth to Mochhras	Very Low	Very Low	Negligible Adverse		Very Low	Negligible Adverse
LCA 04 Moel Hebog Uplands	Very Low	Very Low	Negligible Adverse		Very Low	Negligible Adverse

Viewpoint 1: PRow Dolbenmaen No 107, Ty' n-y-berllan.	High	Very Low	Negligible Adverse	Very Low	Negligible Adverse
Viewpoint 2: Garth Road, Porthmadog.	High	None	Neutral	None	Neutral
Viewpoint 3: PRow Porthmadog No 31, Moel-y-Gest.	High	None	Neutral	None	Neutral
Viewpoint 4: Moel-y-Gest Trig point.	High	Very Low	Minor Adverse	Very Low	Minor Adverse
Viewpoint 5: PRow Porthmadog No 6.	High	None	Neutral	None	Neutral
Viewpoint 6: Wales Coast Path – The Cob (western end), Porthmadog.	High	None	Neutral	None	Neutral
Viewpoint 7: Eastbound layby on Porthmadog bypass.	Low	None	Neutral	None	Neutral
Viewpoint 8: PRow Porthmadog No 11.	High	None	Neutral	None	Neutral
Viewpoint 9: Wales Coast Path – The Cob (eastern end), Porthmadog.	High	None	Neutral	None	Neutral
Viewpoint 10: Tan-y-Glannau, Minffordd.	High	None	Neutral	None	Neutral

Table 4-11 – Summary of temporary residual Landscape and Visual effects during construction – Minffordd CSEC and THH

Receptor	Sensitivity	Magnitude of effect	Significance of effect	Additional mitigation	Magnitude of effect	Residual effect
LCA 09 Porthmadog	High	Low	Minor Adverse	No additional mitigation is identified.	Low	Minor Adverse
SCA 20 Porthmadog and Glaslyn Estuary	High	Low	Minor Adverse		Low	Minor Adverse
SCA 21 Dwyrdd Estuary and Morfa Harlech and LCA 10 Morfa Harlech	High	Low	Minor Adverse		Low	Minor Adverse
Viewpoint 1: PRoW Dolbenmaen No 107, Ty' n-y-berllan.	High	None	Neutral		None	Neutral
Viewpoint 2: Garth Road, Porthmadog.	High	Very Low	Minor Adverse		Very Low	Minor Adverse
Viewpoint 3: PRoW Porthmadog No 31, Moel-y-Gest.	High	Very Low	Minor Adverse		Very Low	Minor Adverse
Viewpoint 4: Moel-y-Gest Trig point.	High	None	Neutral		None	Neutral
Viewpoint 5: PRoW Porthmadog No 6.	High	None	Neutral		None	Neutral
Viewpoint 6: Wales Coast Path – The Cob (western end), Porthmadog.	High	None	Neutral		None	Neutral

Receptor	Sensitivity	Magnitude of effect	Significance of effect	Additional mitigation	Magnitude of effect	Residual effect
Viewpoint 7: Eastbound layby on Porthmadog bypass.	Low	None	Neutral		None	Neutral
Viewpoint 8: PRow Porthmadog No 11.	High	None	Neutral		None	Neutral
Viewpoint 9: Wales Coast Path – The Cob (eastern end), Porthmadog.	High	Very Low	Minor Adverse		Very Low	Minor Adverse
Viewpoint 10: Tan-y-Glannau, Minffordd.	High	Very Low	Minor Adverse		Very Low	Minor Adverse

Table 4-12 – Summary of residual Landscape and Visual Effects during operation year 1 (winter) – Minffordd CSEC and THH

Receptor	Sensitivity	Magnitude of effect	Significance of effect	Additional mitigation	Magnitude of effect	Residual effect
LCA 09 Porthmadog	High	Very Low	Negligible Adverse	No additional mitigation is identified.	Very Low	Negligible Adverse
SCA 20 Porthmadog and Glaslyn Estuary	High	Very Low	Negligible Adverse		Very Low	Negligible Adverse
SCA 21 Dwyrdd Estuary and Morfa Harlech and LCA 10 Morfa Harlech	High	Very Low	Negligible Adverse		Very Low	Negligible Adverse
Viewpoint 1: PRow Dolbenmaen No 107, Ty' n-y-berllan.	High	None	Neutral		None	Neutral

Receptor	Sensitivity	Magnitude of effect	Significance of effect	Additional mitigation	Magnitude of effect	Residual effect
Viewpoint 2: Garth Road, Porthmadog.	High	Very Low	Minor Adverse		Very Low	Minor Adverse
Viewpoint 3: PRow Porthmadog No 31, Moel-y-Gest.	High	None	Neutral		None	Neutral
Viewpoint 4: Moel-y-Gest Trig point.	High	None	Neutral		None	Neutral
Viewpoint 5: PRow Porthmadog No 6.	High	None	Neutral		None	Neutral
Viewpoint 6: Wales Coast Path – The Cob (western end), Porthmadog.	High	None	Neutral		None	Neutral
Viewpoint 7: Eastbound layby on Porthmadog bypass.	Low	None	Neutral		None	Neutral
Viewpoint 8: PRow Porthmadog No 11.	High	None	Neutral		None	Neutral
Viewpoint 9: Wales Coast Path – The Cob (eastern end), Porthmadog.	High	None	Neutral		None	Neutral
Viewpoint 10: Tan-y-Glannau, Minffordd.	High	Very Low	Minor Adverse		Very Low	Minor Adverse

Table 4-13 – Summary of enduring residual Landscape and Visual effects during operation year 15 (summer) – Minffordd CSEC and THH

Receptor	Sensitivity	Magnitude of effect	Significance of effect	Additional mitigation	Magnitude of effect	Residual effect
LCA 09 Porthmadog	High	Very Low	Negligible Adverse	No additional mitigation is identified.	Very Low	Negligible Adverse
SCA 20 Porthmadog and Glaslyn Estuary	High	Very Low	Negligible Adverse		Very Low	Negligible Adverse
SCA 21 Dwyrdd Estuary and Morfa Harlech and LCA 10 Morfa Harlech	High	Very Low	Negligible Adverse		Very Low	Negligible Adverse
Viewpoint 1: PRoW Dolbenmaen No 107, Ty' n-y-berllan.	High	None	Neutral		None	Neutral
Viewpoint 2: Garth Road, Porthmadog.	High	Very Low	Minor Adverse		Very Low	Minor Adverse
Viewpoint 3: PRoW Porthmadog No 31, Moel-y-Gest.	Very High	None	Neutral		None	Neutral
Viewpoint 4: Moel-y-Gest Trig point.	Very High	None	Neutral		None	Neutral
Viewpoint 5: PRoW Porthmadog No 6.	High	None	Neutral		None	Neutral

Viewpoint 6: Wales Coast Path – The Cob (western end), Porthmadog.	Very High	None	Neutral	None	Neutral
Viewpoint 7: Eastbound layby on Porthmadog bypass.	Low	None	Neutral	None	Neutral
Viewpoint 8: PRow Porthmadog No 11.	Very High	None	Neutral	None	Neutral
Viewpoint 9: Wales Coast Path – The Cob (eastern end), Porthmadog.	Very High	None	Neutral	None	Neutral
Viewpoint 10: Tan-y-Glannau, Minffordd.	High	Very Low	Minor Adverse	Very Low	Minor Adverse

4.10 Summary

Glaslyn Cables

- 4.10.1 During construction significant impacts on LCA 09 Porthmadog and SCA 20 Porthmadog and Glaslyn Estuary have been identified. No additional mitigation has been identified and the residual effects would remain at significant. Significant impacts for receptors at Viewpoint 10 have been identified. No significant impacts have been identified for the remaining receptors at the representative viewpoints during construction. Impacts on landscape receptors would reduce during operation, resulting in no significant residual effects.

Wern CSEC

- 4.10.2 No significant effects have been identified for landscape receptors and visual receptors at the representative viewpoints during the construction or operation of the proposed works at Wern CSEC.

Minffordd CSEC and THH

- 4.10.3 No significant effects have been identified for landscape receptors and visual receptors at the representative viewpoints during the construction or operation of the proposed works at Minffordd CSEC and THH.

5. Ecology and Nature Conservation

5.1 Introduction

- 5.1.1 This chapter presents an assessment of the likely significant effects on ecologically sensitive receptors that could arise from the construction, operation and maintenance of the works at Glaslyn as described in **Chapter 2: Glaslyn Cables Works**.
- 5.1.2 This chapter describes the baseline ecological conditions in the Glaslyn works site and associated Study Area (as defined in **Section 5.3**). The chapter also presents the scope of the assessment, potential impacts and resulting effects, the mitigation measures required to avoid, reduce or offset any significant negative effects, and the likely residual effects after these mitigation measures have been adopted.
- 5.1.3 This chapter is supported by the following figures and appendices:
- **Figure 4.5.1:** Statutory Designated Sites for Nature Conservation in the Wider Area.
 - **Figure 4.5.2:** Statutory Designated Sites for Nature Conservation within 5 km.
 - **Figure 4.5.3:** Non-Statutory Sites Designated for Nature Conservation within 2 km.
 - **Figure 4.5.4:** Habitats of Principal Importance and Ancient Woodland within 2 km.
 - **Volume 8, Appendices: Appendix 1.1.A: Legislation, Policy and Guidance.**
 - **Volume 8, Appendix 1.4.A: Topic Assessment Methodology.**
 - **Volume 8, Appendix 4.2.A: Outline Construction Environmental Management Plan.**
 - **Volume 8, Appendix 4.4.C: Landscape and Ecological Management Plan.**
 - **Volume 8, Appendix 4.5.A: Ecology Report: Habitats Report.**
 - **Volume 8, Appendix 4.5.B: Ecology Report: Hedgerow Report.**
 - **Volume 8, Appendix 4.5.C: Aquatic Survey Report.**
 - **Volume 8, Appendix 4.5.D: Ecology Report: Breeding Bird Surveys (Confidential).**
 - **Volume 8, Appendix 4.5.E: Ecology Report: Wintering Bird Survey Report (Confidential).**
 - **Volume 8, Appendix 4.5.F: Ecology Report: Bat Survey Report.**
 - **Volume 8, Appendix 4.5.G: Ecology Report: Badger Survey Report (Confidential).**
 - **Volume 8, Appendix 4.5.H: Ecology Report: Riparian Mammals Survey Report (Confidential).**
 - **Volume 8, Appendix 4.5.I: Ecology Report: Great Crested Newt Report.**
 - **Volume 8, Appendix 4.5.J: Statutory Designated Site Citations.**

- **Volume 8, Appendix 4.5.K: Arboricultural Impact Assessment.**
- **Volume 8, Appendix 7.1.B: Report to Inform Habitats Regulation Assessment**
- **Volume 8, Appendix 4.5.L: Net Benefit for Biodiversity Assessment and Green Infrastructure Statement.**

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

- **Chapter 4: Landscape and Visual Amenity.**
- **Chapter 8: Water Quality, Resources and Flood Risk** (which includes hydrology and water pollution).
- **Chapter 10: Air Quality and Emissions.**
- **Chapter 11: Noise and Vibration.**
- **Chapter 15: Climate Change.**

5.2 Legislation and Planning Policy

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

Legislation and Treaties

5.2.2 The following legislation and treaties are relevant to Ecology and Nature Conservation:

- The Conservation of Habitats and Species Regulations 2017 (as amended) (the “Habitats Regulations”) (Ref 5.1).
- Ramsar Convention (Ref 5.2).
- Convention on Biological Diversity 1992 (Ref 5.3).
- Wildlife and Countryside Act (WCA) 1981 (as amended) (Ref 4.3).
- The Environment Act 2021 (Ref 4.2).
- The Environment (Wales) Act 2016 (Ref 5.4).
- The Countryside and Rights of Way Act 2000 (Ref 5.5).
- The Protection of Badgers Act 1992 (Ref 5.6).
- The Hedgerows Regulations 1997 (Ref 5.7).
- The Invasive Alien Species (Enforcement and Permitting) Order 2019 (as amended) (Ref 5.8).
- Animal Welfare Act 2006 (Ref 5.9).
- Salmon and Freshwater Fisheries Act 1975 (Ref 5.10).
- Eels (England and Wales) Regulations 2009 (Ref 5.11).

- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (Ref 5.12).
- The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention or CMS) 1979 (Ref 5.13)
- Natural Environment and Rural Communities (NERC) Act 2006 (Ref 5.14).
- The Trade in Endangered Species of Wild Fauna and Flora (Amendment) (EU Exit) Regulations 2018 (Ref 5.15)
- The Convention on the Conservation of European Wildlife and Natural Habitats (the Bern Convention) 1979 (Ref 5.16)
- UK Biodiversity Framework 2024 (Ref 5.17)
- Salmon Act 1986 (Ref 5.18)

National Policy

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

- PPW – Edition 12 (Ref 4.5).
- The Nature Recovery Action Plan for Wales 2020-2021 (Ref 5.19).
- Future Wales – the National Plan 2040 (Ref 4.4).

Local Policy

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

- Anglesey and Gwynedd Joint Local Development Plan 2011 – 2026 (Ref 4.11).
- Anglesey and Gwynedd Joint Local Development Plan Review Report (Ref 5.20).

Guidance

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

- Environmental Improvement Plan 2023 (Ref 5.21).
- Cyfoeth Naturiol Cymru/Natural Resources Wales (NRW) Protected Species Licensing (Ref 5.22).
- Birds of Conservation Concern (BoCC) (Ref 5.23).
- Birds of Conservation Concern Wales (BoCCW) (Ref 5.24).
- The International Union for Conservation of Nature Red List of Threatened Species 2025 (Ref 5.25).
- Natur Gwynedd Biodiversity Action Plan (BAP) (Ref 5.26).
- Chartered Institute of Ecology and Environmental Management (CIEEM) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine (Ref 5.27).
- Institute of Air Quality Management (IAQM) Guidance on the Assessment of Dust from Demolition and Construction (Ref 5.28).

- Institute of Lighting Professionals Guidance Note 08/23 Bats and Artificial Lighting at Night (Ref 5.29).
- Institute of Lighting Professionals. Guidance Note 1 for the Reduction of Obtrusive Light (Ref 5.30).

5.2.6 Ecological Impact Assessment Methodologies are detailed in **in Volume 8, Appendix 1.4.A: Topic Assessment Methodology**.

5.2.7 Guidance and methodologies used for ecological surveys are detailed in their respective reports as included in **Volume 8, Appendices 4.5.A – 4.5.L**.

5.3 Study Area

5.3.1 The Study Area was defined in accordance with standard guidance to include ecological features likely to be at risk from direct and indirect impacts that might arise from the proposed works and is the initial basis for determining a Zone of Influence (Zoi). CIEEM guidance (Ref 5.27) defines a Zoi as: "*...the area over which biodiversity features may be affected by biophysical changes as a result of the proposed project and associated activities*".

5.3.2 The Zoi is based on the:

- Nature of the proposed works, activities, and the potential for effects during construction, operation and maintenance.
- Nature of the land use and nearby habitats, the number of watercourses and water bodies, their connectivity within and outside of the proposed works area and how they may be used by different species or species groups.
- Habitats, behaviours and preferences of different species or species groups and whether these could be affected both spatially and temporally.

5.3.3 All designated sites, sensitive habitats, and protected and notable species that occur within the ecological Zoi of the proposed works have been considered in this assessment.

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

- 10 km from the Glaslyn works site for statutory designated sites of international nature conservation value (e.g. SACs, Special Protection Areas (SPA) and Ramsar sites, as well as proposed or potential sites). This is extended to 30 km for SACs designated for bats, or where bats are listed as a qualifying feature.
- 5 km from the Glaslyn works site for other statutory designated sites of national nature conservation value (e.g. Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNR) and Local Nature Reserves (LNR)).
- 2 km from the Glaslyn works site for non-statutory sites for nature conservation (e.g. Wildlife Sites (WS), candidate WS (cWS) and Sites of Importance for Nature Conservation (SINC)).
- 2 km from the Glaslyn works site for ancient woodland.
- 2 km from the Glaslyn works site for Habitats of Principal Importance (HoPI), as listed under Section 7 of the Environment (Wales) Act (2016) (Ref 5.4).

- 2 km from the Glaslyn works site for records dated within the last ten years (2014 onwards) of protected and notable species (see paragraph 5.4.8), or the closest hydrologically connected monitoring location in the case of aquatic ecological records.
- 2 km from the Glaslyn works site for the status of water bodies subject to the Water Framework Directive (WFD) (Ref 5.12) which are assessed in **Chapter 8: Water Quality, Resources and Flood Risk**, and informed by the assessment of aquatic ecology receptors presented in this chapter. As water pollution may spread downstream or there could be downstream flood risk effects, to identify all the relevant ecological, chemical and physical features of water bodies that may be impacted and that contribute to the water bodies' overall importance, the Study Area was extended beyond 2 km for hydrologically linked surface water bodies.
- 50 m from the Glaslyn works site for ancient and veteran trees not in areas of ancient woodland.
- 50 m from the Glaslyn works site for other habitats not covered above.

5.3.5 These distances reflect standard professional good practice for identification of features within and external to the Glaslyn works site that could be affected.

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

5.3.7 The Zol, with regard to habitats and sedentary species lost to site clearance for construction, are easiest to define as they should be restricted to the footprint of the proposed works within the Glaslyn works site. However, for those biophysical changes that can extend beyond the Glaslyn works site, the Zol has been determined by the nature of the biophysical change and the sensitivity to this change of the ecological feature in question. For example, a badger may be subject to disturbance from light pollution impacting their sett or foraging area, whereas other species, such as certain bat species, may avoid lit areas by a much greater distance.

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

5.3.9 The Study Areas described and set out in **Table 5-1** are representative of the Zols for those receptors identified as important ecological features (IEF) within this chapter.

5.4 Assumptions, Limitations and Uncertainties

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

5.4.2 As noted in **Chapter 2: Glaslyn Cables Works**, the earliest construction could start is in Q1 2026. Construction is anticipated to require at least three years, with operation anticipated to commence in 2030. Should the construction programme be extended this will not change the results of the Ecological Impact Assessment (EclA) with respect to

flora, as the impact is not affected by the duration of activity but rather the change or loss of any habitats. The impact on fauna is likely to be similar if the construction period is extended, with respect to any habitat loss. The assessment also represents a worst case in terms of impacts to species. For example, although it is acknowledged that a longer construction period could result in prolonged disturbance, this is unlikely to occur for most of the Glaslyn works site due to the sequential nature of the construction programme.

- 5.4.3 Specific assumptions and limitations relevant to each survey, including how any limitations have been overcome, are included in the relevant technical reports presented in **Volume 8, Appendices 4.5.A – 4.5.J**. There are no survey-specific constraints that represent a significant limitation or data gap and the baseline that has been established is suitably robust.

5.5 Net Benefit for Biodiversity

- 5.5.1 The Environment (Wales) Act 2016 (Ref 5.4) Part 1 – Section 6: Biodiversity and resilience of ecosystems duty states that public authorities “*must seek to maintain and enhance biodiversity in the exercise of functions in relation to Wales, and in so doing promote the resilience of ecosystems, so far as consistent with the proper exercise of those functions*”.
- 5.5.2 PPW – Edition 12 (Ref 4.5) expands on this by stating: “the planning system has a key role to play in helping to reverse the decline in biodiversity and increase the resilience of ecosystems. Recognising that development needs to take place and some biodiversity may be impacted, the planning system should ensure that overall, there is a net benefit for biodiversity and ecosystem resilience, resulting in enhanced well-being”.
- 5.5.3 PPW – Edition 12 (Ref 4.5) also states that: “All development must deliver a net benefit for biodiversity and ecosystem resilience from the baseline state (proportionate to the scale and nature of the development proposed)”.
- 5.5.4 The assessment incorporates guidance from the following resources:
- PPW – Edition 12 (Ref 4.5).
 - NRW's guidance note for local planning authority staff undertaking a green infrastructure statement.
 - Welsh Government Approach to Net Benefits for Biodiversity and the Diversity, Extent, Condition, Connectivity and Aspects (DECCA) Framework in the Terrestrial Planning System.
 - NRW's Terrestrial and freshwater Resilient Ecological Networks: a guide for practitioners in Wales.
- 5.5.5 The following key themes emerged as key topics of the NBB assessment for Glaslyn Cables to focus on:
- Stepwise approach to mitigation.
 - Application of the DECCA framework to support ecosystem resilience with regards to green infrastructure. This involving consideration of both habitats and the species that are present.
 - Explore opportunities for incorporating green infrastructure, paying due regard to the Building with Nature Standards Framework.

- 5.5.6 NRW's Terrestrial and freshwater Resilient Ecological Networks: a guide for practitioners in Wales includes nine principles on the Sustainable Management of Natural Resources. These include:
- Adaptive management – to manage adaptively by planning, monitoring, reviewing and where appropriate changing action.
 - Scale – to consider the appropriate scale for action.
 - Collaboration and engagement – to promote and engage in collaboration and engagement.
 - Public participation – to make appropriate arrangements for public participation in decision-making.
 - Evidence – to take account of all relevant evidence and gather evidence in respect of uncertainties.
 - Multiple benefits – to take account of the benefits and intrinsic value of natural resources and ecosystems.
 - Long term – to take account of the short, medium, and long-term consequences of actions.
 - Preventative action – to take action to prevent significant damage to ecosystems.
 - Building resilience – to take account of the resilience of ecosystems, in particular the following aspects:
 - Diversity between and within ecosystem.
 - The connection between and within ecosystems.
 - The scale of ecosystems.
 - The condition of ecosystems including their structure and function.
 - The adaptability of ecosystems.
- 5.5.7 Evidence of the application of these principles will be detailed in the NBB assessment and Green Infrastructure Statement.
- 5.5.8 NRW's Terrestrial and Freshwater Resilient Ecological Networks: A Guide for Practitioners in Wales also includes a stepwise decision framework, outlining three logical steps to help identify priorities and keep the programme on track:
- Understand the place.
 - Create a vision and plan to build resilience through creating networks that reflect the landscape character.
 - Organise the project delivery.
- 5.5.9 The Stepwise approach to mitigation will be followed throughout the lifecycle of the proposed works. These steps include:
- Avoidance – actions taken to avoid causing impacts to the environment prior to beginning development (e.g. moving part of the development to a different location).
 - Minimise – If avoidance is not possible, adverse impacts to biodiversity must be minimised, by reducing the size of Proposed Development and maintaining the

connectivity of habitats. Impacts must also be minimised for Section 7 habitats and features used by Section 7 species to ensure their populations are maintained.

- Mitigate/Restore – If impacts cannot be avoided or sufficiently minimised then adverse effects to biodiversity must be mitigated against, and/or habitats and features for species restored. The mitigation and restoration must target the specific adverse effects of the Proposed Development, seek to restore in excess of like-to-like, and account for factors like time lags in recovery of habitats and species populations.
- Compensate on-site/off-site - Compensation must always be a last resort and must be of significant magnitude to fully compensate for any loss, be place based, and take account of the Section 6 Duty, the DECCA framework and appropriate ecological advice from the local authority Ecologist, NRW or a suitably qualified ecologist.
- Long-term management - A Long-Term Management Plan should be produced setting out the management of the site and future monitoring arrangements for all secured measures. The management plan must identify the funding mechanisms in place to meet the management plan objectives and the achievement of net benefits for biodiversity.

5.5.10 A review of the ecological survey data relating to protected and notable species has been carried out to inform the NBB assessment. With areas that support protected and notable species being mapped and used to highlight areas where species-specific mitigation measures should be targeted and to highlight areas where populations of protected and notable species may be isolated due to poor connectivity across the landscape. Where connectivity across the landscape is limited, habitat enhancement and/or creation measures will be proposed to inform the design of the proposed works.

5.5.11 A NBB assessment and Green Infrastructure Statement, presented within a combined document (**Volume 8, Appendix 4.5.L: Net Benefit for Biodiversity Assessment and Green Infrastructure Statement**) summarises the findings of this process and accompanies the consent applications.

5.6 Baseline

5.6.1 This section sets out the scope and methodology for the assessment of the ecological impacts of the proposed works.

Data Sources

5.6.2 The sources of published information that have been used to establish the baseline conditions are set out in this section. The overall topic assessment methodology is provided in **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**.

Methods

Desk Study

5.6.3 A desk study was carried out to identify sites designated for nature conservation and records of protected and notable habitats and species (Important Ecology Features) and invasive non-native species (INNS) that are relevant to the Glaslyn works site. The desk study also identified the status of water bodies covered by the WFD (Ref 5.12) to identify those likely to be impacted from an ecological perspective.

- 5.6.4 The different Study Areas (as defined in Section 5.3) apply to different ecological features.
- 5.6.5 Cofnod, the local biological records centre, was contacted in June 2023 to gain information on pre-existing ecological data (i.e. locally designated sites, HoPI, ancient woodland and existing records of protected and notable species and INNS within 2 km of the Glaslyn works site). This data was refreshed on a sixth monthly basis; the latest refresh was November 2024.
- 5.6.6 Online data resources that were reviewed for the desk study comprised:
- Natural Resources Wales website (Ref 5.31) for information on statutory designated sites of nature conservation interest and to confirm reasons for their designation.
 - JNCC website (Ref 5.32) for site information and designation details of SAC, SPA and Ramsar Sites.
 - DataMap Wales website (Ref 5.33) for information on the location and extent of HoPI.
 - Woodland Trust Ancient Tree Inventory website (Ref 5.34) for records of veteran and ancient trees in and up to 50 m from the Glaslyn works site.
 - National Biodiversity Network (NBN) Atlas website (Ref 5.35) for records of notable aquatic species and INNS, where data licensing conditions allow.
 - Natural Resources Wales DataMap Wales website for records of aquatic species (fish, macroinvertebrate and macrophytes) and WFD watercourses (Ref 5.33).
 - Natur Gwynedd BAP website (Ref 5.26) for BAP habitats and species.
 - British Trust for Ornithology (BTO) Wetland Bird Survey (WeBS) data (Ref 5.36) for non-breeding bird data.
- 5.6.7 Protected and notable habitats and species comprise those listed under Schedules 1, 5 and 8 of the WCA 1981 (as amended) (Ref 4.3); Schedules 2, 4 and 5 of the Habitats Regulations (Ref 5.1); and species and habitats of principal importance for nature conservation in Wales listed pursuant to Section 7 of the Environment (Wales) Act 2016 (Ref 5.4). Other habitats and species are also considered and have been assessed, e.g. those included in national, regional or local Red Data Books and Lists but not protected by legislation.
- 5.6.8 Records of INNS, as listed under Schedule 9 of the WCA 1981 (as amended) (Ref 4.3), have been considered when assessing the likely significant ecological effects of the proposed works. The presence of such species generally has a detrimental impact on natural habitats and legislation is in place to control their spread. It is important to consider the potential spread of INNS, the likely significant effects resulting from this, and any mitigation that may be required to prevent its spread.
- 5.6.9 The removal of such species may be desirable and beneficial for ecology. Measures will be taken to ensure that such invasive species are not inadvertently brought onto the Glaslyn works site. The species concerned are not relevant ecological features for the purposes of EclA but need to be considered (see **Volume 8, Appendix 1.4.A: Legislation, Policy and Guidance**), for their potential for adverse effects arising from the proposed works, or their potential to conflict with biodiversity mitigation and enhancement proposals.

Sources of Information – Field Surveys

- 5.6.10 The requirement for ecological field surveys was informed by the desk study and extended Phase 1 habitat survey (as presented in **Volume 8, Appendix 4.5.A: Habitats Report**) in addition to analysis of the proposed works design.
- 5.6.11 The Phase 1 habitat survey followed the standard JNCC method ‘Handbook for Phase 1 habitat survey: A technique for environmental audit’ (Ref 5.37). In summary, this comprised walking over the habitat within and up to 50 m of the Glaslyn works site boundary (where safely accessible) and recording the habitat types and boundary features present. The survey was extended to include an appraisal of the potential suitability of the habitats present to support protected and notable species of plants or animals. Field signs, habitat features with potential to support protected species, and any sightings or auditory evidence were recorded when encountered.
- 5.6.12 Aquatic habitat scoping surveys were completed to assess the quality of targeted aquatic habitats (watercourses and ditches). This involved conducting habitat appraisal at locations where potential impacts were considered likely, to assess the potential for water bodies to support protected or notable species and inform further survey work. Where deemed suitable, targeted aquatic macroinvertebrate, macrophyte, and fish surveys were scoped in on selected water bodies (described within **Volume 8, Appendix 4.5.C: Aquatic Ecology Report**).
- 5.6.13 Ecological field surveys were carried out to characterise the ecological baseline within the relevant Survey Areas, as presented in **Table 5-1**. Details regarding the definition of the Survey Areas for each ecological receptor and any limitations are presented in the associated survey reports within **Volume 8, Appendices 4.5.A – 4.5.L**.
- 5.6.14 Detailed field surveys for terrestrial invertebrates were not carried out following the desk study, extended Phase 1 habitat survey and through analysis of the proposed works’ design. The Glaslyn works site contains a variety of habitats, but the dominant habitat type which would be directly impacted comprises improved and poor semi-improved grassland and species poor marshy grassland which are unlikely to support notable invertebrate assemblages. The majority of habitat that may support notable terrestrial invertebrates or invertebrate communities (e.g. riverbanks, wetland, species rich marshy grassland, woodland, and scrub) will be largely retained or avoided during construction of the proposed works, which for most of the Glaslyn works site will be temporary. It is anticipated that NBB proposals (as presented in **Volume 8, Appendix 4.5.L: Net Benefit for Biodiversity Assessment and Green Infrastructure Strategy**) and measures in **Volume 8, Appendix 4.4.C: Landscape and Ecological Management Plan**, may be of benefit for terrestrial invertebrates.
- 5.6.15 Detailed field surveys for reptiles were not carried out following the desk study, extended Phase 1 habitat survey and through analysis of the design. Reptile surveys of nine areas within the Glaslyn works site were carried out in support of the proposed North Wales Connection (NWC) Project in 2017-2018 associated with Wylfa Horizon (the project was subsequently ceased). Considering only adults and sub-adults (which reflects the breeding population) the following peaks (during a single survey for each species) were recorded within each reptile Survey Area across the survey years. (The reptile Survey Areas described below are those affiliated with the NWC Project from 2017-2018).
- Survey Area 1 – no reptiles.
 - Survey Area 2 – 1 adult slow-worm (*Anguis fragilis*).

- Survey Area 3 – no reptiles.
- Survey Area 4 – 3 adult slow-worms and 2 adult grass snakes (*Natrix helvetica*).
- Survey Area 5 – 2 sub-adult slow-worms.
- Survey Area 6 – 1 adult grass snake.
- Survey Area 7 – 2 adult slow-worms.
- Survey Area 8 – 3 adult common lizards (*Zootoca vivipara*), 2 adult slow-worms and 2 adult grass snakes.
- Survey Area 9 – no reptiles.

- 5.6.16 When evaluating peak adult count, the six Survey Areas where reptile presence was confirmed were found to support low reptile populations (as defined in the Froglife (1999) guidance (Ref 5.38) whereby a low population comprises less than five individuals recorded on one survey visit), with no more than two adults seen during a single visit.
- 5.6.17 Given the low numbers of reptiles recorded in 2017-18, and that most habitats preferred by reptiles (such as field margins, hedgerow bases, ditches and woodland areas) will be retained and protected during construction or will be subject to only temporary disturbance, further reptile surveys in 2023-24 were not considered necessary. No changes to the habitats present in the majority of the Glaslyn works site have occurred since the surveys were conducted, and therefore it is reasonable to conclude that the numbers of reptiles would remain similar to that found previously. Given the temporary nature of the majority of the proposed works, mitigation for reptiles would remain as identified previously. Consideration for any embedded mitigation required for reptiles, which would be secured through production of a CEMP, is included in this chapter. It is anticipated that NBB proposals (as presented in **Volume 8, Appendix 4.5.L: Net Benefit for Biodiversity Assessment and Green Infrastructure Statement**) and measures in **Volume 8, Appendix 4.4.C: Landscape and Ecological Management Plan**, may of benefit for reptiles.
- 5.6.18 Separate species-specific surveys for hedgehog (*Erinaceus europaeus*), brown hare (*Lepus europaeus*) and polecat (*Mustela putorius*) were not carried out as part of the assessment. Records of these species have been obtained from the desk study and they are assumed to be present within the Glaslyn works site. Consideration for any embedded mitigation required for hedgehog, brown hare and polecat, which would be secured through production of a CEMP (**Volume 8, Appendix 4.2.A: Outline Construction Environmental Management Plan**), is included in this chapter. It is anticipated that NBB proposals (as presented in **Volume 8, Appendix 4.5.L: Net Benefit for Biodiversity Assessment and Green Infrastructure Statement**) and measures in **Volume 8, Appendix 4.4.C: Landscape and Ecological Management Plan (LEMP)** may be of benefit for these species.
- 5.6.19 Surveys specific to common amphibian species (e.g. common frog (*Rana temporaria*), common toad (*Bufo bufo*), smooth newt (*Lissotriton vulgaris*) and palmate newt (*Lissotriton helveticus*)) have not been carried out. Ponds and ditches within and close to the Glaslyn works site may support these species, with records provided through the desk study. The Glaslyn works site offers suitable terrestrial habitats in the form of hedgerows, scrub, poor semi-improved grassland and woodland. The mitigation proposed for reptiles and other species, which would be secured through production of a CEMP, will also reduce potential effects on common amphibian species, along with

the retention of and buffers applied to ponds present in the Glaslyn works site. It is anticipated that NBB proposals (as presented in **Volume 8, Appendix 4.5.L: Net Benefit for Biodiversity Assessment and Green Infrastructure Statement**) may be of benefit for these species.

5.6.20 **Table 5-1** presents details of the coverage, methods and survey periods of field surveys carried out within the relevant Survey Areas.

Table 5-1 – Ecological surveys carried out to characterise baseline conditions

Survey	Survey method	Survey period	Survey Area	Justification for the Survey Area
Extended Phase 1 habitat survey. INNS were also recorded where observed. Presented in Volume 8, Appendix 4.5.A: Habitats Report.	Extended Phase 1 habitat survey was conducted in accordance with the JNCC method (Ref 5.37).	Between May and August 2023. Supplemented and refreshed during 2024 to take account of adjustments to the Glaslyn works site boundary.	The Glaslyn works site and to a maximum of 50 m from the Glaslyn works site boundary, where viewable or access was permitted.	Habitats that are likely to be impacted by the proposed works are within the Glaslyn works site boundary.
Targeted habitat survey. Presented in Volume 8, Appendix 4.5.A: Habitats Report.	Selected habitats of greater botanical interest, where likely to be impacted by the proposed works, were surveyed in greater detail (i.e. National Vegetation Classification (NVC) survey and species lists with abundance ratings) to help inform mitigation, habitat compensation and enhancement proposals.	June 2024.	The habitats subjected to enhanced vegetation survey in the Glaslyn works site were identified from the initial Phase 1 habitat survey and desk study information.	Habitats that are likely to be impacted by the proposed works are within the Glaslyn works site boundary.
Hedgerow survey. Presented in Volume 8, Appendix 4.5.B: Hedgerow Report.	Hedgerows in the Glaslyn works site, which will be likely impacted by the proposed works, were surveyed and assessed for their 'Importance' against the Wildlife and Landscape Criteria, detailed in the Hedgerows Regulations (Ref 5.7).	August - November 2023, May 2024 and September – November 2024.	The Glaslyn works site plus a 50 m buffer where the hedgerow adjoins the Glaslyn works site boundary.	The Glaslyn works site and 50 m buffer is an appropriate Survey Area, acknowledging that the hedgerows that are likely to be impacted by the proposed works are within the Glaslyn works site, but

Survey	Survey method	Survey period	Survey Area	Justification for the Survey Area
				may go beyond the Glaslyn works site boundary.
Aquatic scoping survey. Presented in Volume 8, Appendix 4.5.C: Aquatic Ecology Report.	Walking accessible and safe stretches of targeted water body banks, noting physical habitat features (such as riparian cover, channel substrate, habitat type, modifications, and in-stream vegetation) to assess the potential for water bodies to support protected, notable or invasive species and inform further survey work.	June – September 2024.	Within the Glaslyn works site.	The surveys targeted water bodies within the Glaslyn works site that are potentially subject to crossings or other impacts, such as culverting.
Aquatic macrophyte surveys, including the presence of any INNS. Presented in Volume 8, Appendix 4.5.C: Aquatic Ecology Report.	During the aquatic scoping surveys where the habitat was deemed suitable, surveys for macrophytes were carried out over a 100 m representative stretch of watercourses following the UKTAG River Assessment Method for Macrophytes and Phytobenthos (Ref 5.39).	June – September 2024.	Within the Glaslyn works site.	The surveys targeted water bodies within the Glaslyn works site that are potentially subject to crossings or other impacts, such as culverting.
Aquatic macroinvertebrate surveys. Presented in Volume 8, Appendix 4.5.C: Aquatic Ecology Report.	During the aquatic scoping surveys where the habitat was deemed suitable, surveys for macroinvertebrates were carried out over a 100 m representative stretch of watercourses following the UKTAG River Assessment Methods for Benthic Invertebrate Fauna (Ref 5.40).	Spring (March to May) and Autumn (September to November) 2024.	Within the Glaslyn works site.	The surveys targeted water bodies within the Glaslyn works site that are potentially subject to crossings or other impacts, such as culverting.

Survey	Survey method	Survey period	Survey Area	Justification for the Survey Area
Fish surveys. Presented in Volume 8, Appendix 4.5.C: Aquatic Ecology Report.	During the aquatic scoping surveys where habitat was deemed suitable for protected/notable species, surveys for fish were scoped in. However, following site limitations (as outlined in Volume 8, Appendix 4.5.C: Aquatic Ecology Report), no fish surveys could be completed. Consequently, relevant desk study data has been used to inform the fish assemblage following the precautionary approach.	June – September 2024.	Within the Glaslyn works site.	The surveys targeted water bodies within the Glaslyn works site that are potentially subject to crossings or other impacts, such as culverting.
Breeding birds. Presented in Volume 8, Appendix 4.5.D: Ecology Report: Breeding Bird Surveys.	Surveys for breeding birds were based on an adaptation of the Common Bird Census methodology (Ref 5.42) and Gilbert <i>et al.</i> (Ref 5.43).	April and June (inclusive) 2023.	Within the Glaslyn works site plus an approximate 100 m buffer, where birds were detectable and considered useful to the assessment, to record the breeding bird assemblage.	There are no standardised Survey Areas for assessing the impacts of development on breeding bird populations. However, the Survey Area provides information on breeding birds within the Glaslyn works site, and its immediate surroundings, including contiguous areas where birds may potentially be adversely affected. This is sufficient to determine the likely impacts of the proposed works on breeding bird species in the area.
Non-breeding birds.	Surveys of non-breeding birds used transect-based walkovers across	November 2022 to March	Habitats to the east of Porthmadog (e.g. Glaslyn	There are no standardised Survey Areas for assessing

Survey	Survey method	Survey period	Survey Area	Justification for the Survey Area
Presented in Volume 8, Appendix 4.5.E: Ecology Report Glaslyn Wintering Bird Survey Report.	appropriate habitat, including the Glaslyn saltmarsh and habitats to the east of Porthmadog within and up to approximately 500 m (including some observations up to 1 km) from the Glaslyn works site, following methods as detailed 'Bird Monitoring Methods' (Ref 5.43) and 'Bird Census Techniques' (Ref 5.42).	2023 (inclusive). An additional survey was carried out in October 2024.	saltmarsh and river, grazing pasture to the north and south of the A487 Porthmadog Bypass, and mudflats), including the Glaslyn works site boundary and an approximate 500 m (with some observations up to 1 km) buffer east of Porthmadog.	the impacts of development on non-breeding bird populations. However, the Survey Area provides information on non-breeding birds within the Glaslyn works site and its immediate surroundings, including contiguous areas, where birds may potentially be adversely affected. This is sufficient to determine the likely impacts of the proposed works on wintering bird species occurring in the area.
Bats – Ground Level Tree Assessments and Potential Roost Feature inspection survey. Presented in Volume 8, Appendix 4.5.F: Bat Survey Report.	These inspection surveys were carried out of targeted structures and trees, following guidance as described in the Bat Conservation Trust (BCT) guidelines (Ref 5.44) and (Ref 5.45).	Initial assessments were carried out in 2023, and inspection surveys were carried out on targeted structures and trees between February and June 2024.	The Glaslyn works site, plus targeted trees within 30 m of the Glaslyn works site where the potential for impacts were identified.	The surveys targeted structures and trees which are likely to be impacted by the proposed works. Information was collated on the location of trees and structures identified as potentially affected and were assessed for their suitability for roosting bats. This has informed the proposed works' design, along with offset buffers, to avoid direct and indirect effects upon potential roost sites (and avoidance of trees and woodland with

Survey	Survey method	Survey period	Survey Area	Justification for the Survey Area
				higher ecological value irrespective of bats which should be avoided).
Bats – Roost Surveys. Presented in Volume 8, Appendix 4.5.F: Bat Survey Report.	Trees and structures that could potentially be directly or indirectly impacted by the proposed works have been assessed for their suitability for use by bats. Those with bat roost suitability that could not be avoided by design adjustments have been subjected to further surveys. Trees and structures with potential roost features (PRFs) that could be reached from ground level were initially surveyed using endoscopes. For PRFs that could not be reached by endoscope, as the use of tree climbing was not possible, emergence-re-entry surveys have been carried out as described in the Bat Conservation Trust (BCT) guidelines (Ref 5.44 and Ref 5.45) .	May to September 2024.	Within the Glaslyn works site, as only those will be directly or indirectly impacted by the proposed works. No trees with multiple roost features were identified outside of the Glaslyn works site boundary that could potentially be indirectly impacted by the proposed works i.e. within 15 m (for example due to noise disturbance).	The surveys targeted trees and a barn which are likely to be directly or indirectly affected by the proposed works.
Bats – Foraging and commuting. Presented in Volume 8, Appendix 4.5.F: Bat Survey Report.	Targeted walked transect surveys were carried out at three areas within the Glaslyn works site: at Garth CSEC (moderate suitability for foraging and commuting bats), at Porthmadog and Tremadog (low suitability for foraging and commuting bats) and at Wern CSEC (low suitability for foraging and commuting bats). The surveys were conducted	Garth: spring, summer and autumn (monthly April to September 2023). Porthmadog and Tremadog: spring (May	Three targeted areas (transects) within the Glaslyn works site boundary.	The bat activity Survey Area and survey effort for the Glaslyn works site was determined through consideration of the size of the Glaslyn works site, the quality of habitat present which is suitable for bats and its proximity to Coedydd Derw a Safleoedd

Survey	Survey method	Survey period	Survey Area	Justification for the Survey Area
	as described in the Bat Conservation Trust (BCT) 2016 guidelines (Ref 5.44)), as they were carried out prior to the release of the BCT 2023 guidelines (Ref 5.45). The surveys were supplemented by the deployment of static bat detectors, (three in the Garth transect and two in the Wern transect).	2023), summer (July 2023), autumn (September 2023). Wern: spring (May 2023), summer (July 2023), autumn (September 2023), spring (May 2024).		Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC in accordance with the criteria described in the Bat Conservation Trust (BCT) guidelines (Ref 5.44 and Ref 5.45).
Badger. Presented in Volume 4.5.G: Ecology Report: Badger Survey Report.	A walkover survey searching for signs of badger activity as described in the Mammal Society's 'Surveying Badgers' publication (Ref 5.46). The survey was initially carried out in combination within the Phase 1 habitat survey. Further field surveys and camera trap surveys were carried out to expand on and monitor initial findings.	Between May and August 2023, and February to March and April 2025, to take account of ongoing badger sett monitoring.	The Glaslyn works site and up to a 50 m buffer from the Glaslyn works site boundary (some setts were identified beyond this and have been included in results for information).	50 m is an appropriate Survey Area as it covers the 30 m distance at which direct effects could occur and acknowledges that badger setts present beyond this distance are unlikely to be impacted by the proposed works, e.g. through construction disturbance.
Riparian mammals. Presented in Volume 8, Appendix 4.5.H: Riparian Mammals Survey Report.	The survey involved a habitat suitability assessment and searching for field signs for otter and water vole along targeted watercourses where impacts were likely, in accordance with standard industry guidance (Ref 5.47, Ref 5.48, Ref 5.49 and Ref 5.50).	For water vole, two surveys were carried out on each targeted watercourse and ditch: one in the later part of the	The Glaslyn works site and up to 200 m up and downstream of the Glaslyn works site boundary of potentially impacted areas.	The Survey Area is sufficient to determine presence or absence of otter and water vole and to assess potential impacts on both species.

Survey	Survey method	Survey period	Survey Area	Justification for the Survey Area
		breeding season (July to September 2023 and one in the early part of the breeding season (April to June 2024). Otter surveys were carried out in combination with the water vole surveys. Additional survey and monitoring were carried out in August and December 2024 and March 2025 to take account of adjustments to the proposed works area and to confirm the absence of potential		

Survey	Survey method	Survey period	Survey Area	Justification for the Survey Area
		otter holts or resting places.		
Great crested newt (GCN) Habitat Suitability Index (HSI) survey. Presented in Volume 8, Appendix 4.5.I: Great Crested Newt Report.	An HSI survey of water bodies within 250 m of the Glaslyn works site, and with habitat connectivity, was carried out in accordance with Oldham et al. (Ref 5.51). The aim of the survey was to evaluate the suitability of water bodies to support GCN.	June 2023 and May 2024.	The Glaslyn works site and up to 250 m from the Glaslyn works site boundary.	The Survey Area is sufficient to determine presence or absence of GCN and to assess potential impacts on this species. GCN typically use terrestrial habitat up to 500 m from their breeding ponds (Ref 5.51). However, given the temporary nature of the proposed works, and lack of records of GCN in the locality, 250 m is an appropriate Survey Area, acknowledging the notable decrease in abundance of GCN beyond 250 m from a breeding pond (Ref 5.51).
GCN eDNA Survey. Presented in Volume 8, Appendix 4.5.I: Great Crested Newt Report.	An eDNA survey was carried out of water bodies that were identified as potentially suitable for this species.	June 2023 and May 2024.	Water bodies within and up to 250 m from the Glaslyn works site with HSI scores >0.43.	The Survey Area is sufficient to determine presence or absence of GCN and to assess potential impacts on this species. The combination of HSI and eDNA surveys is sufficient as all ponds were found to be negative for GCN.

Survey	Survey method	Survey period	Survey Area	Justification for the Survey Area
INNS. Presented in Volume 8, Appendix 4.5.A: Habitats Report.	INNS observations were recorded when noted during the ecology field surveys. They will also be recorded during pre-construction surveys and construction work.	Multiple site visits between April 2023 and March 2025.	Within the Glaslyn works site.	The Survey Area is sufficient as only habitats within the Glaslyn works site will be directly impacted by the proposed works and could potentially facilitate the spread of INNS.

Impact Assessment Method

- 5.6.21 The impact assessment detailed in this chapter has been carried out in accordance with CIEEM's guidelines (Ref 5.27). Details of the technical methods used to determine the baseline conditions, sensitivity of the receptors, magnitude of effects and the significance criteria that have been used for the Ecology and Nature Conservation assessment can be found in **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**.

Baseline Results

- 5.6.22 This section outlines the baseline ecological characteristics of the Glaslyn works site and relevant Study Areas.

Sites Statutorily Designated for Biodiversity Importance

- 5.6.23 There are six international statutory sites for nature conservation (i.e. SAC, SPA and Ramsar sites) in the 10 km Study Area and two further SACs designated for bats within 30 km of the Glaslyn works site.
- 5.6.24 Twenty-two other statutory designated sites for nature conservation (SSSI, NNR, LNR) are present in the 5 km Study Area.
- 5.6.25 The locations of these statutory sites, relevant to the Glaslyn works site, are shown in **Figure 4.5.1** and **Figure 4.5.2**. Designated sites are listed in **Table 5-2** in ascending order, with those closest to the Glaslyn works site boundary listed first, starting with internationally designated sites, then national and local statutory sites. Designation details are summarised in **Volume 8, Appendix 4.5.J: Statutory Designated Site Citations**.

Table 5-2 – Statutory sites designated for nature conservation within 10 km (international) and 5 km (national) of the Glaslyn works site (extended to 30 km for international sites designated for bats)

Site name and designation	Approximate distance (km) and direction from closest point to the Glaslyn works site	Importance or value
Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC	Within the Glaslyn works site.	International (Very High).
Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC	0.54 km south.	International (Very High).
Northern Cardigan Bay/Gogledd Bae Ceredigion SPA	2.94 km south-west.	International (Very High).
Morfa Harlech a Morfa Dyffryn SAC	3.18 km south.	International (Very High).
Corsydd Eifionydd/Eifionydd Fens SAC	6.12 km north-west.	International (Very High).
Rhinog SAC	6.66 km south-east.	International (Very High).
Glynllifon SAC	12.92 km north.	International (Very High).
Mwyngloddiau Fforest Gwydir/Gwydyr Forest Mines SAC	24.36 km north-east.	International (Very High).
Glaslyn SSSI	Within the Glaslyn works site.	National (High).
Ysbyty Bron y Garth SSSI	Within the Glaslyn works site.	National (High).
Coed Tremadog SSSI and NNR	0.37 km north-east and 0.38 km north-east.	National (High).
Morfa Harlech SSSI and NNR	0.54 km south and 0.83 km south-east.	National (High).
Tiroedd a Glannau Rhwng Cricieth ac Afon Glaslyn SSSI	0.80 km south-west.	National (High).
Parc Y Borth LNR	1.30 km south-west.	National (High).
Pen y Banc LNR	1.31 km south.	National (High).

Site name and designation	Approximate distance (km) and direction from closest point to the Glaslyn works site	Importance or value
Afon Ddu SSSI	1.65 km north-east.	National (High).
Coedydd Dyffryn Ffestiniog (Gogleddol) SSSI	2.14 km east.	National (High).
Aberdunant SSSI	2.16 km north.	National (High).
Mwyngloddiau Llanfrothen SSSI	2.34 km north-east.	National (High).
Dolorgan Barn SSSI	3.90 km south-east.	National (High).
Maes Meillion a Gefail-y-cwm SSSI	3.95 km south-east.	National (High).
Coedydd Nanmor SSSI	4.06 km north.	National (High).
Hafod Garregog NNR	4.50 km north-east.	National (High).
Glanllynau a Glannau Pen-ychain i Gricieth SSSI	4.53 km south-west.	National (High).
Glyn Cywarch SSSI	4.57 km south-east.	National (High).
Coedydd Beddgelert a Cheunant Aberglaslyn SSSI	4.84 km north.	National (High).
Coedydd De Dyffryn Maentwrog SSSI	4.92 km east.	National (High).
Ceunant Llennyrch NNR	4.92 km east.	National (High).

Non-Statutory Sites Designated for Nature Conservation

- 5.6.26 There are 41 non-statutory sites designated for nature conservation (e.g WS) within the 2 km Study Area (as defined in **Section 5.3** of this chapter). Two of these (Ty'n-y-berllan and Coed Bryn-twr/Wern) are in the Glaslyn works site.
- 5.6.27 These sites have been designated as WS and cWS. The latter may be suitable for designation and may become so in the lifetime of the proposed works.
- 5.6.28 These sites are shown on **Figure 4.5.3** and are summarised in **Table 5-3**. The non-statutory sites are listed with those closest to the Glaslyn works site first.

Table 5-3 – Non-statutory designated sites for nature conservation within 2 km of the Glaslyn works site

Non-statutory designated site	Description	Location of designated site
Ty'n-y-berllan cWS	Broadleaved woodland and neutral grassland.	Within Glaslyn works site (western end at Wern).
Coed Bryn-twr/Wern cWS	Broadleaved woodland, acid grassland and standing water.	Within Glaslyn works site (western end at Wern).
Coed y Chwarel WS	Broadleaved woodland.	0.01 km south-west.
Nursery Wood cWS	Broadleaved woodland and semi-improved neutral grassland.	0.01 km north.
Coed yr Eglwys cWS	Broadleaved woodland and neutral grassland.	0.03 km north-west.
Coed y Cefn cWS	Coniferous woodland.	0.06 km south-east.
Gwernddwryd WS	Acid grassland, broadleaved woodland and marshy grassland. Lowland acid grassland, valley mire with bog or acid fen vegetation.	0.14 km west.
Glegyrog cWS	Broadleaved woodland.	0.15 km west.
Penamser cWS	Scattered trees, bracken and acid grassland.	0.15 km south-east.
Geirth Mawr cWS	Broadleaved woodland and neutral grassland.	0.26 km west.
Coed Allt-wen cWS	Broadleaved woodland.	0.27 km north-east.
Coed y Garth cWS	Broadleaved woodland.	0.31 km south-west.
Abergafren WS	Semi-improved neutral grassland and broadleaved woodland. Upland oakwood, lowland acid grassland.	0.34 km south-east.

Non-statutory designated site	Description	Location of designated site
Coed Tu hwnt l'r Bwlch cWS	Broadleaved woodland.	0.42 km south-west.
Bronygarth Hospital WS	Marshy grassland and broadleaved woodland. Lowland bog, upland oakwood, wet woodland, lowland acid grassland, rush pasture.	0.45 km east.
Moel-y-Gest cWS	Acid grassland, dry dwarf shrub heath, bracken and broadleaved woodland or scrub.	0.51 km south.
Cae Canol cWS	Marshy grassland, neutral grassland and acid grassland.	0.58 km north-west.
Cae Canol WS	Marshy grassland, neutral grassland and acid grassland.	0.64 km south-east.
Coed Tan-yr-allt cWS	Broadleaved woodland.	0.72 km north.
Pen-y-bryn WS	Semi-improved neutral grassland and marshy grassland. Swamp, rush pasture and lowland mixed deciduous woodland.	0.73 km east.
Portmeirion Woodlands cWS	Broadleaved woodland.	0.78 km south.
Borthwen cWS	Broadleaved woodland.	0.80 km south-east.
Garth cWS	Broadleaved woodland and neutral grassland.	0.84 km south.
Hafod Cae Maen cWS	Semi-improved neutral grassland.	0.88 km south.
Pentrefelin cWS	Semi-improved neutral grassland.	1.09 km west.
Bron-y-foel cWS	Acid grassland, dry dwarf shrub heath and broadleaved woodland.	1.12 km south-east.
Coedydd Cae-merched cWS	Broadleaved woodland.	1.28 km north-east.
Parc y Borth WS	Lowland mixed deciduous woodland.	1.30 km south-west.
Garreg Wen cWS	Broadleaved woodland, acid grassland and neutral grassland.	1.46 km south-west.
Coed Garreg-goch cWS	Broadleaved woodland.	1.65 km south-west.
Borth y Gest cWS	Acid grassland and marshy grassland.	1.66 km south-west.
Glan Morfa Bach (West) cWS	Neutral grassland and marshy grassland.	1.70 km south.
Pen-y-Bwlch WS	Marshy grassland, wet woodland and rush pasture.	1.71 km north-east.

Non-statutory designated site	Description	Location of designated site
Glan Cedron cWS	Acid grassland, neutral grassland, marshy grassland and coniferous woodland.	1.75 km north-west.
Afon Cedron cWS	Acid grassland.	1.76 km north-west.
Bryn Neuadd WS	Acid grassland, wet heath and acid grassland mosaic and marshy grassland. Bog, heathland, rush and rhos pasture, wet woodland.	1.81 km north-west.
Glan-y-morfa-mawr pools cWS	Standing water.	1.90 km south.
Traeth Mawr Woodland cWS	Broadleaved woodland and standing water.	1.91 km north-east.
Gwaith Powdwr cWS	Dry dwarf shrub heath and bracken.	1.93 km east.
Carreg Wen cWS	Dune grassland and broadleaved woodland.	1.94 km south-west.
Hir Ynys bog cWS	Marshy grassland.	1.97 km north-east.

Wildlife Trust Sites

- 5.6.29 Two North Wales Wildlife Trust (NWWT) sites are in the Study Area, as shown in **Figure 4.5.3**. The site of the Traeth Glaslyn NWWT Reserve is wholly in the Glaslyn works site. Gwaith Powdwr NWWT is 1.91 km east of the Glaslyn works site.

Habitats

Ancient Woodland

- 5.6.30 There are 80 sites of Ancient Semi-Natural Woodland, 38 sites of Restored Ancient Woodland, seven Plantations on Ancient Woodland sites and one site of Ancient Woodland of unknown category within the Study Area.
- 5.6.31 Five areas of ancient woodland are present within the Glaslyn works site: one to the north of the A487-High Street roundabout, one centrally situated at Pensyflog, and three additional areas at Wern. These are discussed in greater detail in **Section 5.9** of this chapter and illustrated in **Figure 4.5.4**.

Ancient and Veteran Trees

- 5.6.32 A review of the Woodland Trust Ancient Tree Inventory (Ref 5.34) indicates that there are no recorded ancient or veteran trees within the Study Area. The nearest is a veteran tree approximately 0.25 km south of the Glaslyn works site, and is an ornamental tree species situated within the grounds of Wern Manor.
- 5.6.33 The arboricultural survey (**Volume 8, Appendix 4.5.K: Arboricultural Impact Assessment**) recorded 810 trees in the Study Area. Eighteen of which were identified as being significant (ancient or veteran trees).

Habitats of Principal Importance

- 5.6.34 Data supplied by Cofnod and Datamap Wales (Ref 5.33) identified the following HoPI within the Study Area. The locations of these habitats are shown in **Figure 4.5.4**:
- Coastal and floodplain grazing marsh (in the Glaslyn works site boundary and the proposed works area).
 - Lowland fen and reedbed (in the Glaslyn works site boundary but outside of the direct works area due to the use of HDD).
 - Saltmarsh (in the Glaslyn works site boundary and the proposed works area).
 - Lowland dry acid grassland (in the Glaslyn works site boundary and the proposed works area).
 - Purple moor grass and rush pasture (in the Glaslyn works site and the proposed works area).
 - Traditional orchard (0.04 km east of the Glaslyn works site boundary).
 - Lowland heathland (0.16 km north-east of the Glaslyn works site boundary).
 - Lowland meadow (0.72 km south of the Glaslyn works site boundary).
 - Maritime cliff and slope (1.53 km south of the Glaslyn works site boundary).
 - Blanket bog (1.90 km north of the Glaslyn works site boundary).
 - Raised bog (1.90 km north of the Glaslyn works site boundary).
- 5.6.35 Further HoPI present within the Study Area, but not currently identified by Cofnod or on the Datamap Wales website (Ref 5.33) are:
- Hedgerow.
 - River.
 - Standing water or pond.
 - Deciduous woodland.
- 5.6.36 Coastal and floodplain grazing marsh HoPI is present throughout the Glaslyn works site. It is not a habitat type but rather a landscape type which supports a variety of habitats; the defining features are hydrological and topographical rather than botanical. Grazing marsh is defined as periodically inundated pasture or meadow, typically with ditches or rills containing standing brackish or fresh water. Almost all areas are grazed, and some are cut for hay or silage (Ref 5.33).
- ### Broad Terrestrial Habitats
- 5.6.37 The broad terrestrial habitat types present in the Glaslyn works site were identified during the Phase 1 habitat survey, carried out between May and August 2023. These habitats were further defined by detailed habitat surveys, where required, such as for selected grassland areas and hedgerows, that were carried out between June and November 2024. See **Volume 8, Appendix 4.5.A: Ecology Report: Habitats Report** and **Volume 8, Appendix 4.5.B: Ecology Report: Hedgerow Report**.
- 5.6.38 **Table 5-4** presents a summary of broad terrestrial habitats that are present in the Glaslyn works site and the Survey Area, alongside area calculations (taken from

digitised maps of the Phase 1 habitats) and an evaluation including importance and value (sensitivity) of ecological features.

Table 5-4 – Broad habitat types in the Glaslyn works site and the Survey Area and their ecological importance

Habitat type	Phase 1 habitat survey code	Area (ha)/length (km) (site limits)	Area (ha)/length (km) (Survey Area limits)	Ecological importance	Rationale
Semi-natural broadleaved woodland	A1.1.1	3.39 ha	21.94 ha	Up to County (Medium)	Lowland mixed deciduous woodland is a HoPI. Wet woodland is listed in the Gwynedd BAP (Ref 5.26). The locations of lowland mixed deciduous woodland HoPI is not yet provided on the DataMap Wales website (Ref 5.33) although broadleaved semi-natural woodland is in the Glaslyn works site boundary. Wet woodland is identified as a component of the Glaslyn SSSI and some is in the Glaslyn works site boundary.
Broadleaved plantation woodland	A1.1.2	1.11 ha	3.02 ha	Local (Low)	Common and widespread species. Not a HoPI. Occurs throughout the Glaslyn works site, although concentrated along the A487 Porthmadog Bypass (highway planting).
Coniferous plantation woodland	A1.2.2	0.04 ha	0.09 ha	Site (Very Low)	Common and widespread. Occurs in one location in Glaslyn works site where non-native coniferous species planted to provide a wind break. Occurs in further location outside of Glaslyn works site but within Survey Area, where it abuts Wern Manor gateway.
Mixed semi-natural woodland	A1.3.1	0.03 ha	0.37 ha	Site (Very Low)	Common and widespread species. Not a HoPI. Occurs in one small location adjacent to the Glaslyn works site where native broadleaved species are colonising around remnant planted coniferous tree species.

Habitat type	Phase 1 habitat survey code	Area (ha)/length (km) (site limits)	Area (ha)/length (km) (Survey Area limits)	Ecological importance	Rationale
Mixed plantation woodland	A1.3.2	0.52 ha	0.66 ha	Local (Low)	Common and widespread species. Not a HoPI. Primarily near Wern CSEC.
Dense or continuous scrub	A2.1	2.15 ha	6.93 ha	Site (Very Low)	Common and widespread. Not a HoPI. Occurs throughout the Glaslyn works site.
Scattered scrub	A2.2	0.23 ha and 0.42 km	1.22 ha and 0.56 km	Site (Very Low)	Common and widespread. Not a HoPI. Occurs throughout the Glaslyn works site.
Broadleaved parkland or scattered trees	A3.1	1.95 km	5.2 km and 0.72 ha	National (High) for veteran and ancient trees. Otherwise of Site (Very Low) for scattered trees to Local (Low) importance parkland	Not a HoPI, unless veteran or ancient trees. Individual trees can provide suitable habitat for protected and notable species, including bats and barn owl. The data presented in the Arboricultural Baseline Report (Volume 8, Appendix 4.5.K Arboricultural Impact Assessment) states that 18 trees were identified as likely ancient or veteran within the Study Area.
Semi-improved neutral grassland	B2	6.17 ha	15.61 ha	Local (Low)	Whilst not a HoPI in its own right, areas of semi-improved neutral grassland present in the Glaslyn works site are included in the Coastal and Floodplain Grazing Marsh (CFGM) HoPI which covers all of the Glaslyn works site. Given the lack of botanical diversity, and the limited potential to support bird assemblages of high

Habitat type	Phase 1 habitat survey code	Area (ha)/length (km) (site limits)	Area (ha)/length (km) (Survey Area limits)	Ecological importance	Rationale
					conservation value, these grassland areas are of local importance (low value).
Improved grassland	B4	19.64 ha	41.51 ha	Site (Very Low)	Whilst not a HoPI in its own right, areas of improved grassland present in the Glaslyn works site are included in the CFGM HoPI which covers the majority of the Glaslyn works site. Given the lack of botanical diversity, and the limited potential to support bird assemblages of high conservation value, these grassland areas are of site importance (very low value).
Marshy grassland	B5	25.66 ha	49.08 ha	Up to County (Medium)	Some of the marshy grassland areas are purple moor grass and rush pasture which is a HoPI. Rhos pasture Habitat Action Plan (HAP) is listed in the Gwynedd BAP (Ref 5.26). Marshy grassland is included in the CFGM HoPI.
Poor semi-improved neutral grassland	B6	14.56 ha	25.06 ha	Site (Very Low)	See Improved grassland B4.
Other tall herb and fern – ruderal	C3.1	0.65 ha	1.32 ha	Site (Very Low)	See Improved grassland B4.
Swamp	F1	1.90 ha	2.62 ha	Up to County (Medium)	Lowland wetland is listed in the Gwynedd BAP (Ref 5.26). Areas of swamp are in the CFGM HoPI.

Habitat type	Phase 1 habitat survey code	Area (ha)/length (km) (site limits)	Area (ha)/length (km) (Survey Area limits)	Ecological importance	Rationale
Marginal and inundation – marginal vegetation	F2.1	0.32 ha	0.68 ha	Local (Low)	Whilst not a HoPI in its own right, these narrow strips of emergent vegetation occur on the margins of the Rivers HoPI.
Marginal and inundation – inundation vegetation	F2.2	0.33 ha	0.64 ha	Local (Low)	Small areas of vegetated gravel are present within Afon Glaslyn which are subjected to periodic inundation. Whilst not a HoPI in their own right, these areas occur within the Rivers HoPI.
Standing water	G1	0.06 ha and 0.08 km	0.16 ha and 0.08 km	Local (Low)	Ponds can be defined as permanent (or seasonal) water bodies up to 2 ha in extent and qualify as being a HoPI if they meet one or more criteria for UKBAP classification (Ref 5.52, including supporting species of high conservation importance. All ponds identified in the Glaslyn works site have been constructed recently in support of the A487 Porthmadog Bypass, between the highway and parallel railway line. These ponds are generally very shallow and densely vegetated. Highway drainage ditches holding standing water are also present in the Glaslyn works site. In the wider survey area, an ornamental garden pond, quarry drainage pond and hospital grounds pond were also recorded. No species of high conservation importance were recorded in association with these water bodies. The water bodies in the Glaslyn works site and in the wider survey area are unlikely to reach the

Habitat type	Phase 1 habitat survey code	Area (ha)/length (km) (site limits)	Area (ha)/length (km) (Survey Area limits)	Ecological importance	Rationale
				(Low) importance only.	
Saltmarsh	H2.6	0 ha	0.09 ha	Up to County (Medium)	Coastal saltmarsh is a HoPI and is listed within the Gwynedd BAP (Ref 5.26) as part of the Lowland Wetland Habitat Action Plan. Areas of saltmarsh are in the CFGM HoPI.
Cultivated or disturbed land – arable	J1.1	7.14 ha	12.17 ha	Site (Very low)	See Improved grassland B4.
Cultivated or disturbed land – amenity grassland	J1.2	4.43 ha	10.88 ha	Site (Very Low)	See Improved grassland B4.
Ephemeral and short perennial	J1.3	0.23 ha	0.38 ha	Site (Very Low)	Common and widespread. Not a HoPI. Occurs throughout the Glaslyn works site.
Introduced shrub	J1.4	0.0 ha	0.05 ha	Site (Very Low)	Common and widespread. Not a HoPI. Planted garden shrubs present close to Glaslyn works site.
Intact native species-rich hedge	J2.1.1	0.22 km	0.37 km	Up to County (Medium)	Hedges are present in the Glaslyn works site and are a HoPI and legally protected under the Hedgerows Regulations (Ref 5.7).
Intact species- poor hedge	J2.1.2	0.0 km	0.2 km	Up to County (Medium)	See J2.1.1 above.

Habitat type	Phase 1 habitat survey code	Area (ha)/length (km) (site limits)	Area (ha)/length (km) (Survey Area limits)	Ecological importance	Rationale
Defunct species-poor hedge	J2.2.2	0.48 km	1.1 km	Up to County (Medium)	See Intact native species-rich hedge J2.1.1.
Species-poor hedge with trees	J2.3.2	0.0 km	0.16 km	Up to County (Medium)	See Intact native species-rich hedge J2.1.1.
Other linear habitats (including fence, wall, dry ditch, earth bank)	J2.4; J2.5; J2.6; J2.8;	3.42 km	6.59 km	Site (Very low)	Common and widespread. Not a HoPI.
Other area habitats (including caravan sites, buildings, bare ground and hard standing)	J3.4; J3.6; J4; J5	9.78 ha	29.65 ha	Site (Very low)	Common and widespread. Not a HoPI.

Legally Protected and Notable Species and INNS

- 5.6.39 The desk study data search, obtained from Cofnod in November 2024, returned records of protected and notable species within the 2 km Study Area for the preceding 10 years. These protected and notable species, including species of biodiversity importance are summarised in relevant technical reports, included as **Volume 8, Appendices 4.5.A – 4.5.I.**
- 5.6.40 **Table 5-5** presents a summary of protected and notable animal species that have been identified as present, or potentially present, within the Glaslyn works site and their respective Survey Areas, alongside an evaluation of importance or value (sensitivity) and associated rationale. Descriptions of the baseline conditions are presented in **Volume 8, Appendices 4.5.A – 4.5.I.**

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

Species or species group	Baseline detail	Ecological importance	Rationale
Terrestrial invertebrates	The desk study returned records of 26 notable terrestrial invertebrate species in the 2 km Study Area (within the last 10 years, up to 2024). None were recorded in the Glaslyn works site; the closest is 10 m west. No records of the Lilljeborg's whorl snail (<i>Vertigo lilljeborgi</i>), which is included within the citation for Glaslyn SSSI, were provided within the Study Area. A recent survey by NRW for this species, recorded them upstream of the Glaslyn works site 2.2 km north at Pont Croesor (Ref 5.54). NRW advised it did not expect to find this species in the Glaslyn works site and that further surveys for <i>Vertigo lilljeborgi</i> were not required in support of the proposed works. The habitats recorded within the majority of the proposed works area are common in a local and national context and unusual or rare assemblages of invertebrates are not expected. Invertebrate assemblages which form part of the statutory designated sites (which comprise more	National (High) importance for <i>Vertigo lilljeborgi</i>. Local importance (Low) for general assemblage.	The desk study recorded 26 species listed as Species of Principal Importance under Section 7 of the Environment (Wales) Act 2016 (Ref 5.4).

Species or species group	Baseline detail	Ecological importance	Rationale
	uncommon habitats) are assessed, where required, as part of the sites themselves. The vast majority of statutory designated sites will be avoided through the use of HDD.		
Aquatic macroinvertebrates as presented in Volume 8, Appendix 4.5.C: Aquatic Ecology Report.	The desk study returned three records of freshwater pearl mussel (<i>Margaritifera margaritifera</i>) 1.78 km north of the Glaslyn works site, in the Afon Ddu with no records within the Glaslyn works site. Scarce blue-tailed damselfly (<i>Ischnura pumilio</i>) the cased caddisfly <i>Limnephilus fuscicornis</i> and variable damselfly (<i>Coenagrion pulchellum</i>) were also recorded within 2 km of the Glaslyn works site. No other notable aquatic macroinvertebrates were recorded in the 2 km Study Area (in the last 10 years, up to 2024). During the field surveys, one notable species was identified, the beetle <i>Hydraena palustris</i>.	National (High) importance for freshwater pearl mussel. District (Medium) importance for scarce blue-tailed damselfly, variable damselfly, and the beetle <i>Hydraena palustris</i>. Local importance (Low) for the cased caddisfly <i>Limnephilus fuscicornis</i> and other species.	Freshwater pearl mussel is listed on Schedule 5 of the WCA 1981 (Ref 4.3) and listed as Species of Principal Importance. The scarce blue-tailed damselfly, variable damselfly, and the beetle <i>Hydraena palustris</i> are listed as Near Threatened by The International Union for Conservation of Nature (IUCN) (Ref 5.25). The cased caddis <i>Limnephilus fuscicornis</i> is listed as Nationally Scarce and is also listed within the IUCN Red Data Book (RDB) (Ref 5.53).
Aquatic macrophytes as presented in Volume 8, Appendix 4.5.C: Aquatic Ecology Report.	The desk study returned records of dwarf spike-rush (<i>Elocharis parvula</i>) and sharp rush (<i>Juncus acutus</i>) within 2 km of the Glaslyn works site.	District (Medium) importance for dwarf spike-rush. Local (Low) importance for sharp rush.	Dwarf spike-rush is listed as Nationally rare and a Schedule 8 species under the WCA 1981 (Ref. 4.3).

Species or species group	Baseline detail	Ecological importance	Rationale
	No notable macrophytes or bryophytes were recorded during the field surveys.		Sharp rush is listed as Nationally scarce, however it is not listed on the JNCC UK Red list for plants.
Fish as presented in Volume 8, Appendix 4.5.C: Aquatic Ecology Report.	The desk study returned records of three notable fish species: European eel (<i>Anguilla Anguilla</i>), brown/sea trout (<i>Salmo trutta</i>) and Atlantic salmon (<i>Salmo salar</i>) in the 2 km Study Area and within the last ten years, up to 2024. Fish surveys were proposed to be conducted following the aquatic scoping exercise but due to site access and unsuitable fish habitat during the survey season at those sites where access was possible (e.g. low water depth and dissolved oxygen concentration outside safe limits), this prevented field surveys from being completed. Due to this, the baseline fish assemblage has been established from desk study records only, and following the precautionary approach, have been assumed to be present throughout where suitable habitat has been identified during the habitat appraisals.	National (High) importance for European eel, brown/sea trout and Atlantic salmon. Local (Low) importance for other species.	The notable fish identified represent migratory species which are all protected by both national and European legislation (outlined below). The salmonids (Atlantic salmon and brown/sea trout) are mentioned in the Afon Ddu SSSI citation. All fish and their habitats are protected under the Salmon and Freshwater Fisheries Act 1975 (Ref 5.10). It is an offence to wilfully disturb spawn, spawning fish or spawning areas, cause pollution likely to harm fish, and to cause impedance to fish passage for migratory species. There are other offences in relation to specific fish species. Eels are protected by the Eels Regulations 2009 (Ref 5.11), Bonn Convention (Appendix II; Ref 5.13), Section 42 species (previously UKBAP) under the NERC Act 2006 (Ref 5.14), listed in CITES Appendix II and in the EU implementation of CITES rules (Annex B to Council Regulation

Species or species group	Baseline detail	Ecological importance	Rationale
			(EC) No 338/97; EU, 1996 (Ref 5.15), and listed as Species of Principal Importance . Brown/sea trout are listed as a Section 42 species (previously UKBAP) under the Natural Environment and Rural Communities Act 2006 (Ref 5.14) and listed as Species of Principal Importance. Atlantic salmon are protected under the Salmon Act 1986 (Ref 5.18), The Conservation of Habitats and Species Regulations 2017 (Ref 5.1), Bern Convention (Appendix III) (Ref 5.16), The Conservation of Habitats and Species Regulations 2017 (as amended) 2017 (Schedule 4) (Ref 5.1). They are also listed as a Section 42 species (previously UKBAP) under the NERC Act 2006 (Ref 5.14) and listed as Species of Principal Importance. Local species action plans have been drawn together for salmonids (brown trout and Atlantic salmon).
Breeding and non-breeding birds as presented in Volume 8, Appendix 4.5.D:	The desk study returned records of 154 protected and notable bird species in the 2 km Study Area (in the last 10 years, up to 2024). Forty two species were listed on Schedule	Local (Low)	All nesting birds are protected under the WCA 1981 (as amended) (Ref 4.3). Habitats across the Glaslyn works site support breeding and non-

Species or species group	Baseline detail	Ecological importance	Rationale
Ecology Report: Breeding Bird Surveys and Volume 8, Appendix 4.5.E: Ecology Report Glaslyn Wintering Bird Survey Report, respectively.	1 of the WCA 1981 (as amended) (Ref 4.3); 33 species were listed as Priority Species in Wales (Ref 5.4); 45 species were included on the BoCC Red List (Ref 5.23); 32 species on the BoCC Red Wales list (Ref 5.24), 79 species included on the BoCC Amber List (Ref 5.23) and 83 species on the BoCC Amber Wales list (Ref 5.23). WeBS data obtained from the BTO covered two count sites which are the closest and most relevant to the Glaslyn works site; Traeth Bach and Glaslyn Marshes, neither intercept the Glaslyn works site. Data for Glaslyn Marshes revealed that no species were present in nationally important numbers (1% or more) for the latest five-year mean. The Traeth Bach WeBS site data revealed that greenshank represented more than 1% (1.48%) of the national wintering population. The Traeth Bach count site covers a relatively large and varied extent of habitats, including coastal areas which are not found within the Survey Area. It is likely that most birds recorded during the WeBS counts were found in the wider extents of the WeBS site, particularly the large coastal areas,		breeding birds including notable and priority species during the breeding season. However, when assessing against the national population estimates in Woodward <i>et al.</i> (Ref 5.57) to determine whether any were of national significance (which would be achieved if the recorded population was at least 1% of the national population), none of the species recorded met this threshold. The non-breeding bird survey area encompassed part of Glaslyn SSSI and recorded an abundant and diverse wintering assemblage of Target Species (see wintering bird report for definition), for which this SSSI is partially designated. There were, however, no occurrences of red-throated diver during the surveys, suggesting there is no link between the survey area and the Northern Cardigan Bay SPA. When assessing against the national population estimates in Woodward <i>et al.</i> (Ref 5.57) to determine whether any were of national significance, none of the species recorded met this threshold population level.

Species or species group	Baseline detail	Ecological importance	Rationale
	and not present in large numbers adjacent to the Glaslyn works site. Breeding bird surveys carried out in 2023 recorded 63 birds using the Survey Area, with 40 species confirmed as holding at least one territory each. Territory-holding species comprised seven species listed as Priority Species in Wales (Ref 5.4); six listed on the BoCC Red List (Ref 5.23); four species on the BoCC Red Wales list (Ref 5.24), 10 species on the BoCC Amber List (Ref 5.23) and three further species on the BoCC Amber Wales list (Ref 5.24). Osprey (<i>Pandion haliaetus</i>) (flying over only, so not included in the total species count) and green sandpiper (<i>Tringa ochropus</i>), both on Schedule 1 of the WCA 1981 (as amended) (Ref 4.3) were recorded in the Survey Area but were not breeding. Non-breeding bird surveys carried out during the winter of 2022 and 2023, and October 2024 recorded four species on Annex 1 of the EU Birds Directive (Ref 5.55) or Schedule 1 of the WCA 1981 (Ref 4.3) in the Survey Area; black-tailed godwit (<i>Limosa limosa</i>), whooper swan (<i>Cygnus cygnus</i>), little egret (<i>Egretta garzetta</i>) and merlin (<i>Falco</i>		

Species or species group	Baseline detail	Ecological importance	Rationale
	<i>columbarius</i>). Of these, only merlin and little egret were recorded within 100 m of the Glaslyn works site. Four species listed as Priority Species in Wales (Ref 5.4); eight listed on the BoCC Red List (Ref 5.23); three species on the BoCC Red Wales list (Ref 5.24), 10 species on the BoCC Amber List (Ref 5.23) and one further species on the BoCC Amber Wales list (Ref 5.24).		
Bats as presented in Volume 8, Appendix 4.5.F: Bat Survey Report.	The desk study returned records of the following bat species in the Study Area, (in the last 10 years, up to 2024): soprano pipistrelle (<i>Pipistrellus pygmaeus</i>), common pipistrelle (<i>Pipistrellus pipistrellus</i>), unidentified pipistrelle species (<i>Pipistrellus</i> sp.), lesser horseshoe (<i>Rhinolophus hipposideros</i>), unidentified <i>Myotis</i> species, noctule (<i>Nyctalus noctula</i>), brown long-eared bat (<i>Plecotus auritus</i>) and whiskered/Brandt's bat (<i>Myotis mystacinus/brandtii</i>). Field surveys carried out in 2023 identified a derelict barn near Wern CSEC that could provide potential habitat for roosting bats. Emergence re-entry surveys completed in 2024, confirmed that a non-breeding day roost used by soprano pipistrelle	Foraging and commuting habitat for the overall bat assemblage – Regional (Medium) Importance within the SAC and County or District (Medium) Importance within Wern.	All bat species and their roosts are legally protected in the UK under the WCA 1981 (as amended) (Ref 4.3) and Habitats Regulations (Ref 5.1). Seven of these bat species are also listed as Species of Principal Importance. Lesser horseshoe bat is listed on the Species Action Plan (SAP) list of the Gwynedd BAP (Ref 5.26). Biodiversity importance of foraging and commuting bats is based on species rarity, estimated numbers of bats, presence of possible roosts and the type or complexity of commuting foraging features. All known roosts are to be retained. Further rationale for the value of the species found on-site is given

Species or species group	Baseline detail	Ecological importance	Rationale
	bats was present; with a single bat emerging from the northern part of the barn on two separate occasions. The barn will not be directly impacted by the proposed works. Field surveys carried out in 2023 and 2024 likewise identified seven trees with PRFs that could potentially be impacted by the proposed works. Further surveys were completed, using endoscopes and emergence-re-entry survey techniques; no signs of roosting bats were recorded within any of the trees. A further tree with bat roost features (Tree 4.T244) was identified during the initial field survey within the Glaslyn works site but outside of the proposed works area (See Figure 4.5.F.3, Volume 8, Appendix 4.5.F: Bat Survey Report). Since it was deemed unaffected by direct or indirect impacts, no further surveys were conducted at that time. However, due to changes in the proposed working area, this tree will now be directly impacted. Three further trees (4.T269, 4.T449 and 4.T450) were not assessed for bat roost potential as land access was not permitted at the time of survey. Additional surveys of these		in Volume 8, Appendix 4.5.F: Bat Survey Report .

Species or species group	Baseline detail	Ecological importance	Rationale
	trees will be carried out pre-construction during the appropriate season unless the trees can be retained. The findings will determine suitable mitigation measures, which may include obtaining an NRW licence if roosting bats are confirmed. Species recorded during the activity surveys (activity transects and static bat detectors) in 2023 and 2024 comprised: common pipistrelle, soprano pipistrelle, unidentified pipistrelle species, noctule, brown long-eared, <i>Myotis</i> species, Nathusius' pipistrelle, serotine (<i>Eptesicus serotinus</i>), Leisler's (<i>Nyctalus leisleri</i>), lesser horseshoe, and greater horseshoe (<i>Rhinolophus ferrumequinum</i>).		
Badger (<i>Meles meles</i>) as presented in Volume 8, Appendix 4.5.G: Ecology Report: Badger Survey Report.	The desk study returned 69 badger records within the 2 km Study Area (in the last 10 years, up to 2024), including in the Glaslyn works site. Most of these records consist of data collected during the 2016-2018 AECOM badger surveys (conducted to support the National Grid NWC Project) and subsequently provided to Cofnod. The data includes records of outlier, subsidiary and a main badger sett within the Glaslyn works site.	Local (Low)	Badgers are protected under The Protection of Badgers Act 1992 (Ref 5.6).

Species or species group	Baseline detail	Ecological importance	Rationale
	The field surveys carried out between 2023, and 2025 identified 11 badger setts in the Glaslyn works site (three main, one annex, two subsidiary and five outlier), with an additional six setts recorded between the Glaslyn works site and a 30 m buffer (three subsidiaries and three outliers). One sett between 30 m and 50 m from the Glaslyn works site was identified (annex). Additionally, 18 badger setts beyond 50 m from the Glaslyn works site were identified (one main, one annex, one subsidiary and 15 outlier).		
Otter, as presented Volume 8, Appendix 4.5.H: Riparian Mammals Survey Report.	The desk study returned 45 records of otter in the 2 km Study Area (in the last 10 years, up to 2024), including within the Glaslyn works site. Most of these records consist of data collected during the 2016-2018 AECOM otter surveys (conducted to support the National Grid NWC Project) and subsequently provided to Cofnod. Field surveys carried out between 2023 and 2025 confirmed otter field signs along the Nant-yr-Afron-oer (Watercourse 4.7b), Watercourse 4.26 and Afon Glaslyn (Watercourse 4.33), as shown in the form of spraint (faeces), footprints, slides	District (Medium)	Otter is protected under Schedule 5 of the WCA 1981 (as amended) (Ref 4,28) and The Conservation of Habitats and Species Regulations (Ref 5.1). Otter is also a Species of Principal Importance. Otter is listed on the SAP list of the Gwynedd BAP (Ref 5.26). Otter is Near Threatened on the global IUCN (Ref 5.25).

Species or species group	Baseline detail	Ecological importance	Rationale
	and paths, and Watercourse 4.35 in the form of footprints. See Figure 4.5.H.3 in Volume 8, Appendix 4.5.H: Riparian Mammals Survey Report . A potential holt site (but unconfirmed) was recorded on Watercourse 4.33 (Afon Glaslyn) comprising of a bankside recess and a potential access point from the bank top. A recent spraint was also present. This potential holt is only suitable at low tide, having the potential to flood and making it unsuitable as a natal holt. This potential holt is more than 40 m from localised temporary works within the Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC and Glaslyn SSSI.		
Water vole as presented in Volume 8, Appendix 4.5.H: Riparian Mammals Survey Report .	The desk study returned one record of water vole in the 2 km Study Area (in the last 10 years, up to 2024), approximately 1.8 km north of the Glaslyn works site. No water voles were recorded in the Glaslyn works site boundary during the 2016-2018 AECOM surveys (conducted to support the National Grid NWC Project) and subsequently provided to Cofnod. Field surveys carried out in 2023 and 2024 recorded no signs of	N/A	Water vole is protected under the WCA 1981 (as amended) (Ref 4.3). Water vole is a Species of Principal Importance. Water vole is listed on the SAP list of the Gwynedd BAP (Ref 5.26). and are of Least Concern status under the global IUCN (Ref 5.25). No conclusive evidence of water vole was recorded within the Survey Area, indicating likely absence of this species.

Species or species group	Baseline detail	Ecological importance	Rationale
	water vole. Brown rat (<i>Rattus norvegicus</i>) was recorded on Nant-yr-Afron-oer (Watercourse 4.7b (data not shown on figure)). American mink (<i>Neovison vison</i>) (which preys on water vole) was recorded at Afon Glaslyn Watercourse 33 (data not shown on figure).		
Great crested newts (<i>Triturus cristatus</i>) as presented in Volume 8, Appendix 4.5.I: Great Crested Newt Report.	The desk study returned no records of great crested newt (GCN) presence in the 2 km Study Area (in the last 10 years, up to 2024). These records include results of data collected during the 2016-2018 AECOM GCN surveys (conducted to support the National Grid NWC Project), where no GCN were recorded. Sixteen water bodies were identified within 250 m of the Glaslyn works site; none of which were inside the Glaslyn works site boundary. One was scoped out for further survey due to the A487 road barrier and lack of hydrological links. Field surveys carried out in 2023 and 2024 comprised HSI Assessments of the remaining 15 water bodies and eDNA surveys of the eight water bodies considered suitable for GCN. No GCN were recorded.	N/A	GCN are protected in the UK under the WCA 1981 (as amended) (Ref 4.3) and Habitats Regulations (Ref 5.1). They are also listed as a Species of Principal Importance.

Species or species group	Baseline detail	Ecological importance	Rationale
Red squirrel (<i>Sciurus vulgaris</i>)	The desk study returned no records of red squirrel in the 2 km Study Area (in the last 10 years, up to 2024), although 13 records were supplied of grey squirrel (<i>Sciurus carolinensis</i>). The optimal habitat for red squirrel consists of well-managed coniferous and broadleaved woodlands. Due to the absence of red squirrel records, the presence of unsuitable habitat within the Glaslyn works site, and the occurrence of grey squirrels, which adversely affect red squirrel populations in the UK, red squirrel are considered likely absent from the Glaslyn works site.	N/A	Red squirrels are protected under Schedule 5 of the WCA 1981 (Ref 4.3) and are listed as a Species of Principal Importance under Section 7. Red Squirrel are Least Concern under the global IUCN (Ref 5.25).
Pine marten (<i>Martes martes</i>)	The desk study returned a single record of pine marten in the 2 km Study Area (in the last 10 years, up to 2024); 1.4 km to the north in 2023. The optimal habitat for pine marten consists of diverse woodland habitat, old trees and a well-developed ground and shrub layer. Due to the single pine marten record and the presence of unsuitable habitat within the Glaslyn works site, pine marten is considered likely absent from the Glaslyn works site.	N/A	Pine marten are protected under Schedule 5 of the WCA 1981 (Ref 4.3) and are listed as a Species of Principal Importance.
Reptiles	The desk study records slow worm, common lizard, grass snake and	Local (Low)	All reptiles are protected from intentional injuring or killing under

Species or species group	Baseline detail	Ecological importance	Rationale
	adder (<i>Vipera berus</i>) in the 2 km Study Area (in the last 10 years, up to 2024). All except adder have been recorded in the Glaslyn works site; these Glaslyn works site records consist of data collected during the 2016-2018 AECOM reptile surveys (conducted to support the National Grid NWC Project) and subsequently provided to Cofnod. Widespread species of reptile are likely to be present but are unlikely to occur in significant numbers or assemblages due to the suitability of the habitats present within the Glaslyn works site. The areas where permanent land take is required for extension of the Wern CSEC and the retained haul road comprise improved and poor semi-improved grassland which are of lower suitability for reptiles. The most suitable reptile habitat within the Glaslyn works site (e.g. along field margins, hedgerow bases, scrub boundaries, ditches and woodland areas) will be retained and protected, or will be subject to temporary disturbance impacts during construction rather than permanent loss.		the WCA 1981 (as amended) (Ref 4.3) and are Species of Principal Importance. Adder is listed on the SAP list of the Gwynedd BAP (Ref 5.26).

Species or species group	Baseline detail	Ecological importance	Rationale
Other (more commonly recorded) amphibians	The desk study returned records of common toad, common frog and two records of palmate newt (<i>Lissotriton helveticus</i>) in the 2 km Study Area (dated in the last 10 years, up to 2024). No records were identified from within the Glaslyn works site. The closest palmate newt record was 1.2 km north-east. Ponds and ditches in and close to the Glaslyn works site may support common amphibian species. Ponds and ditches will be retained. Suitable terrestrial habitats in the form of hedgerows, scrub, semi-improved grassland and woodland are also present within the Glaslyn works site. Such areas will be retained and protected or will be subject to temporary disturbance impacts during construction rather than permanent loss.	Local (Low)	Common amphibians are protected by the WCA 1981 (as amended) (Ref 4.3), prohibiting their advertisement and sale. The common toad is a Species of Principal Importance. These species are common in a local and national context.
Hedgehog	The desk study returned records of hedgehog in the 2 km Study Area (in the last 10 years, up to 2024). None of these records are from the Glaslyn works site; the closest record is approximately 0.9 km west. The optimal habitat for hedgehog comprises woodland, farmland, hedgerows, long grass and scrub. Due to records of	Local (Low)	Hedgehog is a Species of Principal Importance and of Near Threatened status under the global IUCN (Ref 5.25).

Species or species group	Baseline detail	Ecological importance	Rationale
	hedgehog within the Study Area, and presence of suitable habitat within the Glaslyn works site, hedgehog is assumed to be present.		
Brown hare	The desk study returned records of brown hare in the 2 km Study Area (in the last 10 years, up to 2024). None of these records are from the Glaslyn works site; the closest record is approximately 1.25 km north-west. Optimal habitat for brown hare comprises grassland habitat and woodland edges. Due to records of brown hare within the Study Area, and presence of suitable habitat within the Glaslyn works site, brown hare is assumed to be present.	Local (Low)	Brown hare is a Species of Principal Importance and listed on the SAP list of the Gwynedd BAP (Ref 5.26). Brown hare is of Least Concern under the global IUCN (Ref 5.25).
Polecat	The desk study returned records of polecat in the 2 km Study Area (in the last 10 years, up to 2024). None of these records are from the Glaslyn works site; the closest record is approximately 0.6 km west. The optimal habitat for polecat comprises woodland, farmland, hedgerows, long grass and scrub. Due to records of polecat within the Study Area, and presence of suitable habitat within the Glaslyn works site, polecat is assumed to be present.	Up to County (Medium)	Polecat is a Species of Principal Importance and listed on the SAP list of the Gwynedd BAP (Ref 5.26). Polecat is of Least Concern under the global IUCN (Ref 5.25).

Species or species group	Baseline detail	Ecological importance	Rationale
Flora, Lichen and Fungi	The desk study returned records of five protected or notable plant species in the 2 km Study Area (including historical records >10 years old)), comprising bluebell (<i>Hyacinthoides non-scripta</i>), dwarf spike-rush, Welsh mudwort (<i>Limosella australis</i>), lesser butterfly-orchid (<i>Platanthera bifolia</i>) and Welsh marsh-orchid (<i>Dactylorhiza purpurella</i> subsp. <i>cambrensis</i>). (It is noted that as a consequence of taxonomic research, <i>Dactylorhiza purpurella</i> subsp. <i>cambrensis</i> is now grouped within <i>Dactylorhiza purpurella</i>). Five further species of special botanical interest associated with the Glaslyn works site and specifically the Glaslyn SSSI citation were returned from the desk study and comprise: early marsh-orchid (<i>Dactylorhiza incarnata</i>), northern marsh-orchid (<i>Dactylorhiza purpurella</i>), slender spike-rush (<i>Eleocharis uniglumis</i>), small water-pepper (<i>Persicaria minor</i>) and whorled caraway (<i>Trocardis verticillate</i>). and	District (Medium) for dwarf spike-rush and Welsh mudwort Local (Low) for other species	Plants are protected by Schedule 8 of the WCA 1981 (as amended) (Ref 4.3) (bluebell, dwarf spike-rush and Welsh mudwort). Notable plants are listed as Species of Principal Importance (lesser butterfly-orchid and western marsh-orchid). Other plants of special interest are those listed within the Glaslyn SSSI citation and as Locally Rare or Locally Scarce in the Merionethshire Rare Plant Register 2014 (Ref 5.56) or Caernarvonshire Rare Plant Register 2008 (out of print). The lichen <i>Sticta canariensis</i> and violet coral are listed as Species of Principal Importance. A Species Action Plan for waxcaps is included within the Gwynedd BAP (Ref 5.28).

Species or species group	Baseline detail	Ecological importance	Rationale
	A lichen <i>Sticta canariensis</i> was recorded 0.8 km north and violet coral (<i>Clavaria zollingeri</i>), a fungus, was recorded 1.44 km north-west of the Glaslyn works site. Several species of waxcap were recorded in a cemetery 25 m to the south of the Glaslyn works site and in woodland 25 m to the north of the Glaslyn works site. No other protected or notable lichen or fungi were recorded in the Study Area (dated in the last 10 years, up to 2024). Bluebell has been recorded in the Glaslyn works site during the Phase 1 habitat surveys. Whorled caraway was recorded in the Glaslyn works site during the NVC survey.		
INNS	The desk study returned records of seven INNS species of plant in the 2 km Study Area (dated in the last 10 years, up to 2024), which are listed on Schedule 9 of the of the WCA 1981 (as amended) (Ref 4.3). Five of these (Himalayan balsam (<i>Impatiens glandulifera</i>), Japanese knotweed (<i>Reynoutria japonica</i>), monbretia (<i>Crocosmia pottsii</i> x <i>aurea</i> = <i>C. x crocosmiiflora</i>), New Zealand pigmyweed (<i>Crassula helmsii</i>) and Pontic rhododendron (<i>Rhododendron ponticum</i>)) are recorded in the Glaslyn works site.	N/A	Several confirmed INNS species are listed in Schedule 9 of the WCA 1981 (as amended) (Ref 4.3). There are statutory constraints regarding their potential spread (as set out in Volume 8, Appendix 1.1.A: Legislation, Policy and Guidance) as it is illegal to deliberately spread invasive species, and mitigation will be required during construction to prevent their spread within the Glaslyn works site.

Species or species group	Baseline detail	Ecological importance	Rationale
	American skunk cabbage (<i>Lysichiton americanus</i>), and Himalayan honeysuckle (<i>Leycesteria formosa</i>), which are both listed on Great Britain Non-native Species Inventory Portal Checklist of Non-native Species (Ref 5.58) are also recorded in the Glaslyn works site. Field surveys identified the presence of all species mentioned above as present in the Glaslyn works site. Additionally, evidence of American mink which are listed on Schedule 9 of the of the WCA 1981 (as amended) (Ref 4.3), was recorded along the banks of the Afon Glaslyn during riparian mammal surveys, Canada goose (<i>Branta canadensis</i>) and Egyptian goose (<i>Alopochen aegyptiaca</i>) were identified during the ornithological surveys and buddleia (<i>Buddleja davidii</i>) was recorded during the Phase 1 habitat surveys. Aquatic field surveys also recorded the macrophyte species Nuttall's waterweed (<i>Elodea nuttallii</i>).		

Future Baseline

- 5.6.41 This section considers changes to the baseline conditions, previously described, that might occur in the absence of the proposed works and during the period over which the proposed works would have been in place.
- 5.6.42 In the absence of the proposed works, it is likely that habitats in the Glaslyn works site would continue to be under agricultural management. Although the distribution of some species may change in response to changes in livestock management, the species assemblages are likely to remain broadly the same.
- 5.6.43 In relation to habitats within Glaslyn SSSI, their current condition is unknown, based on the NRW Protected Sites Assessment 2020 (Ref 5.59). Glaslyn SSSI Management Statement (Ref 5.60) outlines the importance of maintaining appropriate levels of cattle grazing, maintaining existing watercourses in their current state, and avoiding ploughing, re-seeding or applying fertiliser for favourable habitat condition status.

Construction

- 5.6.44 If the proposed works were not constructed, the existing habitats are likely to continue being present. However, some changes in habitat extent, composition and structure would occur from ecological succession e.g. the gradual establishment of tree and shrub seedlings within woodland areas and along hedgerows. These resultant gradual changes in habitat composition are unlikely to materially alter the ecological baseline and the habitats and species present are very unlikely to undergo significant change prior to the start of construction or within the construction period. In relation to Glaslyn SSSI, assuming cattle stocking levels remain constant and other agricultural practices remain in line with NRW recommendations, the condition is anticipated to remain unchanged. The proposed works will necessitate minor localised modifications to the reinstatement and landscaping plans previously approved as part of consent for the EVIP scheme at Minffordd. For this assessment, the EVIP landscaping is assumed as built and will be treated as part of the baseline when calculating the NBB and GI requirements for the proposed works.

Operation (Including Maintenance)

- 5.6.45 In the absence of the proposed works being developed, it is unlikely there will be any marked change in the habitats within the Glaslyn works site, other than potential changes in farming practices. It is noted, however that changing climatic conditions resulting from climate change may influence the resilience of certain habitats and species within and adjacent to the Glaslyn works site. Habitats such as broadleaved trees and scrub would be more mature but are likely to support a broadly similar species assemblage and farmland will also be managed accordingly, maintaining broadly similar species assemblages.

5.7 Consultation and Scope of Assessment

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

Consultation

- 5.7.2 Consultation in relation to Ecology and Nature Consultation has been carried out with stakeholders. **Table 5-6** provides an overview of consultation and the actions taken to address any responses within the assessment.

Table 5-6 – Consultation and stakeholder engagement

Consultee	Date and nature of consultation	Summary of response	How and where addressed
NRW	12 September 2024 – Introduction to surveys	No <i>Verigo lilljeborji</i> surveys required. Results to be shared with further consultation	n/a
NRW	10 June 2025 - Written response to Breeding bird report, non breeding bird report and habitats report for Glaslyn. 29 July 2025 – meeting to discuss responses to comments.	Breeding birds – Suggests further consideration of breeding Osprey. Non breeding birds – consider including BTO WeBS data for Glaslyn Marshes. Habitats – Notes the presence of additional notable plant species for the SSSI than stated but records are older than 10 years. Area B not fully accessed due to H&S which may not provide accurate assessment.	Discussed the reasoning why Osprey will not be adversely affected. Included the results of WeBS data for two count areas including Glaslyn Marshes. Habitats report – included records of notable plants older than 10 years. Discussed why Area B survey was adequate. Stated requested additional information would be provided in the chapter and other documents, but not relevant for the baseline report.
Gwynedd Council	29 May 2024	Project introduction	n/a
Eryri National Park		Project introduction	n/a

Activities or Receptors Scoped Out of the Assessment

- 5.7.3 Construction of the proposed works is likely to lead to an increase in the number of vehicles on the local highway network (see **Chapter 9: Traffic and Transport**). IAQM guidance (Ref 5.28) sets out criteria to establish the need for an air quality assessment for construction of a development as being a change of more than 200 Heavy-Duty Vehicle (HDV) (also known as HGV) or more than 1,000 total vehicles (as two way annual daily average traffic flow). As detailed in **Chapter: 10 Air Quality and Emissions**, owing to the expected traffic levels from the proposed works being below

IAQM guidance (Ref 5.28), a detailed dispersion modelling exercise was not conducted as the effect is not anticipated to be significant. Since no significant effects are anticipated, this chapter does not assess potential impacts on ecological features (e.g. habitats, sites, and species) from construction-phase traffic-related air quality changes. Similarly, as described in **Chapter 2: Glaslyn Cables Works**, HGV movements are not anticipated during operation or maintenance of the proposed works. Any maintenance inspections would involve infrequent use of Light Goods Vehicles (LGV) or cars, resulting in no anticipated air quality impacts on ecological features. See also **Chapter 10: Air Quality and Emissions** which has scoped out assessment of the operational and maintenance effects of the proposed works on air quality due to the low level of traffic generated resulting in no significant effects being predicted.

- 5.7.4 With regards construction dust, air quality assessments (detailed in **Chapter 10: Air Quality and Emissions**) have followed the IAQM construction dust guidance (Ref 5.28). This examines the risk of construction dust to ecological sites holding a National or European designation within 50 m of the Glaslyn works site. WSs and cWS have also been considered within this chapter.
- 5.7.5 **Table 5-7** summarises the potential Ecology and Nature Conservation receptors that have been considered and states whether they have been scoped in (included) or scoped out (excluded) from the Ecology and Nature Conservation assessment with a justification of the decision.

Table 5-7 – Scope of the Ecology and Nature Conservation assessment

Receptor	Scoped in/out per phase		Justification
	Construction	Operation	
Statutory Designated Sites within 10 km (international) and 5 km (national and local) of the Glaslyn works site (extended to 30 km for international sites designated for bats). (See Table 5-2)	Scoped In: Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC Glaslyn SSSI Traeth Glaslyn NWWT Reserve Ysbyty Bron y Garth SSSI		Construction is proposed within Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC, Glaslyn SSSI and Traeth Glaslyn SSSI; there is potential for direct habitat loss and fragmentation within these sites. Works are also proposed immediately adjacent to Ysbyty Bron y Garth SSSI. The existing cables which cross a small section of the edge of this SSSI will be decommissioned but left <i>in situ</i>. Works will be required within approximately 8-9 m from the edge of the SSSI to the west of the retained section and approximately 7 m to the east of the retained section of cables. Habitat degradation to all of these sites could result from water quality impacts due to pollution and construction runoff, as well as from air quality impacts associated with construction-generated dust. Potential injury, mortality or disturbance of associated species could also occur. The introduction or further spread (where already present) of INNS during construction through the movement of machinery, vehicles and people could also impact statutory designated sites through habitat degradation. Similar effects could occur from maintenance works, depending on their nature and extent.
	Scoped In: Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC Northern Cardigan Bay/Gogledd Bae Ceredigion SPA		These statutory sites are more than 0.5 km from the Glaslyn works site and no habitat loss or fragmentation or injury or mortality to associated species is anticipated inside the boundaries of these sites. No direct mortality of dolphin or seal (which are associated with the Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC) would be expected to result from the construction of the proposed works. Otters are associated with some of these statutory designated sites and use water bodies and riparian habitats in the Glaslyn works site. However, no otter resting sites have been recorded within the proposed works area, and injury or mortality of

Receptor	Scoped in/out per phase		Justification
	Construction	Operation	
	Morfa Harlech a Morfa Dyffryn SAC Afon Ddu SSSI Morfa Harlech SSSI and NNR Tiroedd a Glannau Rhwng Cricieth ac Afon Glaslyn SSSI Pen y Banc LNR		this qualifying species is not anticipated. One possible non-natal holt has been recorded adjacent to Afon Glaslyn, however works under Afon Glaslyn will be carried out by HDD and no above works are proposed within 50 m of the possible holt. Pre-construction surveys will be carried out as required to support the baseline survey findings and inform any additional mitigation or licencing to prevent any potential injury or mortality to otter. Air quality impacts associated with construction-generated dust are likewise not anticipated. Hydrological connections between these statutory designated sites and the Glaslyn works site do exist and there is the potential for habitat degradation from impacts to water quality due to potential pollution events and construction run-off. There is also the potential for disturbance to associated species from noise, lighting or visual effects outside the boundaries of these sites. Similar effects could occur from maintenance works, depending on their nature and extent.
	Scoped Out: Coed Tremadog SSSI and NNR Parc Y Borth LNR		These sites are 0.37 km and 1.3 km from the Glaslyn works site and no habitat loss or fragmentation or injury or mortality to associated species is anticipated. The sites are designated for their botanical and dipteran interest and at such distance air quality impacts associated with construction-generated dust are not anticipated. There is no hydrological connectivity between the proposed works and Parc Y Borth LNR. A hydrological connection does exist between Coed Tremadog SSSI and NNR, a statutory site which is considered to be water dependant (see Chapter 8: Water Quality, Resources and Flood Risk). However, this site is approximately 600 m upstream of the proposed works, and impacts are not anticipated.
	Scoped Out: Glynllifon SAC		These statutory sites are all more than 2 km from the Glaslyn works site and would not be directly impacted by the proposed works. Lesser horseshoe bats are associated with each of these sites. Bats are not only dependent on roosts and foraging habitat within them, but potentially also on habitat that lies outside the

Receptor	Scoped in/out per phase		Justification
	Construction	Operation	
	Mwyngloddiau Fforest Gwydir/Gwydyr Forest Mines SAC Coedydd Dyffryn Ffestiniog (Gogleddol) SSSI Aberdunant SSSI Mwyngloddiau Llanfrothen SSSI Dolorgan Barn SSSI Coedydd Nanmor SSSI Glyn Cywarch SSSI Coedydd Beddgelert a Cheunant Aberglaslyn SSSI Coedydd De Dyffryn Maentwrog SSSI		designated site boundaries. Feeding areas and commuting routes (flightlines) outside the designation may be integral to sustaining the bat population. The Bat Conservation Trust (BCT) have defined Core Sustenance Zones (CSZ) for different bat species (Ref 5.44, Ref 5.45 and Ref 5.61). A CSZ, as applied to bats, refers to the area surrounding a communal bat roost within which habitat availability and quality will have a significant influence on the resilience and conservation status of the colony using the roost. The BCT identifies a weighted average CSZ of 2 km for lesser horseshoe bats. It is also a species that will forage during winter at which time its core foraging range is reduced to 1.2 km from the hibernation site. Coedydd Nanmor SSSI, Coedydd Beddgelert a Cheunant Aberglaslyn SSSI and Coedydd De Dyffryn Maentwrog SSSI are additionally considered to be water dependant statutory sites with hydrological connections to the proposed works area. See Chapter 8: Water Quality, Resources and Flood Risk. However, these sites are all upstream of the proposed works, 4.06 km north, 4.84 km north and 4.92 km east respectively, and impacts are not anticipated.
	Scoped Out: Corsydd Eifionydd/Eifionydd Fens SAC Rhinog SAC Maes Meillion a Gefail-y-Cwm SSSI. Hafod Garregog NNR Glanllynau a Glannau Pen-ychain I Gricieth SSSI		These statutory designated sites without mobile qualifying criteria or with hydrological connectivity further than 2 km from the Glaslyn works site are scoped out as they will not be directly impacted by the proposed works through habitat loss or disturbance. At this distance, disturbance impacts to species using designated sites through increased noise, lighting or visual disturbance will not lead to significant effects. Likewise due to dilution effects, significant impacts to statutory designated sites more than 2 km downstream are not anticipated due to potential pollution events and construction run-off. Hafod Garregog NNR is additionally considered to be a water dependant statutory site with a hydrological connection to the proposed works area. See Chapter 8:

Receptor	Scoped in/out per phase		Justification
	Construction	Operation	
	Ceunant Llennyrch NNR		Water Quality, Resources and Flood Risk. However, this site is 4.5 km upstream of the proposed works and impacts are not anticipated.
Non-statutory designated sites (WS, cWS) (within 2 km of Glaslyn works site).	Scoped In for direct effects: Coed Bryn-twr/Wern cWS		Non-statutory designated sites that are in the Glaslyn works site could be directly impacted during construction through temporary habitat loss or disturbance. The introduction or further spread (where already present) of INNS during construction through the movement of machinery, vehicles and people could also indirectly impact non-statutory designated sites through habitat degradation. Similar effects could occur from maintenance works, depending on their nature and extent.
	Scoped In for indirect effects: Non-statutory designated sites within and up to 50 m from the Glaslyn works site and those with hydrological links.		Non-statutory designated sites which are hydrologically linked to the site could potentially be indirectly impacted through changes to water quality. Sites within 50 m of the Glaslyn works site could potentially be indirectly impacted through construction dust. Similar effects could occur from maintenance works, depending on their nature and extent.
	Scoped out: All other non-statutory designated sites more than 50 m from Glaslyn works site with a lack of hydrological links.		No habitat loss or fragmentation or injury or mortality to associated species is anticipated. There is no hydrological connectivity and no potential for water quality impacts arising from pollution events or construction runoff. At more than 50 m from the Glaslyn works site air quality impacts associated with construction-generated dust are not anticipated.
Habitats of Principal Importance (HoPI)	Scoped in: Coastal and floodplain grazing marsh Lowland fen and reedbed		HoPI that are in the Glaslyn works site could be directly impacted during construction through habitat loss, fragmentation or disturbance. Those which are hydrologically linked could also potentially be indirectly affected through changes to water quality. The introduction or further spread (where already present) of INNS during construction through the movement of machinery, vehicles and people could also indirectly impact HoPI through habitat degradation. Air quality impacts from

Receptor	Scoped in/out per phase		Justification
	Construction	Operation	
	Saltmarsh Lowland dry acid grassland Purple moor grass and rush pasture Traditional orchard Hedgerows Running water (including rivers and streams) Standing water or ponds Deciduous woodland		construction-generated dust could also occur to HoPI within 50 m of the proposed works. Similar effects could occur from maintenance works, depending on their nature and extent.
	Scoped out: Lowland heathland Lowland meadow Maritime cliffs and slopes Blanket bog Raised bog		No habitat loss or fragmentation is anticipated. There is no hydrological connectivity and no potential for water quality impacts arising from pollution events or construction runoff. At more than 50 m from the Glaslyn works site air quality impacts associated with construction-generated dust are not anticipated.
Habitats (non-HoPI)	Scoped in: Scattered trees (ancient and veteran) Semi-natural broadleaved woodland		Habitats that are in the Glaslyn works site could be directly impacted during construction through habitat loss, fragmentation or disturbance. Those which are hydrologically linked could also potentially be indirectly affected through changes to water quality. The introduction or further spread (where already present) of INNS during construction through the movement of machinery, vehicles and people could also indirectly impact habitats through degradation. Air quality impacts from

Receptor	Scoped in/out per phase		Justification
	Construction	Operation	
	Broadleaved plantation woodland		construction-generated dust could also occur to habitats within 50 m of the proposed works.
	Mixed plantation woodland		Similar effects could occur from maintenance works, depending on their nature and extent.
	Semi-improved neutral grassland		
	Marshy grassland		
	Swamp		
	Marginal and inundation – marginal vegetation		
	Marginal and inundation – inundation vegetation		
	Scoped out:		Based on CIEEM guidelines (Ref 5.27) and using professional judgement, features of Site importance, i.e. less than Local (Low) importance, are not considered further in the assessment process and scoped out.
	Mixed semi-natural woodland		
	Coniferous plantation woodland		
	Scattered trees		
	Dense or continuous scrub		
	Scattered scrub		
	Improved grassland		
	Poor semi-improved grassland		
	Other tall herb and fern – ruderal		
	Cultivated or disturbed land – arable		

Receptor	Scoped in/out per phase		Justification
	Construction	Operation	
	Cultivated or disturbed land – amenity Ephemeral or short perennial Introduced shrub Other linear habitats (including fence, wall, dry ditch, earth bank) Other area habitats (including caravan sites, buildings, bare ground and hard standing)		
Ancient Woodland	Scoped in:		Ancient woodland in the Glaslyn works site could be directly impacted during construction through habitat loss, fragmentation or disturbance. Areas which are hydrologically linked could also potentially be indirectly affected through changes to water quality. The introduction or further spread (where already present) of INNS during construction through the movement of machinery, vehicles and people could also indirectly impact ancient woodland through habitat degradation. Air quality impacts from construction-generated dust could also occur to ancient woodland within 50 m of the proposed works. Similar effects could occur from maintenance works, depending on their nature and extent.
Protected and notable species	Scoped in: Terrestrial invertebrates Aquatic macroinvertebrates Aquatic macrophytes		Construction of the proposed works has the potential to impact protected and notable species (where present or potentially present) through habitat loss, fragmentation and disturbance. Construction activities have the potential to result in incidental mortality of species and could also disturb protected and notable species through increased noise and vibration, lighting and through visual disturbance.

Receptor	Scoped in/out per phase		Justification
	Construction	Operation	
	Fish Breeding and non-breeding birds Bats Badger Otter Reptiles Common amphibians Other mammals (hedgehog, brown hare and polecat) Protected and notable flora		Similar effects could occur from maintenance works, depending on their nature and extent.
Protected and notable species:	Scoped out: Red squirrel Water vole GCN Pine marten		The Glaslyn works site, where mostly temporary land take is required, is predominantly comprised of grassland habitats with HDD being used below wooded areas. Given the lack of red squirrel records within the Study Area, and the prevalence of grey squirrel records from the locality, red squirrels are unlikely to be present in the Glaslyn works site and are scoped out from further consideration. Given the lack of water vole records within the Study Area and no evidence of water vole recorded from extensive field surveys, water vole are considered unlikely to be present within the Glaslyn works site and are scoped out from further consideration. The data from multiple years of GCN surveys, along with the combined use of HSI and eDNA methods, provide sufficient evidence to conclude that GCN are unlikely to be present within the Glaslyn works site. GCN are scoped out from further consideration. The Glaslyn works site, where mostly temporary land take is required, is predominantly comprised of grassland habitats with HDD being used below isolated

Receptor	Scoped in/out per phase		Justification
	Construction	Operation	
			wooded areas. Given the single record of pine marten in the Study Area, and the lack of suitable habitat, such as extensive or contiguous mixed woodland, pine marten are considered unlikely to be present within the Glaslyn works site and are scoped out from further consideration.

5.8 Methodology

- 5.8.1 Details of the technical methods used to determine the baseline conditions are provided in **Section 5.6** and **Volume 8, Appendices 4.5.A – 4.5.L**. Full details regarding assessment methods including sensitivity of the receptors, magnitude of effects and the significance criteria that have been used for the ecology assessment are in **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**.

5.9 Potential Effects

- 5.9.1 The proposed works have the potential to affect IEFs (positively or negatively), during construction and operation including maintenance.

Construction

- 5.9.2 The sources of potential effects on IEFs during construction are:
- Habitat loss – direct impacts associated with changes in land use resulting from the proposed works. For example, short-term temporary changes in land use associated with works to facilitate the cable reinforcement works and permanent change in land use owing to the extension of the Wern CSEC and the creation of a permanent new access road to the Wern CSEC.
 - Habitat degradation – direct or indirect impacts resulting in the reduction in the condition of a habitat and its suitability for some or all of the species it supports, e.g. changes in air quality affecting ancient woodland from construction dust or impacts on tree root protection zones.
 - Species mortality – direct impacts on species populations associated with mortalities due to construction activities, e.g. site clearance.
 - Disturbance – indirect impacts resulting from a change in normal conditions (i.e. light, noise, vibration, human activity) that result in individuals or populations of species changing behaviour or range.
 - Spread of INNS – construction methods resulting in spread of INNS and degradation of habitats.

Operation and Maintenance

- 5.9.3 The source of potential effects on IEFs during operation (based on **Section 2.5.1**, where maintenance works comprises monthly inspections) could include:
- Species mortality – direct impacts on species populations associated with mortalities due to operation and maintenance activities, e.g. mowing and strimming.
 - Disturbance – indirect impacts during operation and maintenance resulting from a change in normal conditions (i.e. EMF, light, noise, vibration, human activity) that result in individuals or populations of species changing behaviour or range.
 - Spread of INNS – operation and maintenance methods resulting in spread of INNS.
- 5.9.4 Should maintenance works be more intrusive and require refurbishment or replacement works then impacts would likely be similar to, but no worse than construction effects.

Embedded Mitigation

- 5.9.5 Where practicable, mitigation measures will be incorporated into the proposed works design and how it will be constructed. Through iterative assessment, likely impacts have been assessed on this basis and opportunities to mitigate them identified with the aim of preventing or reducing impacts as much as possible. This approach provides the opportunity to prevent or reduce potential adverse impacts from the outset. This embedded mitigation and mitigation by design approach has been considered when evaluating the significance of the potential impacts on the relevant IEFs.

Construction, Operation and Maintenance

- 5.9.6 Primary avoidance and other mitigation measures will be embedded into the proposed works to minimise construction, operation and maintenance impacts on IEFs, and these are presented in the following sections.

Proposed Works Design

- 5.9.7 The design for the installation of replacement cables largely avoids the Glaslyn SSSI and the Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC by using HDD, allowing the works to pass beneath the SAC and the majority of the SSSI.
- 5.9.8 However, a small area of the Glaslyn SSSI (approximately 1.6 ha) will be directly impacted temporarily to accommodate a HDD compound at the edge of the SSSI on slightly drier ground. Complete avoidance was not feasible due to the technical limitations of the HDD length. Nevertheless, the design avoids the need for two separate HDD sections, which would have required additional infrastructure such as re-entry compounds within the SSSI.
- 5.9.9 After the HDD works are completed, four new link boxes will be constructed in that same area, on raised mounds which will require the permanent loss of approximately 96.8 m² of marshy grassland habitat (four x 24.2 m² link box and associated plinths). Permanent change will likely occur to a further 312 m² (approximately) of surrounding habitat to accommodate the raised bunds and slopes (four x 78 m²).
- 5.9.10 The need for works in Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC has been minimised, by retaining the existing cables which pass through the site, and decommissioning them *in situ*, rather than removing them. This section of cables will be capped at each end and left in place, with only minor works required in the SAC at the existing kiosks. An existing road will be used for access and will not require any modifications or vegetation clearance. Works will be restricted to the existing kiosk locations and will comprise minor scrub removal in the immediate vicinity of each kiosk, and no tree removal or excavation. The above ground element of the kiosk will be removed, and works will be carried out in the existing cable box beneath, before fixing a new cover.
- 5.9.11 Works within the remainder of Glaslyn SSSI will likewise be minimised, with the existing cables retained and decommissioned in situ. Small scale works will be required at 500 m intervals to create monitoring pits to enable the cables to remain safely in place, however these works will be localised, temporary and approximately 24 m x 10 m in area.
- 5.9.12 Works in Ysbyty Bron y Garth SSSI have been avoided by retaining the existing cables, which bisect the site, and decommissioning them *in situ*, rather than removing them.

This section of cable will be capped at each end and left in place. The oil from the existing cables will be drained from a pit outside of the SSSI and in the adjacent field.

- 5.9.13 Most non-statutory designated sites in the 2 km Study Area will be avoided by the proposed works. Coed Bryn-twr/Wern cWS, part of which is recorded as ancient woodland lies along the route of an existing road that will be used temporarily prior to construction of the permanent access road to Wern CSEC. No works will be carried out to this road to facilitate temporary access. Minor tree trimming is required at the junction with the A497 to maintain the existing visibility splay, however this is currently being maintained as part of the highway maintenance required for the A497 and continuation of this by the council highways team will be sufficient for the visibility splay. No further vegetation clearance or tree trimming is anticipated.
- 5.9.14 The southern boundary of Ty'n y berllan cWS slightly overlaps the Glaslyn works site boundary. This cWS is designated for woodland habitat and will not be directly impacted by the proposed works. No other non-statutory designated sites will be directly impacted by the proposed works.
- 5.9.15 Works have been designed to avoid ancient woodland as far as practicable. Minor tree trimming will be carried out in an area mapped as ancient woodland at the junction with the A497, as described previously to maintain the existing visibility splay. This woodland area is, in fact, established on made ground adjacent to the railway line and is unlikely to comprise ancient woodland soils. In addition, some of the likely clearance will include removal of scrub along the woodland edge which includes rhododendron. This edge of the woodland is already subject to periodic vegetation trimming as part of the highway maintenance required for the A497 and continuation of this by the council highways team will be sufficient for the visibility splay. Decommissioning of the existing cables in other locations will leave in longer sections (capped at each end) to avoid direct effects on additional areas of ancient woodland through which the existing cables lie. HDD has also been incorporated into the design in other shorter sections to avoid loss of small areas of semi-natural woodland.
- 5.9.16 Works have also been designed to reduce the overall number of water body crossings and the avoidance of open trenching on main rivers through the use of HDD techniques.
- 5.9.17 Where open cut techniques are proposed, water flow will be maintained through either fluming or over pumping.

Habitat Avoidance Measures

- 5.9.18 The proposed works have been designed to avoid IEFs present in or adjacent to the Glaslyn works site as far as is practicable.
- 5.9.19 The following minimum buffers from key habitat features will be applied to reduce the likelihood of significant ecological effects, where practicable:
- 15 m from woodlands; to prevent incursion into Root Protection Areas (RPAs).
 - 5 m from hedgerows increasing to 15 m where there are hedgerow trees to prevent incursion into RPAs.
 - 15 m from individual retained trees to prevent incursion into RPAs to protect the tree and reduce the likelihood of disturbing any roosting bats that could be present.
- 5.9.20 Further details regarding unavoidable works in tree RPAs is contained in the **Volume 8, Appendix 4.5.K: Arboricultural Impact Assessment Report**. Precautionary measures discussed in that report include protective fencing and temporary ground

protection measures (where necessary) and ensuring all soil storage remains outside RPAs.

- A minimum of 10 m stand-off buffers from watercourses (bank tops) and ponds, including dry ditches, to protect riparian habitats and to mitigate for potential hazards such as chemical and spoil spills into watercourses or water bodies, with the exception of where watercourses and ditches (including seven Main Rivers) are crossed by cabling works and open cut techniques are required, or where bridge construction is required to facilitate creation of the permanent haul road, or where existing cable requiring removal is already in the buffer.
- A minimum of 50 m from Afon Glaslyn bankside (in Glaslyn SSSI) to reduce the likelihood of disturbance to otter, which are a feature of this statutory designated site.

Construction Environmental Management Plan (CEMP)

- 5.9.21 The CEMP (**Volume 8, Appendix 4.2.A: Outline Construction Environmental Methodology Statement**) will include measures to manage the environmental effects of the proposed works and demonstrate compliance with environmental legislation. The CEMP will detail the measures required to mitigate construction related effects on IEFs, including those associated with construction dust deposition, air pollution, pollution incidents including for oil spills when decommissioning the existing cables and bentonite during HDD installations, water quality, light, noise and vibration.

Landscape Environmental Management Plan (LEMP)

- 5.9.22 A LEMP will be implemented which will include post construction monitoring of habitat reinstatement, enhancement and creation to be undertaken in line with landscape provisions and NBB requirements.

Vegetation Clearance

Nesting Birds

- 5.9.23 Vegetation clearance will be carried out in advance of construction and to avoid the nesting bird period which is from March to August inclusive. This will prevent birds nesting within the proposed construction works area prior to construction. Ground nesting species will be dissuaded from nesting within the construction footprint by removing the surface vegetation (including grassland) before the breeding season commences.
- 5.9.24 Where vegetation clearance (including grassland and scrub habitats that may support ground-nesting bird species) cannot be scheduled outside the bird breeding season, the area will be surveyed by a suitably experienced ornithologist prior to any works. If active nests are identified, appropriate buffer zones will be established, and the area will be monitored until the young have fledged. Confirming the absence of nesting activity can be particularly challenging in habitats such as marsh and grassland, which may result in potential localised works delays.

Reptiles, Common Amphibians and Common Mammals

- 5.9.25 Precautionary working methods will be adhered to in areas of habitat suitable for reptiles, common amphibians and common mammals (including tall grassland and ruderal habitats, watercourses and ditches and their associated riparian habitat) to avoid the incidental killing or injury of any such species that may be present. All habitats

suitable for reptiles, common amphibians and common mammals will be subject to two-stage habitat manipulation. Firstly, vegetation will be cut to approximately 150 mm (with the arisings removed), overseen by a suitably experienced appointed ecologist and the area left for a minimum of one day to allow any such species to naturally disperse. Secondly, vegetation will be cleared down to ground level, which will be overseen by the ecologist. Vegetation will be cleared using appropriate equipment based on the type of vegetation to be removed, the area affected, and the risk of killing or injuring reptiles, common amphibians and common mammals. Construction works can commence immediately after completion of the second stage. Reptile hibernacula will be retained and protected during construction where practicable. Any habitat features which could be concealing sheltering reptiles and amphibians (e.g. log piles, rubble mound bunds, any other debris) would not be dismantled during their inactive season (i.e. November to February inclusive) if they cannot be retained.

Fencing

- 5.9.26 Measures will be carried out to ensure there is no incursion into statutory and non-statutory designated sites outside of required construction areas. Security and protection fencing will be erected early in the construction process. The fence design will include gaps at the base to allow mammals that may use retained habitats, including, badger, brown hare, and hedgehog, to pass underneath at strategic locations to avoid fragmentation of habitats, where appropriate. Any temporary fencing present during construction will also allow continued movement of otter along watercourses where they have been found to be present.

Lighting

- 5.9.27 It is anticipated that during construction, works will be restricted to daylight hours wherever practicable, to remove the need for artificial lighting, with focussed task-specific lighting provided where this is not practicable e.g. 24-hour HDD drilling operations. However, task-specific and fixed 'general' lighting will likely be required in months with reduced daylight hours (early mornings and up to 19:00 for general workforce) to meet safety requirements. Outside of core working hours passive infrared sensor (PIR) controlled lights (motion sensors) will be used at construction compounds and at welfare areas.
- 5.9.28 During operation, the Glaslyn works site will not require artificial lighting other than during temporary periods of maintenance or repair. All routine maintenance activities will be scheduled for daylight hours as far as is practicable, and focussed task specific lighting would only be required in the event of emergency works such as equipment failure requiring night-time working.
- 5.9.29 Where lighting is required, it will conform to best practice guidelines with respect to minimising light spill into adjacent habitats to prevent disturbance to bats and other species. This will include the Institute of Lighting Professionals Guidance Notes, in particular GN08/23 Bats and Artificial Lighting at Night (Ref 5.29). and GN-1: Reduction of Obtrusive Light (Ref 5.30) which will be followed in so far as it is reasonably practicable. The following measures will be taken:
- Lights installed will be of the minimum brightness or power rating capable of performing the desired function.
 - Light fittings will be used that reduce the amount of light emitted above the horizontal (reduce upward lighting).

- Light fittings will be positioned correctly, inward facing and directed downwards, and away from watercourses or dry ditches.
- Direction of lights will seek to avoid spillage onto neighbouring properties, habitats, highway or waterway.
- PIR controlled lights (motion sensors) will be used except where temporary focussed task specific lighting is required.

Soil Handling

- 5.9.30 Please refer to **Chapter 7: Geology, Hydrogeology, Land Use and Agriculture** for measures to ensure the sustainable management of the soil resources which are disturbed by the proposed works (and their associated seedbanks) and which support the habitats within the Glaslyn site boundary.

Watercourses

- 5.9.31 Where watercourses and ditches (and Main Rivers) are crossed by cabling works and open cut techniques are required, habitats that are temporarily lost will be reinstated after installation, as soon as works are completed in that location.

Hedgerow

- 5.9.32 Hedgerow removal will be kept to a minimum to minimise habitat fragmentation. Where temporary removal of a section of hedgerow is required, new sections of hedgerow (with the same species mix and of the same or improved condition) will be planted, to maintain habitat connectivity and connectivity for species, such as commuting bats. It is acknowledged that these sections will take some years to mature.

Habitats

- 5.9.33 Where grassland vegetation removal is required, underlying topsoil and subsoil will be stripped and stored appropriately, omitting the use of glyphosate. Once the works are completed, the topsoil and subsoil will be backfilled promptly, retaining the original soil profile and seed bank. Correct handling of soils and associated seedbanks and reinstatement of the habitat will ensure that for most of the Glaslyn works site, any loss is temporary for the duration of the construction period only. Where watercourses and ditches (including Main Rivers) are crossed by cabling works and open cut techniques are required, habitats that are temporarily lost will be reinstated after installation, ideally as soon as works are completed in that location. Further detail on the appropriate measures will be in the **LEMP (Volume 8, Appendix 4.4.C: Landscape and Ecological Management Plan)**. Small scale permanent habitat loss will be compensated with the creation of replacement habitats or habitat management in the Glaslyn works site through NBB as described in **Volume 8, Appendix 4.5.L: Net Benefit for Biodiversity Assessment and Green Infrastructure Statement**.

Acoustic Noise Screening

- 5.9.34 Temporary noise attenuation fencing will be installed within the Glaslyn works site, including around HDD working areas, to minimise potential disturbance to sensitive receptors. This is required to reduce potential effects for human receptors, but will also benefit a range of species including otter and bats. It is anticipated that this measure will

achieve a noise reduction of at least 5 decibels (dB). See **Chapter 11: Noise and Vibration** for further details.

Wildlife Legislation Compliance

- 5.9.35 To comply with relevant wildlife legislation, pre-construction surveys, such as (but not limited to) an updated Phase 1 habitat survey, otter and badger walkovers and bat roost assessments of any affected trees or structures, will be carried out to support the baseline findings. Checks for nesting birds will also be carried out. The purpose of these pre-construction surveys is to ensure mitigation during construction is based on the latest protected species information. This will also be required for any protected species licensing that may be identified as being necessary prior to commencement of works in any area. These surveys will also provide an update on the presence and location of any INNS, the findings of which will inform the implementation of measures to prevent their spread into the wild and will be secured through the CEMP (**Volume 8, Appendix 4.2.A: Outline Construction Environmental Methodology Statement**).
- 5.9.36 Reasonable avoidance measures will be implemented. These include establishing appropriate buffers in the proposed works area, where possible; 30 m around any identified active badger setts and 15 m around trees with bat roost suitability.
- 5.9.37 Measures to avoid animals being injured or killed in construction working areas, such as the inclusion of mammal proof fencing around excavations, covering excavations left open over night or providing a means of escape as appropriate regarding the depth of excavation, will be implemented.

Construction Effects

- 5.9.38 **Table 5-8** provides a summary of the magnitude of impacts and likely significance of effects on IEFs during the construction of the proposed works considering the embedded mitigation described above.

Table 5-8 – Assessment of construction impacts and significance of effects on IEFs during construction

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC	International (Very high)	Habitat loss or fragmentation. Temporary (and reversible).	Small areas of scrub will be removed to facilitate works to existing link boxes within the SAC. The current access track will be used and unamended. The habitat loss immediately around each link box will be minimised and temporary. The scrub is part of the site fabric of the SAC, but not a qualifying habitat, and works will not directly impact qualifying habitats such as oak woodland. Keeping access to the existing unmodified track will prevent damage to trees from machinery, through soil compaction or root disturbance.	Very Low	Minor Adverse	No
		Habitat degradation-impacts to water quality through pollution and construction run off, oil, sediments and spills from cable decommissioning, and air quality from construction dust. Temporary	There is potential for dust emissions, noise and vibration disturbance due to the proximity of construction activities, resulting from the nearby minor kiosk works within the SAC, and the main works outside of the SAC. Standard environmental protection measures, as provided in the CEMP (Volume 8, Appendix 4.2.A: Outline Construction Environmental Management Plan), will be implemented during the construction phase. This will include suitable measures to suppress dust, reduce site runoff and reduce spillage risk and water pollution risk. This will also include pollution control measures to prevent spills from the oil in the cable decommissioning.	Very Low	Minor Adverse	No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
		(short-term) and reversible.				
		Injury or mortality of associated species.	All trees within the SAC will be protected and retained. No trees with PRFs were identified near each link box suitable for bats. It is highly unlikely that roosting bats would be directly impacted, causing injury or mortality. Pre-construction surveys will be carried out as required to support the baseline survey findings and inform any additional mitigation or licencing requirements.	Very Low	Minor Adverse	No
		Disturbance to associated species through noise, lighting, or visual disturbance. Temporary.	No lighting will be required for the minor link box works within the SAC. Works will be carried out over a single day. Noise levels will be kept to a minimum, being no higher than 95 db. Works taking place outside of, but close to the SAC will include the site compound and Minffordd CSEC. The HDD working area, approximately 20 m from the SAC boundary and 60 m from woodland within the SAC, will require 24-hour working on some occasions. Lighting will be required for these night time works. The ground level at this HDD working area will be raised to prevent flooding, however the 24-hour element of the works within the HDD working area will be done at a lower level and be partially screened by the bunds. Lighting will be designed to minimise light spill into adjacent habitats to prevent	Very Low	Minor Adverse	No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
			disturbance to bats as described in Section 5.9. As described in Chapter 11: Noise and Vibration, HDD operations will be scheduled such that the specific tasks will be completed during core (daytime) working hours. However, on longer drills where each operation (drilling and reaming) will occur over multiple days, 24-hour working may be required. Ultimately, night-time working requirements would not be normal working practice and will be determined by on-site ground conditions. Noise contour mapping of the HDD works indicate that projected noise levels within the SAC are not expected to exceed 55 db. Temporary barriers will be installed around the drilling rig to mitigate noise impacts, with an anticipated noise reduction of 5 db. Although the works would cause some temporary disturbance to the edge of an area of woodland and surrounding grassland with scattered trees, designated for lesser horseshoe bats, this is a composite site and comprises approximately 17 ha of a total 2,813 ha site. Bats present here will be habituated to the adjacent A487 Porthmadog Bypass and Cambrian Railway, as well as the nearby village (Minffordd), A497 and Breendon Minffordd Quarry & Asphalt Plant site.			

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC Morfa Harlech a Morfa Dyffryn SAC Afon Ddu SSSI Morfa Harlech SSSI and NNR Tiroedd a Glannau	International (Very High) and National (High)	Habitat degradation - impacts to water quality through pollution and construction run off and air quality from construction dust. Temporary and reversible.	Hydrological connections exist between the Glaslyn works site and these designated sites via the natural drainage network. Standard environmental protection measures, as provided in the CEMP (Volume 8, Appendix 4.2.A: Outline Construction Environmental Management Plan), will be implemented during the construction phase.	Very Low	Minor Adverse	No
Rhwng Cricieth ac Afon Glaslyn SSSI Pen y Banc LNR		Injury or mortality of associated species.	These sites are all more than 0.5 km from the Glaslyn works site. No direct mortality of dolphin or seal (which are associated with the Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC) would be expected to result from the construction of the proposed works. Otters are associated with some of these statutory designated sites and use water bodies and riparian habitats in the Glaslyn works site. However, no otter resting sites have been recorded within the proposed works area, and injury or mortality of this qualifying species is not anticipated while within resting sites. Otter will be able to move across the Glaslyn works sites along the water courses however, otter proof fencing will be installed around deep excavations to prevent otter from being trapped, or escape routes	Very Low	Minor Adverse	No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
			provided from shallower excavations. Pre-construction surveys will be carried out as required to support the baseline survey findings and inform any additional mitigation or licencing to prevent any potential injury or mortality to otter.			
		Disturbance to associated species through noise, lighting or visual disturbance. Temporary.	Given the distance of these statutory sites from the Glaslyn works site, and the intervening habitats (including the A497 Porthmadog Bypass and the Welsh Highland Heritage Railway and Ffestiniog Railway) disturbance from construction noise, lighting, or visual effects to dolphin or seal (which are associated with the Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC) is unlikely. Otters are associated with the Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC and Afon Ddu SSSI and use water bodies and riparian habitats within the Glaslyn works site. Otter are known to have extensive home ranges, with recorded distances for males ranging between 12 and 80 km (Ref 5.62). No otter resting sites have been recorded within the proposed works area, the nearest potential holt (non-natal) is over 50 m from minor link box works, and a greater distance from the main works. Planned works will not prevent otter movement across the landscape. Noise contour mapping of the HDD works indicate that projected noise levels within the location of the potential holt (non-natal) are	Low	Minor Adverse	No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
			not expected to exceed 55 db. Temporary barriers will be installed around the drilling rig to mitigate noise impacts, with an anticipated noise reduction of at least 5 dB. Bureau Veritas identified that a sound pressure level below 50 dB would probably result in a low likelihood of disturbance for otters as it does for humans and many marine species (Ref 5.63). Pre-construction surveys will be carried out as required to support the baseline survey findings and inform any additional mitigation or licensing requirements to reduce the likelihood that otters are disturbed by the proposed works.			
Northern Cardigan Bay/Gogledd Bae Ceredigion SPA	International (Very high)	Indirect degradation impacts on the habitats which the species associated with the SPA depend on, due to runoff during construction or other waterborne pollution or to construction dust.	A hydrological connection exists between the Glaslyn works site, and this designated site via the natural drainage network. Standard environmental protection measures, provided in the CEMP (Volume 8, Appendix 4.2.A: Outline Construction Environmental Management Plan), will be implemented as described above.	Very Low	Minor Adverse	No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
		Temporary and reversible.				
		Impacts to qualifying bird species of the SPA through the potential loss of functionally linked land. Temporary (reversible). Disturbance to qualifying bird species present within the Glaslyn works site due to construction noise and visual disturbance. Temporary.	Northern Cardigan Bay/Gogledd Bae Ceredigion SPA is 2.94 km downstream of the proposed works. No direct mortality of any species associated with this designated site would be expected to result from the proposed works. As stated within the Breeding Bird and Wintering bird Report (Volume 8, Appendix 4.5.D: Ecology Report: Breeding Bird Surveys and Volume 8, Appendix 4.5.E: Ecology Report Glaslyn Wintering Bird Survey Report), red-throated diver, (the qualifying species for Northern Cardigan Bay/Gogledd Bae Ceredigion SPA) was not recorded during surveys and habitat is suboptimal for this species, as red-throated diver is likely to occur in the inshore coastal marine areas of the SPA. The Survey Area (incorporating the Glaslyn works site) does not constitute functionally linked land for this species, and the proposed works are not considered likely to cause an adverse impact on the SPA, including via disturbance to red-throated diver.	N/A	No Effect	No
Glaslyn SSSI and Traeth Glaslyn NWWT Reserve	National (High) National (High)	Habitat loss. Permanent.	Four new link boxes will be constructed on raised bunds which will require the permanent loss of approximately 96.8 m ² of marshy grassland habitat (four x 24.2 m ² link box and associated plinths). Permanent change will	Low	Minor Adverse	No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
			likely occur to a further 312 m² (approximately) of surrounding habitat to accommodate the raised bunds and slopes (four x 78 m²) in the Glaslyn SSSI (436.3 ha). The loss of habitat would not have an adverse effect on structure, function or conservation status of the site as it would affect less than 0.01% of the overall SSSI.			
		Habitat loss – temporary.	Temporary removal of approximately 1.6 ha (0.37% of the SSSI) of marshy grassland will be required to facilitate installation of the HDD pit (M23a <i>Juncus effusus/acutiflorus-Galium palustre</i> rush-pasture <i>Juncus acutiflorus</i> sub-community). No protected or notable plants were recorded during field surveys in this part of the Glaslyn works site, which is comparatively drier than most of the remaining SSSI. However, whorled caraway, considered Locally Scarce in Merionethshire and Locally Rare in Caernarvonshire (Ref 5.56) was recorded in scattered locations within the area. See Volume 8, Appendix 4.5.A: Ecology Report: Habitats Report. Additional small scale temporary works will be required within the SSSI at 500 m intervals to create underground monitoring pits to enable retention of existing cables <i>in situ</i>. These	Low	Minor Adverse	No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
			works will be localised, temporary and each will be approximately 24 m x 10 m in area. The topsoil will be temporarily stored while the works are carried out, which will be stored in suitable areas such as along the track and outside of the more sensitive SSSI habitats. On completion the topsoil will be reinstated. Loss of habitat for the remainder of the SSSI will be avoided through HDD, which will pass under the remainder of the statutory site (comprising terrestrial habitat and the Afon Glaslyn).			
		Habitat degradation-impacts to water quality through pollution and construction run off (sediment), oil, sediments and spills from cable decommissioning, and air quality from construction dust. Temporary.	Standard environmental protection measures, as provided in the CEMP (Volume 8, Appendix 4.2.A: Outline Construction Environmental Management Plan), will be implemented. Earthworks within the SSSI/NWWT boundary have the potential to cause erosion and sedimentation within adjacent CFGM habitat, particularly during times of heavy rain and subsequent flooding. Sedimentation is a naturally occurring process associated with flooding and the CFGM habitat is not likely to be particularly sensitive to such deposition. Soil storage and bunds will be secured to prevent the deterioration that would cause sedimentation. See Chapter 7: Geology, Hydrogeology, Land Use and Agriculture (Soils) for further information. Pollution control measures will be in place to	Low	Minor Adverse	No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
			prevent spills from the oil in the cable decommissioning. Glaslyn SSSI encompasses Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC and works to existing oil cables within the SAC (described above), and the associated impacts are also applicable to Glaslyn SSSI.			
		Injury or mortality of associated species.	Direct impacts to species inhabiting Glaslyn SSSI (such as otter and bats) will be reduced by using HDD under most of the statutory site. Pre-construction surveys will be carried out as required to support the baseline survey findings and inform any additional mitigation or licensing requirements. The proposed works are designed to remain more than 300 m from the bank top of the Afon Glaslyn. Minor works on link boxes within the SAC will be more than 40 m away. This distance or greater will also be applied between the HDD working area and a potential otter holt (non-natal) on the bank of the Afon Glaslyn. Access along the Afon Glaslyn for a width of at least 300 m will always be available to otter during the proposed works. Otter will be able to move across the Glaslyn works site along the water courses however, mitigation will be implemented to prevent otter from being trapped in any excavations left open overnight.	Very Low	Minor Adverse	No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
			No tree removal is proposed within this SSSI that could potentially provide bat roosting habitat; direct impacts to bats are not anticipated. Impacts to protected or notable plants for which the SSSI is designated are not expected as none were recorded in the proposed works area. There is the potential for impacts to plants that are considered Locally Scarce or Locally Rare. There will also be no impacts to the rare snail (<i>Vertigo lilljeborgi</i>), as NRW have advised it does not expect to find this species in the Glaslyn works site. See Terrestrial Invertebrates in Table 5-5.			
		Disturbance to cited species (such as otter and bats) through noise, lighting or visual disturbance. Temporary.	Any disturbance to bat, otter and cited bird species from the proposed works will be temporary and localised to a very narrow area of the SSSI and the HDD pit working area. Consequently, the potential for significant effects to individual bat, otter or bird species or the SSSI assemblage to arise is unlikely. Pre-construction surveys will be carried out to support the baseline survey findings and inform any additional mitigation or licensing requirements, further minimising potential disturbance. This will include checks for otter and Schedule 1 listed bird species. Although not cited, protected migratory fish will travel through the area to reach upstream spawning grounds. Disturbance to these	Low	Minor Adverse	No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
			species from the proposed works will be temporary and localised. Consequently, the potential for significant effects to the migratory fish assemblage is unlikely.			
Ysbyty Bron y Garth SSSI	National (High)	Habitat degradation-impacts to water quality through pollution and construction run off, oil, sediments and spills from cable decommissioning, and air quality from construction dust. Temporary.	Cable decommissioning works are required adjacent to a small section of the SSSI, but retaining the existing cable section which goes through it. Working widths will be restricted in these areas, including for removal of cables connected to and around the edge of Garth CSEC, along with careful working procedures to protect the roots of the surrounding trees, as detailed in Volume 8, Appendix 4.5.K: Arboricultural Impact Assessment so that there will be no detrimental impacts on the trees and SSSI. Standard environmental protection measures, as provided in the CEMP (Volume 8, Appendix 4.2.A: Outline Construction Environmental Management Plan), will be implemented as described above. This will also include pollution control measures in place to prevent spills from the oil in the cable decommissioning.	Low	Minor Adverse	No
		Injury or mortality of associated species (lesser horseshoe bats).	Pre-construction surveys will be carried out as required to support the baseline survey findings and inform any additional mitigation or licencing requirements. Based on current survey information, no bat roost will be lost as part of the proposed works.	Very Low	Negligible	No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
		Disturbance to cited species through noise, lighting or visual disturbance. Temporary.	The SSSI is designated because bats use a building in the former hospital, over 650 m from the nearest point of works. The surrounding habitat within the SSSI provides important feeding habitat for the bats and flight line connections to other bat populations. Although the works would cause some temporary disturbance to the edge of an area of scrub and woodland, designated for lesser horseshoe bats, this is the edge of the 38 ha site. Bats present here will be habituated to the adjacent A487 Porthmadog Bypass and the Cambrian Railway, as well as the nearby village (Minffordd), A497 and Breedon Minffordd Quarry and Asphalt Plant site.	Low	Minor Adverse	No
Coed Bryn-twr/Wern cWS	County (Medium)	Habitat loss or fragmentation (temporary and permanent).	Construction traffic will use an existing access road that passes through this cWS in advance of construction of the permanent haul road. Minor tree trimming is required at the junction with the A497 to maintain the existing visibility splay, however this is currently being maintained as part of the highway maintenance required for the A497 and continuation of this by the council highways team will be sufficient for the visibility splay. No further vegetation clearance or tree trimming is anticipated.	Very Low	Negligible	No
All WS/cWS within 50 m of the Glaslyn works site or	County (Medium)	Habitat degradation-impacts to water quality	Standard environmental protection measures, as provided in the CEMP (Volume 8, Appendix 4.2.A: Outline Construction Environmental Management Plan), will be	Low	Minor Adverse	No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
hydrologically linked to the Glaslyn works site		through pollution and construction works run off, oil, sediments and spills from cable decommissioning. Habitat degradation due to dust and other pollutants (temporary).	implemented as described above. This will also include pollution control measures will be in place to prevent spills from the oil in the cable decommissioning.			
Ancient Woodland	County (Medium)	Habitat loss or fragmentation (temporary).	Ancient Semi-Natural Woodland is present within the centre of the Glaslyn works site; however, it is in an area where existing cables will be retained specifically to avoid loss and disturbance to this irreplaceable habitat. Restored Ancient Woodland Sites are also in the Glaslyn works boundary. One area encompasses an existing road (running north from the A497 to the Wern CSEC), which will be used temporarily, without alteration, until the construction of the main haul road at a separate location is completed. A second Restored Ancient Woodland Site lies adjacent to this access road. One further area of Restored Ancient Woodland is adjacent to the A487- High Street roundabout. No vegetation clearance or tree trimming within these	Very Low	Minor Adverse	No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
			ancient woodland areas is anticipated, and these ancient woodland sites will not be directly affected. Minor tree trimming is required within a further Restored Ancient Woodland Site at the junction with the A497 to maintain the existing visibility splay, however this is currently being maintained as part of the highway maintenance required for the A497 and continuation of this by the council highways team will be sufficient for the visibility splay . This woodland area is, in fact, established on made ground adjacent to the railway line and is unlikely to comprise ancient woodland soils. In addition, some of the likely clearance will include removal of scrub along the woodland edge which includes rhododendron. No further vegetation clearance or tree trimming is anticipated.			
		Habitat degradation-impacts to water quality through pollution and construction works run off. Habitat degradation due to dust and	Standard environmental protection measures, as provided in the CEMP (Volume 8, Appendix 4.2.A: Outline Construction Environmental Management Plan), will be implemented during the construction phase.	Low	Minor Adverse	No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
		other pollutants. Temporary (short-term), reversible.				
Veteran and Ancient trees	Up to National (High)	Habitat Loss	There are 18 ancient or veteran trees in the Study Area (see Volume 8, Appendix: 4.5.K: Arboricultural Impact Assessment). No direct works are proposed to any ancient or veteran trees. The works will result in incursion of the RPA or canopies of seven veteran trees; however, all but one causes of incursion are use of existing roads or hard surfacing, with no planned change in use. The area beyond the existing access in all cases will be fenced off as an exclusion zone. No damage to roots, soil compaction or damage to above ground parts of the trees are anticipated. One veteran tree (T71) will be indirectly affected by a drain entering its RPA.	Low	Minor Adverse	No
		Habitat degradation-impacts to water quality through pollution and construction works run off. Habitat degradation due to dust and	Standard environmental protection measures, as provided in the CEMP (Volume 8, Appendix 4.2.A: Outline Construction Environmental Management Plan), will be implemented during the construction phase.	Very Low	Negligible	No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
		other pollutants. Temporary.				
HoPI Coastal Floodplain grazing marsh (CFGM)	County (Medium)	Habitat loss or fragmentation. Permanent.	The proposed works are wholly within CFGM habitat which includes improved, poor-semi-improved, semi-improved neutral grassland as well as woodland and scrub habitats. The proposed works will result in the permanent loss of approximately 1.66 ha of CFGM habitat due to the extension of the footprint of Wern CSEC, the construction of the permanent haul road from the A498 to the Wern CSEC, installation of link boxes and creation of new habitat to facilitate landscaping and NBB commitments in the Volume 8, Appendix 4.5.L: Net Benefit for Biodiversity Assessment and Green Infrastructure Statement. The loss of this area would not have an adverse effect on the structure, function or conservation status of CFGM as it would affect approximately 1.65% of the CFGM recorded within the Glaslyn works site. CFGM HoPI supports a variety of habitats; the defining features are hydrological and topographical rather than botanical. Grazing marsh is defined as periodically inundated pasture or meadow, typically with ditches or rills containing standing brackish or fresh water (Ref. 5.39). The areas of CFGM that will be permanently lost due to the proposed works comprise mixed plantation	Low	Minor Adverse	No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
			woodland and improved and poor semi-improved grassland; there will be no significant effects on CFGM HoPI.			
Saltmarsh			Saltmarsh HoPI is recorded on Datamap Wales (Ref 5.33) within the proposed works area within Glaslyn SSSI. Completion of the NVC survey in June 2024, confirmed that the habitat in this part of the proposed works area is M23a <i>Juncus effusus/acutiflorus</i>-<i>Galium palustre</i> rush-pasture <i>Juncus acutiflorus</i> sub-community) comprising marshy grassland rather than saltmarsh habitat. Saltmarsh habitat is present in the wider Glaslyn works site but will not be directly impacted by the proposed works as it will be avoided through HDD, which will pass underneath the habitat.	N/A	N/A	No
HoPI Lowland dry acid grassland Purple moor grass and rush pasture	County (Medium)	Habitat loss or fragmentation. Temporary.	Works within these HoPI will be minimised, with the existing cables retained and decommissioned in situ. Small scale works will be required at 500 m intervals (which intersect these HoPI) to create monitoring pits to enable the cables to remain safely in place. These works will be localised, temporary and approximately 24 m x 10 m in area. Their exact location is yet to be determined.	Low	Minor Adverse	No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
HoPI in the Glaslyn works site or within a 50 m buffer or hydrologically linked. Coastal and floodplain grazing marsh Lowland fen and reedbed Saltmarsh Lowland dry acid grassland Purple moor grass and rush pasture Traditional orchard	County (Medium)	Habitat degradation-impacts to water quality through pollution and construction works run off. Habitat degradation due to dust and other pollutants including oil, sediments and spills from cable decommissioning. Temporary.	Standard environmental protection measures, as provided in the CEMP (Volume 8, Appendix 4.2.A: Outline Construction Environmental Management Plan), will be implemented as described above. Soil storage or bunds will be secured to prevent their deterioration that would cause sedimentation. This will also include pollution control measures will be in place to prevent spills from the oil in the cable decommissioning.	Low	Minor Adverse	No
Semi-natural broadleaved woodland Planted broadleaved woodland	Up to County (Medium)	Habitat loss or fragmentation.	Minimal works to woodland is anticipated. However, several areas are next to the proposed works and there is the potential for tree roots and crowns to be impacted. The Volume 8, Appendix: 4.5.K: Arboricultural Impact Assessment assesses and protects retained trees and woodland. The default position is that all RPA and canopies of retained trees will be fenced off as exclusion zones with no access. Where this is not feasible limited access may be	Low	Minor Adverse	No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
			acceptable using fit for purpose ground protection or other protective measures in accordance with BS 5837 (Ref 4.29). There is currently a net loss of broadleaved woodland plantation of 0.08 ha, such as in working areas of cables to be decommissioned. Options are being looked into for off site compensation for this habitat.			
Planted mixed woodland	Local (Low)	Habitat loss or fragmentation (permanent).	An area of planted mixed woodland approximately 0.22 ha will be removed permanently to facilitate the extension of the Wern CSEC. This habitat will be reinstated on site as part of the NBB (Volume 8, Appendix 4.5.L: Net Benefit for Biodiversity Assessment and Green Infrastructure Statement).	Low	Minor Adverse to Negligible once established	No
Semi-improved neutral grassland	Local (Low)	Habitat loss or fragmentation. Temporary.	No permanent loss of semi-improved neutral grassland will be required to facilitate the proposed works. Temporary loss of small extents of this grassland type is required across the Glaslyn works site to facilitate temporary construction access and cable installation but will be reinstated.	Low	Minor Adverse	No
Marshy grassland	County (Medium)	Habitat loss or fragmentation. Permanent and temporary.	Permanent loss of marshy grassland within Glaslyn SSSI is required to facilitate construction of new link pillars following completion of the HDD pit works (see Glaslyn SSSI above). In addition, for approximately 130 m x 50 m of the new access roads into Wern, and planting of scrub for screening.	Low	Minor Adverse	No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
			Temporary loss of other areas of marshy grassland is required to facilitate construction access and cable installation but will be reinstated.			
		Habitat degradation-impacts to water quality through pollution and construction works run off. Habitat degradation due to dust and other pollutants, including oil, sediments and spills from cable decommissioning. Temporary.	Standard environmental protection measures, as provided in the CEMP (Volume 8, Appendix 4.2.A: Outline Construction Environmental Management Plan), will be implemented as described above. This will also include pollution control measures will be in place to prevent spills from the oil in the cable decommissioning.	Low	Minor Adverse	No
Marginal and Inundation vegetation – marginal vegetation	Local (Low)	Habitat loss or fragmentation. Permanent and temporary.	Localised and predominantly temporary loss of marginal vegetation will be necessary to facilitate works on watercourses, including bridge replacements. Minor permanent habitat loss is expected in areas where new bridge construction is required.	Low	Minor Adverse	No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
Standing open water (ponds)	Local (Low)	Habitat loss or fragmentation.	All water bodies present within the Glaslyn works site will be retained.	N/A – No Impact	No Effect	No
Running water, including rivers, field drains, streams and wet ditches	Afon Glaslyn (High) Wet ditches and drains (smaller watercourses) – Local (Low)	Habitat loss or fragmentation.	Direct habitat loss to Afon Glaslyn and its riparian habitat will be avoided using HDD techniques. Localised and predominantly temporary loss of marginal vegetation will be necessary to facilitate works on other watercourses, including bridge replacements, culverts and open cut crossings. Minor permanent habitat loss is expected in areas where new bridge construction is required.	Low	Minor Adverse	No
Hedgerows-Species-poor and species-rich hedgerows (intact and defunct), comprising both Important and non-important hedgerows.	Up to County (Medium)	Habitat Loss. Temporary (medium term while replanted hedgerows re-establish), reversible.	Where practicable, the layout of the proposed works will use existing tracks and field openings as the preferred routes for construction access and cabling works, minimising loss of hedgerows. Temporary hedgerow removal will be required in discrete locations to facilitate the proposed works, including a hedgerow categorised as Important under the Hedgerows Regulations (Ref 5.7) (see Volume 8, Appendix 4.5.B Hedgerow Report). Hedgerows will be replanted (with the same species mix and of the same or improved condition); but will be shallow rooted and will not contain trees where replanted above cables. There will be a permanent loss of hedgerows on site of 0.24	Low	Minor Adverse	No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
			km species poor, with 0.23 km of species rich hedgerows created on site. Off-site compensation will be required for NBB of 0.49 km based on a 3:1 ratio (Volume 8, Appendix 4.5.L: Net Benefit for Biodiversity Assessment and Green Infrastructure Statement).			
All habitats	National (High) to Low (Local)	Habitat degradation-impacts to water quality through pollution and construction works run off. Habitat degradation due to dust and other pollutants including oil, sediments and spills from cable decommissioning. Temporary	Standard environmental protection measures, as provided in the CEMP (Volume 8, Appendix 4.2.A: Outline Construction Environmental Management Plan), will be implemented during construction. This will include suitable measures to suppress dust, reduce site runoff and reduce spillage risk and water pollution risk. Soil storage and bunds will be secured to prevent their deterioration that would cause sedimentation into watercourses and water bodies. This will also include pollution control measures will be in place to prevent spills from the oil in the cable decommissioning.	Low	Minor Adverse	No
All habitats	National (High) to Low (Local)	Introduction or spread of INNS through vehicles, machinery or	Pre-construction checks for INNS will be carried out to support the baseline survey findings and to ensure that INNS, such as Himalayan balsam, Japanese knotweed, montbretia, buddleia, American skunk cabbage, rhododendron and New Zealand	Low	Minor Adverse	No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
		people. Temporary.	pigmyweed, which are known to be present locally, are not spread within or outside of the Glaslyn works site. Works will be conducted under a Biosecurity Management Plan.			
Protected and notable flora	Local (Low)	Loss or damage (bluebell, whorled caraway). Habitat degradation due to dust and other pollutants. Temporary.	Native bluebell is a legally protected plant in woodland within the Glaslyn works site. Whorled caraway is considered Locally Scarce in Merionethshire and Locally Rare in Caernarvonshire (Ref 5.56) Bluebell has been recorded in woodland near Wern. HDD will be used beneath this woodland minimising impacts. However, localised works will be required on the very northern edge of this woodland and there is the potential for adverse impacts to bluebell to occur. Whorled caraway has been recorded in scattered locations within Glaslyn SSSI, including the HDD working area, and may also be subject to adverse impacts. Standard environmental protection measures for retained habitats, as provided in the CEMP (Volume 8, Appendix 4.2.A: Outline Construction Environmental Management Plan), will be implemented as described above. Soil storage and bunds will be secured to prevent their deterioration that would cause sedimentation.	Low	Minor Adverse	No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
Terrestrial Invertebrates	Local (Low)	Loss and fragmentation of habitat used by terrestrial invertebrates resulting in species mortality - permanent and temporary. Habitat degradation due to dust and other pollutants. Temporary.	The habitats recorded in most of the Glaslyn works site are common in a local and national context and unusual or rare assemblages of invertebrates are not expected. The proposed works design retains or reinstates most habitats of value to terrestrial invertebrates, including woodland, species rich marshy grasslands, grassland margins, watercourse and ditch margins, scrub and hedgerows. However, some loss (albeit mostly temporary) cannot be avoided. Landscape planting will ensure that there is no net loss of biodiversity. Where habitats such as woodlands cannot be replanted in situ (such as the Wern CSEC extension) then these will be replaced elsewhere. Standard environmental protection measures for retained habitats, as provided in the CEMP (Volume 8, Appendix 4.2.A: Outline Construction Environmental Management Plan), will be implemented. Soil storage and bunds will be secured to prevent their deterioration that would cause sedimentation into ponds present.	Low - habitat loss during construction	Negligible to Minor Adverse	No
Aquatic Macroinvertebrates (see Volume 8, Appendix 4.5.C: Aquatic)	National (High) importance for freshwater pearl mussel.	Direct impact on species assemblage through disturbance and mortality during open	There are 57 individual water course crossings proposed by the scheme of which: 18 water courses will be crossed by HDD over the six HDD sections with High Voltage Cables (HVC) buried between 3.15 – 18 m deep	Very Low	Minor Adverse for freshwater pearl mussel	No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
Ecology Report).	District (Medium) importance for scarce blue-tailed damselfly, variable damselfly, and the beetle <i>Hydraena palustris</i>. Local importance (Low) for the cased caddisfly <i>Limnephilus fuscicornis</i> and other species.	trenching, construction of temporary roads (including haul roads) and bridges, and temporary culverts. Temporary (short term), reversible).	15 water courses will be crossed by open trenching with HVC buried between 1.0 – 1.17 m deep (including the two main rivers – NRW.MR.05 and NRW.MR.06). - Eight temporary crossings (bridges with spans between 3.1 and 6.7 m and access roads). - Five permanent crossings (bridges with spans between 3.38 – 6.46 m. - Five watercourses to be reworked for access. - Two temporary water course diversions via culverts at lengths of 85 and 110 m. - Two compound earthworks that cross ditches. - Two existing water course crossings that are to be maintained. Installation of HVCs through open cut trenching will result in the disturbance and mortality of aquatic macroinvertebrates through the removal of marginal and riverbed habitats as these are required to install the crossing ducting to the minimum depth of 1.0 m. Similarly, construction of temporary access tracks, diversions via culverts, and watercourse reworking will result in the temporary loss of aquatic habitat. Only one watercourse (Y Cyt - NRW.MR.04) proposed for temporary works has been assessed as having potentially suitable habitat		Negligible for all other species	No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
			for freshwater pearl mussel. All other watercourses have been classified unsuitable due to being dry or ephemeral, poor water quality, and/or containing a lack of suitable substrate (see Volume 8, Appendix 4.5.C: Aquatic Ecology Report). However, as the Y Cyt (NRW.MR.04) is being crossed by HDD, and there will be no impacts to freshwater pearl mussel and these works are deemed a negligible impact. Further, the identified macroinvertebrate assemblage from the watercourses proposed to be impacted are common and widespread within the area (see Volume 8, Appendix 4.5.C: Aquatic Ecology Report). These habitats will be reinstated after the construction phase, the macroinvertebrate community will be able to naturally recolonise post-construction and therefore this is deemed a negligible impact.			
		Direct impact on species assemblage through disturbance and mortality during construction of permanent roads and	Construction of the five new permanent crossings will require watercourses to be culverted to enable ongoing access for works vehicles for both construction and maintenance requirements. The watercourses proposed for the permanent crossings have been assessed as unsuitable for freshwater pearl mussel due to being: dry or ephemeral, poor water quality, and/or containing a lack of suitable substrate a lack of suitable substrate. Further, the identified macroinvertebrate assemblage from these watercourses are	Very Low	Minor Adverse for freshwater pearl mussel Negligible for all other species	No No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
		bridges. Permanent.	common and widespread within the area (see Volume 8, Appendix 4.5.C: Aquatic Ecology Report). These crossings will be small in the context of the extent of the watercourses (excavations to approximately 1.5 m deep and 1.5 m wide), the macroinvertebrate community will be able to naturally recolonise post-construction, and freshwater pearl mussel are assessed as absent so this is deemed a negligible impact.			
		Habitat degradation-impacts to water quality through pollution (i.e. dust, oil, sediments spills from, oil cable decommissioning, surface runoff, pre-construction on compounds/site clearance and general plant movement) leading to mortality of macroinvertebrates.	Standard environmental protection measures, as provided in the CEMP (Volume 8, Appendix 4.2.A: Outline Construction Environmental Management Plan), will be implemented during the construction phase. This will include suitable measures to suppress dust, reduce site runoff and reduce spillage risk and water pollution risk, including 10 m stand-off buffers from watercourses. Soil storage and bunds must be secured to prevent their deterioration that would cause sedimentation into watercourses present.	Very Low	Minor Adverse for freshwater pearl mussel Negligible for all other species	No No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
		Temporary (short-term), reversible.				
Aquatic Macrophytes (see Volume 8, Appendix 4.5.C: Aquatic Ecology Report).	District (Medium) importance for dwarf spike-rush.	Direct impact on species assemblage through disturbance and mortality during open trenching, construction of temporary roads (including haul roads) and bridges, and temporary culverts. Temporary (short term), reversible).	Installation of HVCs through open cut trenching will result in the disturbance and mortality of aquatic macrophytes through the removal of marginal and riverbed habitats as these are required to install the crossing ducting to the minimum depth of 1.0 m. Similarly, construction of temporary access tracks, diversions via culverts, and watercourse reworking will result in the temporary loss of aquatic habitat. These construction activities will also potentially increase the level of shading on a watercourse further limiting habitat suitability for macrophyte species.	Low	Minor Adverse for dwarf spike-rush	No
	Local (Low) importance for all other species.		The watercourses proposed for the temporary in-channel works have a macrophyte assemblage that are common and widespread within the area except for the dwarf spike-rush (see Volume 8, Appendix 4.5.C: Aquatic Ecology Report). It is proposed that all habitats impacted by these temporary works will be reinstated after the construction phase and the macrophyte assemblage will be able to naturally recolonise. Further detail on the habitat reinstatement methodologies will be contained within the LEMP (Volume 8, Appendix 4.4.C: Landscape and Ecological Management Plan).		Negligible for all other species	No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
		Direct impact on species assemblage through disturbance and mortality during construction of permanent roads and bridges. Permanent.	Construction of the new permanent crossings will require watercourses to be culverted to enable ongoing access for works vehicles for both construction and maintenance requirements. The watercourses proposed for the permanent crossings have been assessed as having a macrophyte assemblage that are common and widespread within the area except for the dwarf spike-rush (see Volume 8, Appendix 4.5.C: Aquatic Ecology Report). These crossings will be small in the context of the extent of the watercourses (excavations to approximately 1.5 m deep and 1.5 m wide) and this is assessed as having a Low permanent impact for aquatic macroinvertebrates.	Low	Minor Adverse for dwarf spike-rush Negligible for all other species	No No
		Habitat degradation-impacts to water quality through pollution (i.e. dust, oil, sediments spills from, oil cable decommissioning, surface runoff, pre-construction on compounds/site clearance and	Standard environmental protection measures, as provided in the CEMP (Volume 8, Appendix 4.2.A: Outline Construction Environmental Management Plan), will be implemented during the construction phase. This will include suitable measures to suppress dust, reduce site runoff and reduce spillage risk and water pollution risk, including 10 m stand-off buffers from watercourses. Soil storage and bunds must be secured to prevent their deterioration that would cause sedimentation into watercourses present.	Very Low	Negligible for all species	No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
		general plant movement) leading to mortality of macroinvertebrates. Temporary (short-term), reversible.				
Fish (see Volume 8, Appendix 4.5.C: Aquatic Ecology Report).	National (High) importance for European eel, brown/sea trout and Atlantic salmon. Local (Low) importance for all other species.	Habitat degradation-impacts to water quality through pollution (i.e. dust, oil, sediments spills from, oil cable decommissioning, surface runoff, pre-construction on compounds/site clearance and general plant movement) leading to mortality of fish.	Standard environmental protection measures, as provided in the CEMP (Volume 8, Appendix 4.2.A: Outline Construction Environmental Management Plan), will be implemented during the construction phase. This will include suitable measures to suppress dust, reduce site runoff and reduce spillage risk and water pollution risk, including 10 m stand-off buffers from watercourses. Soil storage and bunds must be secured to prevent their deterioration that would cause sedimentation into watercourses present.	Very Low	Minor Adverse for Nationally important species Negligible for all other species	No No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
		Temporary (short-term), reversible.				
		Direct mortality or disturbance to fish species due to open-trench crossings of watercourses.	Where watercourses are proposed to be open cut for the installation of ducted crossings, there is a risk that this work would result in disturbance and/or mortality to fish species through the removal of aquatic habitat.	Low	Moderate Adverse for Nationally important species	Yes
		Temporary (short-term), reversible.	The proposed methods to maintain the flow in the watercourses whilst trenching is undertaken (flume pipes or over-pumping), also represent a mortality risk to fish from impingement and entrainment. Trenching activities will be temporary and habitats will be reinstated after the construction phase and fish will be able to re-colonise naturally from up- or down-stream habitats. However, the construction works pose a risk to a single cohort of both Nationally and Locally important fish species and additional mitigation is required.		Negligible for all other species	No
		Direct mortality or disturbance to fish species due to flume pipes or over-pumping of watercourses.	The installation of flume pipes or over-pumping during the installation of ducted crossings represents a potential barrier to the migratory fish assemblage within the channel as the current methodology does not provide sufficient detail to ensure fish passage in maintained. In this instance, the invert of the flume pipe may be installed above the bed of the watercourse representing a step that needs to be navigated. Additionally, the over-	Low	Moderate Adverse for Nationally important species	Yes
					Negligible for all	No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
		Temporary (short-term), reversible.	pumping would restrict fish passage upstream of the trenching activities. Trenching activities will be temporary and habitats will be reinstated after the construction phase and fish will be able to re-colonise naturally from up- or down-stream habitats. However, this represents a temporary impact to a single cohort of both Nationally and Locally important fish species.		other species	
		Direct mortality or disturbance to fish species due to the temporary culverting of two watercourses. Temporary (short-term), reversible.	Two temporary watercourse diversions via culverts are proposed of lengths of 85 and 110 m. There is a risk that this work would result in the disturbance and/or mortality to fish species through representing a barrier to fish movements and the removal of aquatic habitat for their installation respectively. Culverting activities will be temporary, and habitats will be reinstated after the construction phase and fish will be able to re-colonise naturally from up- or down-stream habitats. However, as the culvert installation method does not account for fish passage, the construction works pose a risk to a single cohort of both Nationally and Locally important fish species.	Low	Moderate Adverse for Nationally important species Negligible for all other species	Yes No
		Direct mortality or disturbance to fish species	The installation of culverts to facilitate the construction of watercourse crossings represents a potential barrier to fish migration	Medium	Moderate Adverse for	Yes

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
		due to culvert installation for permanent watercourse crossings. Permanent.	as the methodology does not state the measures in place to facilitate fish passage. These activities represent a potential permanent impact to future cohorts of both Nationally and Locally important fish species.		Nationally important species Minor Adverse for all other species	No
		Noise and vibration disturbance to migratory fish species, from HDD crosses main rivers. Temporary (short-term), reversible.	Replacement cables under the majority of main rivers will be installed in ducts via HDD (trenchless technology) with cables being installed up to 18 m deep. The drilling activity can result in noise and vibration through the watercourse which may represent a non-physical barrier to the migratory fish assemblage. This is particularly important for the Afon Glaslyn as the proposed HDD route is in intertidal waters, thus potentially delaying fish from entering the freshwater environments to spawn. This activity will be temporary and could impact a single cohort of fish. That said, given that any noise and vibration from the HDD activities will emanate from the area being directly drilled at the time, it is likely that vibrations and sound propagation will not span the whole width of the river at any one time. The migratory route of fish will not be completely impeded and only a slight delay may be possible, representing a potentially	Very Low	Minor Adverse for Nationally important species Negligible for all other species	No No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
			low impact on the migratory success of the migratory fish assemblage.			
		Lighting	Work outside of daylight hours is not expected other than at the HDD compound, construction compound, cable pulling, jointing, terminating and testing. Where lighting is required it would be temporary task lighting with security and safety lighting required at construction compounds and along worker access routes to work sites. Where artificial lighting is necessary at night, the brightness will be limited to what is safely required to carry out the works and directed towards those areas necessary only, avoiding the potential for light pollution within the surrounding areas. Where lighting is required, it will conform to best practice guidelines for other species (Ref 5.29 and Ref 5.30) which will ensure that light spill is minimised into adjacent habitats (such as watercourses) and prevent disturbance to fish.	Very Low	Minor Adverse	No
Breeding and non-breeding birds (see Volume 8, Appendix 4.5.D: Ecology Report: Breeding Bird Surveys and	Local (Low)	Loss and fragmentation of habitats used by breeding and non-breeding birds, resulting	Habitats such as hedgerows and woodland will largely be retained and most of the breeding bird assemblage across the Glaslyn works site will not be affected. There will be some direct impacts where access and working areas require vegetation clearance. For example, hedgerows and some plantation woodland adjacent to the existing Wern CSEC. However, suitable habitat for breeding	Medium	Minor Adverse	No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
Volume 8, Appendix 4.5.E: Ecology Report Glaslyn Wintering Bird Survey Report).		in species mortality. Noise or visual disturbance. Temporary.	birds will remain available within the surrounding area. The loss of grassland (including marshy) habitat will lead to the temporary displacement of ground-nesting breeding bird species associated with this habitat, such as skylark (<i>Alauda arvensis</i>) and meadow pipit (<i>Anthus pratensis</i>), and birds during the non-breeding season, such as snipe (<i>Gallinago gallinago</i>). However, the surrounding landscape contains suitable habitat for such species in significantly greater extents. Landscape planting and NBB ensure that there is no net loss of biodiversity. Where habitats such as woodlands cannot be replanted in situ (such as the Wern CSEC extension) these will be replaced elsewhere. There will be no more than minor fragmentation of habitats used by breeding and non-breeding birds. Breeding and wintering bird surveys completed for the proposed works identified that no bird species were present in nationally significant (i.e. 1% or more of the national population) numbers. Analysis of WeBS data identified that no species are likely to be present in significant numbers (1% or more) near the Glaslyn works site. Potential impacts on nesting birds resulting from vegetation clearance will be mitigated through the measures outlined in the Section 0 Embedded Mitigation.			

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
			Good industry practice construction methods will be set out in a CEMP (Volume 8, Appendix 4.2.A: Outline Construction Environmental Management Plan) and will include implementation of measures to minimise noise, lighting and vibration disturbance to breeding birds to ensure that, where construction of the proposed works is carried out within the breeding bird season (typically March to August inclusive), then disturbance to breeding birds in adjacent and retained habitats will be minimised.			
Bats (see Volume 8, Appendix 4.5.F: Bat Survey Report).	Up to County (Medium)	Direct loss of bat roosts through trees or structure removal, which could result in injuring or killing bats.	Surveys of trees within the Glaslyn works site that could potentially be impacted by the proposed works recorded no signs of any bat roosts and no known bat roosts will be lost. The proposed works have been designed to avoid all trees that are categorised as PRF M (trees which have the potential to provide roosts for multiple bats). Works may be required to trees that have been categorised as PRF I (trees which may provide roosting potential for individual bats) or close to these trees. If these trees cannot be avoided, they will be section-felled following pre-inspection by and under the supervision of an appropriately licensed ECoW during winter (i.e. November – February) outside of the period when bats are likely to be present. Should bats be identified during the pre-inspection, works will stop, a	Low	No effect currently, potential for Minor Adverse	No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
			licence from NRW would be obtained and mitigation measures updated accordingly. No works will be required to the derelict barn near Wern CSEC, which provides a roost for a small number of soprano pipistrelle bats. Tree 4.T244 will be surveyed for bats pre-construction unless it can be avoided. Similarly, three trees (4.T269, 4.T449 and 4.T450) which could not be assessed for bat roost potential due to restricted land access, will also be surveyed before construction commences. If roosting bats are found, an NRW licence will be obtained to allow for the tree's removal while ensuring roosting bats are not killed or injured. In addition, any trees requiring works for visibility splays will be assessed by an ecologist prior to works to ensure that no suitable bat trees will be affected without further surveys.			
		Disturbance to roosting bats due to construction noise or lighting. Temporary.	Works are proposed near the derelict barn at Wern, which may cause disturbance to roosting bats. The turning head of the new permanent access road ends approximately 7 m from the derelict barn. The proposed Wern CSEC extension lies approximately 30 m away. Vehicles using the temporary existing access route, to be replaced by the new permanent access route, will pass adjacent to the barn. Whilst creation of the new access road will be temporary works, this will be used	Low	Minor Adverse	No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
			as the haul road for the duration of construction in this area. Where practicable, during construction, works will be restricted to daylight hours, when bats are less active, to remove the need for artificial lighting. Focussed task-specific lighting will be provided where this is not practicable (see Section 0 Embedded Mitigation). Where a sufficient buffer from the derelict barn cannot be maintained or where disturbance to bats in this roost is considered likely, an NRW licence will be required and mitigation measures updated accordingly.			
		Loss or severance of foraging or commuting habitat (e.g. hedgerows, watercourses, grasslands) during preparation of the Glaslyn works site, including habitat clearance. Temporary.	The construction of the proposed works will include impacts upon hedgerows and other boundary features, which will adversely impact connectivity across the Glaslyn works site for commuting and foraging bats. The proposed works design retains or reinstates most habitats, including woodland, species rich marshy grasslands, grassland margins, watercourse and ditch margins, scrub and hedgerows. However, some loss (albeit mostly temporary) cannot be avoided. Landscape planting will ensure that there will be no net loss of biodiversity. Where habitats such as woodlands cannot be replanted in situ (such as the Wern CSEC extension) then these will be replaced elsewhere.	Low	Minor Adverse	No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
Badger (See Volume 8, Appendix 4.5.G: Ecology Report: Badger Survey Report).	Local (Low)	Damage or disturbance (construction noise, vibration or lighting) to active badger setts which could result in injuring or killing badgers. Temporary.	Setts will be directly affected, and others disturbed as a result of the works. Pre-construction badger surveys and an application for an NRW badger licence will be required to close setts, and disturb others, and facilitate the proposed works, unless they can be avoided. Based on the proposed works it is not anticipated that closure of a main sett will be required. However, if any main setts require closure, an artificial sett will be constructed in advance of sett closure. Pre-construction badger surveys will be carried out to update baseline conditions and if additional badger setts are identified as being lost or disturbed, or if any changes to badger distribution are identified. Based on the proposed works design and embedded mitigation, one active annex will be directly impacted and require closure. Three main, two subsidiaries and one outlier comprise the active setts within 30 m of proposed works and will be at risk of disturbance from construction noise, vibration and lighting. To minimise levels of disturbance at retained badger setts, a 30 m exclusion zone will be enforced around the sett entrances where possible and not conflicting with the setts, or any others identified pre-construction, where licensable works will likely be needed.	High	Moderate Adverse	Yes

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
			Proposed work within 30 m of one of the three main setts (sett S4.5) comprises the installation of an outfall no closer than 24 m from the nearest entrance. Between the works and S4.5 are two sections of a watercourse. Based on the distance and watercourse profile, the proposed works are unlikely to cause disturbance, and the 30 m exclusion zone is potentially not necessary for the outfall works (depending on pre-construction surveys). The use of light machinery would further reduce any risk of disturbance. Working widths will be restricted for the removal of some sections of decommissioned cables. Careful working procedures to protect the roots of the surrounding trees, as detailed in Volume 8, Appendix 4.5.K: Arboricultural Impact Assessment will ensure that there will be no detrimental impacts on the trees, this will in turn also protect the badger sett S4.33. Construction works will be restricted to daylight hours wherever practicable, when badgers typically remain underground, to remove the need for artificial lighting. Focussed task specific lighting will be provided where this is not practicable, e.g. HDD drilling operations. Where lighting is required, it will conform to best practice guidelines (see Embedded Mitigation section)			

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
			to prevent disturbance to badger and other species. Mitigation will be implemented to prevent badger from being trapped in any excavations left open overnight.			
		Habitat loss or fragmentation. Temporary.	The proposed works will cause temporary loss of badger foraging habitat and fragmentation of badger territory. The proposed works design retains or reinstates most habitats, including woodland, species rich marshy grasslands, grassland margins, watercourse and ditch margins, scrub and hedgerows. However, some loss (albeit mostly temporary) cannot be avoided. Landscape planting will ensure that there will be no net loss of biodiversity. Where habitats such as woodlands cannot be replanted in situ (such as the Wern CSEC extension) these will be replaced elsewhere.	Low	Minor Adverse	No
Otter (see Volume 8, Appendix 4.5.H: Riparian Mammals Survey Report).	District (Medium)	Habitat loss or degradation where the proposed works cross or lie near to watercourses. Permanent and temporary.	Works to watercourses within the Glaslyn works site are described in the Aquatic Macroinvertebrate section. Works to remove existing cables within 5 m of the Nant Yr Afon Oer would fall within 5 m of a watercourse used for commuting otter. Watercourses supporting otter within the proposed works will be retained. The potential holt (non-natal) recorded on watercourse 4.33 (Afon Glaslyn) will be buffered to a minimum of 30 m to avoid potential impacts to otter	Low	Minor Adverse	No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
			resting sites. The nearest point of works comprises minor works to link boxes on an existing section of cable to be retained. Watercourse 4.33 which supports otter will be crossed using HDD to minimise direct impacts, more than 250 m away. (See Figure 4.5.H.3 Volume 8 Appendix 4.5.H Ecology Report: Glaslyn Riparian Mammals). Watercourse 4.26 (see Figure 4.5 H.3 in Volume 8, Appendix 4.5.H: Riparian Mammals Survey Report) which is known to support otter and provides suitable foraging and dispersal habitat will be impacted using open cut methods to install the cable, and the construction of a temporary bridge. Standard mitigation will be implemented during construction to ensure otter populations are not harmed during the works. These include providing adequate fencing around the works especially where digging will occur to prevent otter from entering the work area and becoming trapped, or ensuring escape routes are provided. Standard working practices such as avoiding noise and lights within or near the watercourse during night hours will be adhered to. The same practices will be implemented at watercourse 4.2 as this connects to watercourse 4.7b which is known to support otter and also provides suitable foraging and dispersal habitat. Otter will be allowed continued use of watercourses by retaining access along them.			

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
			This will be achieved through retention of banks of watercourses where not essential to work within, installation of mammal ledges on bridges to allow for continued passage alongside watercourses, and appropriate locations of works site fencing at watercourses that allows passage for otter to be retained, whilst deterring access into the actual areas of works. This will help prevent otter having to move around large areas of works and across roads. Existing mammal ledges on retained structures will be kept intact, with flood levels not affected thereby not affecting their suitability for use. Pre-commencement surveys will be carried out in advance of construction to check if the distribution of otter remains the same and that any mitigation proposed is appropriate.			
		Disturbance to commuting, foraging or resting otter through noise, lighting or visual disturbance/within or near to watercourses. Temporary.	Disturbance to otter is assumed likely due to works to water courses within the Glaslyn works site. Where artificial lighting is necessary, including during any works required at night, the brightness will be limited to what is safely required to carry out the works and directed towards those areas necessary only, avoiding the potential for light pollution within the surrounding areas. Where lighting is required, it will conform to best practice guidelines (see Section 0 Embedded Mitigation) to prevent disturbance to otter and other species.	Low	Minor Adverse	No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
		Habitat degradation impacts to water quality through pollution of watercourses. Temporary.	Standard environmental protection measures, as provided in the CEMP (Volume 8, Appendix 4.2.A: Outline Construction Environmental Management Plan), will be implemented during construction. This will include suitable measures to suppress dust, reduce site runoff and reduce spillage risk and water pollution risk. This will also include pollution control measures to prevent spills from the oil in the cable decommissioning. Soil storage and bunds will be secured to prevent their deterioration that would cause sedimentation into watercourses present.	Low	Minor Adverse	No
Reptiles	Local (Low)	Loss or fragmentation of terrestrial and aquatic habitats used by reptiles for foraging, breeding, or shelter. Incidental killing, injury or disturbance of reptiles present in habitats on Site. Temporary.	Widespread species of reptile (such as slow worm, common lizard, grass snake and adder) are likely to be present but are unlikely to occur in significant numbers or assemblages due to the suitability of the habitats present in the Glaslyn works site. The areas where permanent land take is required for extension of the Wern CSEC and the retained haul road comprise improved and poor semi-improved grassland which are of lower suitability for reptiles. Most of the habitats affected by temporary works are suboptimal for reptiles, however habitats of greater value will be temporarily impacted such as the embankments that abut the Ffestiniog Railway, where low numbers of common reptile have been recorded. These will be	Low	Minor Adverse	No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
			reinstated on completion of the works within that section. The removal of such vegetation without mitigation has the potential to result in killing or injuring reptiles. Vegetation clearance will be carried out at an appropriate time of year, concordant with requirements for other species (such as nesting birds), in a phased approach as detailed in the Embedded Mitigation Section 0, as well as appropriate methodology for removal of features suitable for use by reptiles where unavoidable.			
Other mammals (hedgehog, brown hare, harvest mouse and polecat) and common amphibians	Hedgehog, brown hare, harvest mouse and common amphibians: Local (Low) Polecat: Up to County (Medium)	Habitat loss or fragmentation. Temporary. Incidental killing, injury or disturbance. Temporary.	Most habitat to be affected is suboptimal for common amphibians and mammals, however habitats of value will be impacted such as tussocky grassland, grassland margins, scrub and woodland edges, ditches and hedgerows. Removal of such vegetation without any specific mitigation has the potential to result in the killing or injury of these species. Vegetation clearance will be carried out at an appropriate time of year, concordant with requirements for other species (such as nesting birds), in a phased approach as detailed in the Embedded Mitigation Section 0, as well as appropriate methodology for removal of features suitable for use, where unavoidable.	Low	Minor Adverse	No

A498 Crossing – HDD Option

- 5.9.39 The magnitude of impacts and likely significance of effects shown in **Table 5-8** would be the same for Ecology and Nature Conservation receptors whether the HDD Option or Open Cut Option were taken forward at the A498 crossing.

5.9.40 **Table 5-9** provides a summary of the magnitude of impacts and likely significance of effects on IEFs during the operation of the proposed works considering the embedded mitigation described above.

Operation

Table 5-9 - Assessment of operational impacts and significance of effects on IEFs during operation

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
Fish (see Volume 8, Appendix 4.5.C: Aquatic Ecology Report).	National (High) important migratory fish assemblage (European eel, sea trout and Atlantic salmon)	Direct impact on species assemblage through disturbance caused by EMF from the HVC Permanent installation.	HVC generate EMFs due to the flow of electricity with the type of current (AC or DC) and the cable design influencing the specific EMFs produced. The level of emission is determined based on burial depths with EMF levels decreasing with distance from the source. EMFs are already present in Afon Glaslyn due to the existing 400 kV and 132 kV cable circuits that were installed and operational since 1969. However, the new HDD cables will be installed at HDD.01 and HDD.04. Fish use EMFs for orientation, migration, and navigation. For example, for the identified migratory fish assemblage salmonids (salmon and sea trout), have been shown to be able to detect and potentially respond to magnetic fields, and, European eels have been reported to show delayed passage, potentially due to EMF effects. Given that the proposed cables will emit EMF, there is a potential risk that the migration of these species could be impeded. For this project, including the proposed works, the risk of EMFs has been outlined in an EMF compliance report (Volume 8, Appendix	Negligible	Minor Adverse	No

Ecological feature	Importance (value)	Description of impact	Assessment	Magnitude of impact	Effect category	Significant effect (yes/no)
			7.1.A: Electric and Magnetic Field Assessment). For the crossing on the Afon Glaslyn, the cable design and burial depths will result in a reduction of worst-case levels of magnetic field present from 403.3 μT to 74.9 μT compared to baseline levels owing to increased cable depth and better cable design. No modelling has been completed on the other HHD cables that are buried shallower than the Afon Glaslyn crossing i.e. HDD.01 and HDD.04 which will be buried at depths of 3.8 and 3.15 m, respectively. That said, the findings with the EMF compliance report, found no evidence of EMF causing a barrier to fish movement in migratory species in studies investigating operational cables and post installation EMF exposure. Some evidence of physiological effects exists but is contradictory or at significantly higher exposures than those produced by the proposed works. Given the modelling and findings of the EMF compliance report, EMF from buried cables is considered to have a Negligible impact to the National (High) importance migratory fish assemblage.			

A498 Crossing – HDD Option

- 5.9.41 The magnitude of impacts and likely significance of effects shown in **Table 5-9** would be the same for Ecology and Nature Conservation receptors whether the HDD Option or Open Cut Option were taken forward at the A498 crossing.

Summary

- 5.9.42 The operational phase of the proposed works is not anticipated to result in any additional adverse impacts or significant effects to any other relevant ecological features (designated sites, habitats and species) and is not considered further in this section.

Maintenance

- 5.9.43 Maintenance will comprise electrical isolation of equipment and monthly inspections, using LGVs and working in daylight hours. These small-scale localised maintenance tasks are not likely to cause any adverse impacts or significant effects to the relevant IEFs and are therefore not considered further in this section.
- 5.9.44 Should any future maintenance works subsequently require refurbishment or replacement works which would be more intrusive, the likely significant effects would be similar to those reported for construction in **Table 5-8** and are not assessed separately.

5.10 Mitigation and Residual Effects

Additional Mitigation

- 5.10.1 Additional mitigation measures are required where significant effects are identified following the application of embedded mitigation measures.

Hedgerows

- 5.10.2 Creation of 0.49 km species-rich hedgerows will be carried out as part of off-site compensation for NBB as described in **Volume 8, Appendix 4.5.L: Net Benefit for Biodiversity Assessment and Green Infrastructure Statement**.

Ancient and Veteran Trees

- 5.10.3 Works are proposed in the RPA of one veteran tree (T71) as described in **Volume 8, Appendix 4.5.K: Arboricultural Impact Assessment**. At this location, there will be a localised narrowing of the easement, along with careful working procedures to protect the roots of the tree, in addition to the embedded mitigation measures of protective fencing of the full RPA and all spoil generated being stored outside of the RPA. No other veteran trees will be affected.

Protected and Notable Flora

Bluebell

- 5.10.4 Pre-commencement checks of woodland (including woodland edges) will be carried out by an appointed ECoW with a view to avoid working in areas where bluebell are present and to map their presence in the appropriate season, when they are visible (late April to early June). Should it not be possible to avoid working in some areas where bluebell are present, turves containing this species will be removed, unless undertaken when the plants are visible and can be uprooted with as much surrounding soil as possible. If the

works in this location are very temporary, these will be safely stored, watered and reinstated following completion of the works in this immediate area and then fenced to protect any further encroachment. If this will be longer term then consideration will be given instead to translocating the plants or turves further into the adjoining woodland in an area unaffected, but not already containing bluebells. Bluebell seed may also be harvested, if seasons are appropriate (May to June), to assist re-establishment of the plant in other suitable locations. Full details of working methods and timings will be included within the LEMP (**Volume 8, Appendix 4.4.C: Landscape and Ecological Management Plan**).

Flora within Glaslyn SSSI

- 5.10.5 Prior to the commencement of works, a detailed botanical survey will be carried out of all working areas within the Glaslyn SSSI, to identify any protected or notable plant species, including those listed as being of special interest in the Glaslyn SSSI citation, such as whorled caraway (Locally Scarce in Merionethshire and Locally Rare in Caernarvonshire (Ref 5.56)). The survey findings will inform the development and implementation of targeted conservation measures, for each relevant species, which may include the establishment of protective exclusion zones, seed collection, propagation or plant translocation. All methods and timings will be selected to maximise the success of species retention and minimise ecological impact.
- 5.10.6 Following construction, post-works monitoring will be carried out to assess the effectiveness of these measures, with results used to guide any necessary remedial actions, such as supplementary planting or habitat enhancement. Ongoing management of reinstated or translocated populations will be undertaken to support long-term species viability.
- 5.10.7 The specific procedures, timings and monitoring requirements will be set out in detail within the LEMP (**Volume 8, Appendix 4.4.C: Landscape and Ecological Management Plan**).

Aquatic Macroinvertebrates

- 5.10.8 Suitable freshwater pearl habitat was only identified within the Y-Cyt (NRW.MR.04) with their presence in all other impacted courses deemed unlikely due to the impacted watercourses being classified as unsuitable due to being dry or ephemeral, poor water quality, and/or containing a lack of suitable substrate. However, those watercourses that are being crossed will require pre-commencement checks to be carried out by an ECoW to determine that these watercourses remain unsuitable for freshwater pearl mussel, and that freshwater pearl mussel are therefore absent. Where conditions may have changed between the aquatic assessment surveys and construction, then additional surveys might be required resulting in potentially further mitigation required where identified. For example, if they are found then culverts will be either box culverts or bottomless arch culverts to prevent damaging the riverbed.
- 5.10.9 All in-channel works to be overseen by an ECoW with suitable aquatic experience to ensure no damage to notable species.

Aquatic Macrophytes

- 5.10.10 Prior to construction, pre-construction surveys to be completed to identify dwarf spike-rush specimens (and any additional protected macrophytes that may have established between the aquatic surveys and construction). Any specimens identified to be removed and where practicable kept for reinstatement following the works, or reinstated

upstream of the works away from potential impacts to naturally propagate if this is not possible.

- 5.10.11 All in-channel works will be overseen by an ECoW with suitable aquatic experience to ensure no damage to notable species.

Fish

- 5.10.12 Pre-construction surveys will be carried out to support the desk based assessment and inform any additional mitigation requirements. For example, a fish habitat assessment will be completed to assess if crossing points represent areas of suitable spawning habitat for the protected or notable species. Where the habitat was deemed suitable for these species, surveys for fish were carried out over a 100 m representative stretch of watercourses following the UKTAG Rivers Assessment Methods for Fish Fauna (Ref 5.41). The results of these surveys will inform the watercourses where seasonal constraints to construction can be scoped in and out.
- 5.10.13 Pre-construction fish rescues will be required at all watercourses proposed to be open trenched. Pre-reinstatement fish rescues will also be required for all watercourses where flume pipes are proposed to maintain the flow within the watercourses. These surveys will be completed immediately before trenching, and before reinstatement to ensure all fish within the impacted area are safely removed to avoid mortality.
- 5.10.14 Where over pumping is proposed to be used to maintain the flow within the watercourses, the pumps used will be fish-friendly (i.e. Rotorflush or equivalent), to comply with the Eel Regulations 2009. Specifically, this will require the pumps to have a suitable mesh size and approach velocities to ensure entrainment and impingement risks are reduced and removed, respectively.
- 5.10.15 Where flume pipes are proposed to be used to maintain the flow within the watercourses during open trenching, the invert of the flume pipe will be set below the existing watercourse bed to ensure continued longitudinal connectivity and fish passage.
- 5.10.16 Where the two temporary culverts, and new crossings using culverts are proposed, culvert design will comply with good practice for fish passage which involves installing either box culverts or bottomless arch culverts. Where this is not possible the culvert invert will be set below the existing watercourse bed to ensure continued longitudinal connectivity and fish passage through the culvert.
- 5.10.17 In watercourses deemed suitable for the notable fish species, the installation of watercourse crossings will need be completed outside the migration and spawning seasons of brown/sea trout and Atlantic salmon, and the migration window of European eel. Areas of suitable spawning habitat will be avoided, if present (to be identified through pre-construction checks). If watercourses are deemed unsuitable for these species, and suitable spawning habitat is not present, the avoidance of both the migration and spawning season will not be required. A summary of these ecologically sensitive periods are provided below:
- Atlantic salmon (smolt migration): March to May.
 - Atlantic salmon (adult migration – main run): August to November.
 - Atlantic salmon (spawning): November to December.
 - Sea trout (smolt migration): March to May.

- Sea trout (adult migration): June to October.
- Brown/sea trout (spawning): October to December.
- European eel (elver/glass eel migration): April to October.
- European eel (silver eel migration): August to October.

5.10.18 All in-channel works will be overseen by an ECOW with suitable aquatic experience to ensure no damage to notable species.

Badger

5.10.19 Field surveys recorded one active annex and two disused outlier setts in the proposed works area which will be directly impacted. Those setts found to be active pre-construction will require closure under NRW licence, that can be applied for once planning permission has been granted, with wildlife related conditions having been closed out. Badger sett exclusion can only occur during the non-breeding period July and November (inclusive). Sett closures will be undertaken by installing one way gates over each entrance, with wire mesh surrounding the gates to prevent badger from digging around them. A period of monitoring of each sett for 21 days is required before fully closing the sett. This will be undertaken by the appointed licence named ecologist or any accredited agents on the licence, to ensure that no new entrances have been created. If the closure has been found to be successful, the sett will be removed to the extent required, under a watching brief to ensure no badger remain within. Additional time will be required before the sett is removed if badger have been found to re enter the sett. Works will cease if a removed sett is re-established.

5.10.20 Three active main setts (two natural and one artificial), two active subsidiaries and one active outlier sett are within 30 m of proposed works. Direct impacts are not anticipated, however where disturbance is likely to result from the proposed works, a licence from NRW will be sought. This will also come with required timing restrictions as previously noted. Proposed work within 30 m of one of the three main setts (sett S4.5) is the installation of an outfall no closer than 24 m from the nearest entrance. Between the works and S4.5 are two sections of a watercourse. Therefore, based on the distance and watercourse profile, the proposed works are unlikely to cause disturbance, and the 30 m exclusion zone is potentially not necessary for the outfall works. The use of light machinery would also further reduce any risk of disturbance. Pre-construction surveys will be required to confirm the latest status of each sett (active to disused), presence of any new setts, and which setts will be directly impacted, not directly impacted but at risk of disturbance, and not impacted directly or disturbed.

5.10.21 To minimise disturbance at other badger setts within the Glaslyn works site (but outside of proposed working areas), a 30 m exclusion zone, (not conflicting with licensable works), around the sett entrances will be enforced. The exclusion zone will be delineated by appropriate above ground fencing or ground markings, agreed with the ECoW (this will be the licence named ecologist or any accredited agents authorised to act on their behalf), who will manage works activities alongside the contractor(s).

Bats

5.10.22 Two emergence-re-entry surveys of trees 4.T244, 4.T269, 4.T449 and 4.T450 will be conducted pre-construction to determine if roosting bats are present. Trees 4.T269, 4.T449 and 4.T450 were not assessed for bat roost potential due to restricted land access at the time of survey.

- 5.10.23 Further pre-construction surveys will be carried out to support the baseline survey findings where tree removal or reduction cannot be avoided, including where trimming of trees for the visibility splays will be required. Where impacts to roosting bats cannot be avoided a licence from NRW will be obtained and suitable mitigation put in place. Mitigation will likely include the requirement to install bat boxes in the area.
- 5.10.24 Where the removal or reduction of trees with Low bat roost suitability is unavoidable (trees that are identified as PRF – I), these trees will be section felled in accordance with an approved Method Statement, under an ecological watching brief delivered by a suitably licensed ecologist.
- 5.10.25 Works will take place close to a derelict barn that provides a day roost for a small number of soprano pipistrelle bats. There is the potential for roosting bats to be disturbed by the proposed works and an NRW licence for disturbance to a roost may be required.

Otter

- 5.10.26 Pre-construction surveys will be carried out to support the baseline survey findings where intrusive crossing methods of watercourses are proposed within the Glaslyn works site. Where direct impacts to newly identified otter resting places (should they be present) cannot be avoided a licence from NRW will be obtained and suitable mitigation put in place.
- 5.10.27 Where indirect impacts such as disturbance to newly identified otter resting places are unavoidable, further mitigation will be put in place, such as acoustic fencing.

Biosecurity Management Plan

- 5.10.28 The implementation of a Biosecurity Management Plan that will set out procedures to ensure that no INNS are brought onto the Glaslyn works site or areas of existing INNS are spread, will demonstrate compliance with legislation. Pre-construction surveys will be carried out to provide an update on the presence and location of any INNS previously identified (see **Table 5-5**). This will inform the implementation of measures to prevent their further spread, such as biosecurity measures, exclusion zones or treatment. These procedures will be outlined in the CEMP (**Volume 8, Appendix 4.2.A: Outline Construction Environmental Methodology Statement**).

Enhancement

Bat boxes

- 5.10.29 New roost structures (bat boxes) will be provided (with landowner consent) on retained trees within the Glaslyn works site where possible. No known bat roost will be lost as part of the works and the installation of bat boxes does not need to be relied on for mitigation unless a roost is found during pre-construction surveys. However it would replace potential features on trees removed as part of the works, providing alternatives until such time new trees planted mature or other retained trees develop features suitable for use.

Habitats

- 5.10.30 Habitats created or enhanced for NBB will be carried out as described in **Volume 8, Appendix 4.5.L: Net Benefit for Biodiversity Assessment and Green Infrastructure Statement**.

Monitoring

Pre-construction

- 5.10.31 Pre-construction surveys will be carried out during the appropriate seasons prior to the construction of the proposed works. These will inform detailed design where needed, provide up to date status of protected species that require mitigation during site clearance, and inform any protected species licensing that may be required should species distribution change or detailed design result in licencing requirements for species such as bats, badger or otter.

Construction

- 5.10.32 Ongoing monitoring of habitats and species will be carried out throughout construction, over seen by an appointed ECoW of suitable qualifications and experience. The ECoW will have the appropriate authority to review reasonable avoidance measures, oversee works and recommend action as appropriate, including temporarily stopping works where non-compliant working is observed, e.g. to safeguard protected species and their habitats, or where any other breaches of environmental legislation are likely to occur.

Post-Construction

- 5.10.33 Post-construction monitoring will be carried out in accordance with protected species licences granted for the works.
- 5.10.34 Post-construction monitoring of habitat reinstatement, enhancement and creation will be undertaken in line with landscape provisions and NBB requirements as per the LEMP (**Volume 8, Appendix 4.4.C: Landscape and Ecological Management Plan**).

Residual Effects

- 5.10.35 **Table 5-10** summarises the residual effects of the proposed works on IEF following the implementation of embedded and additional mitigation. The residual effects would be the same for IEFs whether the Open Cut Option or HDD Option were taken forward at the A498 crossing.

Table 5-10 – Residual effects

Receptor	Description of impacts including duration	Embedded mitigation	Significance of effect with embedded mitigation	Additional mitigation/enhancement measures	Residual effect
Veteran and Ancient Trees	Habitat loss due to adverse impacts to tree roots and crowns	Buffers of 15 m from woodlands and 15 m from individual retained trees will be maintained to prevent incursion into RPAs.	Minor Adverse	There will be localised narrowing of the easement around T71, protective fencing around the full RPA and spoil generated will be stored outside of the RPA, along with careful working procedures to protect the roots of the tree, as detailed in Volume 8, Appendix 4.5.K: Arboricultural Impact Assessment so that there will be no detrimental impacts on the health of the retained veteran tree.	Negligible (Not significant)
Poor semi-improved grassland	Habitat loss or fragmentation	Topsoil and subsoil will be stripped and stored appropriately, omitting the use of glyphosate. Once the works are completed, topsoil and subsoil will be backfilled	Minor Adverse	Enhancement of 0.32 ha of poor condition semi-improved grassland to species rich meadow as detailed in: Volume 8, Appendix 4.5.L: Net Benefit for Biodiversity Assessment and Green Infrastructure Statement.	Minor Beneficial (Not significant)

Receptor	Description of impacts including duration	Embedded mitigation	Significance of effect with embedded mitigation	Additional mitigation/ enhancement measures	Residual effect
		promptly, retaining the original soil profile and seed bank.			
Hedgerows- species-poor and species-rich hedgerows (intact and defunct), comprising both Important and non-important hedgerows.	Habitat loss. Temporary (medium term while replanted hedgerows re-establish), reversible.	Stand-off buffers of 5 m will be applied to protect retained hedgerows (extended to 15 m for hedgerows where trees are present). Where temporary removal of a section of hedgerow is	Minor Adverse	Creation of 0.49 km species-rich hedgerows will be carried out as part of off-site compensation for NBB as described in Volume 8, Appendix 4.5.L: Net Benefit for Biodiversity Assessment and Green Infrastructure Statement.	Negligible(Not significant)

Receptor	Description of impacts including duration	Embedded mitigation	Significance of effect with embedded mitigation	Additional mitigation/ enhancement measures	Residual effect
		required, new sections of hedgerow (of the same or improved condition) will be planted. New hedgerow planting will contain native, woody species of local provenance but no trees over cable areas.			

Receptor	Description of impacts including duration	Embedded mitigation	Significance of effect with embedded mitigation	Additional mitigation/enhancement measures	Residual effect
Bats	Loss or severance of foraging or commuting habitat (e.g. hedgerows) during preparation of the Glaslyn works site, including habitat clearance. Temporary (short-term), reversible during site preparation/construction.	Stand-off buffers of 5 m will be applied to protect retained hedgerows (extended to 15 m for hedgerows where trees are present). Where the works require the crossing or removal of sections of hedgerows, the gap will be reduced to the minimum width required for safe working. All hedgerows will be reinstated (of the same or improved condition)	Minor Adverse	Where hedge removals are necessary, 'dead hedging' or alternative will be used, where practicable, in the interim periods to retain connectivity during construction. Dead hedging can comprise vegetation arisings or artificial provision, such as willow screening panels, stock proof fencing or Heras fencing with branches woven into them.	Negligible (Not significant)

Receptor	Description of impacts including duration	Embedded mitigation	Significance of effect with embedded mitigation	Additional mitigation/ enhancement measures	Residual effect
		post construction to ensure bat commuting routes are retained, except for gates along the permanent access road to the Wern CSEC.			
Badger	Damage or disturbance to active badger setts which could result in injuring or killing badgers.	To minimise levels of disturbance at retained badger setts,	Moderate Adverse	An NRW licence is required to permit works that would close or disturb affected badger setts. Mitigation will include seasonal restrictions	Minor Adverse (Not significant)

Receptor	Description of impacts including duration	Embedded mitigation	Significance of effect with embedded mitigation	Additional mitigation/enhancement measures	Residual effect
	Temporary (short-term), reversible.	a 30 m exclusion zone around sett entrances will be enforced		in the timing of the works, and staged closures of the setts monitored by the appointed named ecologist on the licence.	
Aquatic Macroinvertebrates	Direct impact on species assemblage through disturbance and mortality during open trenching, construction of temporary roads (including haul roads) and bridges, and temporary culverts. Temporary (short term), reversible).	Flow to be maintained within the watercourses. Trenching activities will be temporary and habitats will be reinstated after the construction phase	Minor Adverse (for freshwater pearl mussel)	Pre-construction surveys to determine if the watercourses proposed to be crossed remain unsuitable habitat. In addition, all in-channel works will be overseen by an ECoW with suitable aquatic experience. If freshwater pearl mussel are found to be present, then these surveys will inform additional mitigation requirements. For example, any culverts would be either box culverts or bottomless arch culverts to prevent damaging the riverbed.	Minor Adverse (No effect)
	Direct impact on species assemblage through disturbance and mortality during construction of	Flow to be maintained within the watercourses. Trenching	Minor Adverse (for freshwater pearl mussel)	Pre-construction surveys to determine if the watercourses proposed to be crossed remain unsuitable habitat. In	Minor Adverse (No effect)

Receptor	Description of impacts including duration	Embedded mitigation	Significance of effect with embedded mitigation	Additional mitigation/enhancement measures	Residual effect
	permanent roads and bridges. Permanent.	activities will be temporary and habitats will be reinstated after the construction phase.		addition, all in-channel works will be overseen by an ECoW with suitable aquatic experience. If freshwater pearl mussel are found to be present, then these surveys will inform additional mitigation requirements. For example, any culverts would be either box culverts or bottomless arch culverts to prevent damaging the riverbed.	
Aquatic Macrophytes	Direct impact on species assemblage through disturbance and mortality during open trenching, construction of temporary roads (including haul roads) and bridges, and temporary culverts. Temporary (short term), reversible).	Flow to be maintained within the watercourses. Trenching activities will be temporary and habitats will be reinstated after the construction phase.	Minor Adverse (for dwarf spike-rush)	Pre-construction surveys to be completed to identify dwarf spike-rush specimens (and any additional protected macrophytes that may have established between the aquatic surveys and construction). Any specimens identified will be removed and where practicable kept for reinstatement following the works, or reinstated upstream of the works away from potential impacts to	Negligible

Receptor	Description of impacts including duration	Embedded mitigation	Significance of effect with embedded mitigation	Additional mitigation/ enhancement measures	Residual effect
				naturally propagate where this is not possible. All in-channel works will be overseen by an ECoW with suitable aquatic experience.	
Fish	Direct mortality or disturbance to fish species due to open-trench crossings of watercourses. Temporary (short-term), reversible.	Flow to be maintained within the watercourses. Trenching activities will be temporary and habitats will be reinstated after the construction phase.	Moderate Adverse (for the migratory fish assemblage)	Pre-construction surveys to be carried out to support the baseline survey findings and inform any additional mitigation requirements. Pre-construction and pre-reinstatement fish rescues. In-channel stream works to be completed outside the migration and spawning seasons. In-channel works will be overseen by an ECoW with suitable aquatic experience.	Minor Adverse (Not significant)
	Direct mortality or disturbance to fish species due to flume pipes or over-pumping of watercourses. Temporary (short-term), reversible.	Flow to be maintained within the watercourses. Trenching activities will be temporary and habitats	Moderate adverse (for the migratory fish assemblage)	The pumps to be used for over pumping will be 'fish friendly' to comply with the Eel Regulations 2009 and reduce the entrainment and impingement risks.	Minor adverse (Not significant)

Receptor	Description of impacts including duration	Embedded mitigation	Significance of effect with embedded mitigation	Additional mitigation/enhancement measures	Residual effect
		will be reinstated after the construction phase.		Where flume pipes are proposed to be used, the invert of the flume pipe will be set below the existing watercourse bed to ensure continued longitudinal connectivity and fish passage. In-channel stream works to be completed outside the migration and spawning seasons. In-channel works should be overseen by an ECoW with suitable aquatic experience.	
	Direct mortality or disturbance to fish species due to the temporary culverting of two watercourses. Temporary (short-term), reversible.	Flow to be maintained within the watercourses. These culverts will be temporary, and habitats will be reinstated after the construction phase.	Moderate Adverse (for the migratory fish assemblage)	Culvert design will follow good practice for fish passage which involves either box culverts or bottomless arch culverts. Where this is not possible then the culvert invert will be set below the existing watercourse bed to ensure continued longitudinal connectivity and fish passage through the culvert.	Minor Adverse (Not significant)

Receptor	Description of impacts including duration	Embedded mitigation	Significance of effect with embedded mitigation	Additional mitigation/enhancement measures	Residual effect
				In-channel stream works to be completed outside the migration and spawning seasons. In-channel works will be overseen by an ECoW with suitable aquatic experience.	
	Direct mortality or disturbance to fish species due to culvert installation for permanent watercourse crossings. Permanent.	Flow to be maintained within the watercourses.	Moderate Adverse (for the migratory fish assemblage)	Culvert design will follow good practice for fish passage which involves installing either box culverts or bottomless arch culverts. Where this is not possible then the culvert invert will be set below the existing watercourse bed to ensure continued longitudinal connectivity and fish passage through the culvert. In-channel stream works to be completed outside the migration and spawning seasons. In-channel works will be overseen by an ECoW with suitable aquatic experience.	Minor Adverse (Not significant)

Receptor	Description of impacts including duration	Embedded mitigation	Significance of effect with embedded mitigation	Additional mitigation/enhancement measures	Residual effect
Protected and Notable Flora	Direct mortality or disturbance	Where required, topsoil and subsoil will be stripped and stored without the use of glyphosate, then promptly reinstated following works to preserve the original soil profile and seed bank.	Minor Adverse (for whorled caraway)	A pre-works botanical survey of all Glaslyn SSSI working areas will identify protected or notable species, including whorled caraway. Findings will guide measures such as seed collection, propagation, translocation, or exclusion zones to maximise species retention and minimise impacts. Post-construction monitoring and management will ensure the success of reinstated or translocated populations, as detailed in the LEMP.	Negligible

5.11 Summary

- 5.11.1 This chapter of the ES outlines the results of an assessment of the potential significant effects on Ecology and Nature Conservation associated with the proposed works.
- 5.11.2 The assessment concludes that, with the incorporation of embedded and additional mitigation measures, significant effects are unlikely for Statutory and Non-Statutory nature conservation sites, ancient woodlands, and HoPI within the Study Area. Similarly, significant effects are considered unlikely for protected and notable species identified in the Study Area.

6. Historic Environment

6.1 Introduction

- 6.1.1 This chapter presents an assessment of the likely Historic Environment effects that could arise from the construction, operation and maintenance of the proposed works at Glaslyn as described in **Chapter 2: Glaslyn Cables Works**.
- 6.1.2 This chapter describes the baseline conditions currently existing within the Study Area (as defined in **Section 6.3**), the scope of the assessment, the potential effects, the mitigation measures required to prevent, reduce or offset any significant negative effects, and the likely residual effects after these mitigation measures have been adopted.
- 6.1.3 This chapter is supported by appendices as listed below:
- **Volume 8, Appendix 1.1.A: Legislation, Policy and Guidance.**
 - **Volume 8, Appendix 1.4.A: Topic Assessment Methodology.**
 - **Volume 8, Appendix 4.6.A: Historic Environment Desk Based Assessment.**
 - **Volume 8, Appendix 4.6.B: Gazetteer of Historic Assets.**

6.2 Legislation and Planning Policy

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

Legislation

- 6.2.2 The following legislation is relevant to the Historic Environment:
- Ancient Monuments and Archaeological Areas Act 1979 (Ref 6.1).
 - Planning (Listed Buildings and Conservation Areas) Act 1990 (Ref 6.2).
 - Historic Environment (Wales) Act 2023 (Ref 6.3).

National Policy

- 6.2.3 The following national policy is relevant to the Historic Environment:
- PPW – Edition 12 (Ref 4.5).
 - Future Wales: The National Plan to 2040 (Ref 4.4).
 - TAN 24: The Historic Environment (Ref 6.4).

Local Planning Policy

6.2.4 The following local policy is relevant to the Historic Environment:

- Anglesey and Gwynedd Joint Local Development Plan 2011 – 2026 (Gwynedd Council) (Ref 4.11).
- Eryri Local Development Plan 2016 – 2031 (Snowdonia National Park Authority) (Ref 4.13).

Guidance

6.2.5 The following guidance is relevant to Historic Environment:

- Conservation Principles for the Sustainable Management of the Historic Environment in Wales (Ref 6.5).
- Heritage Impact Assessment in Wales (Ref 6.6).
- Managing Change to Listed Buildings in Wales (Ref 6.7).
- Managing Change to Registered Historic Parks and Gardens in Wales (Ref 6.8).
- Managing Conservation Areas in Wales (Ref 6.9).
- Managing Historic Character in Wales (Ref 6.10).
- Managing Lists of Historic Assets of Special Local Interest (Ref 6.11).
- Setting of Historic Assets in Wales (Ref 6.12).
- Chartered Institute for Archaeologists Standard and guidance for historic environment desk-based assessment (Ref 6.13).

6.3 Study Area

Designated Historic Assets

- 6.3.1 A Study Area of 3 km from the Glaslyn works site has been defined to provide historical and archaeological context and to identify designated assets with the potential to be affected by the proposed works (see below regarding settings and refer to **Figure 4.6.A.1**).
- 6.3.2 The settings of designated assets of the highest value (i.e. World Heritage Sites, scheduled monuments, Grade I and II* listed buildings, registered parks and gardens, conservation areas containing a number of assets of the highest value and registered historic landscapes) will be considered, up to 3 km from the Glaslyn works site. These assets will be considered as the proposed works has the potential to result in long-term change to the settings of designated assets, some of which may be at distance from the Glaslyn works site.
- 6.3.3 This will be guided by the proposed works ZTV (prepared as part of **Chapter 4: Landscape and Visual Amenity**) but will also consider physical and historical connectivity and relationships with other assets and the wider landscape.

Non-designated Historic Assets

6.3.4 A Study Area of 500 m from the Glaslyn works site has been defined to provide historical and archaeological context and to identify non-designated assets with the potential to be affected by the proposed works (refer to **Figure 4.6.A.2**). This Study Area will allow for non-designated heritage assets to be set within their wider context and allow for the assessment of archaeological potential within the Glaslyn works site.

6.4 Assumptions and Limitations

6.4.1 The assessment examines possible physical impacts and changes to the setting of assets resulting from the proposed works during the construction and operational phases.

6.5 Baseline

- 6.5.1 A detailed baseline is set out in **Volume 8, Appendix 4.6.A: Historic Environment Desk-based Assessment** (DBA). The DBA sets out a chronological narrative of known assets and assesses the potential for unknown heritage assets to be present within the Glaslyn works site.
- 6.5.2 Most historic assets (the designated assets and non-designated assets) were scoped out of further assessment in the baseline study (**Volume 8, Appendix 4.6.A: Historic Environment Desk-based Assessment**) due to the lack of potential for impacts resulting from the proposed works. Only those assets that have the potential to be impacted by the proposed works are discussed in this chapter.
- 6.5.3 The principal historic assets to be considered are listed in **Table 6-1**. It has been assessed that there will be physical impacts or impacts on settings as a result of the proposed works.

Table 6-1 – Assets scoped into further assessment

Reference	Designation and grade	Name	Location
UNESCO 1633	World Heritage Site	The Slate Landscape of Northwest Wales. Component Part 5: Ffestiniog: its Slate Mines and Quarries, ‘city of slates’ and Railway to Porthmadog	70 m south-east of the Glaslyn works site
CN174	Scheduled Monument	Roman Bath House, Tremadoc	98 m north-east of the Glaslyn works site
Cadw 4626	Listed Building, Grade II*	Wern Manor	56 m east of the Glaslyn works site
Cadw 5234/85406	Listed Building, Grade II*	The Cob	780 m south of the Glaslyn works site

Reference	Designation and grade	Name	Location
Cadw 4627	Listed Building, Grade II	Courtyard Ranges to the west of Wern Manor, including Stables, Coach house and Tower	8 m east of the Glaslyn works site
Cadw 4628	Listed Building, Grade II	Summer House at Wern Manor	182 m east of the Glaslyn works site
Cadw 21554	Listed Building, Grade II	Front Terrace, Balustrade and Steps at Wern Manor	58 m east of the Glaslyn works site
Cadw 4629	Listed Building, Grade II	Wern Lodge	5 m north-west of Glaslyn works site
Cadw 21568	Listed Building, Grade II	Gates to Wern Manor	Within the Glaslyn works site
Cadw 21569	Listed Building, Grade II	Ornamental Garden Pool at Wern Manor	170 m south-east of the Glaslyn works site
Cadw 85323	Listed Building, Grade II	19 Y Graig (Sunnyside), Tremadog	330 m north-east of the Glaslyn works site
Cadw 85325	Listed Building, Grade II	20 Y Graig (Sunnyside), Tremadog	330 m north-east of the Glaslyn works site
Cadw 85328	Listed Building, Grade II	21 Y Graig (Sunnyside), Tremadog	330 m north-east of the Glaslyn works site
Cadw 4438	Listed Building, Grade II	Bodawen Lodge (Building 1)	19 m north-west of the Glaslyn works site
Cadw 85359	Listed Building, Grade II	Bodawen Lodge (Building 2)	26 m north-west of the Glaslyn works site
Cadw 85375	Listed Building, Grade II	Former stable at Bodawen Lodge	30 m north-east of the Glaslyn works site

Reference	Designation and grade	Name	Location
Cadw 85376	Listed Building, Grade II	Former Tremadoc Tramway bridge over drainage ditch	50 m north of the Glaslyn works site
Cadw 85397	Listed Building, Grade II	Porthmadog war memorial, including steps, trilithon and monoliths forming its approach	14 m north-east of the Glaslyn works site
Cadw 5205	Listed Building, Grade II	Rhos House	12 m north-west of the Glaslyn works site
Cadw 4774	Listed Building, Grade II	Plas Newydd Farmhouse	343 m north-east of the Glaslyn works site
Cadw 19800	Listed Building, Grade II	Former Stable Range at Plas Newydd	314 m north-east of the Glaslyn works site
PGW(Gd)19(GWY)	Registered Park and Garden	Wern	Within the Glaslyn works site
PGW(Gd)18(GWY)	Registered Park and Garden	Tan-yr-Allt	550 m north of the Glaslyn works site
HLW (Gw)7	Registered Historic Landscape	Aberglaslyn	Within the Glaslyn works site
PRN 37907	Non-designated asset	Hedge-bank, north-east of Wern	Within the Glaslyn works site
PRN 37908	Non-designated asset	Hedge and ditch, on Traeth Mawr	Within the Glaslyn works site
PRN 37909	Non-designated asset	Hedge and ditch, on Traeth Mawr	Within the Glaslyn works site
PRN 37910	Non-designated asset	Hedge and ditch, on Traeth Mawr	Within the Glaslyn works site
PRN 33528	Non-designated asset	Field boundary, Porthmadog	Within the Glaslyn works site

Reference	Designation and grade	Name	Location
PRN 33531	Non-designated asset	Field boundary, Porthmadog	Within the Glaslyn works site
PRN 33532	Non-designated asset	Field boundary, Porthmadog	Within the Glaslyn works site
PRN 33536	Non-designated asset	Field boundary, Porthmadog	Within the Glaslyn works site
PRN 33537	Non-designated asset	Field boundary, Porthmadog	Within the Glaslyn works site
PRN 33540	Non-designated asset	Culvert/ditch, Porthmadog	Within the Glaslyn works site
PRN 33545	Non-designated asset	Revetted drain, Porthmadog	Within the Glaslyn works site
PRN 33548	Non-designated asset	Culvert/ditch, Porthmadog	Within the Glaslyn works site
PRN 33550	Non-designated asset	Field boundary, Porthmadog	Within the Glaslyn works site
PRN 33551	Non-designated asset	Field boundary, Porthmadog	Within the Glaslyn works site
PRN 21174	Non-designated asset	Croesor Tramway, remains of, Porthmadog	Within the Glaslyn works site
PRN 33554	Non-designated asset	Field boundary, Porthmadog	Within the Glaslyn works site
PRN 33552	Non-designated asset	Field boundary, Porthmadog	6 m east of the Glaslyn Cables works Site
PRN 33553	Non-designated asset	Culvert/ditch, Porthmadog	3 m east of the Glaslyn Cables works Site

Reference	Designation and grade	Name	Location
PRN 68485	Non-designated asset	Plantation, Wern	232 m south-west of the Glaslyn works site
PRN 68486	Non-designated asset	Plantation, Wern	32 m south-west of the Glaslyn works site
PRN 36861	Non-designated asset	Tannery, Plasnewydd Tannery	323 m north-east of the Glaslyn works site
PRN 99275	Non-designated asset	Outfarm, North-East of Plas-newydd, Llanfrothen	369 m north-east of the Glaslyn works site
PRN 68404	Non-designated asset	Minffordd Chapel (Welsh Calvinistic Methodist), Minffordd, Porthmadog	243 m south of the Glaslyn works site
PRN 27317	Non-designated asset	House & Outbuildings, Pen-y-Craig	76 m south of the Glaslyn works site
PRN 27321	Non-designated asset	Building, South-West of Lloc-Meirig	122 m south-east of the Glaslyn works site
PRN 25424	Non-designated asset	Penamser Farm, Porthmadog	139 m south-west of the Glaslyn works site
PRN 25425	Non-designated asset	Outfarm, South-West of Penamser Farm	228 m south-west of the Glaslyn works site

Future Baseline

- 6.5.4 This section considers any changes to the baseline conditions described above that might occur over the lifespan of the proposed works, but in the absence of the proposed works (i.e. in the event that it is not installed).

Existing Baseline (2024)

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

Future Baseline

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

6.6 Consultation and Scope of Assessment

- 6.6.1 This section describes the scope of the assessment of effects on the Historic Environment.
- 6.6.2 **Table 6-2** summarises the date and nature of consultation with statutory stakeholders. Summary of responses is provided, and how and where these were added in the chapter.

Consultation

Table 6-2 – Consultation responses in response to Historic Environment

Consultee	Date and nature of consultation	Summary of response	How and where addressed
Senior Archaeologist	27 October 2023. Email correspondence.	Following archaeological monitoring of geotechnical investigations in the Glaslyn works site Heneb has agreed that no further archaeological investigation is needed within the estuary. Onward archaeological work is likely to be restricted to targeted watching briefs during construction, where the proposed works will affect known assets or any former island/foreshore areas that may be crossed.	See section on previous geotechnical investigations carried out on Glaslyn works site, paras 4.1.4 to 4.1.13 in Volume 8, Appendix 4.6.A: Cultural Heritage Desk-based Assessment of the ES). The monitoring accorded with the previous geoarchaeological assessment in the area. Has informed consideration of the potential impacts.

Consultee	Date and nature of consultation	Summary of response	How and where addressed
Senior Archaeologist Heneb	11 September 2024. Email correspondence.	AECOM sent an email to Heneb requesting feedback regarding the Study Areas to be used in the DBA and ES, and if a Written Statement of Investigation (WSI) was required in advance of Historic Environment Record (HER) data request.	The DBA (Volume 8, Appendix 4.6.A: Cultural Heritage Desk-based Assessment of the ES) has been carried out in accordance with a WSI agreed with Heneb. The DBA's Study Area has been agreed with Heneb.
HER Officer Heneb	11 September 2024. Email correspondence.	A data request for HER data within the Glaslyn works site and within 500 m of the Glaslyn works site was requested.	HER data received from Heneb was used in the DBA assessment (Volume 8, Appendix 4.6.A: Cultural Heritage Desk-based Assessment) and to support the ES.

Scope of the Assessment

- 6.6.3 The assessment considered in this chapter of the ES is as follows:
- Physical impacts to below ground archaeological remains during the construction phase of the proposed works.
 - Changes to the setting of assets as a result of the proposed works during the construction and operation of the proposed works.
- 6.6.4 This chapter focuses solely on the historic environment and assesses potential impacts as a result of the Glaslyn Cables component of the Project. This comprises works associated with the installation of the replacement Glaslyn cables, the removal of redundant cables, works to retained cables, extension of the Wern CSEC, construction of the Minffordd CSEC, the revised Minffordd EVIP THH and the removal of Garth CSEC (as described in **Chapter 2: Glaslyn Cables Works**). Preliminary works comprising the establishment of compounds, the construction of permanent access roads including crossings and bell mouths, and hedgerow and tree clearance have also been considered.
- 6.6.5 Potential impacts on below ground archaeological remains as a result of the operation of the proposed works have not been considered in the scope of the assessment. This is because any impacts on below ground archaeological remains will have occurred and been mitigated during construction .
- 6.6.6 **Table 6-3** summarises the potential Historic Environment receptors that have been reviewed and states whether they have been included or excluded from the Historic Environment assessment. Justifications are provided where receptors have been both included and excluded from the assessment

Table 6-3 – Scope of Historic Environment assessment

Receptor	Scoped in/out per phase		Justification
	Construction	Operation	
World Heritage Site	In	Out	Construction activities have the potential to impact upon the character and setting of the World Heritage Site. No additional impacts through changes to setting are predicted as a result of operation of the proposed works.
Scheduled Monuments	In	Out	Construction activities have the potential to impact upon the character and setting of scheduled monuments. No additional impacts through changes to setting are predicted as a result of operation of the proposed works.
Listed Buildings	In	Out	Construction activities have the potential to impact upon the character and setting of listed buildings. No additional impacts through changes to setting are predicted as a result of operation of the proposed works.
Registered Parks and Gardens	In	Out	Construction activities have the potential to impact upon the character and setting of registered parks and gardens. No additional impacts through changes to setting are predicted as a result of operation of the proposed works.
Conservation Areas	Out	Out	There would be no intervisibility between the Glaslyn works site and the conservation areas, and the proposed works would not result in changes to the setting of the assets. No additional impacts through changes to setting are predicted as a result of operation of the proposed works.
Historic Landscape	In	Out	Construction activities have the potential to impact upon the character and setting of Aberglaslyn registered historic landscape. No additional impacts through changes

Receptor	Scoped in/out per phase		Justification
	Construction	Operation	
			to setting are predicted as a result of operation of the proposed works.
Historic non-designated assets	In	Out	Construction activities have the potential to impact to truncate or remove historic field boundaries and tramway embankment. During operation of the proposed works no additional impacts.
Unknown archaeological/buried archaeological remains	In	Out	There is a low potential to impact as yet unknown archaeological remains. Ground intrusive works have potential to truncate or remove previously unrecorded buried archaeological remains. During operation of the proposed works no additional impacts.

6.7 Methodology

- 6.7.1 The purpose of the Historic Environment assessment is to assess the potential effects of the proposed works on the Historic Environment.
- 6.7.2 Details of the technical methods used to determine the baseline conditions, sensitivity of the receptors, magnitude of effects and the significance criteria that have been used for the Historic Environment assessment can be found in **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**.

6.8 Potential Effects

- 6.8.1 The anticipated effects resulting from the loss or change to Historic Environment elements and features during construction, operation and maintenance of Glaslyn Cables are outlined as follows:

Construction

- 6.8.2 The source of potential Historic Environment effects during the construction phase includes:
- Temporary short-term impacts to assets as a result of change to their setting.
 - Permanent physical impacts to below ground archaeological remains.

Designated Historic Assets

Within 3 km Study Area

Ffestiniog: its Slate Mines and Quarries, 'City of Slates' and Railway to Porthmadog, Component 5 of the Slate Landscape of Northwest Wales World Heritage Site (UNESCO 1633)

- 6.8.3 The Slate Landscape of Northwest Wales comprises six areas together which represent an exceptional example of an industrial landscape which was profoundly shaped by quarrying and mining slate, and transporting it for national and international markets.
- 6.8.4 Ffestiniog: its Slate mines and quarries, 'city of slates' and Railway to Porthmadog is Component 5 of the Slate Landscape of Northwest Wales World Heritage Site.
- 6.8.5 One of the elements which comprises component 5 is the Ffestiniog Railway (element 5.9). One of the attributes of the Outstanding Universal Value which make the World Heritage Site internationally culturally significant is the innovative transport systems linked quarries and processing sites with purpose-built coastal export harbours and with main-line railways. The railway line is 70 m south-east of Glaslyn works site. It is an asset of international importance with significant heritage potential, affording it a high value.
- 6.8.6 Due to its location on Traeth Mawr, the Glaslyn works site forms part of the asset's wider setting, with inter-visibility between the Glaslyn works site and the asset. There is intervisibility between the Glaslyn works site and the Ffestiniog Railway 70 m to the south-east, and also 1.4 km to the south-west along The Cob embankment.
- 6.8.7 The Glaslyn works site does not contribute to the understanding of the attributes of the Outstanding Universal Value of the World Heritage Site.
- 6.8.8 Whilst there will be some alterations and new construction associated with the proposed works, which will include the removal and installation of cables across the Traeth Mawr, the extension of the existing CSEC at Wern, the dismantling of the existing CSEC at Garth and the construction of a new THH and CSEC at Minffordd, the latter in the immediate environs of Garth Quarry which is currently operational. This has already contributed to the local landscape in which the asset lies and the proposed works will have minimal further impact on this setting.
- 6.8.9 These proposed works to replace and install new cabling would also result in temporary visual impacts on the setting of the Ffestiniog Railway due to construction activities.
- 6.8.10 These changes will not result in a substantive change in the ability to appreciate the heritage value of the asset which is derived from architectural, historical and heritage interest.
- 6.8.11 Overall, these changes are assessed as having a permanent very low magnitude of impact on the World Heritage Site, which on an asset of high value, results in a minor adverse significance of effect, which is not significant.

Roman Bath House, Tremadoc (CN174)

- 6.8.12 This Roman bath house is approximately 98 m north-east of the Glaslyn works site. A Roman bathhouse, dated by excavation in 1908 to a period starting in the second century AD and continuing into the fourth. Six rooms were identified and two of them contained hypocausts. There are no surviving upstanding remains of this monument.

- 6.8.13 The monument is of national importance for its potential to enhance our knowledge of Roman remains. It retains significant archaeological potential, with a strong probability of the presence of associated archaeological features and deposits.
- 6.8.14 The asset holds archaeological interest, with its value derived from its ability to understand Roman settlement activity. The asset is of high value.
- 6.8.15 While the site of the Roman bath house is visible from the Glaslyn works site, the Glaslyn works site does not contribute to the understanding of the heritage interests of the asset. The presence of the Tremadog Roundabout has already diminished the setting of the bath house.
- 6.8.16 Any construction activities will result in minimal change in the ability to appreciate the archaeological value of the asset. This is assessed as having a very low magnitude of impact on the Roman bath house which, on an asset of high value, results in a **minor adverse** significance of effect, which is not significant.
- Wern Manor (Cadw 4626) (Grade II*) (PGW(Gd)19(GWY)) (Grade II*)
- 6.8.17 Wern Manor is a Grade II* listed building, and a Grade II* registered historic park and garden. The proposed works will be in the northern and eastern areas of the registered park and garden. Wern Manor itself is approximately 56 m east of the Glaslyn works site. Associated with the house are a number of Grade II listed structures – a west facing courtyard range including stables, coach house and tower (**Cadw 4627**). Also associated with the house is the front terrace, balustrade and steps (**Cadw 21554**), a summer house (**Cadw 4628**) and ornamental garden pool (**Cadw 21569**). The main approach to the house and gardens is to the south where a gate lodge (**Cadw 4629**) and gates (**Cadw 21568**) are located. There are non-designated assets comprising two circular tree plantations (**PRN 68485 & 68486**) in a field to the east of the gardens. The assets' heritage values are drawn from their individual intrinsic architectural and historic interest, as well as their group value with one another as a collection of assets within a designed landscape of historic interest. The setting of house comprises the associated courtyard, outbuildings and garden, as well as the associated surrounding fields. The setting of the garden includes its siting, approaches and carriage drives, as well as any designed key views of, from and within the garden. The proposed works will be in the rural farmed landscape setting of the park and garden, which form part of the historic setting of Wern Manor.
- 6.8.18 The asset holds historical and architectural interest, with its value derived from its ability to illustrate post-medieval country house and parkland design. The asset is of high value.
- 6.8.19 Despite the vegetation screening, the existing Wern CSEC adversely affects the historic setting of the park and garden. Proposed works to extend the Wern CSEC and to construct a new permanent access road from the A498 to both the eastern and western sides of the Wern CSEC would increase the permanent adverse impact on the character and setting of the park and garden. Proposed works to replace and install new cabling would result in temporary noise and visual impacts such on the setting of the parkland due to construction activities.
- 6.8.20 There is no visibility between Wern Manor and the proposed works as the building is heavily screened to the north and north-east with mature trees. However, temporary impacts on the setting of these buildings may be encountered by construction activities from noise and vehicular movements.

- 6.8.21 Overall, there would result in a permanent low magnitude of impact on Wern Manor, which on an asset of high value, results in a moderate adverse significance of effect, which is significant.
- The Cob (Cadw 5234) & The Cob (partly in Penrhyndeudraeth) (Cadw 85406) (Grade II*)
- 6.8.22 This structure is approximately 780 m south of the Glaslyn works site. The Great Embankment or The Cob was conceived by William Madocks MP and built in 1808-11. It is a substantial rubble-built embankment approximately 1.5 km long, consisting of a lower (road) section and a higher (rail) section. The setting of The Cob is the south end of Traeth Mawr and the town and harbour of Porthmadog. The setting of the structure also contributes to its significance.
- 6.8.23 The structure possesses architectural and historical interest, being associated with the reclamation of Traeth Mawr and, later with the construction of the Ffestiniog Railway, giving The Cob a major place in the history of Porthmadog and North Wales and its value is high.
- 6.8.24 The setting of The Cob is the south end of Traeth Mawr and the town and harbour of Porthmadog. The setting of the structure also contributes to its significance. The proposed works form part of the setting of The Cob given its location on the reclaimed estuary. There is intervisibility between the Glaslyn works site and The Cob.
- 6.8.25 The setting of the listed structure would not be altered by the introduction of additional modern industrial infrastructure in the wider agricultural setting of Traeth Mawr. These changes will not result in any substantive change in the ability to appreciate the heritage value of the asset which is derived from architectural and historic and archaeological interest.
- 6.8.26 These changes are assessed as having a very low magnitude of change, which on an asset of high value, results in a minor adverse effect of permanent duration. This permanent effect is not significant.
- Tan-yr-Allt Registered Park and Garden (Cadw 4432) (Grade II*) (PGW(Gd)18(GWY)) (Grade II)
- 6.8.27 Tan-yr-Allt is a Grade II* listed building, and Grade II* registered historic park and garden. The proposed works are 550 m to the south of the registered garden and 740 m south of Tan-yr-Allt House itself. Registered for its historic interest as the house and grounds designed by William Madocks (1773-1828) as his own home, laid out in the 'romantic' manner approximately 1800. There are exceptional views from the house and the lawns in its immediate vicinity over Traeth Mawr and Porthmadog.
- 6.8.28 The gardens at Tan-yr-allt were laid out around the time the house was built, by Madocks, soon after 1800. They lie around and to the immediate east of the house. There is little formal structure, the important elements being the view, trees, and the kitchen garden, the latter which is also separately listed (**Cadw 85388, Grade II**). There is a memorial to Percy Bysshe Shelley who stayed at Tan-yr-Allt in 1812-13 (**Cadw 85401, Grade II**).
- 6.8.29 The asset holds historical and architectural interest, with its value derived from its ability to illustrate post-medieval country house and parkland design. Together the house and gardens are of high value.
- 6.8.30 The proposed works would result in temporary noise and visual impacts such on the setting of the parkland due to construction activities.

- 6.8.31 Overall, these would result in a temporary very low adverse magnitude of impact on Tan-yr-allt, which on an asset of high value, results in a **minor adverse** significance of effect, which is not significant.
- 19 to 21 Y Graig (Sunnyside), Tremadog (Cadw 85323, 85325 & 85328) (Grade II)
- 6.8.32 Nos 19 to 21 belong to a terrace of five two-storey houses built of local stone, roughly coursed and squared random rubble with larger quoins approximately 330 m north-east of the Glaslyn works site on a hillside above the village of Tremadog. An important group of mid-19th-century industrial workers' housing at Sunnyside, this terrace has a well-preserved 19th-century character with good use of local stone. The value of the assets is medium. The setting of the assets is the planned 19th-century village of Tremadog and contributes to the historical integrity of the village.
- 6.8.33 There is a break in tree cover in front of Nos 19 to 21 Y Graig (Sunnyside) which allows a view overlooking the Porthmadog bypass and agricultural fields beyond where works are proposed. Any views of the proposed works would be incidental and would not alter the setting of the terraced houses as their significance is derived from their relationship to the village.
- 6.8.34 Given the proximity to the proposed works, there is potential for temporary setting changes during construction due to visual impacts from construction activities and machinery in this part of the Glaslyn works site. This would result in a very low adverse magnitude of impact, which on an asset of medium value, results in a negligible significance of effect, which is not significant.
- Bodawen Lodge (Buildings 1 & 2) and Former Stable at Bodawen Lodge (Cadw 4438, 85359 & 85375) (Grade II)
- 6.8.35 Nos 1-2 Bodawen Lodge are a pair of early 19th-century houses shown on the 1842 Tithe map. They subsequently became a lodge (although probably still two dwellings) for Bodawen House and are shown as such on the 1871 Tremadog estate plan and 1888 Ordnance Survey. The buildings are approximately 20 to 30 m north of the Glaslyn works site. The value of the assets is medium. The setting of the assets are the house and grounds of Bodawen which is to the north-east and contributes to the historical character of Bodawen. The setting has already been partially diminished by the presence of a new roundabout and road development to the immediate south of the buildings. Any views of the proposed works would be temporary and would not alter the existing setting of the lodge and former stable.
- 6.8.36 Given the close proximity to the proposed works, there is potential for temporary setting changes during construction due to noise and visual impacts from construction activities and machinery in this part of the Glaslyn works site. This would result in a very low magnitude of impact, which on an asset of medium value, results in a **negligible** significance of effect, which is not significant.
- Former Tremadoc Tramway Bridge over Drainage Ditch (Cadw 85376) (Grade II)
- 6.8.37 A simple bridge built over a drainage ditch for the Tremadoc Tramway of approximately 1845, which carried iron ore from nearby Llidiart Ysbytty to Porthmadog harbour. It is 50 m north of the Glaslyn works site. From the late 1850s it was incorporated into the slate-carrying Gorseddau horse-drawn tramway, which became locomotive powered in the 1870s and operated until the 1890s. It is now a footpath and is one of the few surviving structures in Porthmadog associated with the former mineral railways supplying the port. The asset is of medium value.

- 6.8.38 The setting of the asset is the post-medieval industrial landscape of Porthmadog. Whilst there would be intervisibility between the asset and the proposed works, the conversion of the former tramway into a paved public path has already diminished the setting of the industrial landscape.
- 6.8.39 Given the close proximity to the proposed works, there is potential for temporary setting changes during construction due to noise and visual impacts from construction activities and machinery in this part of the Glaslyn works site. These changes will not result in any substantive change in the ability to appreciate the heritage value of the asset which is derived from architectural and historic interest. This would result in a very low adverse magnitude of impact, which on an asset of medium value, results in a **negligible** significance of effect, which is not significant.
- Porthmadog War Memorial, including Steps, Trilithon and Monoliths forming its Approach (Cadw 85397) (Grade II)
- 6.8.40 The 1914-18 and 1939-45 war memorial is a cross surmounting a small eminence, but its approach was also designed to achieve a sense of procession as the memorial is reached by a winding path from street level. It is 14 m north-east of the Glaslyn works site. The asset is of medium value. The setting of the memorial is the landscaped approach and surroundings of the memorial as well as the wider view over the town of Porthmadog. Any views of the proposed works would be temporary and would not alter the existing setting of the memorial.
- 6.8.41 Given the close proximity to the proposed works, there is potential for temporary setting changes during construction due to noise and visual impacts from construction activities and machinery in this part of the Glaslyn works site. This would result in a very low adverse magnitude of impact, which on an asset of medium value, results in a **negligible** significance of effect, which is not significant.
- Rhos House (Cadw 5205) (Grade II)
- 6.8.42 A dwelling house and one-time inn, dating largely from 17th century with considerable later alterations. It is approximately 12 m north-west of the Glaslyn works site. It comprises a two-storey sub-medieval house which has evolved into a L-plan; it is built of rubble construction with slate roofs and end chimneys with distinctive triangular crestings. It is a sub-medieval house with interesting plan-form retaining good traditional character. The asset is of medium value. The setting of the house comprises its curtilage and neighbouring houses.
- 6.8.43 The setting of the listed structure would not be altered by the introduction of additional modern industrial infrastructure in the wider agricultural setting of Traeth Mawr. These changes will not result in any substantive change in the ability to appreciate the heritage value of the asset which is derived from architectural, historic and archaeological interest.
- 6.8.44 Given the proximity to the proposed works, there is also potential for temporary setting changes during construction due to noise and visual impacts from construction activities and machinery in this part of the Glaslyn works site.
- 6.8.45 Overall, these changes are assessed as having a very low magnitude of change which on an asset of medium value result in a minor adverse effect of permanent duration. This permanent effect is not significant.
- Plas Newydd Farmhouse (Cadw 4774) & Former Stable Range at Plas Newydd (Cadw 19800) (Grade II)

- 6.8.46 The present farmhouse (**Cadw 4774**) is one of four ranges which originally formed a 17th-century house as the seat of a junior branch of the Anwyl family. It is approximately 343 m north-east of the Glaslyn works site. The house is two-and-a-half storeys in height, built of rubble construction on boulder and rock foundations. Features include tall chimneys with original moulded capping and weathercoursing. Across the farmyard, immediately south-west of the farmhouse, is the former stable range (**Cadw 19800**). The stable range also formed one of four ranges which originally formed the main 17th-century house. The stable range is rectangular in plan and built of rubble construction, now under a corrugated iron roof. Non-designated built assets on the farm also comprise a tannery (**PRN 36861**) in the farmyard and an outfarm (**PRN 99275**), a short distance to the north-east of the farmstead. Overall, the value of the assets is medium. The setting of the house and the former stable range comprises the farmstead of Plas Newydd and the surrounding agricultural fields.
- 6.8.47 Any views of the proposed works would be incidental and would not alter the setting of the farmhouse, former stable and other buildings on the farm as their significance is derived from their relationship to the farm and the surrounding agricultural fields.
- 6.8.48 The setting of the listed structure would also not be altered by the introduction of additional modern industrial infrastructure in the wider agricultural setting. These changes will not result in any substantive change in the ability to appreciate the heritage value of the asset which is derived from architectural and historic interest.
- 6.8.49 Given the proximity to the proposed works, there is also potential for temporary setting changes during construction due to noise and visual impacts from construction activities and machinery in this part of the Glaslyn works site.
- 6.8.50 Overall, these changes are assessed as having a very low magnitude of impact which on an asset of medium value result in a **minor adverse** effect of permanent duration. This permanent effect is not significant.
- Aberglaslyn Registered Historic Landscape HLW (Gw)7
- 6.8.51 The proposed works are taking place within the Aberglaslyn registered historic landscape HLW (Gw)7 (see **Figure 4.6.A.3**).
- 6.8.52 The Aberglaslyn registered historic landscape comprises Traeth Mawr, or the former tidal estuary at the mouth of the Afon Glaslyn which flows south from Snowdonia into Tremadog Bay. It includes all the reclaimed land up to the base of the cliffs or slopes surrounding the former estuary as far as Aberglaslyn, the Porthmadog Cob embankment, the planned Georgian village of Tremadog, and Porthmadog.
- 6.8.53 The reclamation of Traeth Mawr and the building of Tremadog is an excellent example of the product of landlord initiative and conscious landscape creation in pursuit of economic objectives in the late 18th and early 19th centuries.
- 6.8.54 The area also includes the Penrhyndeudraeth peninsula to the south which includes the location and setting of the architecturally exotic, planted, Italianate village of Portmeirion designed by Clough Williams-Ellis.
- 6.8.55 The area holds historical and heritage interest, with its value derived from its ability to illustrate major post-medieval reclamation scheme and other landlord driven schemes of economic improvements such as the planned settlements of Tremadog, Porthmadog and Portmeirion. The landscape exhibits considerable coherence and is of high value.
- 6.8.56 Whilst there will be some alterations and new construction associated with the proposed works, the new additions will be in the immediate environs of existing National Grid

infrastructure or infrastructure which is currently undergoing construction. The existing infrastructure has already contributed to the erosion of the local landscape in which the asset lies and the proposed works will have minimal further impact to the erosion of this setting. The removal of the Garth CSEC will have a beneficial impact.

- 6.8.57 These changes will also introduce temporary noise and visual impacts into the setting of the landscape which will temporarily alter the character of the surroundings in which the asset is experienced. These changes will not result in any substantive change in the ability to appreciate the heritage value of the asset which is derived from historic and heritage interest.
- 6.8.58 Overall, these would result in a permanent very low adverse magnitude of impact on the Aberglaslyn registered historic landscape, which on an asset of high value, results in a **minor adverse** significance of effect, which is not significant.

Non-designated Historic Assets

Within the Glaslyn Works Site

Hedge-bank, North-East of Wern (PRN 37907)

- 6.8.59 Part of a tree-lined bank which runs north-south across the Glaslyn works site within the Wern Historic Park and Garden. The value of the asset is derived from its archaeological interest as part of the post-medieval field system in the area and may help to illustrate the process of land enclosure in the area during the 19th century. The asset would likely hold local interest and is of low value.
- 6.8.60 The proposed works would result in physical impacts to the hedge-bank. However, given the limited width of the proposed works in this area, it is unlikely that total loss of this asset will occur. The magnitude of impact is medium, which on assets of low value, would result in a **minor adverse** significance of effect, which is not significant.

Hedge and Ditch, on Traeth Mawr (PRN 37908)

- 6.8.61 Part of a hedge and ditch which runs north-south across the Glaslyn works site. This is the Penmorfa-Ynyscynhaiarn parish boundary. The value of the asset is derived from its archaeological interest as part of the post-medieval field system in the area and may help to illustrate the process of land reclamation in the area during 19th century. The asset would likely hold local interest and is of low value.
- 6.8.62 The proposed works would result in physical impacts to the hedge-bank. However, given the limited width of the proposed works in this area, it is unlikely that total loss of this asset will occur. The magnitude of impact is medium, which on assets of low value, would result in a **minor adverse** significance of effect, which is not significant.

Hedge and Ditch, on Traeth Mawr (PRN 37909)

- 6.8.63 This is part of a hedge and ditch which runs north-south across the Glaslyn works site. This is a field boundary depicted on the tithe map on Traeth Mawr. The value of the asset is derived from its archaeological interest as part of the post-medieval field system in the area and may help to illustrate the process of land reclamation in the area during 19th century. The asset would likely hold local interest and is of low value.
- 6.8.64 The proposed works would result in physical impacts to the hedge-bank. However, given the limited width of the proposed works in this area, it is unlikely that total loss of this asset will occur. The magnitude of impact is medium, which on assets of low value, would result in a **minor adverse** significance of effect, which is not significant.

Hedge-bank, on Traeth Mawr (PRN 37910)

- 6.8.65 This is part of a bank and treeline which runs north-south across the Glaslyn works site. This is a field boundary depicted on the tithe map on Traeth Mawr. The value of the asset is derived from its archaeological interest as part of the post-medieval field system in the area and may help to illustrate the process of land reclamation in the area during 19th century. The asset would likely hold local interest and is of low value.
- 6.8.66 The proposed works would result in physical impacts to the hedge-bank. However, given the limited width of the proposed works in this area, it is unlikely that total loss of this asset will occur. The magnitude of impact is medium, which on assets of low value, would result in a **minor adverse** significance of effect, which is not significant.

Field Boundary, Porthmadog (PRN 33528)

- 6.8.67 Earth bank and ditches with trees and hedges running along the top of it, the ditches are approximately 1.60 m in width. The value of the asset is derived from its archaeological interest as part of the post-medieval field system in the area and may help to illustrate the process of land reclamation in the area during 19th century. The asset would likely hold local interest and is of low value.
- 6.8.68 The proposed works would result in physical impacts to the field boundary. However, given the limited width of the proposed works in this area, it is unlikely that total loss of this asset will occur. The magnitude of impact is medium, which on assets of low value, would result in a **minor adverse** significance of effect, which is not significant.

Field Boundary, Porthmadog (PRN 33531)

- 6.8.69 Earth bank with ditches running either side and trees and hedges running along top. Ditches are approximately 1.60 m in width. The value of the asset is derived from its archaeological interest as part of the post-medieval field system in the area and may help to illustrate the process of land reclamation in the area during 19th century. The asset would likely hold local interest and is of low value.
- 6.8.70 The proposed works would result in physical impacts to the field boundary. However, given the limited extent of the proposed works in this area, it is unlikely that total loss of this asset will occur. The magnitude of impact is medium, which on assets of low value, would result in a **minor adverse** significance of effect, which is not significant.

Field Boundary, Porthmadog (PRN 33532)

- 6.8.71 This boundary consists of a dry stone wall. There are trees/hedges/wooden posts with wire fencing running along the field side of the wall. A tarmac path runs along the other side. This wall is made up of granite/sandstone/old concrete - angular and sub-angular stones. The value of the asset is derived from its archaeological interest as part of the post-medieval field system in the area and may help to illustrate the process of land reclamation in the area during 19th century. The asset would likely hold local interest and is of low value.
- 6.8.72 The proposed works would result in physical impacts to the field boundary. However, given the limited width of the proposed works in this area, it is unlikely that total loss of this asset will occur. The magnitude of impact is medium, which on assets of low value, would result in a **minor adverse** significance of effect, which is not significant.

Field Boundary, Porthmadog (PRN 33536)

- 6.8.73 This is an earthen bank with two narrow culverts on either side. The value of the asset is derived from its archaeological interest as part of the post-medieval field system in

the area and may help to illustrate the process of land reclamation in the area during 19th century. The asset would likely hold local interest and is of low value.

- 6.8.74 The proposed works would result in physical impacts to the field boundary. However, given the limited width of the proposed works in this area, it is unlikely that total loss of this asset will occur. The magnitude of impact is medium, which on assets of low value, would result in a **minor adverse** significance of effect, which is not significant.

Culvert/Ditch, Porthmadog (PRN 33540)

- 6.8.75 No culvert is apparent and appears to be a general drainage ditch. The value of the asset is derived from its archaeological interest as part of the post-medieval field system in the area and may help to illustrate the process of land reclamation in the area during 19th century. The asset would likely hold local interest and is of low value.

- 6.8.76 The proposed works would result in physical impacts to the culvert/ditch. However, given the limited width of the proposed works in this area, it is unlikely that total loss of this asset will occur. The magnitude of impact is medium, which on assets of low value, would result in a **minor adverse** significance of effect, which is not significant.

Revetted Drain, Porthmadog (PRN 33545)

- 6.8.77 This is listed in the assessment for the Porthmadog Bypass as feature 9: a revetted drain (see **Section 4.3.19 in Volume 8, Appendix 4.6.A: Cultural Heritage Desk-based Assessment**). No revetment is apparent and it appears to be a general drainage ditch. The value of the asset is derived from its archaeological interest as part of the post-medieval field system in the area and may help to illustrate the process of land reclamation in the area during 19th century. The asset would likely hold local interest and is of low value.
- 6.8.78 The proposed works would result in physical impacts to the revetted drain. However, given the limited width of the proposed works in this area, it is unlikely that total loss of this asset will occur. Therefore, the magnitude of impact is medium, which on assets of low value, would result in a **minor adverse** significance of effect, which is not significant.

Culvert/Ditch, Porthmadog (PRN 33548)

- 6.8.79 This is a ditch with steep banks of post-medieval date which turns at a right angle at the northern end. The value of the asset is derived from its archaeological interest as part of the post-medieval field system in the area and may help to illustrate the process of land reclamation in the area during 19th century. The asset would likely hold local interest and is of low value.
- 6.8.80 The proposed works would result in physical impacts to the ditch. However, given the limited width of the proposed works in this area, it is unlikely that total loss of this asset will occur. The magnitude of impact is medium, which on assets of low value, would result in a **minor adverse** significance of effect, which is not significant.

Field Boundary, Porthmadog (PRN 33550)

- 6.8.81 Dry stone wall of mixed local stone and generally well built. However, in places the wall has slumped and collapsed. Initially stock proofed with stones set on edge along the top of the wall then there are later additions of posts, barbed wire, stock fencing along both sides of the wall.
- 6.8.82 The value of the asset is derived from its archaeological interest as part of the post-medieval field system in the area and may help to illustrate the process of land

reclamation in the area during 19th century. The asset would likely hold local interest and is of low value.

- 6.8.83 The proposed works would result in physical impacts to the field boundary. However, given the limited width of the proposed works in this area, it is unlikely that total loss of this asset will occur. The magnitude of impact is medium, which on assets of low value, would result in a **minor adverse** significance of effect, which is not significant.

Field Boundary, Porthmadog (PRN 33551)

- 6.8.84 Low dry stone revetment with the Welsh Highland Railway on its eastern side and farmland on its western side.
- 6.8.85 The value of the asset is derived from its archaeological interest as part of the post-medieval field system in the area and may help to illustrate the process of land reclamation in the area during 19th century. The asset would likely hold local interest and is of low value.
- 6.8.86 The removal of the stone wall and vegetation clearance would result in physical impacts to the field boundary. However, given the limited width of the proposed works in this area, it is unlikely that total loss of this asset will occur. The magnitude of impact is medium, which on assets of low value, would result in a minor adverse significance of effect, which is not significant.

Croesor Tramway, remains of, Porthmadog (PRN 21174)

- 6.8.87 The embankment of the Welsh Highland Railway/Croesor tramway just to the south-west of Pen-y-Mount station. At this point the railway embankment overlies the embankment constructed by W. A. Maddocks in 1800 which reclaimed land in the western branch of Traeth Mawr extending as far as Penmorfa.
- 6.8.88 The value of the asset is derived from its archaeological interest as part of the post-medieval industrial development in the area and may help to understand transport systems and techniques used in the 19th century in Wales. The asset would likely hold local interest and is of low value.
- 6.8.89 The removal of vegetation, topsoil and railway line would result in physical impacts to the tramway embankment. However, given the limited width of the proposed works in this area, it is unlikely that total loss of this asset will occur. The magnitude of impact is medium, which on assets of low value, would result in a minor adverse significance of effect, which is not significant.

Field Boundary, Porthmadog (PRN 33554)

- 6.8.90 Boundary runs between the road and the grounds of Porthmadog football club and consists of concrete posts and heavy duty fencing with a ditch on the eastern side. The ditch is generally overgrown and filled with silt and rubbish. It also appears to be revetted with stones on its western side.
- 6.8.91 The value of the asset is derived from its archaeological interest as part of the post-medieval field system in the area and may help to illustrate on the process of land reclamation in the area during the 19th century. The asset would likely hold local interest and is of low value.
- 6.8.92 The removal of the fence, vegetation clearance and topsoil clearance would result in physical impacts to the field boundary. However, given the limited width of the proposed works in this area, it is unlikely that total loss of this asset will occur. The magnitude of

impact is medium, which on assets of low value, would result in a **minor adverse** significance of effect, which is not significant.

Within 500 m Study Area

Field Boundary, Porthmadog (PRN 33552)

- 6.8.1 This boundary consists of posts, stock fencing, barbed wire which runs between the Welsh Highland Railway to the west and farmland to the east, located approximately 6 m east of the proposed works.
- 6.8.2 The value of the asset is derived from its archaeological interest as part of the post-medieval field system in the area and may help to understand the process of land reclamation in the area during the 19th century. The asset would likely hold local interest and is of low value.
- 6.8.3 The removal of the fence, vegetation clearance and topsoil clearance would result in physical impacts to the field boundary. However, given the limited width of the proposed works in this area, it is unlikely that total loss of this asset will occur. The magnitude of impact is medium, which on assets of low value, would result in a minor adverse significance of effect, which is not significant.

Culvert/Ditch Portmadog (PRN 33553)

- 6.8.4 A culvert which along with post fencing/barbed wire fence forms the boundary between farmland and the road to Porthmadog football club, located approximately 3 m east of the proposed works.
- 6.8.5 The value of the asset is derived from its archaeological interest as part of the post-medieval field system in the area and may help to illustrate the process of land reclamation in the area during the 19th century. The asset would likely hold local interest and is of low value.
- 6.8.6 The clearance of vegetation and topsoil, and the construction of an entry point for an access road would result in physical impacts to the culvert/ditch. However, given the limited width of the proposed works in this area, it is unlikely that total loss of this asset will occur. The magnitude of impact is medium, which on assets of low value, would result in a **minor adverse** significance of effect, which is not significant.

Minffordd Chapel (Welsh Calvinistic Methodist), Minffordd, Porthmadog (PRN 68404)

- 6.8.7 Minffordd Methodist Chapel was built in 1871 and rebuilt in 1879. It is approximately 243 m south of the proposed works. The present chapel, dated 1879, is built in the Romanesque style of the gable-entry type to the design of architect Owen Morris Roberts of Porthmadog. The setting of the chapel comprises its position along the A497 on the approach into Minffordd.
- 6.8.8 The chapel possesses architectural and historic interest as a surviving chapel opened in the 19th century and is of local interest and is of low value.
- 6.8.9 The chapel would experience a temporary change in its setting during construction due to increased noise and the presence of construction infrastructure in its setting. This would have a low adverse magnitude of impact, which on an asset of low value would result in a negligible significance of effect, which is not significant.

House & Outbuildings, Pen-y-Craig (PRN 27317)

- 6.8.10 A house and outbuildings present on Ordnance Survey mapping in the late 19th and early 20th centuries and remain extant. They are approximately 76 m south of the

Glaslyn works site. The buildings comprise a small farm complex with views of the surrounding land, including to the north towards the Glaslyn works site.

- 6.8.11 The farm buildings possess architectural and historic interest as surviving examples of the post-medieval farm industry which has persisted and are of local interest. The buildings are of low value.
- 6.8.12 The house and outbuildings would experience a temporary change in their setting during construction due to increased noise and the presence of construction infrastructure in its setting. This would have a low adverse magnitude of impact, which on an asset of low value would result in a negligible significance of effect, which is not significant.

Building, South-West of Lloc-Meirig (PRN 27321)

- 6.8.13 A building present on Ordnance Survey mapping in the late 19th and early 20th centuries remains extant. It is approximately 122 m south of the Glaslyn works site. The building stands alone with views of the surrounding land, including to the north towards the Glaslyn works site.
- 6.8.14 The farm building possesses architectural and historic interest as a surviving example of the post-medieval farm industry which has persisted and is of local interest. The building is of low value.
- 6.8.15 The farm building would experience a temporary change in its setting during construction due to increased noise and the presence of construction infrastructure in its setting. This would have a low adverse magnitude of impact, which on an asset of low value would result in a negligible significance of effect, which is not significant.

Penamser Farm, Porthmadog (PRN 25424)

- 6.8.16 A farmstead present on Ordnance Survey mapping in the late 19th and early 20th centuries remains extant. It is approximately 139 m south-west of the Glaslyn works site. The buildings comprise a small farm complex with views of the surrounding land, including to the north towards the Glaslyn works site.
- 6.8.17 The farm and outbuildings possess architectural and historic interest as a surviving example of the post-medieval farm industry which has persisted and are of local interest. The farmstead is of low value.
- 6.8.18 The farmstead would experience a temporary change in its setting during construction due to increased noise and the presence of construction infrastructure in its setting. This would have a low adverse magnitude of impact, which on an asset of low value would result in a negligible significance of effect, which is not significant.

Outfarm, South-West of Penamser Farm (PRN 25425)

- 6.8.19 A building present on Ordnance Survey mapping in the late 19th and early 20th centuries remains extant. It is approximately 228 m south-west of the Glaslyn works site. The building stands alone with views of the surrounding land, including to the north towards the Glaslyn works site.
- 6.8.20 The farm building possesses architectural and historic interest as a surviving example of the post-medieval farm industry which has persisted and is of local interest. The building is of low value.
- 6.8.21 The farm building would experience a temporary change in its setting during construction due to increased noise and the presence of construction infrastructure in its

setting. This would have a low adverse magnitude of impact, which on an asset of low value would result in a **negligible** significance of effect, which is not significant.

6.8.22 A498 Crossing – HDD Option

- 6.8.23 If the HDD option was taken forward, the impact would be the same as stated above. In the case of Hedge-bank, on Traeth Mawr (PRN 37910), there is potentially a reduced magnitude of effect, as the open cut section through the hedge and bank would not need to be excavated.

6.9 Mitigation and Residual Effects

Construction

- 6.9.1 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, which consist of hedges, banks, ditches, culverts and a tramway embankment. These are historic landscape features associated with the early 19th-century reclamation of Traeth Mawr. Additional 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.
- 6.9.2 Apart from Wern Manor (Cadw 4626) (Grade II*) (PGW(Gd)19(GWY)) (Grade II*) where a moderate adverse significant effect has been identified, no significant effect has been identified on the setting of the World Heritage Site, scheduled monuments, listed buildings and historic landscapes, during the construction or operation of the proposed works. Considerations of size, materials, distribution, lighting and screening in the final designs of the alterations to the existing Wern CSEC, the construction of the new Minffordd CSEC, the increased height of the Minffordd EVIP THH and the removal of the Garth CSEC will ensure that impact on the setting of designated historic assets will be kept to a minimum.
- 6.9.3 The scope of mitigation will be set out in a WSI and agreed with the Archaeological Advisor for Heneb prior to works commencing.

6.10 Summary

- 6.10.1 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 which consist of hedges, banks, ditches, culverts and a tramway embankment. These are historic landscape features associated with the early 19th-century reclamation and the subsequent development of Traeth Mawr.
- 6.10.2 The potential additional mitigation measures described in **Section 6.9** comprising a programme of archaeological investigation, recording and reporting would not minimise the physical impact, as the archaeological evidence would still be removed, but would compensate for their loss by preserving them by record. This would reduce the magnitude of impact, resulting in no significant residual effects.
- 6.10.3 Apart from Wern Manor (Cadw 4626) (Grade II*) (PGW(Gd)19(GWY)) (Grade II*) where a moderate adverse significant effect has been identified, no significant effect has been identified on the setting of designated historic assets during the construction or operation of the proposed works. Considerations of size, materials, distribution, lighting and screening in the final designs of the alterations to the existing Wern CSEC, the

construction of the new Minffordd CSEC, the increased height of the EVIP Minffordd tunnel head house, and the removal of the Garth CSEC will ensure that impact on the setting of designated historic assets will be kept to a minimum.

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

7.1 Introduction

- 7.1.1 This chapter presents an assessment of the likely Geology, Hydrogeology, Land Use and Agriculture (Soils) effects that could arise from the construction, operation and maintenance of the works at Glaslyn as described in **Chapter 2: Glaslyn Cables Works**.
- 7.1.2 This chapter describes the baseline conditions currently existing within the Study Area (as defined in **Section 7.3**), the scope of the assessment, the potential effects, the mitigation measures required to avoid, reduce or offset any significant negative effects, and the likely residual effects after these mitigation measures have been adopted.
- 7.1.3 This chapter is supported by figures and appendices as listed here:
- **Figure 4.7.1:** Made Ground, Superficial Geology and Historic Borehole logs
 - **Figure 4.7.2:** Bedrock Geology.
 - **Figure 4.7.3:** Hydrogeology.
 - **Figure 4.7.4:** Groundwater Vulnerability.
 - **Figure 4.7.5:** Potential Sources of Contamination.
 - **Figure 4.7.6:** Historic Potential Sources of Contamination.
 - **Figure 4.7.7:** Mining Quarrying and Mineral Resources.
 - **Figure 4.7.8:** Surface Ground Workings.
 - **Volume 8, Appendix 1.1.A: Legislation, Policy and Guidance.**
 - **Volume 8, Appendix 1.4.A: Topic Assessment Methodology.**
 - **Volume 8, Appendix 4.7.A: Initial Conceptual Site Model and Risk Assessment.**
- 7.1.4 Other chapters that are useful to review in association with this chapter are as follows:
- **Chapter 8: Water Quality, Resources and Flood Risk** (which covers surface water and hydrology).

7.2 Legislation and Planning Policy

- 7.2.1 This section summarises the legislation, planning policies and guidance documents relevant to Geology, Hydrogeology, Land Use and Agriculture (Soils). Details can be found in **Volume 8, Appendix 1.1.A: Legislation, Policy and Guidance**.

Legislation

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

- The Environment Act 2021 (Ref 4.2).
- Environment (Wales) Act 2016 (Ref 5.4)
- The Environmental Protection Act 1990 and Part IIA (the Contaminated Land Regime) (Ref 7.1).
- The Water Act 2003 (Ref 7.2).
- The Environment Act 1995 (Ref 7.3).
- The Water Resources Act 1991 (as amended) (Ref 7.4).
- The Land Drainage Act 1991 (as amended) (Ref 7.5).
- The Building Act 1984 and the Building (Amendment) Regulations 2016 (Ref 7.6).
- The Water Environment (Water Framework Directive (WFD)) (England and Wales) Regulations 2017 (Ref 5.12).
- *Groundwater (England and Wales) Regulations 2009* (Ref 7.7)
- The Private Water Supplies (Wales) Regulations 2017 (Ref 7.8).
- The Environmental Permitting (England and Wales) Regulations 2016 (Ref 7.9).
- The Environmental Damage (Prevention and Remediation) (Wales) Regulations 2015 (Ref 7.10).
- Contaminated Land (Wales) Regulations 2006 (Ref 7.11).
- Hazardous Waste (England and Wales) Regulations 2005 (as Amended) (Ref 7.12)
- Anti-Pollution Works Regulations 1999 (Ref 7.13).
- Control of Asbestos Regulations 2012 (Ref 7.14).
- Construction (Design and Management) Regulations 2015 (“CDM Regulations”) (Ref 7.15).
- The Confined Spaces Regulations 1997 (Ref 7.16).

National Policy

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

- PPW – Edition 12 (Ref 4.5).
- Welsh Assembly Government, TAN 6: Planning for Sustainable Rural Communities 2010 (Ref 4.8).

Local Policy

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

- Anglesey and Gwynedd Joint Local Development Plan 2011 – 2026 (Ref 4.11).
- Eryri Local Development Plan 2016 – 2031 (Snowdonia National Park Authority) (Ref 4.13).

Guidance

7.2.5

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

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

- Institute of Environmental Management and Assessment (IEMA)⁶, A New Perspective on Land and Soil in EIA 2022 (Ref 7.34).
- Institute of Quarrying, Good Practice Guide for Handling Soils in Mineral Workings 2021 (Ref 7.35).
- Welsh Assembly Government, The Code of Good Agricultural Practice for the Protection of Water, Soil and Air for Wales No. 20 2011 (Ref 7.36).
- British Society of Soil Science, Guidance Document 3 Working with Soil Guidance Note on Benefitting from Soil Management in Development and Construction 2022 (Ref 7.37).

7.3 Study Area

- 7.3.1 The Study Area for this assessment is the area over which the potential direct and indirect effects of the proposed works are predicted to occur during the construction and operation phases.
- 7.3.2 The direct effects on geology and hydrogeology are those that may arise during construction and operation (including maintenance).
- 7.3.3 The indirect effects involve disturbing the ground in such a way that contaminant linkages (source-pathway-receptor) are created, for example, introducing a new pathway allowing potentially contaminated dusts, during construction or, to migrate offsite to nearby residential or commercial properties.
- 7.3.4 The Study Area for geology and hydrogeology is the entirety of the ground within the Glaslyn works site (**Figure 4.7.1**), along with a buffer extending 250 m around the Glaslyn works site to identify potential offsite sources of contamination to inform the baseline condition within and adjacent to the Glaslyn works site. With regards to groundwater abstraction and Source Protection Zones (SPZs) the Study Area includes a buffer extending 1 km beyond the Glaslyn works site.
- 7.3.5 Impacts to soils in relation to agriculture and rural land use typically occur only on the land directly impacted by the proposed works, including land used for access and compounds. A wider Study Area is not applied when describing and considering agricultural soils unless stripped soil is transported off-site. It is proposed to reuse excavated materials onsite during the construction works.
- 7.3.6 These Study Areas are appropriate for the assessment of geology, hydrogeology and contaminated land in accordance with methodology set out in the DMRB LA 109 Geology and Soils (Ref 7.28), which although applicable to road schemes, is considered to provide a suitable framework within which to conduct EIA for assessing geology and hydrogeology on schemes which include linear elements (including the proposed works). It is also a well-established and tested methodology, familiar to the statutory consultees.
- 7.3.7 For agriculture and land use (soils) assessment is guided by the IEMA, A New Perspective on Land and Soil in EIA document (Ref 7.34). It is part position paper, part

⁶ The Institute of Environmental Management and Assessment (IEMA) changed its name to the Institute of Sustainability and Environmental Professionals on 17 July 2025. At the time of writing, guidance was still IEMA branded and will be referred to throughout this volume.

educational resource and part methodological guidance; it provides a framework rather than rigid approach to assessing soil functions and services.

7.4 Assumptions and Limitations

- 7.4.1 The assessment presented in this chapter reflects the information obtained and evaluated at the time of reporting (March 2025), and has referenced published data, records and web-based information obtained to date.
- 7.4.2 The baseline presented is founded on data gathered through desktop research.
- 7.4.3 The assessment includes consideration of the construction, operation and maintenance, phases of the proposed works and is based upon the design information in **Chapter 2: Glaslyn Cables Works**.
- 7.4.4 This assessment has been carried out on the assumption that all proposed activities will be confined wholly within the boundaries of the Glaslyn works site, (the proposed works area) specifically within existing hardstanding areas.
- 7.4.5 Whilst recognising limitations to some aspects of the design, a worst-case approach to assess the potential effects to best and most versatile (BMV) agricultural land by applying buffers to preliminary design information and using Welsh Government's mapping of the preliminary model of ALC.
- 7.4.6 A geotechnical and geo-environmental ground investigation will be carried out to inform the detailed design of the proposed works. This is a commitment which will be captured within the Outline CEMP included in **Volume 8, Appendix 4.2.A: Outline Construction Environmental Management Plan**.

7.5 Baseline

- 7.5.1 The following section provides a summary of the existing ground conditions within the respective subtopic Study Areas for the proposed works. The information is presented based on the division of significant sources and receptors. Generally, the baseline conditions presented refer to sources and receptors within the Glaslyn works site. However, relevant significant sources and receptors identified outside of the Glaslyn works site that may affect or be affected by the proposed works, are also identified in the baseline.
- 7.5.2 For ease of referencing across the Geology, Hydrogeology, Land Use and Agriculture (Soils) chapter, the proposed works within the Glaslyn works site has been divided into three sections which consist of:
- West – from Wern CSEC to the western perimeter of the town of Porthmadog.
 - Central – the town of Porthmadog.
 - East – from the eastern perimeter of Porthmadog town to Garth CSEC.
- 7.5.3 These sections are depicted on each of the figures referenced in paragraph 7.1.3.

Data Sources

7.5.4

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

- British Geological Survey (BGS) 1:50,000 mapping Sheet 119 Snowden (Ref 7.38).
- BGS 1:10,000 mapping, SH53NE and SH54SW (Ref 7.39).
- Geological Memoirs Geology of the country around Snowden 1987 (Ref 7.40).
- BGS GeoIndex Online Mapping Service (Ref 7.41).
- Groundsure Free Data Viewer (Ref 7.42).
- Welsh Government (Data Map Wales) for geological SSSI, Geological Conservation Review (GCR) sites, Regionally Important Geodiversity Sites (RIGS), SPZ and Licensed Water Abstractions (Ref 5.33).
- Unexploded Ordnance (UXO) Risk Map Risk Maps | Zetica UXO (Ref 7.43).
- Mineral Safeguarding Areas (MSA) Geographical Information System (GIS) data from Gwynedd Council received 31 May 2024 (Ref 7.44).
- Mining Remediation Authority Map Viewer (Ref 7.45).
- Private Water Abstraction Record from Gwynedd Council received 26 November 2024 (Ref 7.46).
- Potential Land Contamination Points from Gwynedd Council received 23 January 2025 (Ref 7.47).
- Defra MAGIC maps (Ref 7.48).
- NRW, LANDMAP (Ref 7.49).
- Data Map Wales (Ref 5.33) Groundsure Enviro, Geo and Map Insight data referenced GSIP-2024-16474-21178 and 21179 (provided as GIS data on 21 November 2024) (Ref 7.50).

7.5.5

In addition, the following reports have been referenced:

- EGS, June 2014. Factual Report on Ground Investigation (Ref 7.51).
- WSP Ltd, February 2018. Ground Investigation Report (Ref 7.52).
- SOCOTEC, December 2023. Ground Investigation Report (Factual Account of Fieldwork, Monitoring And Laboratory Testing). Report No. F3038-23 (Ref 7.53).
- Arup, August 2023. Glaslyn Cable Uprating Geotechnical Desk Study. Reference: GLAS-ARUP-DS-ZZ-RP-X-0009 (Ref 7.54).
- 6Alpha, July 2023. Detailed Unexploded Ordnance (UXO) Threat & Risk Assessment (Ref 7.55).

Geology

Published Records

- 7.5.6 The published 1:50,000 scale geological map of the area Sheet 119 – Snowdon (Ref 7.38), 1:10,000 Sheet SH53NE and SH54SW (Ref 7.39) and GIS data sourced from the BGS indicate the proposed works is underlain by the geological succession summarised in **Table 7-1** and shown on **Figures 4.7.1** and **Figure 4.7.2**.

Table 7-1 – Geological succession from published mapping

Section of route	Age	Group	Geological stratum
West – from Wern CSEC to the western perimeter of the town of Porthmadog.	Quaternary.	Superficial Deposits.	Alluvium – Clay, Silt, Sand and Gravel fluvial deposits. Till, Devensian – Diamicton.
	Cambrian.	Mawddach Group Bedrock.	Ffestiniog Flags Formation Mudstone. Dolgellau Formation Mudstone and Siltstone.
	Ordovician.	Tremadoc Series Bedrock.	Dol-cyn-afon Formation.
	Ordovician.	Ogwen Group Bedrock.	Nant Ffrancon Subgroups – Cataclasite, Ironstone and Siltstone.
Central – the town of Porthmadog.	Quaternary.	Superficial Deposits.	Alluvium – Clay, Silt, Sand and Gravel fluvial deposits.
	Ordovician.	Ogwen Group Bedrock.	Nant Ffrancon Subgroups – Cataclasite and Siltstone.
East – from the eastern perimeter of Porthmadog town to Garth CSEC.	Quaternary.	Superficial Deposits.	Alluvium – Clay, Silt, Sand and Gravel fluvial deposits.
	Ordovician.	Ogwen Group Bedrock.	Nant Ffrancon Subgroup – Siltstone.
		Tremadoc Series Bedrock.	Dol-cyn-afon Formation.

Artificial Deposits

- 7.5.7 Two records of Artificial Deposits (Made Ground) are shown on the BGS GeoIndex (Ref 7.43) and Groundsure GIS data (Ref 7.50) within the Glaslyn works site. One is associated with Cerrigduon Sewage Treatment Site, Porthmadog, LL49 9PQ, east of Snowdon Street and south of the A487 Porthmadog Bypass (on Grid Reference SH 57463 39063). The second is towards the east of the proposed works associated with Penrhyndeudraeth Quarry (Grid Reference SH 59336 38674).
- 7.5.8 It is anticipated that where the proposed works cross existing infrastructure such as the A498 Porthmadog Bypass, railway lines, A487 and in the vicinity of residential and commercial properties that Made Ground or Artificial Deposits are likely to be encountered.

- 7.5.9 Made Ground (topsoil and subsoil) may be present, likely in the form of reworked natural strata and cement bound sand (CBS) associated with the installation of the existing underground cables. The existing cables are buried on average between 0.9 – 1.2 m below ground level (m bgl).

Alluvium

- 7.5.10 Alluvium underlies the entire Glaslyn works site. These deposits are derived from a river dominant environment depositing sand and gravel in channels to form river terrace deposits with the finer silt and clay material forming floodplain alluvium.
- 7.5.11 A previous site investigation carried out by ESG on behalf of AMEC Transmission and Distribution in June 2014 (Ref 7.51) indicates presence of alluvial deposits between 0.50 m bgl and 10.0 m bgl (depth to bedrock was not proven) comprising clay, silt and sand in the area between Wern and the Welsh Highland Heritage Railway.

Till

- 7.5.12 Till deposits are recorded on BGS Mapping (Ref 7.41) and Groundsure GIS data (Ref 7.50) at the western extent of the Glaslyn works site at the existing Wern CSEC. Till (also known as Boulder Clay) is described by BGS (Ref 7.41) as sorted and unstratified drift, generally over consolidated. It consists of a heterogeneous mixture of clay, sand, gravel, and boulders varying widely in size and shape (diamicton). There is the potential that Till deposits underlie Alluvium across the Glaslyn works site.

Head

- 7.5.13 Head deposits are undifferentiated deposits comprising of clay, silt, sand and gravel. These are recorded to underlie a very small section of the Glaslyn works site, east of Garth CSEC. No other Head deposits have been identified on the mapping within the Glaslyn works site.

Bedrock Geology

- 7.5.14 At the western extent of the Glaslyn works site at the existing Wern CSEC, bedrock consists of a succession of Dolgellau Formation, Ffestiniog Flags Formation and Dol-cyn-afon Formation. Travelling eastward from Wern CSEC for approximately 1.5 km, the Glaslyn works site are underlain by the Dol-cyn-afon Formation. The bedrock geology for the central section of the Glaslyn works site for a distance of 0.87 km is that of the Nant Ffrancon Subgroup (cataclasite). Travelling further eastward for approximately 1.9 km the bedrock geology of the east area of the Glaslyn works site consists of Nant Ffrancon siltstone. The remainder of the area towards the eastern extent to Minffordd/Garth CSEC consists of the Dol-cyn-afon Formation.
- 7.5.15 A description of each named bedrock geological formations as described in BGS GeoIndex Online Mapping Service (Ref 7.41) across the Glaslyn works site is described below in geological timescale.

Ffestiniog Flag Formation

- 7.5.16 Ffestiniog Flag Formation consist of regular alternations of dark grey, massive, poorly laminated mudstone and paler grey, quartzose siltstone and sandstone. The latter occur in beds, up to 2 m thick, which, with the intervening mudstones, give rise to a distinctive scarp and slack topography. The Ffestiniog Flags Formation ranges in thickness from 475 m to 650 m.

- 7.5.17 The mudstones consist of fine sericite, chlorite and muscovite with scattered chlorite-mica stacks and disseminated pyrite. The sandstones are mainly quartzose, well sorted and fine to medium grained. Their top and bottom contacts are sharp. Cross-lamination, ripple-drift lamination and scour-and-fill structures, indicative of high-energy environments, are common throughout.

Dolgellau Formation

- 7.5.18 The Dolgellau Formation, which range from 35 – 60 m thickness, consists of dark grey to black, carbonaceous and pyritous mudstones, generally thinly laminated, which mark a major change in sedimentation. Thin sandstone beds are rare; large carbonate nodules and small phosphate nodules occur locally.
- 7.5.19 The mudstones of the Dolgellau Formation comprise very fine chlorite and sericite with phosphate nodules, opaque carbonaceous grains and framboidal pyrite. The beds are finely laminated with up to 25 to 30 laminae per centimetre; bioturbation is generally absent. The base of the formation is marked by dark grey to black mudstones with pale siltstone laminae and it weathers distinctively ('fingerstall bed'). A source of radioactivity was noted as uranium in the phosphate nodules and it is enriched in the dark mudstone bands. Chemical analyses showed uranium contents of 17 ppm in the black mudstones and up to 60ppm in the basal beds at Ogof-Ddu, near Criccieth to the west. These values are higher than average uranium concentrations recorded within mudstones (1 – 5 ppm). The Dolgellau Formation may be encountered at the Wern CSEC if piled foundations are required for proposed structures and the overlying bedrock of Dol-cyn-afon Formation proves to be thin or not adequately competent.

Dol-cyn-afon Formation

- 7.5.20 The Dol-cyn-afon Formation outcrops above the Dolgellau Formation at the eastern and western section of the proposed works at Wern CSEC to east of the A498 and from the crossing of the A487 Porthmadog Bypass and Cambrian Railway Line to Garth. It comprises deposits of mudstone and siltstone, formed within open sea environments approximately 479 to 488 million years ago.

Nant Ffrancon Subgroup

- 7.5.21 The Nant Ffrancon Subgroup is described predominately as a siltstone and is in the middle of the Glaslyn works site (approximately 230 m east of where the proposed works crosses the A498 to approximately 100 m south of where it crosses the A487 Porthmadog Bypass and Cambrian Railway Line). There is an approximate 680 m wide horizon of breccia in the very west of the formation. This subgroup formed approximately 451 to 479 million years ago in the Ordovician Period and is dominated by a shallow sea environment.

Faults & Linear Features

- 7.5.22 The published 1:50,000 scale geological map of the area (sheet 119 – Snowdon) (Ref 7.38) indicates a slide breccia which separates the Nant Ffrancon subgroup unconformably from the underlying Dol-cyn-afon Formation. This horizon of breccia trends north-west to south-east with the hanging wall to the north-east. Within the hanging wall there are several pods of ooidal ironstone.
- 7.5.23 There are two faults which cross the proposed works east of Porthmadog harbour. They are both unnamed and trend in a north-south direction with downthrows to the west.

- 7.5.24 There are other faults close to the proposed works which predominantly trend north-west to south-east to the west of the Glaslyn works site and north south trending to the east.

Historical BGS Borehole Logs

- 7.5.25 The BGS holds numerous historical records of boreholes within the vicinity of the proposed works. There are eighty historical boreholes within the study area. The records reviewed have limited geological descriptions, a summary of which is in **Tables 7-2** and **Table 7-3**. Locations of historical boreholes are shown on **Figure 4.7.5**. The logs the boreholes terminated before the base of the bedrock was proven.

Table 7-2 – Summary of BGS Geo Index boreholes

Section	BGS boreholes
West– from Wern CSEC to the western perimeter of the town of Porthmadog.	Fourteen. existing boreholes within and adjacent to the Study Area (SH53NE49, NE48, NE47, NE46, NE45, NE44, NE43; SH53NE80, NE81, NE82, NE83, NE84, NE85, NE86). Only SH53NE83 is noted within the Glaslyn works site.
Central – the town of Porthmadog.	Twenty-one existing boreholes within the Study Area (SH53NE32 to NE42, SH53NE79 to NE70). Only SH53NE42, NE79, NE78, NE40, NE76 to NE71, NE39 to NE33 are noted within the Glaslyn works site.
East – from the eastern perimeter of Porthmadog town to Garth CSEC.	Forty-five existing boreholes within the Study Area (SH53NE69 to NE50, SH53NE31 to NE7). Only SH53N69, NE61, NE26 are noted within the Glaslyn works site.

Table 7-3 – Summary of BGS Geo Index borehole geology

Stratum Type	Description
Artificial Ground	Made ground was recorded in SH53NE43 at 0.80 m bgl described as firm mid brown slightly sandy (fine) clayey silt with a little subangular to subrounded fine and medium gravel and occasional fine rootlets.
Glacial Till	Light to dark grey fine to coarse grained slightly weathered calcareous quartzite and mudstone angular fine to coarse mudstone gravel.
Alluvium	Medium dense green-grey slightly silty fine and medium sand.
Superficial	Firm, dark brown silty clay. Loose locally medium dense grey mottled orange-brown silty fine and medium sand. Very dense dark grey slightly sandy (medium to coarse) angular to subrounded fine to coarse gravel.
Bedrock	Bedrock was not encountered in any of the borehole locations in Table 7-2 , (borehole depths reached 50 m bgl) apart from BH

SH53NE15 at the eastern end of the proposed works where Upper Cambrian mudstone was encountered at 17.30 m bgl. Described as dark grey very thin bedded moderately weathered cleaved mudstone.

Ground Stability

7.5.26 Ground stability across the Glaslyn works site is recorded in the Groundsure GIS data (Ref 7.42) as follows:

- Collapsible Ground Stability – shown at the western extent of the Wern CSEC and the eastern extent Minffordd and Garth CSECs; along the northern perimeter of Ysgol Eifionydd Secondary School, a settlement north-west of Pensyflog (co-ordinates 52.9336, -4.1415); the Tremadog Roundabout; and the southern section of the A498 where it joins A497.
- Compressible Ground Stability – compressibility and uneven settlement hazards have not been identified but are probably present across the Glaslyn works site. Land use should consider specifically the compressibility and variability of the proposed works.
- Ground Dissolution Stability – soluble rocks are either not thought to be present within the ground across the Glaslyn works site, or not prone to dissolution and dissolution features are unlikely to be present.
- Landslide Ground Stability – the proposed works should consider slope instability problems may be present or anticipated. Site investigation should consider specifically the slope stability of the Glaslyn works site. Slope instability problems are probably present or have occurred in the past. Land use should consider specifically the stability of the Glaslyn works site along the western edge.
- Running Sand Ground Stability – running sand conditions may be present across the Glaslyn works site. Constraints may apply to land uses involving excavation or the addition or removal of water.
- Shrinking or Swelling Clay Ground Stability – ground conditions across the Glaslyn works site are predominantly low plasticity.

Soils

7.5.27 Information on soil associations is derived from Cranfield Environment Centre Land Information System (LandIS) (Ref 7.56). This is the most detailed available soils mapping covering England and Wales and is produced from survey data from the Soil Survey of England and Wales. LandIS National Soil Map mapping (Ref 7.56) was obtained at an early stage of the assessment but is not licensed for reproduction. It identified three soil associations within the Study Area: Saline 1 soils of variable texture flooded by high tides; well drained fine loamy or fine silty Manod soils; and deep stoneless silty and fine sandy Rockcliffe soils, as described in **Section 7.4**. Reference to 'unripe' soils relates to generally wet to saturated muds and alluvium with no soil development.

7.5.28 The soil associations' susceptibility to wind and water erosion, as determined from Knox *et al.*, (2015) (Ref 7.57) indicate the three soil associations are at 'very small' to 'small' risk of water and wind erosion and can be effectively managed and protected using standard guidance and best practice measures.

Table 7-4 – Soils associations within the Study Area

Soil association	Geology	Soil type	Soil characteristics	Wetness class
Saline 1	Marine alluvium	Unripened gley soils	Soils of variable texture flooded by high tides. Many are soft and unripened, others, often on higher sites or of sandy texture, are firm and ripened. Frequently calcareous.	Dendritic creek system channels much of the tidewater but when creeks overflow, the silt-laden waters are partially checked by the vegetation and coarse textured material is deposited, forming low banks or levees.
Manod	Palaeozoic slate, mudstone and siltstone	Typical brown podzolic soils	Well drained fine loamy or fine silty soils over rock. Shallow soils in places. Bare rock locally. Steep slopes common.	The soils are permeable and well drained (Wetness Class I) but because of the climate, the soils remain moist throughout most years.
Rockcliffe	Marine alluvium	Typical alluvial gley soils	Deep stoneless silty and fine sandy soils.	The soils are well drained (Wetness Class I) in this intensively pumped area and respond well to underdrainage because of their permeable subsoil.

7.5.29 LandIS soilsclapes information (Ref 7.56) identifies that the soil types in the western section, from Wern CSEC to the western perimeter of the town of Porthmadog, are loamy and clayey soils within the coastal flats with naturally high groundwater. The soils of the central section at Porthmadog are freely draining acid loamy soils over rock. This is repeated at the Minffordd and Garth CSEC, having crossed saltmarsh soils.

Sites Designated for Geodiversity Interest

7.5.30 There are two geological SSSIs close to the west of the Glaslyn works site. The Ty'n Llan SSSI lies approximately 50 m north-west of the Glaslyn works site and Wern Road Section SSSI is approximately 120 m south of the Glaslyn works site, along the A497.

7.5.31 One RIGS has been identified within 1 km of the Glaslyn works site. This relates to the Tremadog Ironstone Mine 396 m to the north of the Glaslyn works site at National Grid Reference 255627, 340251. As this does not fall within the Study Area it has not been considered further.

- 7.5.32 There are other sites of interest close to but outside of the Glaslyn works site which comprise SACs, NNRs, National Parks and Ancient Woodland. These are discussed further in **Chapter 5: Ecology and Nature Conservation**.

Mineral Safeguarding Areas

- 7.5.33 The sterilisation of minerals occurs when other non-minerals developments take place on, or close to, mineral deposits and render them incapable of being extracted.
- 7.5.34 The Joint Local Development Plan 2017 (Ref 4.11) indicates that *‘Safeguarding policies will be required to ensure that mineral resources which may be needed at some time in future are not sterilised by other forms of development, without consideration of that need. A decision to safeguard a particular mineral resource does not imply that planning permission will be granted for its working. The method of identification of the MSA will need to be explained and justified and the MSA’s shown on the Proposals Maps.’*
- 7.5.35 Paragraph 5.14.7 of PPW (Ref 4.5) states that; *‘It is important that access to mineral resources, including secondary, recycled and marine dredged materials, which society may need, as well as the minerals related infrastructure to deliver this need, is safeguarded in order to prevent sterilisation by other forms of permanent development. Planning authorities should consider the long term and the need for preventative action to avoid the creation of problems in the future. Safeguarding does not indicate an acceptance of mineral working, but that the location and quality of the mineral is known and that the environmental constraints associated with extraction, including the potential for extraction of mineral resources prior to undertaking other forms of development, have been considered.’*
- 7.5.36 Sandstone, slate and igneous rocks have been identified across the Glaslyn works site. Whilst the extraction of these resources may not be currently viable for reasons of price, geology, quality and previous extractive work, this situation may change, and they may be required at some point in the future. The spatial extent of these deep and shallow resources, excluding certain areas of constraint, are identified as safeguarding areas.
- 7.5.37 The BGS North West Wales Aggregates Safeguarding Map of Wales (Ref 7.58) has been reviewed for aggregate safeguarding areas and has identified the following within 250 m of the Glaslyn works site are presented on **Figure 4.7.7**:
- One Category 1 Aggregate Safeguarding Area of high specification aggregate - Sandstone and Igneous rocks within the eastern end of the Glaslyn works site.
 - One Category 2 Aggregate Safeguarding Area associated with slate is in the western to central area of the Glaslyn works site.
 - One Category 2 Aggregate Safeguarding Area associated with igneous rocks is in the 250 m Study Area of the Glaslyn work site, north of the central part of the Glaslyn works site.
- 7.5.38 Category 1 is considered nationally important whilst Category 2 is considered important for regional and local markers. Of those identified, on the BGS map, only the Category 1 area at Y Garth is also denoted in the Gwynedd Council Local Development Plan as within a Mineral Site Buffer Zone (MSBZ). A Mineral Buffer Zone is defined as ‘Areas of protection around permitted and proposed mineral workings where new developments sensitive to adverse impact, including residential areas, hospitals and schools should be resisted’ in the Joint Local Development Plan 2017 (Ref 4.11).
- 7.5.39 The Joint Local Development Plan (Ref 4.11) Policy MWYN 5 Buffer Around Mineral Sites notes that ‘planning applications for mineral extraction within the buffer zones

identified on the Proposals Map will not normally be permitted unless a new buffer zone can be provided to reflect the minimum distances referred to in MTAN 1:Aggregates, unless there are and justifiable reasons for reducing the distance’.

Historical and Current Mineral Surface Ground Workings, Quarrying and Mining

- 7.5.40 There is one historical mineral planning area identified on the Groundsure GIS data within 250 m of the Glaslyn works site at Breedon Minffordd Quarry and Asphalt Plant.

Non-Coal Mining

- 7.5.41 Across the Glaslyn works site underground mine workings may have occurred in the past or current mines may be working at significant depth to modern engineering standards.
- 7.5.42 There are five locations within the Study Area which are noted as known to have underground mining or considered likely within or very close to the proposed works. These are as follows:
- West of Pensyflog residential area, around the Welsh Highland Heritage Railway.
 - Clwb Chwaraeon Madog Sports Club.
 - North of the Porthmadog Roundabout where the A4971 High Street joins the A487 at Bodawen Nursing Home.
 - North of the A487 Porthmadog at Ysbyty Alltwen NHS.
 - Ysgol Eifionydd Secondary School.
- 7.5.43 There are two locations identified as Class D mineral veins. The locations of the mineral veins are:
- South of Bodawen, to the east of the A4971 High Street.
 - Where the proposed works crosses Pensyflog to the south of the Glaslyn works site.
- 7.5.44 Class E mineral vein associated with ironstone deposits areas have been identified within the two Class D locations identified above, one of which just crosses into the Glaslyn works site.
- 7.5.45 The above indicates locations where underground mining is known to have occurred within the Study Area. It is noted that the locations, noted as having been mined, are typically associated with outcrops of bedrock material, which in some cases are noted as ‘Ynys’ (island), and that the thickness of Alluvium deposits along the underground cable route is significant (circa 30 m). See further details in Section 7.9, ‘Ground Investigation’.

Coal Mining

- 7.5.46 The Mining Remediation Authority Map Viewer (Ref 7.45) does not show the Glaslyn proposed works site to be in a coal mining reporting area.

Surface Ground Workings

- 7.5.47 Surface ground workings are shown to be present on the Groundsure GIS data (Ref 7.50) at 10 locations either on, directly adjacent to or within the Glaslyn works site. These are summarised in **Table 7-5**.

Table 7-5 – Summary of surface ground workings

Location	Date	Description	Approx location to the Glaslyn works site
West	1887	Unspecified Pit.	On the Glaslyn works site boundary.
	1953	Pond.	Approx 35 m west of Butlers Cottage on the western Glaslyn works site boundary.
	1953	Unspecified ground workings.	Adjacent to Glaslyn works site, north of Butlers Cottage.
	1953	Sewage Filters.	South of Tremadog and south approximately 60 m of the A487 Porthmadog Bypass.
Porthmadog	1887	Unspecified pit.	Approx 40 m north of Porthmadog Roundabout.
	1960	Unspecified pit.	Directly adjacent to Welsh Highland Heritage Railway north of the sewage works.
	1975	Sewage works.	Chapel Street Porthmadog.
East	1888	Pond.	Adjacent to A487 Porthmadog Bypass.
	1913 - 1975	Breedon Minffordd Quarry and Asphalt Plant.	Adjacent to A487 Porthmadog Bypass.
	1888	Water body.	South-west of Quarry crosses over the Glaslyn works site.
	1975	Sewage works.	Adjacent to Glaslyn works site on eastern side of proposed works.
	1913	Cemetery.	Adjacent to the south-eastern side of the Glaslyn works site.

Hydrogeology

7.5.48 The Study Area for 'Hydrogeology' is within 250 m of the Glaslyn works site.

7.5.49 Hydrogeology within the Glaslyn works site and within the 250 m Study Area are shown on **Figure 4.7.3**. Aquifers within the Study Area are summarised in **Table 7-6**.

Table 7-6 – Summary of aquifers across the proposed works

Stratum	Description	Aquifer designation
Superficial deposits	Alluvium.	Secondary A.
	Till.	Undifferentiated.
	Head.	Unproductive.
Bedrock	Ffestiniog Flags Formation.	Secondary B.
	Dolgellau Formation.	
	Dol-cyn-afon Formation.	
	Nant Ffrancon Subgroup.	

Groundwater Vulnerability

- 7.5.50 The BGS Geoindex (Ref 7.43) identifies the superficial deposits across the whole Glaslyn proposed works as being high vulnerability for the Secondary A aquifer and medium sensitivity for the undifferentiated and unproductive aquifers. The secondary B bedrock aquifers, beneath the whole Glaslyn proposed works, have medium vulnerability.
- 7.5.51 The BGS indicate that groundwater vulnerability identified as high relates to areas that can easily transmit pollution to groundwater which are characterised by high-leaching soils and the absence of low-permeability superficial deposits. Medium vulnerability relates to areas that offer some groundwater protection.

Source Protection Zones

- 7.5.52 The Study Area for SPZ is a 1 km radius from the Glaslyn proposed works.
- 7.5.53 There are no SPZ within 1 km of the proposed works according to Data Map Wales (Ref 5.33).

Groundwater Abstractions

- 7.5.54 No groundwater abstractions have been identified within 1 km of the Glaslyn works site.

Private Water Supplies

- 7.5.55 There are eight private water supplies that have been identified within 1 km of the Glaslyn works site based on the information supplied by Gwynedd Council. The locations are shown on **Figure 4.8.6, Volume 8, Appendix 4.8.A: Abstractions and Discharges** and the information is summarised in **Table 7.7**.

Table 7-7 – Summary of private water supplies across the Study Area

Area	Direction from the Glaslyn works site	Distance from Glaslyn works site	Name
West	West	Between 50 m to 100 m	Bryn Wern
	South	Between 100 m to 250 m	Fferm Penamser
	South	Between 250 m to 500 m	Hen Moelwyn Dairy
	South	Between 250 m to 500 m	Tyddyn Engan
	North	Between 500 m to 1 km	Cae Crwn
	South	Between 500 m to 1 km	Bron Y Foel
	North	Between 500 m to 1 km	Cwm Bach
Central	North	Between 500 m to 1 km	Plas Tan Yr Allt
East	No private water supplies within 1 km		

Hydrology

- 7.5.56 Hydrological conditions are detailed in **Chapter 8: Water Quality, Resources and Flood Risk**.

Ground Investigation Information

EGS Factual Report on Ground Investigation – June 2014 (Ref 7.51)

- 7.5.57 ESG were commissioned by AMEC T & D to undertake an intrusive ground investigation in 2014 for the Front End Engineering Design for a proposed replacement cables route between Wern and Garth (the project did not take place).
- 7.5.58 The ground investigation was carried out between March and May 2014, comprising eight cable percussion boreholes, 46 trial pits and 21 dynamic sample locations.
- 7.5.59 Ground conditions comprised Topsoil overlying Alluvium which typically comprised predominantly sand or clay. Made Ground was present at the surface within 14 exploratory holes ranging from 0.2 m to 0.9 m thickness. No evidence of contamination was identified on the exploratory hole logs provided.
- 7.5.60 Geotechnical and geo-environmental laboratory testing was carried out. Geo-environmental testing was carried out on 15 soil samples at 0.5 m depth from Alluvium except for one sample of Made Ground. Samples were tested for a range of potential contaminants based on metals, asbestos, cyanide, phenols, sulphate, polyaromatic hydrocarbons, petroleum hydrocarbons, benzene, toluene, ethyl benzene, methyl tert-butyl ether and xylenes.
- 7.5.61 Five soil samples were submitted for waste acceptance criteria (WAC) testing all from the Alluvium at 0.5 m depth.
- 7.5.62 The ESG report does not include an assessment of the chemical testing results. However, a high-level review of the available chemical analysis indicates that the

majority of determinants tested were below the laboratory limit of detection or present at low concentrations. Higher concentrations of petroleum hydrocarbons (as TPH >C10-C40) were obtained from soil samples from SI02 at 0.5 m bgl (Alluvium) at 171 mg/kg and SI01 at 0.9 m bgl (possible alluvial gravel) at 1540 mg/kg. Both samples were collected at the western end of the proposed cable route, near the Wern CSEC.

- 7.5.63 One sample (SI14 at 0.5 m bgl) screened positive by the laboratory for asbestos with amosite free fibres identified from probable alluvial sand. SI14 was in fields to the north-west of Porthmadog, close to the A498. No asbestos quantification testing was carried out on this sample.
- 7.5.64 The leachate results from the WAC testing showed some elevated concentrations of metals, in particular arsenic, copper, lead and zinc, when compared to published water quality criteria.
- 7.5.65 No ground gas or groundwater level monitoring or groundwater analysis was carried out as part of the investigation. ESG indicate that monitoring wells were installed in several holes but were decommissioned on the instructions of AMEC prior to any monitoring being carried out.

SOCOTEC Ground Investigation Report (Factual Account of Fieldwork, Monitoring And Laboratory Testing) – December 2023 (Ref 7.53)

- 7.5.66 SOCOTEC was commissioned by Murphy Group Ltd on behalf of National Grid to carry out a ground investigation across the full length of the Glaslyn Cables Route. The purpose of the investigation was to provide geotechnical and geoenvironmental data to aid the design of replacing the existing underground Glaslyn cables.
- 7.5.67 The ground investigation was carried out between Wern and Minffordd comprising 25 cable percussion boreholes (to 2.2 m to 20.45 m bgl), nine machine excavated trial pits (1.2 m to 3 m bgl) and 13 monitoring pits (to 1.2 m bgl) for subsequent CPTs.
- 7.5.68 Permeability testing was also carried out within the alluvium with results ranging from 1.2×10^{-3} to 8.5×10^{-6} m/s.
- 7.5.69 Ground conditions were reported as follows:
 - Topsoil was present in all locations except ABH06 (approximately 150 m south of A487, west of Lon Y Traeth) and ABH07, (approximately 180 m south of A487, east of Ysgol Eifionydd Playground).
 - Made ground only was encountered in localised areas (ABH06, ABH06A, ABH07) up to 1.2 m thick north-east of Porthmadog to the south of the A487 Porthmadog Bypass (see **Figure 4.7.1**).
 - Alluvium was present in all boreholes and trial pits comprising variable thickness and quantities of silt, sand and/or clay.
 - There was a thin layer of pseudo-fibrous peat present in ATP01 (0.15 m thick).
 - Siltstone and mudstone bedrock was not proved in all locations.
- 7.5.70 Ground gas and groundwater instrumentation was installed in selected boreholes. SOCOTEC indicate that monitoring will be carried out on a monthly basis for 12 months. Two sets of readings were provided in the SOCOTEC report from the 06 November and 04/05 December 2022. Gas monitoring data is only provided for four wells (ABH06A, ABH13, ABH16, ABH21).

- 7.5.71 Geotechnical and geo-environmental laboratory testing was carried out. Geo-environmental testing was undertaken on 19 samples for the following determinands:
- Metals.
 - pH.
 - Sulphate.
 - Asbestos (screen).
 - Petroleum hydrocarbons (screen).
 - Phenols.
 - Cyanide.
 - Organic matter.
 - WAC testing (seven samples).
- 7.5.72 No interpretation of the chemical testing data was provided by SOCOTEC.
- 7.5.73 A preliminary review indicates the majority of soil testing results are low except for metals in made ground from ABH07 at 0.5 m depth and alluvium in ABH12 at 0.5 m. Lead in ABH07 at 0.5 m slightly exceeds the human health assessment criteria for public open spaces but not for a commercial land use.
- 7.5.74 No asbestos was detected by the laboratory on the soil samples received.
- 7.5.75 Results obtained for contaminants in leachate from the seven soil samples scheduled for WAC testing were low.
- 7.5.76 The results obtained from the ground gas monitoring data provided are low.
- Geotechnical Engineering Limited (GEL) Glaslyn Cable Uprating Factual Ground Investigation Report. Report Ref:38141. Document Number: GLAS-GEO-ZZ-RP-X-0001. November 2024
- 7.5.77 GEL, commissioned by J. Murphy & Sons Ltd, undertook a ground investigation along the Glaslyn Cable Uprating route between 23 April 2024 and 20 June 2024. The GI was required to inform design for new HDD locations and access road bridge structures along the route.
- 7.5.78 The GI comprised fifteen boreholes (15.45 to 35.45m bgl), forty inspection pits (to 1.30m bgl), forty-nine cone penetration tests (2.66 to 49.94m bgl) and forty-one dynamic cone penetrometer tests (0.04 to 1.6m bgl).
- 7.5.79 Permeability testing was also carried out within the alluvium with results ranging from 7.4×10^{-6} to 1.2×10^{-6} m/s. Insufficient water take was recorded for some tests where the permeability could not be calculated.
- 7.5.80 Made Ground was recorded in one location only ACPT46-Pit (0 – 0.40m bgl) in a field at a proposed watercourse crossing to the north-east of Ysgol Eifionydd, Porthmadog. Material consistent with Alluvium superficial deposits was encountered in all locations to depths between 14.5m bgl and 35.45+m bgl across the length of the proposed works. Bedrock was encountered in ABH30 at 27.2m bgl, ABH32 at 5.3m bgl, ABH36 at 18.9m bgl, ABH43 at 14.5m bgl (all siltstone) and ABH44 at 15m bgl (mudstone).
- 7.5.81 There are no observations of visual or olfactory evidence of potential contamination within the exploratory hole logs.

- 7.5.82 Water strikes were recorded in all boreholes at shallow depths of 0.9m bgl to 2.2m bgl across the route. Groundwater levels were monitored at ABH30, ABH32 and ABH38 with groundwater recorded at 0.66m to 1.01m bgl, 0.20m to 0.40m bgl and 1.15m to 1.50m bgl, respectively.
- 7.5.83 Fifty-two soil samples were tested for soil aggressivity parameters and loss on ignition.

Unexploded Ordnance

- 7.5.84 Online Zetica UXO risk mapping (Ref 7.43) shows “Low Risk” for the whole Study Area.
- 7.5.85 The Preliminary UXO assessment provided within the Arup desk study in April 2023 (Ref 7.54) concluded there is a potential risk from UXO associated with the following and a detailed UXO assessment was recommended:
- Rifle Ranges – two former rifle ranges.
 - World War 1 era army camp – Porthmadoc Army camp I.
 - World War 1 era army camp – Porthmadoc Army camp II.
- 7.5.86 The army camps and one of the rifle ranges were to the north-east (camp I) and east (camp II and rifle range) of Porthmadog. Arup indicate the location of the second rifle range is unclear, although they considered it was likely to have been in general vicinity of the Army camps and railway line.
- 7.5.87 A detailed UXO threat and risk assessment was prepared by 6Alpha Associates in July 2023 (Ref 7.55). The majority of the area was considered low risk except for the area immediately north-east of Porthmadog to Afon Glaslyn which was assessed as medium risk from accidental dumping, land service ammunition and small arms ammunition due to World War 1 British military camps and rifle range. Appropriate mitigation comprises UXO emergency response plan, UXO safety awareness briefing and an on-call Explosive Ordnance Disposal engineer.

Landfilling

- 7.5.88 From a review of the Groundsure GIS data (Ref 7.50) there are no active or recent landfill sites within the Study Area.
- 7.5.89 There is one historical landfill site approximately 250 m north of Clwb Chwaraeon Madog indicated on the Groundsure GIS data (Ref 7.50). The name of the landfill is Y Traeth which accepted household waste. No further details were available.

Waste Sites

- 7.5.90 There is one Historical Waste Site identified on the Groundsure GIS data (Ref 7.50) within the Study Area. The Recycling Facility, at Gelert House, Ffordd Penamser, Porthmadog is approximately 250 m south of the Glaslyn works site.

Ground Gas

- 7.5.91 No significant potential sources of ground gas have been identified.
- 7.5.92 The potential for gas generation has been assessed based on the possible sources identified using guidance provided in BS 8576. Alluvium has been identified, mapped across limited areas of the Glaslyn proposed works. BS 8576 indicates that natural soil strata such as alluvium with a low degradable organic content would have a very low gas generation. Made Ground is likely to be present at the Site (albeit anticipated to be

limited in thickness) which is anticipated to have a low degradable organic carbon and represent a very low gas generation potential.

Radon

- 7.5.93 From a review of the Groundsure GIS (Ref 7.50), the majority of the proposed works is not within a radon affected area, as between 0 and 1 % of properties are above the Action Level. However, in small sections at Pont Penamser, Pensyflog and Minffordd this increases to between 1 and 3 % of properties being above the Action Level and to between 3 and 5 % at Garth CSEC. Basic radon protective measures may be necessary where 3-5% are above the action level in accordance with BR211 (Ref 7.59).

Regulated Activities

- 7.5.94 Recorded in the Groundsure GIS data (Ref 7.50) there are 20 Licensed Discharge Consents to Controlled Waters within the Study Area. Thirteen are current and effective, five are expired, and two have been revoked. Three expired in 1983, two expired in 1985, and two were revoked in 1965 and 1995. The 13 current licensed discharge consents to controlled waters are summarised in **Table 7-8**.

Table 7-8 – Summary of current licensed discharge consents to controlled waters

Area	Direction from the Glaslyn works site	Distance from the Glaslyn works site	Effluent type description
West	South-east	Between 50 m and 100 m	Sewage Discharges (Not Water Company).
	North-east	Between 100 m and 250 m	Sewage discharges – sewer storm overflow - Water Company.
Central	North	Between 100 m and 250 m	Bodawen Nursing Home. Sewage discharges – final/treated effluent – not Water company.
	North	Between 50 m and 100 m	Bodawen Nursing Home. Sewage discharges – final/treated effluent – not Water company.
	South-west	Within 50 m	Snowden Street Pumping Station (PS). Sewage discharges – sewer storm overflow – Water company.
	South-west	Within 50 m	Snowden Street PS. Sewage discharges – pumping station – Water company.
	South-west	Within 50 m	Bakers Lane.

Area	Direction from the Glaslyn works site	Distance from the Glaslyn works site	Effluent type description
			Sewage discharges – sewer storm overflow – Water company.
	South	Within 50 m	Chapel Street/Madog Street. Sewage discharges – sewer storm overflow – Water company.
	Central	Within the Glaslyn works site	Ty Bricks Caravan Park. Sewage discharges – final/treated effluent -not Water company.
	South	Between 100 m and 250 m	Porthmadog STW Storm Storage Port. Sewage discharges – Pumping Station – Water Company.
	South	100 m	Porthmadog Wastewater Treatment Plant. Sewage discharges – final/treated effluent – Water company.
East	North	Between 100 m to 250 m	Minffordd Quarry. Trade discharges – site drainage (contaminated surface water not waste).
	North	Between 100 m to 250 m	Minffordd Quarry. Sewage discharges – final/treated effluent – not Water company.

7.5.95 There are two current Licensed Pollutant Release Part A2 B records on the Groundsure GIS data (Ref 7.50) between 100 m and 250 m of the whole Study Area. These are summarised below:

- Tesco Filling Station, Tesco 4095, Stryd Fawr, Porthmadog, Gwynedd, LL49 9NU, for unloading of petrol into storage at Service Stations.
- Hanson Aggregates Premix, Minffordd Plant, Minffordd, Penrhyndeudraeth, LL48 6HP, for use of bulk cement.

Pollution Incidents

7.5.96 Within the Groundsure data (Ref 7.50) there are 16 records of pollution incidents within the Study Area. These are summarised in **Table 7-9**.

Table 7-9 – Summary of pollution incidents

Area	Direction from the Glaslyn works site	Distance from the Glaslyn works site	Pollutant
West	North-west	Between 100 m and 250 m	Construction and demolition materials and wastes. Category 4 no impact.
	North	Between 50 m and 100 m	Crude sewage. Category 3 minor.
	South	Between 100m and 250m	Specific waste materials. Category 3 minor.
	North	Between 100 m and 250 m	Crude sewage. Category 3 minor.
	North	Between 100 m and 250 m	Grey water. Category 3 minor.
	North	Between 100 m and 250 m	Petrol. Category 3 minor.
Central	Central	50 m	General biodegradable material or waste. Category 3 minor.
	South	Up to 50 m	Grey water. Category 3 minor.
	South	250 m	Storm sewage. Category 2 significant.
East	South	Between 50 m and 100 m	Slurry and dilute slurry. Category 3 minor.
	South	Between 50 m and 100 m	Gas and fuel oils. Category 3 minor.
	South-east	Between 250 m and 500 m	Other pollutant. Category 4 no impact.
	East	Between 250 m and 500 m	Crude sewage. Category 3 minor.

Environmental Designated Sensitivities

- 7.5.97 A review of currently available information on MAGIC (Ref 7.48) and from Gwynedd Council did not identify any Ramsar sites, NNR, SPA or LNR in 250 m of the Glaslyn proposed works site.
- 7.5.98 Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC, Glaslyn SSSI and Ysbyty Bron y Garth SSSI are located within the Glaslyn works site and 250 m Study Area. Tyn-Llan SSSI and Wern Road Section SSSI are located within the Study Area in the western extent.
- 7.5.99 There are a number of WS, cWS and ancient woodland within the Glaslyn works site and 250 m Study Area as detailed further in Section 5.

Site History

- 7.5.100 Online mapping (Ref 7.60) from 1842 to 1952 shows the west side of the Glaslyn proposed works is predominantly fields and occasional areas of woodland. The Nant yr Afon oer runs along the northern boundary of this western section of the Glaslyn works site. The Great Western Railway is shown between 250 m and 500 m of the southern Glaslyn works site.
- 7.5.101 In the central area of Glaslyn proposed works the town of Porthmadog is shown on the online mapping (Ref 7.60). In addition, sewage filter beds approximately between 250 m and 500 m are shown north of the Glaslyn works site. Between 100 m and 250 m there is a railway station and railway. Allotment gardens are shown 50 m south of the Glaslyn works site. South of the Glaslyn works site in the central section of Glaslyn proposed works there is the Croesor Tramway which is shown within 50 m east of the Glaslyn works site.
- 7.5.102 Online mapping (Ref 7.60) for the eastern section of Glaslyn proposed works 1842 to 1952 shows a rifle range 50 m south of the Glaslyn works site and a tank is depicted north of the rifle range (approximately 50 m). Through the centre of the eastern section runs the Ffestiniog Railway Line. There is shown a cemetery approximately 50 m east of the Glaslyn works site. An old quarry is shown 500 m east of the Glaslyn works site. The Minffordd and Garth quarry lies between 100 m and 250 m north of the Glaslyn works site. Occasional residential dwellings, fields, pastureland, sand and mud from the peninsula are also shown on the mapping.

Current Industrial Land Uses

- 7.5.103 Current industrial land uses in the Study Area include:
- West – Tanks, slurry bed, vehicle repair shop and pylons.
 - Central – Welsh Highland Heritage Railway, Ffestiniog Railway, sewage works, unspecified factories, garages, electricity Substation, haulage company and a fire station.
 - East – Garth Quarry and associated infrastructure and pylons.

Information from Statutory Authorities

Contaminated Land Records

- 7.5.104 There are several examples of potentially contaminative land uses noted present within 250 m of the Glaslyn works site predominantly around the central area Porthmadog; these include ambulance and fire station, farming processes, heritage railway, petrol stations, industrial tanks, stone quarrying, textiles, vehicle repair testing and servicing, travelling cranes and gantries, waste storage processing and disposal, water pumping station and unspecified factories.

Potential Areas of Contaminated Land

- 7.5.105 On site:
- Artificial Ground – Artificial Ground (Made Ground) is anticipated at Cerrigduon Sewage Treatment Site, east of Snowdon Street and south of the A487 Porthmadog Bypass (on Grid Reference SH 57463 39063) and towards the east of the proposed works associated with Penrhyndeudraeth Quarry (Grid Reference SH 59336 38674). Artificial Ground is also anticipated where the proposed works cross existing

infrastructure such as the A498 Porthmadog Bypass, railway lines, A487 and in the vicinity of residential and commercial properties. Made Ground was reported in two of the previous ground investigation locations between 0.2 and 0.9 m thickness, and up to 1.2 m thick north-east of Ysgol Eifionydd to the south of the A487 Porthmadog Bypass. No other locations of made ground were recorded during the ground investigations undertaken by Socotec in 2023 and GEL in 2024.

Historical Potentially Contaminative Land Uses

- 7.5.106 The Study Area has generally been in agricultural use during the course of its history, being reclaimed from the Glaslyn estuary from 1811. Isolated examples of potentially contaminative land uses are present within the Study Area and these include quarries, pits, refuse heaps, lime kilns, railway sidings, docks, smithies, tanneries, sewage works, slaughter houses, gas works, power stations, gravel pits, iron foundries, corn mills, railway and tramway sidings, cuttings, garages, and unspecified works. Two historical tanks have been identified in the Glaslyn works site, both approximately 150 m south-west from Garth CSEC.
- 7.5.107 Sewage works, sewages filters, railway sidings, have been identified in the Study Area, these are presented on **Figure 4.7.6** Historical potentially contaminated land uses are discussed further in the contaminated land risk assessment for the proposed works provided in **Volume 8, Appendix 4.7.A: Initial Conceptual Site Model and Risk Assessment**.

Current Potentially Contaminative Land Uses

- 7.5.108 The current potentially contaminative land uses in the Study Area are mainly linked to agricultural uses. However, there are potentially contaminative land uses extending to petrol stations, unspecified works, railways, tanks, fire stations and refuse tips. The proposed works cross the Welsh Highland Heritage Railway line and Ffestiniog Railway. A fire station is based 66 m south of the Glaslyn works site at Bodawen. Further details are presented in **Volume 8, Appendix 4.7.A: Initial Conceptual Site Model and Risk Assessment** and **Figure 4.7.6**.

Contaminated Land Risk Assessment

- 7.5.109 A qualitative risk assessment for contaminated land has been carried out for the construction and operational phase of the proposed works. The risk assessment assumes that standard good practices would be implemented during the works and has been used to identify where additional mitigation measures would be required.
- 7.5.110 The contaminated land risk assessment for the proposed works has been provided in **Volume 8, Appendix 4.7.A: Initial Conceptual Site Model and Risk Assessment**.
- 7.5.111 The potential risk for the proposed works is moderate to low. Where risks have been identified that may result in potentially significant environmental effects these have been brought forward into the effect assessment.

Future Baseline

- 7.5.112 The Glaslyn works site would be in predominantly agricultural or open areas of land, although it overlaps with existing land uses associated with railway lines and roads.
- 7.5.113 Although there is the potential for the baseline presented in this chapter to change over time; it is considered that the data presented provides a good representation of land use and geological, hydrogeological, land use and soil conditions at this stage of the

proposed works; and the baseline presented provides a realistic platform on which to base the impact assessment.

- 7.5.114 With respect to land contamination, any future development in the Study Area is subject to appropriate consenting regimes. This requires consideration of the potential for contamination to be present. The developer would be required to carry out remediation to ensure the development is suitable for its proposed use.
- 7.5.115 Furthermore, natural attenuation processes have the potential to mitigate risks over time from any existing sources of contaminants present in soil and groundwater.
- 7.5.116 Changes in groundwater abstractions could affect the groundwater flow regime and climate change could influence the future baseline conditions, due to changes on the rainfall regime, recharge, groundwater levels and flow. However, these changes are long-term and are not predictable at this stage.

7.6 Scope of Assessment

- 7.6.1 This section describes the scope of the assessment of effects on Geology, Hydrogeology, Land Use and Agriculture (Soils).
- 7.6.2 A number of potential effects are associated with an assumed reasonable worst case relating to potential soil and groundwater contamination for the Glaslyn works site, which have been derived by a qualitative assessment based on desk study research, iCSM and human health risk assessment presented in **Volume 8, Appendix 4.7.A: Initial Conceptual Site Model and Risk Assessment**. The ground investigations undertaken in 2023 and 2024 along the route recorded made ground in one area only to the north east of Ysgol Eifionydd. It is noted that chemical testing was limited in both ground investigations. However, apart from the Made Ground, no indication of potential contamination, visual or olfactory, was recorded during the two ground investigation works. The risks of encountering potential contamination during the construction stage will be mitigated by the adoption of a discovery strategy whereby if any contamination is discovered during the construction process work will stop until a method statement for dealing with the contamination is agreed with Gwynedd Council and NRW.
- 7.6.3 **Table 7-10** summarises the potential Geology, Hydrogeology, Land Use and Agriculture (Soils) receptors that have been reviewed and states whether they have been included or excluded from the Geology, Hydrogeology, Land Use and Agriculture (Soils) assessment. Justifications are provided where receptors have been both included and excluded from the assessment.

Table 7-10 – Scope of Geology, Hydrogeology and Land Use and Agriculture (Soils) assessment

Receptor	Scoped in/out per phase		Justification
	Construction	Operation	
Geology	In	Out	There are two geological SSSIs which are in the Glaslyn works site: the Glaslyn SSSI and the Ysbyty Bron y Garth SSSI. There is the potential for a partial loss or damage to these designated receptors during construction.

Receptor	Scoped in/out per phase		Justification
	Construction	Operation	
Construction workers	In	Out	Contamination could be present in localised areas of Made Ground. Activities relating to trenching, foundation construction, earthworks and associated transportation activities and material storage have the potential to expose construction workers to contaminants in soil, dust, vapours or groundwater excavations. Potential impacts may result from the accidental leak of fuels, oils or chemicals from plant or from stored liquids. Other impacts may also result from the use of materials and substances with polluting potential (e.g. concrete, fuel, oils and soil) which could be mobilised to ground or controlled waters. Risk of encountering UXO and unexpected contamination during excavations. Potential for impact from radon and other ground gases to buildings and enclosed structures.
Maintenance Workers	Out	In	Activities relating to routine maintenance activities have the potential to expose maintenance workers to contaminants in soil, dust, vapours or groundwater excavations. Potential impacts may result from the accidental leak of fuels, oils or chemicals from plant or from stored liquids. Other impacts may also result from the use of materials and substances with polluting potential (e.g. fuel, oils and soil) which could be mobilised to ground or controlled waters.
Surface water	In	In	The potential mobilisation of existing contamination via the exposure of soils or increases in rainwater infiltration and run-off through changes in ground cover or in excavations or bulk earthworks and stockpiling. On-site construction traffic, through compaction or erosion of the existing soils, could increase surface water run-off and the potential for erosion and transportation of sediment. Leaks or spills from existing oil filled cables. Potential impacts may result from the accidental leak of fuels, oils or chemicals from plant or from stored liquids. Other impacts may result from the use of materials and substances polluting potential (e.g. concrete, fuel, oils and soil) which have the potential to be mobilised to ground or controlled waters. During operation potential impacts that could arise

Receptor	Scoped in/out per phase		Justification
	Construction	Operation	
			include impact to soil quality, groundwater and watercourses from accidental spills from handling or leakage of fuels, lubricants and store chemicals (if required) or leaks from existing oil-filled cables. Existing areas of contamination or the importation and/or re-use of contaminated materials during construction could lead to effects during operation. The creation of preferential pathways which could result in contaminant migration through an aquiclude into an aquifer due to installation of foundations or along backfill to trenches during construction which would remain during the operation phase.
Groundwater – Secondary A aquifer	In	In	Potential for the creation of new contaminant linkages i.e. through pile foundation construction or excavations through an aquiclude into aquifers. Changes to the hydrogeological regime (e.g. dewatering activities) may impact groundwater flow, groundwater levels, abstractions or ecologically designated sites. Leaks or spills from existing oil filled cables. Potential impacts may result from the accidental leak of fuels, oils or chemicals from plant or from stored liquids. Other impacts may also result from the use of materials and substances polluting potential (e.g. concrete, fuel, oils and soil) which have the potential to be mobilised to ground or controlled waters. During operation potential impacts that could arise include impact to soil quality, groundwater and watercourses as a result of accidental spills from handling or leakage of fuels, lubricants and store chemicals (if required) or leaks from existing oil filled cables. Existing area of contamination or the importation and/or re-use of contaminated materials during construction could lead to effects during operation. The creation of preferential pathways which could result in contaminant migration through an aquiclude into an aquifer due to installation of foundations or along backfill to trenches during construction which would remain during the operation phase.
Groundwater - Secondary B Aquifer			
Groundwater – Undifferentiated Aquifer			
Groundwater – Unproductive Aquifer			
Mineral Resources	In	Out	There is a Category 1 Aggregate Safeguarding Area of high specification aggregate - Sandstone and Igneous rocks in the eastern end of the Glaslyn works site

Receptor	Scoped in/out per phase		Justification
	Construction	Operation	
Ground stability	In	Out	Changes in subsoil or rock structure or shallow groundwater that could affect ground instability.
Land Use and Agriculture (soils)	In	Out	The Minffordd CSEC including laydown areas would use areas of agricultural land, of which 0.2 ha is potentially BMV land. Localised reinstatement works for removal of surface ancillary equipment and joint bays of the existing cables will have a potential temporary effect on improved grassland. The cables will be laid through agricultural land at a greater depth than would be disturbed through normal agricultural practices (i.e. below ploughing depth) and would have no effects on land use or agriculture during operation.

7.7 Methodology

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

7.8 Potential Effects

- 7.8.1 The anticipated effects resulting from the loss or change to Geology, Hydrogeology, Land Use and Agriculture (Soils) elements and features during construction, operation and maintenance of the proposed works are outlined below.

Construction

- 7.8.2 A number of potential effects are associated with an assumed reasonable worst case relating to Geology, Hydrogeology, Land Use and Agriculture (Soils) for the proposed works, which have been derived by a qualitative assessment based on desk study. To accurately mitigate the impacts of potential contaminants, the actual nature, extent and magnitude of the presence of any significant potential contamination needs to be assessed through investigation during the construction works if contamination is encountered.
- 7.8.3 The potential effects for Geology, Hydrogeology, Land Use and Agriculture (Soils) are detailed below along with the mitigation measures and the overall residual effect and its significance.
- 7.8.4 Potential receptors in the context of the Geology, Hydrogeology, Land Use and Agriculture (Soils) assessment are geology (superficial and bedrock geology), hydrogeology (Aquifers, SPZ's and groundwater abstractions), human health (construction workers and site users), development infrastructure and soils.

- 7.8.5 The geology underlying the Glaslyn works site is classified as having a medium sensitivity.
- 7.8.6 The sources of potential Geology, Hydrogeology, Land Use and Agriculture (Soils) effects during the construction phase include:
- Groundwater and ground pollution due to chemical spillages and leaks, including from oil-filled cables.
 - Disturbance of potentially contaminated soils, sediments and waters posing a risk to construction workers, groundwater, and geology.
 - Importation of contaminated aggregates posing a potential risk to human health and underlying geology and groundwater quality.
 - Requirement to remove/reinstate spoil from construction of the buried cables posing a potential risk to human health and the environment.
 - Partial loss or damage to geological receptors during construction.
- 7.8.7 The anticipated effects resulting from the loss or change to Land Use and Agriculture (Soils) elements and features during construction of the proposed works include works associated with the development of the CSECs and temporary withdrawal of agricultural land use for design elements that include:
- Topsoil clearance.
 - Topsoil stockpile.
 - Creation of compound areas.
 - Access routes.
 - Cable routeing.
 - Drainage.
 - Decommissioning works of redundant cables.
- 7.8.8 Construction activity can result in temporary disturbance and permanent loss of soil resources (adverse). The preparatory works including temporary compounds would involve the temporary removal and storage of topsoil and subsoil along the length of the open cut cable route. Decommissioning of redundant cables would require more limited removal of soils than cable installation but the worst-case assumptions discussed in paragraph 7.8.9 have been assumed. Where temporary removal of topsoil and subsoil would be required for decommissioning the materials would be stored along the route of open cut cable installation.
- 7.8.9 Where the extent of the working area has not been finalised a buffer has been applied to determine the anticipated worst-case effects to soils. The buffered design was overlaid upon the preliminary agricultural land classification mapping available in Data Map Wales (Ref 5.33). The worst-case assessment was that 18,737 m² (1.87 ha) of Subgrade 3a (BMV land) would be disturbed. Summary data are provided in

7.8.10 **Table 7-11.**

Table 7-11 – Worst-case land requirements for design elements within land categories contained within ALC

Design Element	Area (m ²) of ALC category				
	Subgrade 3a	Subgrade 3b	Grade 5	Non-agricultural	Urban
Topsoil clearance	4,805	0	224,532	164	5,555
Topsoil stockpile	1,694	0	71,975	51	1,492
Compounds	0	0	141,387	0	1,917
Access	1,046	43	51,343	623	1,784
Cable route	5,810	0	390,675	6,556	5,227
Drainage	357	0	42,311	1,518	548
CSECs	1,961	0	3,642	72	0
Decommissioning works	3,064	167	131,441	3	3,552

7.8.11 The sensitivity and magnitude ratings have been classified based on Table 5-1 and Table 5-2 of **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**.

7.8.12 The CSECs are permanent but the above data include also areas of laydown, which is temporary but to assess worst-case these areas are included. Including laydown, the total area could affect 0.2 ha of BMV land and 0.36 ha of non-BMV. The BMV land is medium sensitivity and the magnitude is low. It would represent a slight adverse effect (not significant). Non-BMV land is low or very low sensitivity and magnitude is low and would have a negligible effect.

7.8.13 For other works, BMV land temporarily withdrawn from agriculture is medium sensitivity receptor of low magnitude extent. The non-BMV land represents a combination of low and very low sensitivity and a worst-case total area of moderate magnitude. The worst-case scenario for these potential effects would range from slight to negligible adverse effects (not significant).

A498 Crossing – HDD Option

7.8.14 If the HDD option was taken forward, the impact would be the same as stated above . There would be no further impacts to Geology, Hydrogeology, Land Use and Agriculture (Soils) for HDD when compared to the open cut technique.

Operation and Maintenance

7.8.15 Operation has been assessed to include maintenance of the cables associated with the proposed works.

7.8.16 Pathways by which the identified geological and hydrogeological receptors have the potential to be impacted by the proposed works during the operational phase include:

- The foundations of structures and/or cables may provide a preferential pathway for contaminants to migrate to non-contaminated soils, geology and groundwater.

- The potential for aggressive ground contaminants posing a risk to foundations or cable infrastructure.

7.8.17 The location of cables during operation would be below the depth of agricultural cultivations and there are no anticipated effects to Land Use and Agriculture (Soils).

A498 Crossing – HDD Option

7.8.18 If the HDD option was taken forward, the impact would be the same as stated above . There would be no further impacts to Geology, Hydrogeology, Land Use and Agriculture (Soils) for HDD when compared to the open cut technique.

7.9 Mitigation and Residual Effects

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

Construction Phase Mitigation

Construction Environmental Management Plan

7.9.2 The main mitigation measure to prevent adverse effects on geology and hydrogeology during all phases of the proposed works would be to ensure good site practice and management. A CEMP will be developed and implemented and will form the basis of the approach to mitigating potential effects on the natural and built environment and the local community.

7.9.3 The CEMP (**Volume 8, Appendix 4.2.A: Outline Construction Environmental Management Plan**) will include a range of standard site management and construction techniques which have been identified in **Chapter 2: Glaslyn Cables Works** to minimise the risk to construction workers, and pollution of uncontaminated strata and controlled waters (groundwater and surface waters). Measures contained within the CEMP will limit the potential for dispersal and accidental releases of potential contaminants, soil-derived dusts and uncontrolled run-off to occur during construction. For example, the CEMP will set out how material is to be excavated, segregated, and stockpiled to minimise the potential for run-off, soil quality degradation and wind dispersal of dusts. The CEMP will also establish procedures for dealing with unexpected soil or groundwater contamination that may be encountered.

Ground Investigation

7.9.4 Ground investigation may be required in targeted areas of the Glaslyn works site if potential contamination is encountered during the construction works. Such ground investigation works would be undertaken as part of the Discovery Strategy for the scheme and agreed with Gwynedd Council and NRW. Any ground investigation works required along the Glaslyn works site will be undertaken in accordance with the relevant guidance and legislation including BS 10175:2011 (Ref 7.22) and Land Contamination Risk Management (LCRM) (Ref 7.18). Ground investigation works undertaken in 2023 and 2024 across the Glaslyn works site did not record evidence of significant potential contamination.

Dealing with Potential Contamination during Construction

- 7.9.5 A method statement, discovery strategy, will be prepared for dealing with potential contamination being present during construction. The method statement will be informed by proposed ground investigation works, agreed with the regulatory authorities (including the Local Authority and NRW) and prepared before ground works start. It is anticipated that this will be a condition of the grant of planning permission.
- 7.9.6 Potential impacts specific to construction workers (and any adjacent site users) during the construction phase would be controlled and mitigated by the following measures and through working in accordance with CIRIA C811 (Ref 7.25):
- Measures to minimise dust generation and run-off.
 - Provision of Personal Protective Equipment (PPE), such as gloves, barrier cream, overalls etc. to minimise direct contact with soils.
 - Provision of adequate hygiene facilities and clean welfare facilities for all construction site workers.
 - Monitoring of confined spaces for potential ground gas accumulations, restricting access to confined spaces, i.e. to suitably trained personnel only, and use of specialist PPE, where necessary.
 - Preparation and adoption of a site and task specific health and safety plan as is required under Health and Safety legislation.
 - Risk from UXO. A detailed UXO threat and risk assessment was prepared by 6Alpha Associates in July 2023 (Ref 7.55). The majority of the area was considered low risk except for the area immediately north-east of Porthmadog to Afon Glaslyn which was assessed as medium risk from accidental dumping, land service ammunition and small arms ammunition due to World War 1 British military camps and rifle range. Appropriate mitigation comprises UXO emergency response plan, UXO safety awareness briefing and an on-call Explosive Ordnance Disposal engineer.

Excavated Materials and Soils and Waste Management

- 7.9.7 A materials management plan will be prepared and implemented following the protocols within the CL:AIRE Definition of Waste: Development Industry Code of Practice (Ref 7.31) to ensure that excavated materials are re-used appropriately, sustainably and remain outside the waste hierarchy. Materials which need to be removed from the Glaslyn works site will be disposed of to an appropriately permitted facility.
- 7.9.8 Any material imported to the Glaslyn works site, such as for supporting foundations, will be natural quarried stone or, if recycled, the material will undergo chemical testing. The suite of contaminants and site use criteria will be agreed with regulatory authorities to demonstrate that the material is suitable for use within the Glaslyn works site and does not pose a risk to human health or the environment.
- 7.9.9 The disposal of soil waste contaminated or otherwise, to landfill sites would be mitigated by minimisation of the overall quantities of waste generated during construction, and by considering whether that excavated material consigned to landfill cannot, as an alternative, could be put to use either on the Glaslyn works site or on other sites.
- 7.9.10 There is the potential for asbestos to be present in any Made Ground within the Glaslyn works site, albeit the risk is low, as only localised Made Ground was encountered during the previous ground investigation by SOCOTEC. The main risk of asbestos disturbance

would be during the construction and existing cable decommissioning phase. Any Made Ground found to be contaminated with asbestos will be suitably managed if it is to be retained on-site or removed in line with guidance provided in CAR-SOIL 2012 (Ref 7.61). Asbestos management will be included within the CEMP.

- 7.9.11 Where there is a requirement to dispose of surplus excavated materials off-site as waste, the material will be characterised to determine whether it is Hazardous or Non-Hazardous waste in accordance with the Technical Guidance WM3 (Ref 7.62). Once this is established, the appropriate disposal facility will be determined through WAC analysis, prior to construction.
- 7.9.12 A Soil Management Plan will be prepared and followed, consistent with the guidance in the Defra (2009) Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (or updated version thereof) (Ref 7.33) and other relevant documents such as The Institute of Quarrying's Good Practice Guide for Handling Soils in Mineral Workings (Ref 7.35).as an appendix to the CEMP.

Soil and Groundwater Pollution Control Mitigation

- 7.9.13 It is unlikely that the proposed works will require excavation to depths that would create flow paths between potentially contaminated soils and/or groundwater in the underlying superficial deposits and the bedrock aquifers.
- 7.9.14 A Water Management Plan will be in place to mitigate potential impacts to identified receptors by ensuring surface water run-off quality and quantity is managed effectively. This includes intercepting surface run-off from the works areas by filters and 'header' drains running along the edge of the temporary haul roads being discharged to appropriate surface watercourses under an environmental permit or to foul sewer under a trade effluent consent.
- 7.9.15 Various fuels, oils and chemicals would be required during the construction of the proposed works. Measures to reduce potential effects associated with these substances during construction will be set out in the CEMP and will include:
- A Pollution Prevention Plan which will outline pollution mitigation measures to be adopted including a Control of Substances Hazardous to Health assessment, fuel inventory and the key personnel contacts to be notified in the event of a significant pollution incident, which could lead to the contamination of controlled waters or soils.
 - Any hazardous materials will be stored in designated locations with specific measures to prevent leakage and the release of their contents. This will include a requirement for storage areas to be set back an appropriate distance from surface water features and drains to prevent any uncontrolled discharge (and take into consideration the positions of any groundwater abstraction wells), on an impermeable base with an impermeable bund that has no outflow and is of adequate capacity to contain at least 110% of the contents. Valves and trigger guns will be protected from vandalism and kept locked when not in use.
 - Only well-maintained plant and other equipment will be used during construction to minimise the potential for accidental pollution from leaking machinery or damaged equipment. Static machinery and plant are expected to be stored on hardstanding areas when not in use and, where necessary, to make use of drip trays beneath oil tanks/engines/gearboxes/hydraulics. Spill response kits containing equipment that is appropriate to the types and quantities of materials being used and stored during construction will be maintained within the Glaslyn works site for the duration of the works.

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

Hydrogeological Mitigation

- 7.9.17 The ground investigation works undertaken by Socotec (2023) and GEL (2024), recorded water strikes within exploratory hole locations, undertook in-situ permeability testing and subsequently groundwater level monitoring at selected locations. The water strikes and the groundwater level monitoring recorded the presence of shallow groundwater (circa 0.4m to 2m bgl) across the Glaslyn works site.
- 7.9.18 In-situ testing of soil permeability calculated values ranging from 1.2×10^{-3} m/s to 1.2×10^{-6} m/s which indicates generally moderate to low permeability across the Glaslyn works site.
- 7.9.19 An understanding of groundwater across the Glaslyn works site has been obtained from ground investigation, in-situ testing and monitoring. Where dewatering is required, a dewatering scheme will be developed prior to construction to demonstrate that there is an effective strategy to manage water arising from the operations and, where required, sufficient proposals to treat the water prior to controlled discharge. Any such assessment will consider the effects of any draw down or impacts on nearby abstractions or resources.

Mineral Safeguarding Areas

- 7.9.20 Construction of the proposed works has the potential to affect existing mineral resources, and proposed areas of mineral exploitation. This could occur by sterilisation of the resource through direct excavation during construction of the proposed works or through temporary and/or permanent severance or isolation that may occur during the construction phase of the proposed works, possibly continuing through to its operational phase.
- 7.9.21 There is a Mineral Safeguarding of hard rock designation within the Glaslyn works site at Garth CSEC (see **Figure 4.7.7**). However, the planned works at this location includes decommissioning of a buried cable, and removal only in the eastern extent. No further action is required.

Operational Phase Mitigation

- 7.9.22 Where possible, measures will be put in place during the construction phase through the CEMP which will avoid or minimise the identified potential operational impacts, largely based on the findings of any ground investigation and risk assessments carried out. Potential impacts during the operational phase for which mitigation may be required would already have been implemented at construction phase. With exception to redundant cable sections which have been made safe and the had the oil drained from the cables. These areas will be monitored annually for any residual effects due to potential leaks from the sump installed during construction to capture any residual oil.

Residual Effects

- 7.9.23 The potential effects are detailed below along with the mitigation measures and the overall residual effect and its significance.
- 7.9.24 Effects categorised as 'Neutral' or 'Slight' are considered 'Not Significant'. Effects categorised as 'Moderate' or 'Large' or 'Very Large' are considered potentially 'Significant'.

- 7.9.25 The sensitivity and magnitude of the potential impacts have been assigned the relevant rating according to Table 5-1 and Table 5-2 presented in **Volume 8, Appendix 1.4.A: Topic Assessment Methodology** where appropriate examples have been listed.
- 7.9.26 In relation to ground stability, the ratings are drawn from published policy and good practice guidance and based on professional judgements within AECOM and have been successfully used on other assessments.

Table 7-12 – Residual effects of the proposed works

Residual effect	Description	Receptor	Mitigation and significance	Phase ⁷		
				C	O	M
Sterilisation of Mineral Resources.	The Glaslyn works site encroaches into a Mineral Site Buffer Zone at Y Garth near the eastern end of the Glaslyn Works site.	Minerals Resources	The mineral resources at the Mineral Site Buffer Zone will not be impacted by the proposed works (decommissioning of existing cables) or render the sites inaccessible for future use. The effects on mineral resources during the proposed works would be no worse than slight adverse (not significant)	✓		✓
Groundwater and ground pollution due to chemical spillages and leaks.	Potential for plant to leak or spill oil or fuel. Leaks and spillages could occur in any area of the Glaslyn works site in which the plant is operating and during refuelling. There is potential for spills and drips associated with stored fuels and chemicals brought onto the Glaslyn works site to enter the underlying uncontaminated strata and contaminate shallow groundwater.	Soils	The residual effect from chemical spillages and leaks would be a slight effect (not significant) Should spillages occur they will be managed in accordance with the CEMP and localised effects on soils and geology would be minimal.	✓		✓
		Geology		✓		✓
		Groundwater	Spillages or leaks are highly unlikely to occur due to the construction management measures in place, and if spillages and leaks were to occur these would unlikely be widespread, given the CEMP measures. The residual effect of chemical spillages and leaks during construction, maintenance and decommissioning of the existing cables would be of minor magnitude. Although the sensitivity of the groundwater is medium the impact significance would be slight (not significant)	✓		✓

⁷ C = Construction Phase, O = Operational Phase, M = Maintenance

Residual effect	Description	Receptor	Mitigation and significance	Phase ⁷		
				C	O	M
			due to the low magnitude. It is primarily the low risk of a leak or spillage that limits the impact significance, although it is recognised that the risk is not zero.			
		Human Health	The residual effect from chemical spillages and leaks during construction and maintenance would be slight (not significant) as spillages would be unlikely and if they did occur would be managed to have no measurable impact on human health through appropriate incident response procedures.	✓		✓
Reduction of soil quality during handling and storage.	During the excavation and storage of soils, minor changes to soil characteristics such as soil hydrology and soil structure, could occur due to handling and storage of topsoil and subsoil in inappropriate conditions. Soils stored in bunds are also susceptible to erosion from run-off during heavy rainfall or wind erosion during dry periods. The reduction in the quality of the soils could lead to the loss or alteration to one or more key important features.	Soils	With mitigation in place, there would be no measurable reduction of soil quality during handling and storage resulting in an effect of low magnitude. Small areas of soils may be BMV land of medium sensitivity, but the magnitude of impacts to these soils is low and mostly temporary. For the most part the sensitivity of the soils is low or very low. The significance to Land Use and Agriculture (Soils) would be a slight effect (not significant). Excavated soils will be stored in accordance with the CEMP and degradation and disturbance will be kept to a minimum. Good practice guidance to be contained within the CEMP is primary mitigation measure. The overlying topsoil would be stored separately	✓		✓

Residual effect	Description	Receptor	Mitigation and significance	Phase ⁷		
				C	O	M
			from subsoil. Subsoil stockpiles would be stored on exposed subsoil, from which topsoil had been stripped, to avoid soil mixing. Soil storage would be as close as practicable to the point of excavation. Reinstatement would match local subsoil and topsoil depths. The significance of these operations is contained within the effects described above and hence the overall outcome would be a slight effect (not significant).			
Reduction of soil quality and groundwater levels due to construction traffic.	The tracking of heavy plant across the Glaslyn works site during construction could compact the ground surface causing degradation of soil quality. In addition, compaction could lead to a decrease in infiltration and potential water logging and increase of surface water runoff, and a reduction of local groundwater levels.	Soils and Groundwater	Residual effects relating to compaction of soils and creating a decrease in infiltration rates are likely to be limited to temporary access tracks, temporary compounds and the working areas, and would be short-term. With the mitigation in place, within the CEMP, there would not be a measurable reduction of soil quality or infiltration and the impact magnitude would be low. As the sensitivity of the soils is low and although the sensitivity of the groundwater is medium the impact significance would be slight (not significant).	✓		✓
Disturbance of potentially contaminated soils, sediments and waters	The excavation and disturbance of the soils during construction could lead to a number of effects associated with contaminated soils:	Soils, geology and groundwater	The baseline assessment has identified a number of potential contaminative land uses in the Study Area and a number of potential effects associated with the presence of potentially contaminated materials. However,	✓		

Residual effect	Description	Receptor	Mitigation and significance	Phase ⁷		
				C	O	M
posing a risk to construction workers, groundwater, soils and geology.	• Vehicles tracking over potentially contaminated soils have the potential to spread contamination and carry it off-site. • Construction workers may be exposed during the excavation of material to potentially harmful contaminants and ground gases. • Disturbance of soils may alter the chemical conditions within the Glaslyn works site soils resulting in mobilisation of potential contaminants. • The surfaces of contaminated material may be exposed in excavations, which could cause dissolution and/or mobilisation of contaminants by percolating rainwater. • Arisings from the excavation of soil could potentially result in the stockpiling of contaminated soils on the Glaslyn works site, and reuse on-site. The exposed soils could lead to increased migration of potential contaminants both on-site		the baseline has demonstrated that the potential scale and type of ground contamination within the Glaslyn works site is a low risk with the majority of potential contamination sources being associated with sewage filters, substation, sewage works, railway sidings and infilled land that are likely to be very localised. The vast majority of sources are not within the Glaslyn works site. No ground or groundwater contamination has been identified by ground investigation works carried out to date. There is potential for ground and/or groundwater contamination within areas of infilled ground within the Glaslyn works site. Known areas of contaminated ground would be avoided, where possible. Where this is not possible, remediation would be carried out to either remove the source or prevent the creation of pathways to receptors as described in the CEMP. Most access tracks and working areas will not be retained during operation. They do not pose risk from ground contamination or a risk to groundwater from ground contamination during operation, maintenance and decommissioning of the existing cables, as contaminated ground would have been			

Residual effect	Description	Receptor	Mitigation and significance	Phase ⁷		
				C	O	M
	and off the site through dust generation and to underlying soils and Controlled Waters through leaching and surface water runoff.		avoided, removed and/or mitigated during construction. For the reasons indicated, there will be a negligible magnitude of impact for the medium to high sensitivity receptors, resulting in a Neutral or Slight adverse effect (not significant).			
		Human Health	There would be no residual effects to end users or adjacent users. In relation to radon there would be no enclosed structures that would be occupied so workers are unlikely to be exposed to radon. There would be no effect on construction or maintenance workers. The risks posed to construction workers during remediation works (if any) would be mitigated by design and adherence to health and safety procedures as detailed in the CEMP. As these measures would prevent measurable adverse health effects on construction workers, the impact significance of the residual effects would be a neutral or slight adverse effect (not significant).	✓		
Importation of contaminated aggregates posing a potential risk to	Without controls in place natural or recycled stone imported to create access tracks and other working areas could be contaminated and pose a risk to construction workers,	Soils, geology and groundwater	The use of imported aggregates during construction and maintenance, for example for the construction of access tracks and compounds, may pose a risk to underlying soils, geology and groundwater quality, if the	✓		✓

Residual effect	Description	Receptor	Mitigation and significance	Phase ⁷		
				C	O	M
human health and underlying soils, geology and groundwater quality.	and underlying uncontaminated strata and groundwater.		aggregates were to be contaminated. However, the mitigation measures outlined in the CEMP would mean that only materials suitable for use would be imported. As a result, the residual effects of the importation of aggregates would be at worst minimal, with no measurable effects on construction workers. The significance would be a neutral or slight adverse effect (not significant).			
HDD drilling operation creating a preferential pathway for contaminants to migrate.	Potential for the HDD drilling to create a preferential pathway for any contaminants within overlying strata to migrate along the HDD.	Soils, geology and groundwater	It has been recognised that the HDD routes may present a preferential pathway for contaminants to migrate to non-contaminated strata and groundwater. The existing ground investigations carried out to date and the baseline information within the area of the HDD cable route have not identified contaminated ground or groundwater. However, if contaminated ground was encountered the mitigation measures outlined in Section 7.11 would either remove the identified sources of contamination and/or mitigate its migration along the HDD routes to underlying uncontaminated strata or groundwater. There would not be a measurable change to the underlying geology resulting in an effect of low magnitude. As the sensitivity of the groundwater is medium the	✓		

Residual effect	Description	Receptor	Mitigation and significance	Phase ⁷		
				C	O	M
			impact significance would be a slight adverse effect (not significant).			
Requirement to remove/reinstate spoil from construction of the buried cables posing a potential risk to human health and the environment.	Spoil from the excavations could be generated and be reused elsewhere within the Glaslyn works site or require removal from the Glaslyn works site.	Soils, geology	Topsoil and superficial deposits would be excavated from the proposed works and along the new access tracks and during the removal of cables along the existing route. These materials would be reused on-site, access track/working areas re-instatement and landscaping during the construction phase. Materials would be reused under the CEMP to ensure they would be physically and chemically suitable for re-use. The natural composition of the material in relation to the placement location will also be assessed for suitability for reuse. If material were to be unsuitable, they would be disposed of off-site to a suitable site in accordance with the CEMP. As a result, the residual effects on soils and geology would be of low magnitude as the reuse of material in suitable locations within the Glaslyn works site would mean that changes from the baseline conditions would be barely distinguishable. With the soils and geology being of low sensitivity the significance would be a slight adverse effect (not significant).	✓		

Residual effect	Description	Receptor	Mitigation and significance	Phase ⁷		
				C	O	M
Requirement for dewatering, reducing flow to groundwater abstractions and surface water bodies, and changes to soil hydrology.	In order to excavate below groundwater, dry working will be required for the installation of the cable, and dewatering would be required within the excavations. Groundwater could likely be extracted from sumps within the excavation and discharged to surrounding ground. Internal dewatering utilising sump pumps may also be required in the HDD launch and exit pits. Groundwater levels could be locally affected, and a reduction in levels could lead to reduced baseflow to watercourses and to groundwater abstraction points. In addition, the quality of surrounding soils could be affected, through a reduction of soil water changing the soil structure.	Soils and geology	It is likely that the water table is relatively shallow beneath many areas within the Glaslyn works site, particularly within the superficial deposits of Alluvium. To excavate below groundwater, dry working will be required for the installation of the cables, and dewatering would be required. The placement of cables directly underground will require trenches, each being a minimum of 2 m wide and 1 m deep. The impact of any dewatering would reduce considerably with the distance from the abstraction point. It is unlikely that significant effects would be recorded more than 50 m from the point of abstraction, although effects may be recorded more than 100 m from the excavation. The intention is for any water extracted from the HDD launch pits to be released back into the same catchment area, adjacent to the extraction point. Due to the limited drawdown and the short duration of dewatering required, any short-term changes to the quality of the surrounding soils due to lowering of the groundwater levels, would be of medium magnitude and given the low sensitivity of the soils the significance would be a slight adverse effect (not significant).	✓	✓	✓

Residual effect	Description	Receptor	Mitigation and significance	Phase ⁷		
				C	O	M
			Construction of the HDD drilling operation may require dewatering due to its locality at Afon Glaslyn and other smaller watercourses and drainage ditches.			
		Groundwater	The impact of any dewatering would reduce considerably with the distance from the pumping point. It is unlikely that significant effects would be recorded more than 50 m from the point of abstraction, although effects may be recorded more than 100 m from the excavation. As it is assumed the average maximum depth of the buried cable would be approximately 1 m, the maximum drawdown required to provide a dry working area would be less than 1 m. Due to the limited drawdown and the short period of pumping required, any short-term changes to the resource and/or quality of the surrounding groundwater or surface water during dewatering would be of medium magnitude. Given the medium sensitivity of the majority of the groundwater the impact significance would be slight (not significant). The majority of the proposed works would be remote from properties and hence it is unlikely that dewatering of the excavations for the installation would impact on existing wells and boreholes. To facilitate dewatering during	✓	✓	✓

Residual effect	Description	Receptor	Mitigation and significance	Phase ⁷		
				C	O	M
			construction, a water well survey would be carried out over an area approximately 300 m from the required location. Should an assessment show that there is an unacceptable risk of derogation of existing water supply sources a replacement supply would be provided. This would consist of the provision of a temporary supply, such as a water bowser to ensure a continued water supply to the property during the construction period. The magnitude of impact is negligible for these very high sensitivity receptors. The significance would be a slight adverse effect (not significant).			
Requirement for dewatering, reducing quality or levels of groundwater supporting sites protected under European and UK habitat legislation, such as a SSSI.	In order to excavate below groundwater, dry working may be required for the installation of the cable, and dewatering could be required within the excavations. Groundwater would be extracted from sumps within the excavation and discharged to surrounding ground. Groundwater levels could be locally affected, and a reduction in levels and quality could affect designated sites supported by the groundwater.	Groundwater	The GI works recorded groundwater at shallow depths across the length of the Glaslyn works site, particularly within the superficial deposits of Alluvium. To excavate below groundwater, dry working will be required for the installation of the cables, and dewatering would be required. The placement of cables directly underground will require trenches, each being a minimum of 2 m wide and 1 m deep. The impact of any dewatering would reduce considerably with the distance from the abstraction point. It is unlikely that significant effects would be recorded more than 50 m from the point of abstraction, although effects	✓		

Residual effect	Description	Receptor	Mitigation and significance	Phase ⁷		
				C	O	M
			may be recorded more than 100 m from the excavation. The intention is for any water extracted from the HDD launch pits to be released back into the same catchment area, adjacent to the extraction point. Due to the limited drawdown and the short duration of dewatering required, any short-term changes to the quality or levels of groundwater supporting designated sites, would be of negligible to low magnitude and given the medium to high sensitivity of the designated sites the significance would be a neutral to slight adverse effect (not significant). Construction of the HDD drilling operation may require dewatering due to its locality at Afon Glaslyn and other smaller watercourses and drainage ditches.			
Potential for oil leaks from redundant cables.	Redundant cables are to be made safe with the oil removed from within the cables and remain <i>in situ</i> . There is potential for residual oil to migrate into the surrounding areas.	Soils, Geology and Groundwater	A sump is to be installed at the site where the redundant cables will remain <i>in situ</i> to capture any residual oil from the cables which will be monitored annually. There will be a negligible magnitude of impact for the medium to high sensitivity receptors, resulting in a Neutral or Slight adverse effect (not significant).	✓		✓

7.10 Summary

- 7.10.1 It has been demonstrated that 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. The mitigation measures discussed in this chapter are expected to prevent any significant effects during construction, operation and maintenance.

8. Water Quality, Resources and Flood Risk

8.1 Introduction

- 8.1.1 This chapter presents an assessment of the likely Water Quality, Resources and Flood Risk effects that could arise from the construction, operation and maintenance of the works at Glaslyn as described in **Chapter 2: Glaslyn Cables Works**.
- 8.1.2 This chapter describes the baseline conditions currently existing within the study area (as defined in Section 8.3), the scope of the assessment, the potential effects, the mitigation measures required to prevent, reduce or offset any significant negative effects, and the likely residual effects after these mitigation measures have been adopted.
- 8.1.3 This chapter is supported by a number of figures and appendices as listed below:
- **Figure 4.8.1:** Site location.
 - **Figure 4.8.2:** Zone of Influence.
 - **Figure 4.8.3:** Route breakdown.
 - **Figure 4.8.4:** Topographic overview.
 - **Figure 4.8.5:** Hydrological overview.
 - **Figure 4.8.6:** Water resources.
 - **Figure 4.8.7:** Water dependant designated sites.
 - **Figure 4.8.8:** Water Framework Directive waterbodies.
 - **Figure 4.8.9:** Flood risk overview.
 - **Volume 8, Appendix 1.1.A: Legislation, Policy and Guidance.**
 - **Volume 8, Appendix 1.4.A: Topic Assessment Methodology.**
 - **Volume 8, Appendix 4.2.A Outline Construction Environmental Management Plan**
 - **Volume 8, Appendix 4.8.A: Abstractions and Discharges.**
 - **Volume 8, Appendix 4.8.B: Water Framework Directive Assessment.**
 - **Volume 8, Appendix 4.8.C: Flood Consequence Assessment.**
- 8.1.4 Other chapters and documents that are useful to review in association with this chapter are as follows:
- **Volume 4, Chapter 5: Ecology and Nature Conservation.**
 - **Volume 4, Chapter 7: Geology, Hydrogeology, Land Use and Agriculture (Soils).**

8.2 Legislation and Planning Policy

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

Legislation

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

- The European Union (EU) Floods Directive (2007/60/EC) (Ref 8.1), as enacted into domestic law by the Flood Risk Regulations 2009 (Ref 8.2).
- The EU Water Framework Directive (2000/60/EC) (WFD) (Ref 8.3) as enacted into UK domestic law by the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (Ref 5.12).
- The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 (Ref 8.4).
- Floods and Water Management Act 2010 (Ref 8.5).
- Water Resources Act 1991 (Ref 8.6).
- Water Act 2003 (Ref 8.7).
- Environment Act 1995 (Ref 7.3).
- Land Drainage Act 1991 (Ref 7.5) and 1994 (Ref 8.8).
- Environmental Protection Act 1990 (Ref 7.1).
- Control of Pollution Act 1974 (Ref 8.9).

National Policy

- 8.2.3 The TAN 15 2025 edition (Ref 8.10) provides guidance in relation to development and flooding, and is supported by the Flood Map for Planning (Ref 8.11) which incorporates flood risk extents based on predicted climate change over the next century.

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

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

- Flood Zone 3 – areas with greater than 0.5% chance of flooding from the sea in a given year, including the effects of climate change.
- 8.2.5 TAN 15 Defended Zones are areas that benefit from Risk Management Authority flood defences with the following minimum Standard of Protection, of 1% (present day) for rivers and 0.5% (present day) for the sea..
- 8.2.6 National Grid also have national policy for developments and flood risk. National Grid PS(T)_095 - Flood Mitigation Policy (Ref 8.12) reiterates the need for new and existing sites (or key equipment therein) to meet declared flood resilience levels. This will ensure the site is safe and operational during flooding events with no loss of supply or risk to system stability.

Local Policy

- 8.2.7 The following local policy is relevant to Water Quality, Resources and Flood Risk:
- West of Wales Shoreline Management Plan (SMP) (Ref 8.13):
 - For The Cob at Porthmadog the SMP identifies a policy of ‘Holding The Line’, i.e. maintaining and where necessary strengthening the existing line of defence. This policy applies in the short term, (0 to 20 years) medium term (20 to 50 years) and long term (50 to 100 years) because of the economic importance of the benefits provided to the protected area and region by The Cob tidal defences.
 - The documents are set to be reviewed on a ten-year cycle, however, the SMP3 which was due in 2022 has not yet been released and policies may therefore change. If coastal change is observed to be progressing at different rates than previously estimated, the associated policy may be adjusted correspondingly.
 - Anglesey and Gwynedd Joint Local Development Plan 2011-2026 (Ref 8.14) - Strategic Policy PS6: Alleviating and Adapting to the Effects of Climate Change. Proposals will only be permitted where it is demonstrated with appropriate evidence that they have fully taken account of and responded to the following:
 - Implementing sustainable water management measures in line with the objectives of the Western Wales River Basin Management Plan.
 - Locating away from flood risk areas, and aim to reduce the overall risk of flooding within the Plan area and areas outside it, taking account of a 100 years and 75 years of flood risk in terms of the lifetime of residential and non-residential development, respectively, unless it can be clearly demonstrated that there is no risk or that the risk can be managed.
 - Aim for the highest possible standard in terms of water efficiency and implement other measures to withstand drought, maintain the flow of water and maintain or improve the quality of water, including using sustainable drainage systems (in line with Policy PCYFF 6).

8.3 Study Area

- 8.3.1 The Glaslyn works site would run between the existing Wern CSEC (SH 543401) and the and the existing Garth CSEC (SH 595387) (**Figure 4.8.1**).
- 8.3.2 The area for this assessment of effects is not limited to the total construction width for the Glaslyn cable route and the compound areas as defined by the Glaslyn works site.

The study area for this assessment has been defined through setting a Zone of Influence (ZOI) within which all water environment effects resulting from the proposed works are expected to occur (**Figure 4.8.2**).

- 8.3.3 In this instance the ZOI has been set to include the fluvial and tidal Flood Zone associated with the Afon Glaslyn and Y Cyt waterbodies as this is well defined by local topography. No Water Environment impacts are expected to propagate further upstream or downstream than this, and the topography restricts the flood zone from changing extent significantly as a result of proposed works.
- 8.3.4 The topography of the area upstream of the Glaslyn works site consists of a relatively flat, low elevation area which comprises the wider floodplain of the Glaslyn and Y Cyt systems. The floodplain is bounded to the north, east and west by high relief topography.
- 8.3.5 The northern extent of the ZOI is at Pont Aberglaslyn where the steeper, topographically constrained reach of the Afon Glaslyn transitions to a low-lying floodplain. The ZOI has a 100 m buffer around the area of low-lying topography extending south from the Pont Aberglaslyn to the Cob at Porthmadog.

8.4 Assumptions and Limitations

- 8.4.1 The assessment presented in this chapter reflects the information obtained and evaluated at the time of reporting (August 2025), and has referenced published data, records and web-based information obtained to date.
- 8.4.2 The baseline presented is predominantly based on data gathered through desktop research. Additionally, a walkover of the Glaslyn works site has been undertaken to inform the assessment of the hydrology, flood risk and Water Framework Directive (WFD) elements of the assessment. The walkover was carried out on 30th and 31st August 2023 by two WSP hydrologists. The route of the walkover started at the Wern CSEC and followed the existing cable route towards Porthmadog. Whilst most of the proposed cable route
- 8.4.3 was able to be accessed, due to a large amount of livestock and boggy conditions on the left bank of the Afon Glaslyn, adjacent to the Garth CSEC, less points were taken.
- 8.4.4 The assessment includes consideration of the construction, operation and maintenance, phases of the proposed works and is based upon the design information in Chapter 2: Glaslyn Cable Works and has been undertaken on the assumption that all proposed activities will be confined wholly within the boundaries of the Glaslyn Cable Works.
- 8.4.5 The assessment for flood risk has been informed by the output of hydraulic modelling prepared by a third party. As stated in the accompanying FCA (**Appendix 4.8.C**) the flood modelling available at time of reporting shows a minor increase in increase in flood risk to residential receptors and therefore the FCA is not currently compliant with the requirements of TAN15.
- 8.4.6 Mitigation approaches have been discussed in consultation with NRW and these are currently being pursued, with hydraulic modelling being undertaken by a third party in order to confirm their effectiveness. As the modelling results have not been completed at the time of reporting, an updated version of the FCA or supplementary report will be required to provide details of the updated modelling results. This information will be submitted as supplementary environmental information during the planning process.

8.5 Baseline

Glaslyn Works Site Description

- 8.5.1 The Glaslyn works site for the proposed works are shown in **Figure 4.8.1**. The Glaslyn works site is situated in land surrounding the town of Porthmadog, Gwynedd, Wales, UK. The Glaslyn works site cover an area linking the Wern, Garth and Minffordd CSECs, which are situated respectively on the western and south-eastern edges of the Afon Glaslyn floodplain. This section describes the baseline situation for the Glaslyn works site.

Route Breakdown

- 8.5.2 For the purpose of this chapter the route has been divided into five sections running west to east (see **Figure 4.8.3**). These sections have been delineated based on the different aspects of the proposed works, including CSEC, HDD sections and current infrastructure e.g. road and rail networks.

Section A: Wern CSEC to A498

- 8.5.3 Section A encompasses the area between Wern CSEC and the A498 highway. It is bound by the A487 to the north and by the A497 and Cambrian Railway Line to the south.

Section B: A498 to Porthmadog Roundabout

- 8.5.4 Section B includes the area between A498 and the Porthmadog Roundabout connecting the A487 Porthmadog Bypass to the A4971 High Street. This section is south of the A487 Porthmadog Bypass and north of the woodland near Pensyflog and Porthmadog. The cable routes in this section would cross National Cycle Route 8, Eisteddfod Stone Circle, and Bodawen Playground in close vicinity to the Porthmadog Roundabout.

Section C: Porthmadog Roundabout to Snowdon Street

- 8.5.5 Section C is to the east of the Porthmadog Roundabout and encompasses all areas within the ZOI up to the interface with Snowdon Street in the north-east of Porthmadog.

Section D: Afon Glaslyn Crossing

- 8.5.6 Section D begins at Snowdon Street and encompasses the ZOI associated with the floodplain of the Afon Glaslyn, including the HDD crossing of the Afon Glaslyn floodplain and the Glaslyn SSSI.

Section E: East of Afon Glaslyn crossing to Minffordd CSEC

- 8.5.7 Section E consists of the existing Garth CSEC and proposed Minffordd CSEC and the THH (the latter similar to that consented as part of the EVIP project).

Climate

- 8.5.8 The Meteorological Office (Met Office) website holds the latest set of 30-year rainfall averages, covering the period 1991-2020 (Ref 8.15). Average annual rainfall of 1988.41 mm/a was recorded for the Cwmystadrlllyn climate station 6km north-west from the Glaslyn works site.

Topography and Land Use

- 8.5.9 As stated in **Section 8.4.1**, the Glaslyn works site span from the west of Porthmadog, at the Wern CSEC, crossing Porthmadog and the Glaslyn estuary and terminating at the Minffordd CSEC to the east of the Glaslyn estuary. **Figure 4.8.4** shows the topography of the study area and immediate surroundings based on NRW LiDAR data (Ref 8.16). This area covers a large area of flat low-lying land, mainly between 0.3 m AOD and 3.7 m AOD between the Garth and Wern CSECs. However, the route rises to ~25 m AOD at the access road west of the Wern CSEC. The land use directly surrounding the Glaslyn works site is mainly neutral and improved grasslands used for livestock grazing, there are also residential areas surrounding the Glaslyn works site including the town of Porthmadog and areas classified as saltmarsh in the Afon Glaslyn floodplain. Although the areas of land directly surrounding the Glaslyn works site are flat low-lying land, in the western sections of the route (Wern CSEC to Porthmadog Roundabout) the topography rises to heights of ~345 m AOD (north), ~95 m AOD (west) and ~260 m AOD (south).
- 8.5.10 Due to the spatial extent of the Glaslyn works site, further details on the topography and land use have been split between the cable route sections.

Section A: Wern CSEC to A498

- 8.5.11 The topography surrounding the Wern CSEC varies between ~25 m AOD (western access track) and ~3 m AOD (east of the Wern CSEC). However, the topography to the north, south and west quickly rises to heights of ~345 m AOD, ~260 m AOD and ~95 m AOD respectively. The land coverage around the Wern CSEC mainly includes areas of broadleaf woodland and improved grassland but is predominantly used for cattle grazing and the existing Wern CSEC site. As the topography rises to the north, south and west, the land cover becomes dominated by broadleaf woodland and improved grassland.
- 8.5.12 The cable route section spanning eastwards towards the A498 follows a relatively flat topography ranging from ~3 m AOD (east of the Wern CSEC) to ~2.3 m AOD (west of the A498). The area surrounding the cable route mainly comprises of arable/agricultural land and improved/neutral grassland (intersected with numerous drainage ditches) predominantly used for cattle grazing as well as isolated areas of broadleaved woodland.

Section B: A498 to Porthmadog Roundabout

- 8.5.13 From the A498 to Porthmadog Roundabout the terrain along the cable route remains relatively flat, with the topography steeply rising to the north and south of the Glaslyn works site to heights of ~205 m AOD and ~225 m AOD respectively. The area directly surrounding the cable route mainly comprises of arable/ land and improved/neutral grassland. However, around the eastern end of the cable route and to the north and south, the land-use changes to more urban and suburban areas around Tremadog and Porthmadog, as well as an area of broadleaf woodland to the north-east of this section.

Section C: Porthmadog Roundabout to Snowdon Street

- 8.5.14 From Porthmadog Roundabout to Snowdon Street the topography along the cable route remains relatively flat, ranging from ~2.8 m AOD in the west to ~1.6 m AOD around Snowdon Street. The land-use of Section C is predominantly neutral grassland, with urban and suburban areas closer to Porthmadog and arable land to the north. Additionally, Section C also contains the Porthmadog Railway Station, Cambrian Railway Line, Welsh Highland Heritage Railway and Ffestiniog Railway.

Section D: Afon Glaslyn Crossing

- 8.5.15 Section D is made up of the Afon Glaslyn floodplain, in this area the topography is low lying and gently slopes into the main channel either side of the Afon Glaslyn. The topography ranges between 1.6 m AOD (in the east and west) and ~0 m AOD in near the main channel. The landcover is predominantly saltmarsh south of the Cob (A487 Porthmadog Bypass) and arable land north of the Cob. Adjacent to the eastern bank of the Afon Glaslyn channel is an area of ancient woodland, through which the existing cable route runs.

Section E: Minffordd CSEC

- 8.5.16 The land directly adjacent to the Minffordd CSEC is at 1.9 m AOD, the topography then rises to heights of 3 m AOD to ~30 m AOD towards Minffordd. The land cover in this section is mixture of improved grassland and suburban areas associated with Minffordd and current cable route infrastructure. Minffordd Quarry is also to the north of this section on the opposing side of the A487 Porthmadog Bypass.

Hydrology

- 8.5.17 The following section describes the hydrology associated with the proposed cable route. An overview can also be seen on **Figure 4.8.5**.

Afon Glaslyn

- 8.5.18 The Afon Glaslyn is an NRW Main River that arises on the slopes of Yr Wyddfa (formerly Mount Snowdon) and drains southwards to the Irish Sea at Porthmadog. In total the watercourse drains a catchment of 151 km². The catchment can be characterised as steep and mountainous in nature, becoming flatter in the wide floodplain area towards Porthmadog. To the east of Porthmadog, the Afon Glaslyn passes through the Traeth Mawr, an area of reclaimed land protected from the sea by a series of flood risk management structures and sluice gates, before discharging through a tide gate outlet structure situated within the Inner Cob, and into the tidal inner harbour. Under normal tidal conditions, the Afon Glaslyn becomes tide-locked during periods of high tide, and river water accumulates in the lowest areas of Traeth Mawr before draining out at low tide. The volume of water stored within Traeth Mawr is dependent on tidal conditions (whether spring or neap tide and meteorological conditions), the volume of flow arriving from the upper catchment and the phasing of any fluvial flood event with the high tide. The area of Traeth Mawr that would be inundated in a flood event is therefore dependent on the severity of the combined fluvial and tidal event.

Y Cyt / Nant Yr Afon Oer

- 8.5.19 The Y Cyt / Nant Yr Afon Oer is an NRW Main River, and a tributary of the Afon Glaslyn. It originates at NGR SH 54357 40295 in the western section of the proposed cable route near Penmorfa and flows through Porthmadog. After flowing through Porthmadog, a tide gate controls the flows from the Y Cyt to the tidal inner harbour. In the event of tide-locking, a bypass channel and tide gate connect the lower Y Cyt to the Glaslyn, via Abattoir Cyt, allowing flows from the Y Cyt to be stored in the lower Traeth Mawr. This acts as a 'safety-valve' to reduce the risk of flooding to Porthmadog from a tide-locked Y Cyt (if additional storage is available here).

Y Cyt Drainage Ditches

- 8.5.20 There are a series of ditches draining the agricultural land in the western sections of the proposed cable route that form the catchment of the Y Cyt system. While all these ditches are man-made uniform channels, a number of them are designated as NRW

Main Rivers. In addition, this area is within the Glaslyn and Pensyflog Internal Drainage Districts administered by NRW.

Geology, Hydrogeology and Soils

Geology

- 8.5.21 A detailed description of geology is included in the Chapter 7: Geology, Hydrogeology, Land Use and Agriculture (Soils). This section provides a summary of the bedrock and superficial deposits which the cable route overlies.
- 8.5.22 Error! Reference source not found. provides a summary of the bedrock and superficial deposits underlying the proposed cable route from BGS geology data (Ref 8.17).

Table 8-1 – Bedrock and Superficial Deposits

Cable route section	Bedrock geology	Superficial deposits
Section A - Wern CSEC to A498	Dol-cyn-afon Formation (Grey mudstone and silty mudstone and siltstone with bioturbated sandstones locally)	Alluvium (clay, silt, sand and gravel)
Section B - A498 to Porthmadog Roundabout	Nant Ffrancon Subgroup (Mudstones, silty mudstones and sandstones)	Alluvium (clay, silt, sand and gravel)
Section C - Porthmadog Roundabout to Snowdon Street	Nant Ffrancon Subgroup (Mudstones, silty mudstones and sandstones)	Alluvium (clay, silt, sand and gravel)
Section D - Afon Glaslyn Crossing	Nant Ffrancon Subgroup (Mudstones, silty mudstones and sandstones) Dol-cyn-afon Formation (Grey mudstone and silty mudstone and siltstone with bioturbated sandstones locally)	Alluvium (clay, silt, sand and gravel)
Section E – Minffordd CSEC	Dol-cyn-afon Formation (Grey mudstone and silty mudstone and siltstone with bioturbated sandstones locally)	Alluvium (clay, silt, sand and gravel)

- 8.5.23 As illustrated in Error! Reference source not found., the majority of the Glaslyn works site overlies a consistent and low permeability geology, mainly the low permeability Nant Ffrancon Subgroup consisting of Mudstones, silty mudstones and sandstones, and the Dol-cyn-afon Formation consisting of grey mudstone and silty mudstone and siltstone with bioturbated sandstones locally. Superficial deposits of Alluvium (clay, silt, sand and gravel) can be found across the entirety of the Glaslyn works site.

Hydrogeology

Bedrock Aquifer Status

- 8.5.24 The Defra MAGIC website (Ref 7.48) indicates that the bedrock geology underlying the Glaslyn works site is a Secondary B aquifer. These aquifers as defined are mainly lower permeability layers that may store and yield limited amounts of groundwater through

characteristics like thin cracks (called fissures) and openings or eroded layers (Ref 8.19).

Bedrock aquifer vulnerability

- 8.5.25 BGS groundwater vulnerability mapping (Ref 8.19) indicates that the Secondary B Aquifer associated with the bedrock geology underlaying the majority of the Glaslyn works site (Sections A, B, C and D) is at high vulnerability. Section E, the area surrounding the Minffordd CSEC, is indicated as medium vulnerability.

Superficial deposits aquifer status

- 8.5.26 The Defra MAGIC (Ref 7.48) website also indicates that the superficial deposits underlaying the Glaslyn works site a Secondary A aquifer. These aquifers comprise permeable layers that can support local water supplies and may form an important source of base flow to rivers.

Superficial deposits aquifer vulnerability

- 8.5.27 BGS groundwater vulnerability mapping indicates that the Secondary A Aquifer associated with the superficial deposits underlying the majority of the Glaslyn works site (Sections A, B, C and D) is at high vulnerability. Section E is indicated as medium vulnerability.

Soils

- 8.5.28 Soil types (Ref 8.18) along the cable route sections comprise the following.

Section A: Wern CSEC to A498

- 8.5.29 The Wern CSEC and cable route to the A498 is on loamy and clayey soils of coastal flats with naturally high groundwater. Although to the north and south there are freely draining acid loamy soils over rock.

Section B: A498 to Porthmadog Roundabout

- 8.5.30 Section B is predominantly on loamy and clayey soils of coastal flats with naturally high groundwater, with a freely draining acid loamy soils over rock to the north and south.

Section C: Porthmadog Roundabout to Snowdon Street

- 8.5.31 Section C is on loamy and clayey souls of coastal flats with naturally high groundwater.

Section D: Afon Glaslyn Crossing

- 8.5.32 Section D is predominantly underlain by naturally wet saltmarsh soils across the lower reaches of the Afon Glaslyn floodplain. And the western and northern areas of the Afon Glaslyn floodplain are underlain by loamy and clayey soils of coastal flats with naturally high groundwater.

Section E: Minffordd CSEC

- 8.5.33 Section E is predominantly underlain by naturally freely draining acid loamy soils over rock.

Abstractions and Discharges

- 8.5.34 The abstractions and discharges within the ZOI are shown in **Figure 4.8.6** and detailed in **Volume 8, Appendix 4.8.A: Abstractions and Discharges**. A summary is provided below.

Abstractions

- 8.5.35 NRW data show that there is one licensed surface water abstraction (abstracting from two abstraction points) within the ZOI. The abstractions are on the left bank of the Afon Glaslyn approximately 210 m upstream of the Glaslyn works site. The abstraction is associated with mining related activities (mineral washing and dust suppression) at Minffordd Quarry. There are no groundwater abstractions within the ZOI.

Discharges

- 8.5.36 There are 21 licensed discharges within the ZOI. NRW data shows that these include sewage from water undertakers and non-water undertakers, and trade discharges:
- Eleven sewage discharges from water undertakers.
 - Seven sewage discharges from non-water undertakers.
 - Three discharges from trade.

Private Water Supplies

- 8.5.37 A request was made to Gwynedd Council for details of any private water supplies (PWS) in the area. Based on the information received, there are 22 PWS sources within the ZOI, PWS locations are presented in **Figure 4.8.6**. No information was provided on whether these water supplies are from surface water or groundwater.
- 8.5.38 The available PWS data is not necessarily comprehensive and Gwynedd Council state that there may be properties that abstract water privately without their knowledge.

Water Dependant Designated Sites

Conservation Sites

- 8.5.39 An analysis of statutory and non-statutory conservation sites was undertaken to assess the water dependency of conservation sites within the ZOI. Conservation sites with no water dependency were screened out of further assessment. Details of the screened in conservation sites are included in **Table 8-2** and displayed on **Figure 4.8.7**. No LNRs, SPAs or Ramsar sites are present within the ZOI.

Table 8-2 – Conservation Site and Potential Water Designation

Site name	Designation	Water dependency
Coedydd Beddgelert a Cheunant Aberglaslyn	SSSI	Geomorphological features of interest including boulder-bed reach.
Coedydd Nanmor	SSSI	Wet woodland habitat.
Glaslyn	SSSI	Wet woodland, saltmarsh and oligotrophic lowland river.
Meirionnydd Oakwoods and Bat Sites	SAC	Wet woodland habitat.
Hafod Garregog	NNR	Wet woodland habitat.

Bathing Waters

8.5.40 There are no designated bathing waters within the ZOI.

Water Quality and Water Framework Directive Assessment

8.5.41 A full WFD assessment is included in **Volume 7, Appendix 4.8.B: Water Framework Directive Assessment**, however, a summary of the WFD waterbodies is provided below, and displayed on **Figure 4.8.8**.

8.5.42 There are seven WFD river water bodies within the ZOI:

- Glaslyn – Nanmor to Colwyn (GB110065053910).
- Nanmor (GB110065053930).
- Glaslyn – tidal to Afon Croesor (GB110065053860).
- Croesor (GB110065053890).
- Gaseg (GB110065053840).
- Portreuddyn (Glaslyn) (GB110065053810).
- Porthmadog Cut (GB110065053800).

8.5.43 The Llyn and Eryri (GB41002G204600) Groundwater WFD water body is present within the ZOI.

8.5.44 There are no transitional WFD waterbodies within the ZOI. The Glaslyn transitional water body is downstream of the ZOI; however, it has been screened out of the assessment as it is separated from the upstream waterbody (Glaslyn – tidal to Afon Croesor) by a tidal gate and an approximately 4 m high embankment (the Cob Bach).

8.5.45 No WFD canal, lake or coastal waterbodies are present within the ZOI. The full WFD assessment (**Volume 8, Appendix 4.8.B: Water Framework Directive Assessment**) concludes that the Glaslyn Cable Works would not impact on the WFD status or objectives of any associated surface water or groundwater bodies near the Glaslyn Cable Works. The assessment also concludes no adverse impacts on Protected Areas in hydrological connection with the scheme. And the Glaslyn Cable Works would not prevent the achievement of the wider WFD objectives in the Western Wales RBD and is not predicted to have an impact on any other water body within the Western Wales RBD or

8.5.46 mitigation measures developed to achieve good status.

Flood Consequences Assessment

8.5.47 A full Flood Consequence Assessment (FCA) is included in **Volume 8, Appendix 4.8.C: Flood Consequence Assessment**, however a summary of the flood risk is provided below (and displayed on **Figure 4.8.9**):

- According to the Flood Map for Planning the site is situated within fluvial Flood Zones 2 and 3, defended tidal Flood Zone 3, and surface water and small watercourses Flood Zones 2 and 3.
- The proposed development being an energy end use (not associated with power plants) is classified as 'Less Vulnerable' under TAN 15. According to Section 10 of TAN15, Less Vulnerable developments are conditionally acceptable in or on greenfield sites in Zone 3 whereas all developments are generally permissible in

fluvial Flood Zone 1/2. The proposed development is therefore acceptable unless it would cause an increase in flood risk to other receptors.

- The modelling currently shows a small increase in fluvial flood depths across agricultural land, and a minor increase in flood depth to residential receptors in the south of Tremadog. No new residential flood risk receptors are shown to be affected as a result of the works.
- The entire site is within tidal Flood Zone 3. However, as this area is defended flood zone, the development is classed as 'Less vulnerable' in TAN 15 and that mitigation measures have been included to protect the permanent works, it is anticipated that these will be sufficient to protect from tidal flooding.
- The proposed development is outlined to be at risk from surface water and small watercourses. Permanent infrastructure has been raised above the modelled fluvial flood levels and will therefore in this instance also be suitably raised above the pluvial flood depths.
- The risk of groundwater flooding has been preliminary assessed as medium. The development platforms will be raised above the existing ground levels to accommodate for the overland flow in the area, as such groundwater is unlikely to impact on the development.
- The risk of flooding from reservoirs, sewers, highways and artificial sources is considered low – negligible.
- The permanent infrastructure (once operational) will primarily be unmanned. Due to the location of the development, safe access and egress will be available to the west and east via the A487 or A497. No personnel shall access any part of the proposed development if flooding is occurring, or if an NRW flood warning is received.

8.5.48 The assessment of flood risk has been undertaken based on the latest information available at time of reporting, consisting of the output of flood modelling reported in document (GLAS-ARUP-DS-ZZ-FN-X-0011, dated 08 July 2025). As this modelling shows a small increase in flood depth to residential receptors in Tremadog and surrounding agricultural land. This report is unable to conclude that the requirements of TAN15 are met by the Glaslyn Cable Works at this time. However, following consultation with NRW (06 August 2025) an approved mitigation approach is being pursued. These comprise:

- A. Through lowering of the permanent access roads to Wern (currently designed to 300mm). Two scenarios will be modelled these being as existing ground level and at a height of 100 mm.
- B. In the construction phase all temporary works (ramps, access roads and compounds) will be sufficiently designed with inclusion of conveyance pipes so as not to act as a barrier to flood water movement across the floodplain.
- C. Finally, conveyance pipes can be placed passing through the temporary HDD compounds themselves if needed, with suitable part-raising of internal ground levels to maintain access/construction activities within the compound.

8.5.49 These mitigations were discussed with NRW and are currently being modelled in order to confirm their effectiveness. While the modelling results have not been completed at time of reporting, they will be included as supplementary environmental information during the planning process. When this information is submitted, it will be accompanied

by justification that the scheme is aligned with the acceptability criteria in TAN15 and Planning Policy for Wales (PPW).

Future Baseline

- 8.5.50 Although there is the potential for the baseline presented in this chapter to change over time; it is considered that the data presented provides a good representation of the environmental and hydrological conditions at this stage of the proposed works; and the baseline presented provides a realistic platform on which to base the impact assessment.
- 8.5.51 However, as a result of climate change, it is predicted that winters will become generally wetter and summers generally drier. It is also likely that peak rainfall intensities could increase, and the magnitude of flood events could also increase as a consequence.
- 8.5.52 Land use change can affect the permeability of the ground, which in turn can affect surface water run-off. Given that much of the land within the Study Area is currently used for agriculture, it is unlikely that the future run-off regime will change significantly within the Study Area. However, there may be further urban expansion within some of these areas which would result in an increase in surface water runoff. However, all development will be required to utilise SuDS to manage the rates and volumes of
- 8.5.53 runoff to no greater than pre-development levels, and as such land use change is not expected to pose a significant change in runoff within the Study Area.
- 8.5.54 Given the current overall Status / Potential of all the WFD water bodies, it is anticipated that in future, supported by upward trends, their status will improve (or remain as 'Good') to one of 'Good' Status/Potential, as required by the WFD.

8.6 Scope of Assessment

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

Spatial Scope

- 8.6.2 The study area for the Water Environment assessment has been defined through the setting of a ZOI within which all Water Environment effects as a result of the proposed works are expected to occur. In this instance the ZOI has been set to include the fluvial and tidal Flood Zone associated with the Afon Glaslyn and Y Cyt waterbodies as this is well defined by local topography.

Temporal Scope

- 8.6.3 The temporal scope of the assessment of effects on the Water Environment is consistent with the period over which the proposed works would be carried out and therefore covers the construction, operation and maintenance phases. The construction works are planned to be undertaken over a period of approximately 3 years from Q2 2026 – Q2 2029 to coordinate with the wider Project and will occur in phases. The design life of the proposed infrastructure is anticipated to be 80 years and operational and maintenance works will occur throughout this period.

Proposed Works Activities

- 8.6.4 A brief overview of the proposed works is provided here. Further details are provided in **Chapter 2: Glaslyn Cables Works**. The proposed works includes the decommissioning of existing cables and the construction, operation and maintenance of up to ~6 km of replacement cables to upgrade the existing National Grid distribution network between the existing Wern and proposed Minffordd CSECs.
- 8.6.5 As the proposed works comprise linear infrastructure, the construction methods would predominantly be consistent along the length of the route. Therefore, development activities which would be repeated multiple times have been considered as single groups of activities for the purposes of screening.
- 8.6.6 Error! Reference source not found. summarises the proposed works activities and determines whether they are screened in or out of further assessment on the basis of having a potential impact on the Water Environment.
- 8.6.7 The following proposed works activities have not been taken forward for screening on the basis that they have no potential to impact on flood risk, water resources and the aquatic environment:
- Pre-commencement works.
 - Right of way fencing.
 - Overhead cables.

Table 8-3 – Screening assessment of proposed works activities

Activity / Infrastructure	Element of construction / maintenance of interest	Screened in or out of further assessment
Hedgerow and tree removal (Construction)	• Hedgerow and tree removal	Screened out as effects from proposed activity are expected to have a negligible impact on the water environment. These works will be limited and focussed on where construction access is required with riparian trees largely unaffected due to the use of Horizontal Directional Drilling (HDD).
Site establishment (Construction)	• Soil stripping and storage • Aggregate laying and compaction to form hard standing • Installation of offices, welfare facilities and generators • Storage of plant and equipment	Screened in due to the potential for sediment mobilisation during construction, potential release of pollutants during construction, and flood plain displacement.
Cable corridor laying (Construction)	• Land drainage • Soil stripping and storage	Screened in due to the potential for pollutants to be released during

Activity / Infrastructure	Element of construction / maintenance of interest	Screened in or out of further assessment
	• Trenching • Duct installation • Cable installation • Jointing installation • Reinstatement of easement	construction, and the potential for excavations to affect surface water flow paths and groundwater quantity.
Cable corridor watercourse crossing – open cut (Construction)	• Trenching • Fluming • Damming • Reinstatement of channel and banks	Screened in due to the potential for hydromorphology, ecological continuity, water quantity and quality to be affected.
Cable corridor watercourse crossings – Trenchless (Construction)	• HDD works • HDD compounds	Screened in due to the potential flood plain displacement and increased flood risk from HDD compounds and the potential for water quantity and quality to be affected.
Permanent above ground infrastructure (Construction and Operation)	• Joint bay kiosks • Wern CSEC • Minffordd CSEC	Screened in due to potential flood plain displacement and increased flood risk and the potential for water quality and quantity to be affected.
Haul roads and access roads (Construction and Operation)	• Access road – A498 to Wern CSEC • Haul roads	Screened in (Construction) due to the potential for sediment mobilisation and where temporary culverts are required over small watercourses. Screened in (Operation) due to potential for sediment mobilisation.
Decommissioning of existing infrastructure (Construction)	• Purging of cables to be removed • Cut, purging, capping of cables and installation of monitoring points for cables remaining in situ • Decommissioning of existing Garth CSEC	Screened in due to risk of sediment mobilisation and pollutants.

Activity / Infrastructure	Element of construction / maintenance of interest	Screened in or out of further assessment
Operation and maintenance (Operation)	• Presence of buried cable and above ground infrastructure • Operations and maintenance activities will be detailed in the Operations and Maintenance manual which will be developed.	Screened in due to risk of sediment mobilisation and pollutants.

Potential Receptors

- 8.6.8 The baseline characterisation identifies potential water environment receptors within the following three broad receptor types:
- Flood risk.
 - Aquatic environment.
 - Water resources.

8.6.9 Each of these receptor types are discussed below.

Identification of Receptors

- 8.6.10 The baseline characterisation enables identification of potential flood risk, aquatic environment and water resources receptors:
- Flood risk receptors are defined within this assessment as people, property and infrastructure that could be at risk of flooding (both on site and off site). Further detail is provided in the FCA in **Volume 8, Appendix 4.8.C: Flood Consequence Assessment**.
 - Aquatic environment receptors are defined within this assessment as either WFD surface and groundwater water bodies or water-dependent designated conservation sites. The basic unit for identification of aquatic environment receptors is WFD surface and groundwater water bodies, as defined in the NRW's Cycle 3 River Basin Management Plans. Groundwater WFD water bodies have been considered under these receptors due to their potential to feed aquatic environment receptors. The potential for impacts on the supporting water quality and hydromorphology for freshwater dependent sites is also considered. This includes all sites that are internationally and nationally designated for nature conservation purposes (i.e. SAC, SPA, Ramsar sites, SSSI and NNR). In this context, the potential water dependence, and consequent impacts on water quality and hydromorphology arising from the proposed works are considered in respect of the condition and conservation objectives of each designated site. All conservation sites outside of the ZOI, or those within which have been deemed to not have a hydrological or hydrogeological component to their designation, have been screened out from further assessment here.
 - Water resources receptors are defined as surface water and groundwater abstractions including their associated catchment areas. The potential for impacts on water quality, and water balance and flow regime in the catchments upstream of abstraction locations are assessed to determine potential effects on the abstractions themselves. The assessment of abstractions considers both those from surface water and groundwater sources. Discharges to surface water are also considered,

although there is little scope for effects of the proposed works during construction on discharges, apart from direct physical impingement, which should be largely avoided through the imposition of suitable stand off distances between working areas and discharge infrastructure.

8.6.11 Error! Reference source not found. summarises the water environment receptors that are subject to potential effects from the Scheme.

Table 8-4 – Water environment receptors subject to potential effects

Receptor	Reason for inclusion
Flood Risk receptors	
Third party receptors including third-party people, property and infrastructure within and outside of the ZOI.	Planning policy states that a project cannot increase flood risk to third parties or in watercourses downstream.
Aquatic Environment receptors	
WFD Groundwater bodies Llyn and Eryri (GB41002G204600)	One WFD groundwater body which is intersected by the ZOI.
WFD River Water Bodies Glaslyn - Nanmor to Colwyn (GB110065053910) Nanmor (GB110065053930) Glaslyn - tidal to Afon Croesor (GB110065053860) Croesor (GB110065053890) Gaseg (GB110065053840) Portreuddyn (Glaslyn) (GB110065053810) Porthmadog Cut (GB110065053800)	Seven WFD surface water bodies (river) which are intersected by or are upstream of the Glaslyn works site.
Conservation Sites Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites (SAC) Coed Tremadog (SAC, SSSI & NNR) Hafod Garregog (SAC, SSSI & NNR) Coedydd Beddgelert a Cheunant Aberglaslyn (SSSI) Coedydd Nanmor (SSSI) Glaslyn (SSSI) Tyn-Llan (SSSI)	These sites, in the ZOI, are Designated Conservation Sites and identified as water dependent.
Water Resources receptors	
Licensed Abstractions	One licensed abstraction within the ZOI whose associated catchment area has a possible hydraulic pathway from the Glaslyn works site.

Licensed Discharges	21 discharges within the ZOI which have the potential to be affected by the proposed works.
PWS abstractions	22 private water supply abstractions within the ZOI which have the potential to be affected by the proposed works.

8.6.12 **Table 8-5** summarises the potential Water Quality, Resources and Flood Risk receptors that have been reviewed and states whether they have been included or excluded from the Water Quality, Resources and Flood Risk assessment.

Table 8-5 – Scope of Water Quality, Resources and Flood Risk assessment

Receptor	Scoped in/out per phase		Justification
	Construction	Operation	
Flood risk	In	In	Third party receptors including third-party people, property and infrastructure within and outside of the ZOI may be at risk of flooding during construction, decommissioning and operational activities. Temporary watercourse crossings, above ground joint bay kiosks, temporary stockpiles and construction compounds, and raised access tracks within floodplain areas have the potential to influence watercourse conveyance, runoff rates, flow pathways, and volumetric displacement of flood water.
Aquatic environment	In	In	There is potential for accidental contamination entering watercourses from leakage or spillage of fuels and chemicals from stores, HDD works and vehicles onsite. Additionally, there is potential that ground disturbance and mobilisation of sediments or contaminants could lead to silt laden or otherwise contaminated runoff entering watercourses.
Water resources	In	In	There is potential for accidental contamination entering surface water and groundwater catchments of water resources. This may arise from leakage or spillage of fuels and chemicals from stores, HDD works and vehicles onsite. Additionally, there is potential that ground disturbance and mobilisation of sediments or contaminants could lead to silt laden or otherwise contaminated runoff entering watercourses.

8.7 Methodology

- 8.7.1 Full details of the technical methods used to determine the baseline conditions, sensitivity of the receptors, magnitude of effects and the significance criteria that have been used for the Water Quality, Resources and Flood Risk assessment are in **Appendix 1.4.A: Topic Assessment Methodology**.

8.8 Potential Effects

- 8.8.1 The anticipated effects resulting from the loss or change to Water Quality, Resources and Flood Risk elements and features during construction, operation and maintenance of the proposed works are outlined as follows:

Construction

- 8.8.2 The source of potential Water Quality, Resources and Flood Risk effects during the construction phase includes:
- Aquatic environment and water resources receptors:
 - Deterioration in the water quality of surface water bodies via generation of sediment laden run-off from working areas and discharge of dewatered groundwater from excavations.
 - Potential effects on hydromorphology and flow regime of surface water bodies as a result of increased runoff, dewatering of excavations and sediment inputs from working areas or direct watercourse disturbance (including from new watercourse crossings).
 - Deterioration in the water quality of surface and groundwater bodies affected by disturbance of contaminated land, or accidental spillage of pollutants (e.g. fuel or oil).
 - Deterioration in water quality due to permitted discharges from construction (e.g. treated sewage effluent from welfare facilities).
 - Impacts on groundwater levels from dewatering activities and the effects of underground infrastructure.
 - Flood risk and building development receptors:
 - Changes to fluvial or tidal flood risk associated with raised structures in the floodplain (loss of floodplain storage and continuity and change in floodplain flow conveyance).
 - Changes to surface water flood risk due to changes in runoff rates and flow pathways resulting from ground disturbance and creation of new impermeable surfaces.

- 8.8.3 The source of potential flood risk effects during the construction phase are further detailed within the FCA (**Volume 8, Appendix 4.8.C: Flood Consequence Assessment**).

Operation and Maintenance

- 8.8.4 The source of potential Water Quality, Resources and Flood Risk effects on receptors during the operational phase includes:

- Aquatic environment and water resources receptors:
 - Potential for accidental contamination entering watercourses associated with spillage or leakage of fuels, lubricants or other chemicals.
 - Ground disturbance and mobilisation of sediments or contaminants leading to silt laden or otherwise contaminated runoff entering watercourses.
 - Physical disruption to existing infrastructure (for example, septic tank soakaways or discharge outfalls) from isolated repairs of joint bay kiosks or cable circuits.
 - Changes in channel morphology and fluvial geomorphological processes, should cables become exposed at watercourse crossings.
- Flood risk receptors:
 - Changes to fluvial or tidal flood risk associated with loss of floodplain storage and change in floodplain flow conveyance, where permanent above ground infrastructure is in tidal or fluvial flood zones.
 - Changes to surface water flood risk due to changes in flow pathways and runoff rates resulting from changed ground levels and creation of new impermeable surfaces for permanent above ground infrastructure.
 - Changes to groundwater flood risk due to presence of underground infrastructure.

8.8.5 The source of potential flood risk effects during the operation and maintenance phase are also further detailed within the FCA (**Volume 8, Appendix 4.8.C: Flood Consequence Assessment**).

8.9 Mitigation and Residual Effects

Embedded Measures

8.9.1 A series of embedded measures will be implemented during in the construction, operation and maintenance.

- An Outline Construction Environmental Management Plan (CEMP) (**Appendix 4.2.A Outline Construction Environmental Management Plan**) will include measures to ensure surface and groundwater quality are not impacted by the proposed works.
 - The EMP details that no works (in, over or under) will be undertaken within 20 m of a watercourse bank without technical environmental advice regarding the requirement for a permit (FRAP). This includes all HDD works under NRW Main Rivers. Works will only proceed once appropriate mitigation (within technical environmental advice and/or FRAP) has been installed and all conditions have been met.
 - The EMP also details that storage and handling of hazardous substances (including fuels) should not occur within 10 m of any inland freshwater or coastal waters, or within 50 m from a well or borehole. This includes the Afon Glaslyn and its associated area of salt marsh, Y Cyt / Nant yr Afon Oer, and the network of drainage channels and ditches around Porthmadog.
- A Flood Evacuation Plan will ensure that all personnel will be evacuated before a potential flood event.

- Construction works will take place during periods of normal to low flow conditions to avoid conveyance-related flood risk effects.
- A Pollution Prevention Plan (PPP) will be prepared to minimise the risk to surface and groundwater quality during construction, operation and maintenance.
- In the unlikely event of a pollution incident, a Pollution Incident Response Plan (PIRP) will have been prepared to minimise and mitigate the magnitude of change on potential receptors. Where watercourses are not crossed via HDD, trenched crossings will be used. However, for all trenched crossings over pumping or fluming will be implemented to maintain the flow regime downstream of the crossing.

- 8.9.2 Further embedded measures can be found within the EMP in **Volume 8, Appendix 4.2.A Outline Construction Environmental Management Plan**.
- 8.9.3 **Table 8-6** and **Table 8-7** detail the residual effects to flood risk, water resources and the aquatic environment during the construction and operation and maintenance phases respectively. The tables detail the potential water environment receptors and associated risks, along with the receptor sensitivity, anticipated magnitude of change and significance based on the methodology in **Appendix 1.4.A: Topic Assessment Methodology**.
- 8.9.4 The sensitivity/importance/value of a receptor is defined using the criteria set out in Table 7-1 in **Appendix 1.4.A: Topic Assessment Methodology** and is defined as very low, low, medium, high and very high.
- 8.9.5 The magnitude of change on a receptor resulting from activities relating to the development is defined using the criteria set out in Table 7-2 of **Appendix 1.4.A: Topic Assessment Methodology** and is defined as very low, low, medium, high and very high.
- 8.9.6 The significance of the environmental effects is based on the combination of the sensitivity/importance/value of a receptor and the magnitude of change and is expressed as major (significant), moderate (probably significant) or minor/negligible (not significant), subject to the evaluation methodology outlined in Table 7-3 of **Appendix 1.4.A: Topic Assessment Methodology**.

Table 8-6 – Flood risk, water resources and aquatic environment residual construction effects

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor	Magnitude of change	Significance	Summary rationale
Flood Risk				
Flood Risk <i>Third party receptors including third-party people, property and infrastructure within and outside of the ZOI.</i> Changes in watercourse conveyance associated with temporary watercourse crossings. Volumetric displacement of flood water associated with the construction of temporary stockpiles and raised access tracks within floodplain areas. Changes in runoff rates and new flow pathways associated with ground disturbance and the development of temporary access tracks and temporary construction compound areas.	High	Medium	Moderate (Potentially significant)	The receptors are of High sensitivity/importance, however, the magnitude of change from construction phase activities is anticipated to be Moderate. The flood modelling results currently indicate a minor increase in flood depth to residential receptors within Tremadog due to the temporary infrastructure within the floodplain. Temporary crossings will be appropriately designed to not impact flow conveyance and flood risk. These crossings will be temporary and in place for short durations and constructed in line with permits from NRW/Lead Local Flood Authority. Floodplain compensation will be implemented to account for volumetric displacement of flood water from raised temporary stockpiles, raised construction compound areas and raised access tracks within floodplain areas.
Water Resources				
Licensed Abstractions	Low	Very low	Negligible	The licensed abstractions at Minffordd Quarry and are of Low sensitivity. The magnitude of change throughout

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor	Magnitude of change	Significance	Summary rationale
<i>One surface water abstractions for Minffordd Quarry (mineral washing and dust suppression).</i> Reduction of water availability to support existing surface water and groundwater abstractions as a consequence of water quantity and quality effects. This could arise from dewatering of the trenched excavations for cabling, ground disturbance for the development of temporary access tracks, temporary construction compound establishment, or the leakage or spillage of fuels and chemicals onsite. This includes the potential for breakout and leakage of bentonite during trenchless crossing.			(Not significant)	construction is anticipated to be Very Low. The abstractions are over 500 m upstream of the Afon Glaslyn crossing. Additionally, the Afon Glaslyn would be crossed using HDD techniques, as such there would be no effects on channel conveyance and water availability, and there would be no release of sediment into the watercourse that could affect the quality of the abstraction. An EMP will detail pollution prevention measures for all works within the Afon Glaslyn floodplain to mitigate against water quality impacts that may impact the abstractions. Contractors will be made aware of their statutory responsibility not to “cause or knowingly permit water pollution.” A PPP and PIRP will be prepared for the proposed works, the latter in line with Pollution Prevention Guideline 21 (PPG 21, 2009), and all contractors will be briefed on these plans, with copies made available on Glaslyn works site.
Licensed Discharges <i>21 licensed discharges within the ZOI.</i> Physical disruption to existing discharge infrastructure (for example, septic tank soakaways or discharge outfalls) from trenching, temporary access track and	Low	Very low	Negligible (Not significant)	There are no planned works activities near any licensed discharges in the ZOI that would cause physical disruption to existing discharge infrastructure. The location of statutory undertaker assets (including water supply and sewer

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor	Magnitude of change	Significance	Summary rationale
temporary construction compound establishment.				pipes, water and waste treatment works etc.) will be confirmed through inspection of detailed plans from the undertakers. All assets potentially affected by the proposed works would be identified, with particular consideration to access roads and crossings.
PWS abstractions <i>22 PWS within the ZOI.</i> Reduction of water availability to support existing surface water and groundwater abstractions as a consequence of water quantity and quality effects. This could arise from dewatering of the trenched excavations for cabling, ground disturbance for the development of temporary access track and temporary construction compound establishment, or the leakage or spillage of fuels and chemicals onsite. This includes the potential for breakout and leakage of bentonite during trenchless crossing.	Medium	Very Low	Negligible (Not significant)	The receptor is of Medium sensitivity, however, the magnitude of change from construction phase activities is anticipated to be Very Low, thus the significance is Negligible. There are no PWS near the proposed works that would be directly impacted. Embedded environmental measures would prevent any impacts on local groundwater quality, quantity or resource availability. In line with good practice, PPPs will be developed to detail how ground and surface waters would be protected from construction and operation related pollution. These would include information on the use and storage of any fuels, oils and other chemicals, and pollution incidence response planning.
Aquatic Environment				
WFD Groundwater bodies <i>Llyn and Eryri</i>	Low	Very Low	Negligible	As the WFD waterbody is of Poor Status, it is of Low sensitivity. Due to limited extent of proposed works compared to

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor	Magnitude of change	Significance	Summary rationale
A decline in groundwater levels arising from dewatering of the trenched excavations for cabling or the development of less permeable access tracks and temporary construction compounds establishment reducing infiltration. Potential for accidental contamination entering groundwater or watercourses, associated with spillage or leakage of fuels, lubricants or other chemicals. This includes the potential for leakage of bentonite during trenchless crossing.			(Not significant)	the area of the groundwater body and the low permeability of bedrock, and anticipated effectiveness of environmental embedded measures combine to limit magnitude of change to the baseline condition to be Very Low. Dewatering of trench excavations will be carefully monitored, and groundwater flow disruption and drawdown would be minimised via good construction practices. The time any excavation is open would be kept to a minimum to minimise ingress of water and dewatering requirements. Dewatering of excavations will be undertaken in line with good practice. Effects of dewatering on potential receptors will be incorporated into the proposed approaches for each piece of infrastructure. Appropriate treatment would be installed before discharge to surface or groundwater, this would include the use of siltbusters (or similar) before discharge to surface waters. Appropriate licences and permits will be applied for if required. During HDD activities, the drilling fluid engineer will carefully monitor the fluid usage in the recycling system and will quickly identify if fluid is being lost into the strata. If fluid loss is identified there

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor	Magnitude of change	Significance	Summary rationale
				are a number of measures that can be taken to seal the bore, including the following: • Modifying the drilling fluid properties to increase the effectiveness of the bentonite clay filter cake that lines the wall of the borehole. Standard process and procedures in place for drilling, data collection and communication. dAppropriate drill fluid monitoring (fluid properties, fluid volume and flow, and downhole annular pressure).Addition of stop-loss materials to bridge and seal larger voids in the soil.dModifying the mud weight (drilling fluid density) to either balance or counter the groundwater pressure depending on ground conditions. For trenchless crossings detailed pre-drilling planning of methods and processes will be undertaken. The extensive pre-drill planning would include the compilation of potential sub-surface structures along the route, environmental due diligence of the sites of the entry and exit holes, a geotechnical investigation along the proposed route to determine geological conditions with an emphasis on identifying sensitive areas and problematic ground conditions, and the analytical analysis of fluid pressures

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor	Magnitude of change	Significance	Summary rationale
				versus depth of cover to determine adequate depths of cover to minimise breakouts. Techniques will be employed by the Contractor to manage the risk of drilling fluid breakout or losses into the deposits or strata surrounding the HDD bore. Drilling fluids would be used to seal permeable deposits or strata. The naturally occurring bentonite clay would be used as the base for the drilling fluid, which would line the bore wall, preventing fluid loss and near-surface groundwater ingress.
WFD River Water Bodies intersected by the Glaslyn works site <i>Glaslyn - tidal to Afon Croesor (GB110065053860).</i> <i>Porthmadog Cut (GB110065053800).</i> Potential for accidental contamination entering watercourses. This could arise from cable installation or the leakage or spillage of fuels and chemicals from stores and vehicles onsite. Ground disturbance and mobilisation of sediments and contaminants leading to silt laden or otherwise contaminated runoff entering watercourses. Changes to watercourse morphology as a result of works in or near watercourses	Medium	Low	Minor (Not significant)	The WFD waterbodies are of Moderate Status and thus of medium sensitivity. There would be extensive proposed works in catchments during the construction phase, however, the anticipated effectiveness of embedded environmental measures and considerable attenuation and dilution combine to limit magnitude of change to baseline conditions. If water being pumped from excavations is suspected to be contaminated, appropriate measures would be taken in accordance with NRW guidance and the Environmental Permitting Regulations (Ref 7.9) to prevent uncontrolled or

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor	Magnitude of change	Significance	Summary rationale
(for example, installation of watercourse crossings and associated earthworks).				unauthorised releases of this water to ground or to the water environment. Any temporary crossings would be in place for the minimal time possible and consents obtained where relevant. All permanent cable crossings would pass beneath the bed of watercourses (there will be no 'within bank' crossings). Sufficient depth between the bed of the watercourse and the top of the cable (whether trenchless or open cut) would be provided to ensure no potential for exposure of cable due to scour. In line with good practice, PPPs will be developed to detail how ground and surface waters would be protected from construction and operation related pollution. These would include information on the use and storage of any fuels, oils and other chemicals, and pollution incidence response planning.
WFD River Water Bodies upstream of the Glaslyn works site (Good Status) <i>Nanmor (GB110065053930).</i> <i>Croesor (GB110065053890).</i> <i>Glaslyn - Nanmor to Colwyn (GB110065053910).</i> Potential for accidental contamination entering watercourses. This could arise from cable installation or the leakage or	High	Very Low	Minor (Not significant)	The WFD waterbodies are of Good Status and as such are classed as High sensitivity receptors. However, these waterbodies are upstream of the Glaslyn works site and the anticipated effectiveness of embedded environmental measures and considerable attenuation and dilution combine to limit magnitude of change to baseline conditions.

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor	Magnitude of change	Significance	Summary rationale
spillage of fuels and chemicals from stores and vehicles onsite.				In line with good practice, PPPs will be developed to detail how ground and surface waters would be protected from construction and operation related pollution. These would include information on the use and storage of any fuels, oils and other chemicals, and pollution incidence response planning.
WFD River Water Bodies upstream of the Glaslyn works site (Moderate Status) <i>Gaseg (GB110065053840).</i> <i>Portreuddyn (Glaslyn) (GB110065053810).</i> Potential for accidental contamination entering watercourses. This could arise from cable installation or the leakage or spillage of fuels and chemicals from stores and vehicles onsite.	Medium	Very Low	Negligible (Not significant)	The WFD waterbodies are of Moderate Status, as such, they are classified as Medium sensitivity receptors. These waterbodies are upstream of the Glaslyn works site and the anticipated effectiveness of embedded environmental measures and considerable attenuation and dilution combine to limit magnitude of change to baseline conditions. In line with good practice, PPPs will be developed to detail how ground and surface waters would be protected from construction and operation related pollution. These would include information on the use and storage of any fuels, oils and other chemicals, and pollution incidence response planning.
Water dependant SACs intersected by the Glaslyn works site	Very High	Very Low	Minor (Not significant)	The SAC is intersected by the Glaslyn works site is of Very High sensitivity and is designated for a number of water dependent habitats including bog

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor	Magnitude of change	Significance	Summary rationale
<i>Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites SAC.</i> Reduction of water availability to support existing groundwater or surface water designated sites, ecosystems and features. This could arise from dewatering of the trenched excavations for cabling, ground disturbance for the development of temporary access track establishment, or the leakage or spillage of fuels and chemicals onsite. This includes the potential for breakout and leakage of bentonite during trenchless crossing.				woodland, wet heathland and rivers with floating vegetation including water crowfoot. However, the anticipated effectiveness of embedded environmental measures and considerable attenuation and dilution combine to limit magnitude of change to baseline conditions. HDD techniques would be used for the crossing of the Afon Glaslyn and detailed pre-drilling planning of methods and processes will be undertaken. The extensive pre-drill planning would include the compilation of potential sub-surface structures along the proposed route, environmental due diligence of the sites of the entry and exit holes, a geotechnical investigation along the proposed route to determine geological conditions with an emphasis on identifying sensitive areas and problematic ground conditions, and the analytical analysis of fluid pressures versus depth of cover to determine adequate depths of cover to minimise breakouts. Best practice techniques and methodologies will be undertaken during the implementation of HDD works. The HDD works are to be undertaken in accordance with Pipeline Design for Installation of Horizontal directional

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor	Magnitude of change	Significance	Summary rationale
				drilling (Manual of Practice) by ASCE Oct 2014 (Ref 8.20) or similar. Techniques would be employed by the Contractor to manage the risk of drilling fluid breakout or losses into the deposits or strata surrounding trenchless crossings (including HDD bores). The risk of breakouts can be mitigated by adopting good drilling practices, including: • Experienced drillers. • Standard process and procedures for drilling, data collection and communication. • Appropriate drill fluid monitoring (fluid properties, volume, flow and downhole pressure). • Development of a breakout response plan, so that equipment and trained personnel are in place for a rapid response. • Acquisition of rights-of-way or easements for at least the first 60 m from both the entry and exit holes so that no access-related delays are incurred in response to any breakouts. For temporary watercourse crossings, where culverts are to be used, these would be appropriately sized to maintain existing flow conveyance. Where existing

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor	Magnitude of change	Significance	Summary rationale
				culverts already exist nearby, similarly sized culverts may be suitable.
Water dependant SSSIs intersected by the Glaslyn works site <i>Glaslyn SSSI.</i> Reduction of water availability to support existing groundwater or surface water designated, ecosystems and features. This could arise from dewatering of the trenched excavations for cabling, ground disturbance for the development of temporary access track establishment, or the leakage or spillage of fuels and chemicals onsite. This includes the potential for breakout and leakage of bentonite during trenchless crossing.	High	Low	Minor (Not significant)	Whilst the SSSI is intersected by the Glaslyn works site is of High sensitivity, due to their designations, the anticipated effectiveness of embedded environmental measures and considerable attenuation and dilution combine to limit magnitude of change to baseline conditions with respect to the water environment. HDD techniques would be used for the crossing of the Afon Glaslyn and detailed pre-drilling planning of methods and processes will be undertaken. The extensive pre-drill planning would include the compilation of potential sub-surface structures along the proposed route, environmental due diligence of the sites of the entry and exit holes, a geotechnical investigation along the proposed route to determine geological conditions with an emphasis on identifying sensitive areas and problematic ground conditions, and the analytical analysis of fluid pressures versus depth of cover to determine adequate depths of cover to minimise breakouts. Best practice techniques and methodologies will be undertaken during the implementation of HDD works. The

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor	Magnitude of change	Significance	Summary rationale
				HDD works are to be undertaken in accordance with Pipeline Design for Installation of Horizontal directional drilling (Manual of Practice) by ASCE Oct 2014 (Ref 8.21) or similar. Techniques would be employed by the Contractor to manage the risk of drilling fluid breakout or losses into the deposits or strata surrounding including HDD bores. The risk of breakouts can be mitigated by adopting good drilling practices, including: • Experienced drillers. • Standard process and procedures for drilling, data collection and communication. • Appropriate drill fluid monitoring (fluid properties, volume, flow and downhole pressure). • Development of a breakout response plan, so that equipment and trained personnel are in place for a rapid response. • Acquisition of rights-of-way or easements for at least the first 60 m from both the entry and exit holes so that no access-related delays are incurred in response to any breakouts. For temporary watercourse crossings, where culverts are to be used, these will

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor	Magnitude of change	Significance	Summary rationale
				be appropriately sized to maintain existing flow conveyance. Where existing culverts already exist nearby, similarly sized culverts may be suitable.
Water dependant SACs upstream of the Glaslyn works site <i>Coed Tremadog (SAC, SSSI & NNR).</i> <i>Hafod Garregog (SAC, SSSI & NNR).</i> 8.9.7 Reduction of water availability to support existing groundwater or surface water designated or undesignated sites, ecosystems and features. This could arise from dewatering of the trenched excavations for cabling, ground disturbance for the development of temporary access track establishment, or the leakage or spillage of fuels and chemicals onsite. This includes the potential for breakout and leakage of bentonite during trenchless crossing.	Very High	Very Low	Minor (Not significant)	Whilst the conservation sites intersected by the Glaslyn works site are of Very High sensitivity, due to their designations, the anticipated effectiveness of embedded environmental measures and considerable attenuation and dilution combine to limit magnitude of change to baseline conditions. In line with good practice, PPPs will be developed to detail how ground and surface waters would be protected from construction and operation related pollution. These would include information on the use and storage of any fuels, oils and other chemicals, and pollution incidence response planning.
Water dependant SSSIs upstream of the Glaslyn works site <i>Coedydd Beddgelert a Cheunant Aberglaslyn SSSI.</i> <i>Coedydd Nanmor SSSI.</i> <i>Tyn-Llan SSSI.</i> Reduction of water availability to support existing groundwater or surface water	High	Very Low	Minor (Not significant)	The SSSIs are classified as High sensitivity receptors. These SSSIs are upstream of the Glaslyn works site and the anticipated effectiveness of embedded environmental measures and considerable attenuation and dilution combine to limit magnitude of change to baseline conditions.

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor	Magnitude of change	Significance	Summary rationale
designated or undesignated sites, ecosystems and features. This could arise from dewatering of the trenched excavations for cabling, ground disturbance for the development of temporary access track establishment, or the leakage or spillage of fuels and chemicals onsite. This includes the potential for breakout and leakage of bentonite during trenchless crossing.				In line with good practice, PPPs will be developed to detail how ground and surface waters would be protected from construction and operation related pollution. These would include information on the use and storage of any fuels, oils and other chemicals, and pollution incidence response planning.

Table 8-7 – Flood risk, water resources and aquatic environment residual operation and maintenance effects

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor	Magnitude of change	Significance	Summary rationale
Flood Risk				
Third party receptors including third-party people, property and infrastructure within and outside of the ZOI. Changes to fluvial or tidal flood risk associated with loss of floodplain storage and change in floodplain flow conveyance, where permanent above ground infrastructure is in tidal or fluvial flood zones.	High	Medium	Moderate (Potentially significant)	The receptors are of High sensitivity/importance, and the magnitude of change from residual operation and maintenance activities is anticipated to be Medium. The flood modelling results currently indicate a minor increase in flood depth to residential receptors within Tremadog due to the permanent infrastructure.

Changes to surface water flood risk due to changes in flow pathways and runoff rates resulting from changed ground levels and creation of new impermeable surfaces for permanent above ground infrastructure.

Changes to groundwater flood risk due to presence of underground infrastructure.

Water Resources

Licensed Abstractions

Low

Very Low

Negligible
(Not
significant)

Two surface water abstractions for Minffordd Quarry (mineral washing and dust suppression).

Potential for accidental contamination entering groundwater or watercourses, associated with spillage or leakage of fuels, lubricants or other chemicals during operation and maintenance activities.

The two licensed abstractions in the ZOI are over 500 m upstream of the Afon Glaslyn crossing and are used for mineral washing and dust suppression at Minffordd Quarry and are of Low sensitivity. The magnitude of change throughout operation and maintenance will be Very Low. It is anticipated that the effectiveness of embedded environmental measures and considerable attenuation and dilution would combine to limit magnitude of change to baseline conditions. An EMP will detail pollution prevention measures for all maintenance operations to mitigate against water quality impacts that may impact the abstractions. All maintenance activities would be of short duration and have little impact on channel conveyance and water availability, and there would be no release of sediment into the watercourse that could affect the quality of the abstraction.

Licensed Discharges <i>21 licensed discharges within the ZOI.</i> Physical disruption to existing infrastructure (for example, septic tank soakaways or discharge outfalls) from isolated repairs of joint bay kiosks or cable circuits.	Low	Very Low	Negligible (Not significant)	There are 21 licensed dischargers within the ZOI, however, none of these are near proposed works. It is anticipated that the effectiveness of embedded environmental measures would limit magnitude of change to baseline conditions. The licensed discharges are of Low sensitivity and the magnitude of change from operational phase activities is anticipated to be Very Low, thus the significance is Negligible. There are no planned operational or maintenance activities near any licensed discharges in the ZOI that would cause physical disruption to existing discharge infrastructure. The location of statutory undertaker assets (including water supply and sewer pipes, water and waste treatment works etc.) will be confirmed through inspection of detailed plans from the undertakers. All assets potentially affected by the proposed works would be identified.
PWS abstractions <i>22 private water supplies within the ZOI</i> Potential for accidental contamination entering groundwater or watercourses, associated with spillage or leakage of fuels, lubricants or other chemicals during operation and maintenance activities.	Medium	Very Low	Negligible (Not significant)	There are 22 mapped PWS within the ZOI, however, none of the supplies are near the Glaslyn works site, and are upgradient of the Glaslyn works site. The PWS are of Medium sensitivity, however, the magnitude of change from operational and maintenance phase activities is anticipated to be Very Low, thus the significance is Negligible. It is anticipated that the effectiveness of embedded environmental measures and

considerable attenuation and dilution will combine to limit magnitude of change to baseline conditions during operation and maintenance.

Embedded environmental measures would prevent any impacts on local groundwater quality, quantity or resource availability.

In line with good practice, PPPs will be developed to detail how ground and surface waters would be protected from operation related pollution. These would include information on the use and storage of any fuels, oils and other chemicals, and pollution incidence response planning.

Aquatic environment

WFD Groundwater bodies <i>Llyn and Eryri</i> Potential for accidental contamination entering groundwater associated with spillage or leakage of fuels, lubricants or other chemicals during operation and maintenance activities.	Low	Very Low	Negligible (Not significant)	As the WFD waterbody is of Poor Status, it is of Low sensitivity. Due to limited extent and scope of the proposed operational and maintenance works compared to the area of the groundwater body and the low permeability of bedrock, and anticipated effectiveness of environmental embedded measures combine to limit magnitude of change to the baseline condition to be Very Low. In line with good practice, PPPs will be developed to detail how ground and surface waters would be protected from operation related pollution. These would include information on the use and storage of any fuels, oils and other

chemicals, and pollution incidence response planning.

WFD River Water Bodies intersected by the Glaslyn works site <i>Glaslyn - tidal to Afon Croesor (GB110065053860).</i> <i>Porthmadog Cut (GB110065053800).</i> Potential for accidental contamination entering watercourses associated with spillage or leakage of fuels, lubricants or other chemicals operation and maintenance activities. Ground disturbance and mobilisation of sediments and contaminants leading to silt laden or otherwise contaminated runoff entering watercourses. Changes in channel morphology and fluvial geomorphological processes, should cables become exposed at watercourse crossings.	Medium	Low	Minor (Not significant)	The WFD waterbodies are of Moderate Status and of Medium sensitivity. Due to limited extent and scope of the proposed operational and maintenance works, the anticipated effectiveness of embedded environmental measures and considerable attenuation and dilution combine to limit magnitude of change to baseline conditions to Low. In line with good PPPs will be developed to detail how ground and surface waters would be protected from operation related pollution. These would include information on the use and storage of any fuels, oils and other chemicals, and pollution incidence response planning. Cables would be laid at suitable distance beneath all rivers beds and banks to ensure that cables would not become exposed and effect geomorphological processes.
WFD River Water Bodies upstream of the Glaslyn works site (Good Status) <i>Nanmor (GB110065053930).</i> <i>Croesor (GB110065053890).</i> <i>Glaslyn - Nanmor to Colwyn (GB110065053910).</i> Potential for accidental contamination entering watercourses. This could arise from the leakage and spillage of fuels	High	Very Low	Minor (Not significant)	The WFD waterbodies are of Good Status and as such are classed as High sensitivity receptors. However, these waterbodies are upstream of the Glaslyn works site and the anticipated effectiveness of embedded environmental measures and considerable attenuation and dilution combine to limit magnitude of change to baseline conditions.

and chemicals from stores and vehicles during operation and maintenance activities.				In line with good practice, PPPs will be developed to detail how ground and surface waters would be protected from operation related pollution. These would include information on the use and storage of any fuels, oils and other chemicals, and pollution incidence response planning.
WFD River Water Bodies upstream of the Glaslyn works site (Moderate Status) <i>Gaseg (GB110065053840).</i> <i>Portreuddyn (Glaslyn) (GB110065053810).</i> Potential for accidental contamination entering watercourses. This could arise from the leakage and spillage of fuels and chemicals from stores and vehicles during operation and maintenance activities. Ground disturbance and mobilisation of sediments and contaminants leading to silt laden or otherwise contaminated runoff entering watercourses during operation and maintenance activities.	Medium	Very Low	Negligible (Not significant)	The WFD waterbodies are of Moderate Status, as such, they are classified as Medium sensitivity receptors. These waterbodies are upstream of the Glaslyn works site and the anticipated effectiveness of embedded environmental measures and considerable attenuation and dilution combine to limit magnitude of change to baseline conditions. In line with good practice, PPPs will be developed to detail how ground and surface waters would be protected from operation related pollution. These would include information on the use and storage of any fuels, oils and other chemicals, and pollution incidence response planning.
Water dependant SACs intersected by the Glaslyn works site <i>Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites SAC.</i> Potential for accidental contamination entering watercourses. This could arise from the leakage or spillage of fuels and	Very High	Very Low	Minor (Not significant)	The SAC is intersected by the Glaslyn works site is of Very High sensitivity and is designated for a number of water dependent habitats including bog woodland, wet heathland and rivers with floating vegetation including water crowfoot. However, the anticipated effectiveness of embedded environmental measures and

chemicals from stores and vehicles during operation and maintenance activities. Ground disturbance and mobilisation of sediments and contaminants leading to silt laden or otherwise contaminated runoff entering watercourses operation and maintenance activities.				considerable attenuation and dilution combine to limit magnitude of change to baseline conditions during operation maintenance. In line with good practice, PPPs will be developed to detail how ground and surface waters would be protected from operation related pollution. These would include information on the use and storage of any fuels, oils and other chemicals, and pollution incidence response planning.
Water dependant SSSIs intersected by the Glaslyn works site <i>Glaslyn SSSI.</i> Potential for accidental contamination entering watercourses. This could arise from the leakage or spillage of fuels and chemicals from stores and vehicles during maintenance activities. Ground disturbance and mobilisation of sediments and contaminants leading to silt laden or otherwise contaminated runoff entering watercourses during maintenance activities.	High	Very Low	Minor (Not significant)	Whilst the SSSI is intersected by the Glaslyn works site is of High sensitivity, due to their designations, the anticipated effectiveness of embedded environmental measures and considerable attenuation and dilution combine to limit magnitude of change to baseline conditions. In line with good practice, PPPs will be developed to detail how ground and surface waters would be protected from operation related pollution. These would include information on the use and storage of any fuels, oils and other chemicals, and pollution incidence response planning.
Water dependant SACs upstream of the Glaslyn works site <i>Coed Tremadog SAC, SSSI and NNR.</i> <i>Hafod Garregog SAC, SSSI and NNR.</i> Potential for accidental contamination entering watercourses. This could arise	Very High	Very Low	Minor (Not significant)	Whilst the conservation sites intersected by the Glaslyn works site are of Very High sensitivity, due to their designations, the anticipated effectiveness of embedded environmental measures and

from the leakage or spillage of fuels and chemicals from stores and vehicles operation and maintenance activities. Ground disturbance and mobilisation of sediments and contaminants leading to silt laden or otherwise contaminated runoff entering watercourses operation and maintenance activities.				considerable attenuation and dilution combine to limit magnitude of change to baseline conditions. In line with good practice, PPPs will be developed to detail how ground and surface waters would be protected from operation related pollution. These would include information on the use and storage of any fuels, oils and other chemicals, and pollution incidence response planning.
Water dependant SSSIs upstream of the Glaslyn works site <i>Coedydd Beddgelert a Cheunant Aberglaslyn SSSI.</i> <i>Coedydd Nanmor SSSI.</i> <i>Tyn-Llan SSSI.</i> Potential for accidental contamination entering watercourses. This could arise from the leakage or spillage of fuels and chemicals from stores and vehicles operation and maintenance activities. Ground disturbance and mobilisation of sediments and contaminants leading to silt laden or otherwise contaminated runoff entering watercourses operation and maintenance activities.	High	Very Low	Minor (Not significant)	The SSSIs are classified as High sensitivity receptors. These SSSIs are upstream of the Glaslyn works site and the anticipated effectiveness of embedded environmental measures and considerable attenuation and dilution combine to limit magnitude of change to baseline conditions. In line with good practice, PPPs will be developed to detail how ground and surface waters would be protected from operation related pollution. These would include information on the use and storage of any fuels, oils and other chemicals, and pollution incidence response planning.

8.10 Summary

- 8.10.1 The assessment has demonstrated that the construction, operation and maintenance of the proposed works, in combination with the identified mitigation measures, is mostly not anticipated to have significant impacts on the aquatic environment or water resources in the ZOI.
- 8.10.2 There is however potential for significant effects on flood risk during the construction, operation and maintenance of the proposed works. The flood risk impact on residential receptors in Tremadog is currently assessed as being potentially significant. However, additional mitigations are being prepared to address this and will be submitted as supplementary environmental information. When this information is submitted, it is anticipated that it will be possible to conclude that there will be no significant impacts on flood risk during the construction, operation and maintenance of the proposed works.

9. Traffic and Transport

9.1 Introduction

- 9.1.1 This chapter of the ES presents the findings of an assessment of the likely significant Traffic and Transport effects that could arise from the construction, operation and maintenance of the works at Glaslyn as described in **Chapter 2: Glaslyn Cables Works**.
- 9.1.2 This chapter focuses solely on the traffic impacts as a result of the Glaslyn Cables component of the Project. This comprises works associated with the installation of the replacement Glaslyn cables, the removal of redundant cables, works to retained cables, extension of the Wern CSEC, construction of the Minffordd CSEC, the revised Minffordd EVIP THH and the removal of Garth CSEC (as described in Chapter 2). Preliminary works comprising the establishment of compounds, the construction of permanent access roads including crossings and bell mouths,
- 9.1.3 and hedgerow and tree clearance have also been considered.
- 9.1.4 This chapter describes the baseline conditions currently existing in the Study Area (as defined in **Section 9.3**), the scope of the assessment, the potential effects, the mitigation measures required to avoid, reduce or offset any significant negative effects, and the likely residual effects after these mitigation measures have been adopted.
- 9.1.5 This chapter is supported by the following figures and appendices:
- **Figure 4.9.1:** Traffic and Transport Study Area and Traffic Survey Locations.
 - **Figure 4.9.2:** Study Area Road Network.
 - **Figure 4.9.3:** Traffic Accident Locations.
 - **Figure 4.9.4:** Traffic Accident Locations.
 - **Volume 8, Appendix 1.1.A: Legislation, Policy and Guidance.**
 - **Volume 8, Appendix 1.4.A: Topic Assessment Methodology.**
 - **Volume 8, Appendix 4.9.A: Traffic Flow Diagrams.**
 - **Volume 8, Appendix 4.9.B: Traffic Base Counts.**

9.2 Legislation and Planning Policy

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

Legislation

- 9.2.2 The following legislation is relevant to Traffic and Transport:
- Active Travel (Wales) Act 2023 (Ref 9.1).

National Policy

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

- PPW – Edition 12 (Ref 4.5).
- National Transport Delivery Plan (2022 – 2027) (Ref 9.2).
- Future Wales: The National Plan 2040 (Ref 4.4).

Local Policy

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

- Anglesey and Gwynedd Joint Local Development Plan 2011 – 2026 (Ref 4.11).
- North Wales Joint Local Transport Plan (Ref 9.3).
- Mid Wales Local Transport Plan (Ref 9.4).

Guidance

9.2.5 The following supporting guidance is relevant to Traffic and Transport:

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

9.3 Study Area

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

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

- A487 west of A498.
- A498 south of A487.
- A498 north of A487.
- A497 south of A498.
- Penamser Road.
- Britannia Terrace/A497.
- A487 west of Minffordd Roundabout.
- Church Street.
- A498 east of Church Street Junction.
- Porthmadog High Street.

- A487 west of Porthmadog High Street Junction.
- A487 east of Porthmadog High Street Junction.
- Unnamed Road (north of Porthmadog Roundabout).

9.3.3 Automatic Traffic Counts (ATCs) have been carried out at specific locations on the roads above which, collectively, form the Study Area. ATCs collect data in relation to traffic flows passing a point on the road network in both directions. Further details of the ATCs are provided in **Section 9.45** and **Table 9-6** summarises the average annual daily traffic flows. A plan of the locations is provided in **Figure 4.9.1** which, collectively, define the extent of the Study Area.

9.4 Assumptions and Limitations

- 9.4.1 The details provided in this assessment are accurate as of the reporting date and are based on the maximum land area required for the proposed works construction and operation.
- 9.4.2 The Glaslyn works site is in a predominantly rural area where access may be limited by highway design and availability of public transport. It is assumed that the road network and local services will remain unchanged, with the future baseline conditions closely reflecting the current baseline.
- 9.4.3 Due to the nature of the access points in the extent of the proposed Glaslyn works site, not all access points have been included in the scope of this assessment. The access points excluded from the assessment are characterised by their unsuitability for frequent HGV usage due to narrow dirt track conditions, or their role as secondary access points primarily reserved for occasional, ad hoc deliveries. The Traffic and Transport assessment has focused on three primary access points (A498, Porthmadog High Street and Unnamed Road to the west of Quarry Lane/Osmond Terrace junction), which are expected to accommodate the majority of construction and operational traffic. This approach ensures that the assessment reflects realistic and practical site operations.
- 9.4.4 Baseline traffic surveys reflect average annual daily traffic conditions, and construction traffic flows have been estimated based on a best assessment of likely construction needs.
- 9.4.5 This chapter's approach employs a reasonable worst-case scenario, focusing on 24-hour annual average daily two-way vehicle trips and the maximum daily two-way HGV and worker movements during the construction period.
- 9.4.6 The traffic impact during construction is expected to be the most significant stage of the proposed works.
- 9.4.7 A construction period of approximately 40 months is considered the shortest feasible timeline for completing the works and is used as a reasonable worst-case scenario for estimating maximum daily trips. If the construction period were extended, traffic impacts would remain the same or decrease. If construction were to commence later than modelled, the impacts would remain unaffected.

9.5 Baseline

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

Existing Baseline

- 9.5.2 The existing baseline provides a description of the SRN, the local highway network, accessibility in terms of walking, cycling, and public transport, road safety, and the baseline traffic flows. This section is supported by the following figures:
- **Figure 4.9.1:** Traffic and Transport Study Area and Traffic Survey Locations
 - **Figure 4.9.2:** Study Area Road Network.
 - **Figure 4.9.3:** Traffic Accident Locations.
 - **Figure 4.9.4:** Indicative Heavy Goods Vehicle (HGV) Routing.
- 9.5.3 This section is also supported by the traffic count data provided in **Volume 8, Appendix 4.9.B: Traffic Base Counts**.

Strategic Road Network

A487

- 9.5.4 The A487 runs to the north of the Glaslyn works site, following an east-west trajectory that further afield travels north to the Menai Strait. This route provides access to broader areas, including North West England, and South Wales.
- 9.5.5 In this region, the A487 is a single carriageway road that forms part of the Welsh Government's south-north trunk road network. Observational data suggests that this route is heavily trafficked by HGVs year-round, with an influx of tourist traffic during the summer months, as well as localised commuter traffic. Additionally, the road serves as a vital corridor for public transportation, linking nearby towns and villages.
- 9.5.6 In the Study Area, the A487 section maintains an east-west alignment, consisting of a single lane in each direction, flanked by grass verges and lacking footways.
- 9.5.7 The road has a 20-miles per hour (mph) speed limit in Penmorfa and on the approach to the A498, with the approximately 700 m stretch between these points subject to a 40-mph speed limit. The road's character varies, featuring several minor access junctions and residential properties near Penmorfa.
- 9.5.8 The approximately 1.1 km stretch of the A487 between the A498 and Porthmadog High Street is part of the Porthmadog Bypass, which opened in 2011. This section of road is governed by a 40-mph speed limit, decreasing to 30-mph about 80 m east of the A498 junction and roughly 120 m west of the junction with Porthmadog High Street. There is a parking layby on the northern side of the carriageway, approximately 220 m west of the junction with Porthmadog High Street, and a ghost island right turn is provided at the Church Street junction. There are no buildings directly fronting this section of the road.
- 9.5.9 The section of the A487 between Porthmadog High Street and the A497 spans approximately 3.7 km and completes the Porthmadog Bypass. This segment is subject to the national speed limit, which reduces to 30-mph about 70 m east of the Porthmadog High Street junction and around 65 m west of the A497 junction. There are

parking laybys on both the northern and southern sides of the road roughly halfway along this link. Ghost island right turns are available for the junction near Traeth Stadium and for Minffordd Quarry. Two overbridges cross the A487 near the eastern end of this link, with no height restrictions applying to the traffic on this road. As with the previously described section, no buildings front this part of the carriageway.

Local Highway Network

A498

- 9.5.10 The A498 is a north-south single carriageway road that stretches from the A487 near Tremadog in the north to the A497 in the south. It features a single lane in each direction, bordered by narrow grass verges and stone walls on both sides, without footways. The southern section of the road adheres to the national speed limit, while a 30-mph speed limit is enforced on an approximately 215 m segment at the northern end. A height restriction of 4 m is in place for vehicles passing under the railway bridge near the southern end, with warning signs positioned at the A487 and A497 junctions on either side.

Brittania Terrace/A497

- 9.5.11 In the Study Area, the Brittania Terrace/A497, encompassing Porthmadog High Street and Minffordd, is a north-south single carriageway road extending from the A487 roundabout junction in the north to an unclassified road in the south. There is a footway along the link, sometimes on one side and sometimes on both sides of the carriageway. The road starts with a 30-mph speed limit in the northern section, which increases to the national speed limit where the surroundings transition from residential to agricultural use, approximately 850 m south of the A487 junction. Speed limit signage is supplemented with a speed camera warning on the southbound approach.

Porthmadog High Street

- 9.5.12 Porthmadog High Street is a north-south single carriageway road that runs between the A487 in the north and the A497 in Porthmadog town centre to the south. Beyond this point, it continues as the A497 in an east-west direction, linking with Snowdon Street to the east of Porthmadog High Street. Porthmadog High Street consists of a single lane in each direction and is governed by a 20 to 30-mph speed limit. There is a level crossing with lights and dual barriers where Porthmadog High Street intersects the Cambrian Coast Railway line near Porthmadog Railway Station. Footways are provided on both sides of the carriageway for most of the link, with the footway on the eastern side terminating approximately 240 m south of the A487, at the edge of the town centre where the land use shifts from retail and residential to agricultural.

Unclassified Roads

- 9.5.13 An unclassified road (a), which runs south-west to north-east from the Porthmadog Roundabout, provides access to a farm. It transitions into a single-lane track with no road markings roughly 200 m from the Porthmadog Roundabout junction. A give-way junction with warning signs, but no lights or barriers, is in place where the road crosses the Welsh Highland Heritage Railway line.
- 9.5.14 An unclassified road (b) runs north-south past Traeth Stadium, north of Snowdon Street. It is subject to the national speed limit at the northern end, where the single-lane track has uneven surfacing and lacks road markings. The road widens and is tarmacked between Snowdon Street and the northern access to the 'North Wales Regional Sports & Leisure Facility'. This section has a 30-mph speed limit and features speed humps.

No footways are present on either side, and there is no through route for vehicles to Snowdon Street.

- 9.5.15 An unclassified road (c) runs south-west to north-east from the A497, Porthmadog High Street, to the existing Garth CSEC access road. It is a single carriageway without lane markings and includes sporadically widened sections that serve as informal passing places for larger vehicles. There are no footways on either side. The road is mostly subject to the national speed limit, but this reduces to 30-mph for an approximately 215 m stretch where the road passes through a small hamlet with residential properties fronting it.
- 9.5.16 An unclassified road (d) runs south-west to north-east, linking Britannia Terrace/A497 with Quarry Lane/Osmond Terrace. The road is a single carriageway without lane markings and includes informal passing places in some sections. It has no footways on either sides and provides access to some residential properties, agricultural land, and would provide access to the proposed Minffordd CSEC. The majority of the road is subject to the national speed limit, but visibility is constrained at bends due to dense vegetation.

Walking and Cycling

- 9.5.17 The Definitive Map for Gwynedd (Ref 9.7) has been reviewed in the Study Area, using a comprehensive dataset that is regularly updated by each county council or unitary authority in England and Wales.
- 9.5.18 An extract from the Definitive Map highlights the multiple PRow and the nearest NCR 8 to the proposed works. The identified routes that have been identified as intersecting the Glaslyn works site are:
- NCR 8.
 - Porthmadog No 6 Footpath.
 - Porthmadog No 8 Footpath.
 - Porthmadog No 10 Bridleway.
 - Porthmadog No 11 Footpath.
 - Porthmadog No 37 Bridleway.
 - Dolbenmaen No 107 Footpath.

Public Transport Facilities

Bus

- 9.5.19 There are several bus services that may be affected by the proposed works due to temporary traffic management measures and the presence of construction traffic along bus routes. The Study Area is served by multiple bus routes that provide access to key locations (see **Table 9-1**). The primary routes include the A498, Porthmadog High Street and A497, each offering varied levels of service frequency, which are essential for local connectivity.

Table 9-1 – Public transport services – bus

Route section	Bus route	Frequency
A498	3	1 – 3 hours
	T22 TrawsCymru	1 hour
	S4	1 – 2 hours
Porthmadog High Street	G23	1 hour
	T2 TrawsCymru	2 hours
	T22 TrawsCymru	1 hour
	3	1 hour
	S4	30 minutes
Brittania Terrace/A497	G23	1 hour
	T2 TrawsCymru	2 hours
	T22 TrawsCymru	1 hour

9.5.20 The A498 and Porthmadog High Street corridors are served by several bus routes, including Route 3 (1-3 hours), T22 (hourly), S4 (1-2 hours), G23 (hourly), and T2 (2-hour intervals). These services provide reasonable public transport coverage with frequencies ranging from 30 minutes to 3 hours, ensuring accessibility for residents and visitors. However, it is noted that the variability in services may influence the convenience and reliability of public transport as a primary mode of travel, particularly during off-peak hours.

Rail

9.5.21 The Study Area contains two passenger railway stations: Porthmadog Railway Station and Minffordd Railway Station. Additionally, there is a station in Porthmadog for the Ffestiniog and Welsh Highland Heritage Railway. Porthmadog and Minffordd stations are on the Cambrian Coast Railway line, offering services to destinations such as Pwllheli, Machynlleth, Shrewsbury, and Birmingham International.

Summary

9.5.22 In summary, it can be concluded that opportunities that support sustainable travel are mostly related to car sharing and the potential for the use of public transport (bus and rail). People wishing to cycle will also be encouraged and accommodated, but not relied on in terms of trip assessment.

9.5.23 For the purposes of developing a robust assessment of the proposed works, it has been assumed that all staff working on-site, or at adjoining locations, will predominantly travel by private vehicles (sole occupancy or car sharing).

Road Safety

9.5.24 A review of road safety on the local highway network has been carried out. Personal Injury Collision (PIC) statistics have been obtained from CrashMap (Ref 9.8) for the local highway network in the Study Area for the most recent seven-year period

available. The road network in the Study Area is shown in **Figure 4.9.2** and the accident locations are shown in **Figure 4.9.3**.

- 9.5.25 Over the seven years, 41 collisions occurred in the Study Area, categorised as either slight, severe, or fatal. A slight collision is one in which at least one person has been slightly injured. A serious collision is one in which at least one person has been seriously injured and a fatal collision is one in which at least one person has been killed.
- 9.5.26 **Table 9-2** provides a summary of collisions by severity and year and shows that the greatest number of collisions occurred in 2019 and 2020 with a total of eight collisions in each year (five slight, three serious; three slight, five serious, respectively); 2021 recorded a lower number, with a total of four collisions (three slight, one serious). The information also shows that since 2016, collisions have generally increased, with a slight downturn in 2021.

Table 9-2 – Collisions by year and severity

Year	Slight	Serious	Fatal	Total
2016	3	0	0	3
2017	4	3	0	7
2018	2	3	0	5
2019	5	3	0	8
2020	3	5	0	8
2021	3	1	0	4
2022	6	0	0	6
Total	26	15	0	41

- 9.5.27 The data has been split to show collisions on road links, as shown in **Table 9-3**, and collisions that occurred at or near junctions, as shown in

9.5.28 **Table 9-5.** The highest number of collisions were recorded on the A487 West of Minffordd Roundabout (15) and Porthmadog High Street (10) with the remaining links having significantly fewer recorded incidents.

Table 9-3 – Collisions by link and severity

Link	Slight	Serious	Fatal	Total
A487 west of A498	1	0	0	1
A498 south of A487	0	0	0	0
A498 north of A487	0	2	0	2
A497 south of A498	0	0	0	0
Penamser Road	1	0	0	1
Brittania Terrace/A497	1	0	0	1
A487 west of Minffordd Roundabout	10	5	0	15
Church Street	2	0	0	2
A498 east of Church Street Junction	1	0	0	1
Porthmadog High Street	7	3	0	10
A487 west of Porthmadog High Street Junction	1	1	0	2
A487 east of Porthmadog High Street Junction	2	4	0	6
Unnamed Road (north of Porthmadog Roundabout)	0	0	0	0
Total	26	15	0	41

9.5.29 The information in **Table 9-4** further analyses the temporal variation in terms of collisions on A487 West of Minffordd Roundabout and Porthmadog High Street.

Table 9-4 – Collisions on A487 west of Minffordd Roundabout and Porthmadog High Street by year

Link	A487 west of Minffordd Roundabout	Porthmadog High Street
2016	2	0
2017	2	3
2018	1	0
2019	3	3
2020	3	1
2021	1	2

Link	A487 west of Minffordd Roundabout	Porthmadog High Street
2022	3	1
Total	15	10

9.5.30 **Table 9-4** indicates that the collision pattern on the A487 West of Minffordd Roundabout shows consistent collision occurrences each year, while Porthmadog High Street had more variability in collision numbers, with some years showing no collisions at all.

9.5.31

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

Table 9-5 – Collisions by junction and severity

Link	Slight	Serious	Fatal	Total
A498/A487 Roundabout	0	2	0	2
A498/Church Street	2	0	0	2
A497/Church Street	0	1	0	1
Porthmadog Roundabout	1	0	0	1
Porthmadog High Street/Cambrian Terrace	2	0	0	2
Penamser Road/Porthmadog High Street	0	1	0	1
Porthmadog High Street/Snowdon Street	1	1	0	2
A497/Mynwent Minffordd Cemetery	3	2	0	5
A497/Quarry Lane	1	0	0	1
A497/A497 Minffordd Roundabout	0	1	0	1
A487/Traeth Stadium	1	0	0	1
Total	11	8	0	19

9.5.33 The data suggests that the highest number of recorded incidents occurred at the A497/Mynwent Minffordd Cemetery junction to the south-west of Minffordd, with five recorded collisions (three slight, two serious). This is followed by the A498/A487 Roundabout, A498/Church Street, Porthmadog High Street/Cambrian Terrace, and Porthmadog High Street/Snowdon Street junctions, each of which recorded two collisions. The incidents at these locations ranged from slight to serious in severity. Other junctions, including Penamser Road/Porthmadog High Street, Porthmadog Roundabout, A497/Quarry Lane, A497/A497 Minffordd Roundabout, and A487/Traeth Stadium, each recorded one collision.

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

Baseline Traffic Flows

9.5.35 To understand baseline traffic levels, ATC surveys were carried out at 13 locations, surveyed during the week of Thursday 26 September 2024 to Wednesday 02 October 2024. The surveys carried out during this period were carried out to cover roads potentially affected by traffic associated with the works. Due to a sensor failure during this period, the survey at ATC 4.5 (Penamser Road) was carried out separately, from Wednesday 09 October 2024 to Tuesday 15 October 2024.

9.5.36 The ATC locations form the extent of the Study Area, shown in **Figure 4.9.1**.

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

- 9.5.38 The following traffic data has been included: 24-hour Annual Average Daily Traffic (AADT).
- 9.5.39 Winter working hours for workers are expected to be shorter, with worker numbers expected to fluctuate. Worker hours may be reduced in winter depending on proposed works timing. However, the worst-case scenario for traffic impacts is still expected to be in peak periods of the summer months.
- 9.5.40 **Table 9-6** below shows the baseline traffic flows for total vehicles and HGVs in 2024 that will be used as the basis for assessment.

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

ATC	Link description	24 Hour AADT	
		Total vehicles	HGVs
4.1	A487 west of A498	6,913	192
4.2	A498 south of A487	4,391	121
4.3	A498 north of A487	1,701	77
4.4	A497 south of A498	6,825	193
4.5	Penamser Road	5,053	147
4.6	Brittania Terrace/A497	5,073	75
4.7	A487 west of Minffordd Roundabout	13,400	241
4.8	Church Street	2,608	70
4.9	A498 east of Church Street Junction	1,815	28
4.10	Porthmadog High Street	8,323	190
4.11	A487 west of Porthmadog High Street Junction	11,150	374
4.12	A487 east of Porthmadog High Street Junction	8,979	294
4.13	Unnamed Road (north of Porthmadog Roundabout)	176	2

Future Baseline Traffic Flows

- 9.5.41 This section considers changes to the baseline conditions, described above, that might occur in the absence of the proposed works during the period over which the proposed works would have been in place.
- 9.5.42 Any traffic associated with the revised EVIP THH element of the scheme has been included within the overall Glaslyn Cables traffic numbers.
- 9.5.43 The future baseline scenarios are set out and described for this Traffic and Transport chapter below.
- 9.5.44 Subject to being granted consent the earliest construction could start is **2026**.
- 9.5.45 The peak year for traffic movements is assumed to be 2028 and has been used as the future assessment year.

9.5.46 Future baseline traffic flows for the assessment year of 2028 for the peak construction have been derived by applying the national standard Trip End Model Presentation Program v8.1 (TEMPro) to derive traffic growth factors, as indicated in **Table 9-7**. TEMPro growth factors include a forecast of local development growth and attempts to capture growth attributed to these other developments. Theoretically, the growth factor also takes into account cumulative schemes which are captured in the future baseline. The following locations were used to apply a growth factor to the baseline data:

- Gwynedd 010 – W02000019 – Porthmadog.
- Gwynedd 013 – W02000022 – Harlech and Llanbedr.

9.5.47 This growth factor as shown in **Table 9-7** has been applied to the existing traffic flows to derive the baseline future traffic flow.

Table 9-7 – TEMPro growth factors (2024 – 2028)

Period	Region	Region growth factor	Average growth factor
2024 – 2028	Gwynedd 010	1.0355	1.0361
	Gwynedd 013	1.0366	

9.5.48 The **2028** baseline traffic flows are shown in **Table 9-8**. These are the anticipated baseline flows for the peak of the construction period, with the absence of the proposed works along local road links.

Table 9-8 – 2028 baseline traffic flows (two-way) – total vehicles and HGVs

ATC	Link description	24 hour AADT	
		Total vehicles	HGVs
4.1	A487 west of A498	7,163	199
4.2	A498 south of A487	4,549	126
4.3	A498 north of A487	1,762	79
4.4	A497 south of A498	7,071	200
4.5	Penamser Road	5,235	152
4.6	Brittania Terrace/A497	5,256	78
4.7	A487 west of Minffordd Roundabout	13,884	250
4.8	Church Street	2,702	73
4.9	A498 east of Church Street Junction	1,880	29
4.10	Porthmadog High Street	8,623	196
4.11	A487 west of Porthmadog High Street Junction	11,554	387
4.12	A487 east of Porthmadog High Street Junction	9,303	305
4.13	Unnamed Road (north of Porthmadog Roundabout)	182	2

9.6 Scope of Assessment

- 9.6.1 This section outlines the scope of the assessment for Traffic and Transport, which has been produced to follow the methodology outlined in the IEMA Guidelines. Details of the approach and assessment methodology are contained in **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**.
- 9.6.2 **Table 9-9** summarises the potential Traffic and Transport receptors that have been reviewed following the IEMA Guidelines and states whether they have been included or excluded from the Traffic and Transport assessment. Justifications are provided where receptors have been both included and excluded from the assessment.

Table 9-9 – Scope of Traffic and Transport assessment

Receptor	Scoped in/out per phase		Justification
	Construction	Operation	
Severance	In	Out	Construction could generate potentially significant impacts on severance due to an overall increase in traffic volumes, which may disrupt local connectivity and access. Operational traffic volumes are expected to be no different from the baseline. The traffic volumes will be significantly less than in construction, leading to a negligible impact.
Driver Delay	In	Out	Construction is likely to result in potentially significant impacts on driver delay, due to increased traffic levels and possible congestion at key junctions. Operational traffic volumes are expected to be no different from the baseline. The traffic volumes will be significantly less than in construction, leading to a negligible impact.
Pedestrian Delay	Out	Out	Significant effects related to pedestrian delay are unlikely during construction and operation due to low expected levels of pedestrian activity surrounding the Glaslyn works site.
Non-motorised user (NMU) amenity	In	Out	Construction may generate potentially significant impacts on pedestrian and cyclist amenities due to increased traffic levels affecting the safety and comfort of non-motorised users. Operational traffic volumes are expected to be no different from the baseline. The traffic volumes will be significantly less than in construction, leading to a negligible impact.
Fear and intimidation	In	Out	Construction could have potentially significant impacts on fear and intimidation, as higher traffic volumes may increase perceived risks for

Receptor	Scoped in/out per phase		Justification
	Construction	Operation	
			vulnerable road users. Operational traffic volumes are expected to be no different from the baseline. The traffic volumes will be significantly less than in construction, leading to a negligible impact.
Road safety and accidents	In	Out	Construction is anticipated to result in potentially significant impacts on road safety due to increased traffic levels and potential changes in driver behaviour. Operational traffic volumes are expected to be no different from the baseline. The traffic volumes will be significantly less than in the construction phase, leading to a negligible impact.
Total traffic increase	In	Out	Construction could lead to potentially significant impacts on traffic levels as a result of increased vehicular activity associated with the development. Operational traffic volumes are expected to be no different from the baseline. The traffic volumes will be significantly less than in construction, leading to a negligible impact.
HGV increase	In	Out	Construction may result in potentially significant impacts in relation to HGV numbers, contributing to overall traffic volume and potentially affecting road safety and local amenity. Operational traffic volumes are expected to be no different from the baseline. The traffic volumes will be significantly less than in construction, leading to a negligible impact.
Hazardous loads	Out	Out	There are no nearby road features which suggest that the transfer of hazardous materials poses a risk beyond that which would be expected on the general highway network, indicating no significant impacts during the construction or operation.

9.7 Methodology

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

Sources of Information

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

- PIC data has been gathered from CrashMap (Ref 9.8).
- ATCs have been carried out at 13 locations in the Study Area to identify the baseline traffic conditions on the surrounding highway network. The resulting traffic flow diagrams are presented in **Volume 8, Appendix 4.9.A: Traffic Flow Diagrams** and the traffic data is summarised in **Table 9-6**.
- Local travel information has been gathered from various sources including local bus and rail operators (Ref 9.9).
- Ordnance Survey (OS) and Architectural Base Mapping has been used to ascertain an accurate geographical representation of the areas in the vicinity of the proposed works.
- Population data from the City Population website (Ref 9.10).

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

Methodology

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

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

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

Receptor Sensitivity

9.7.7 The methodology for assessing the impact of the proposed works generated traffic will be based on that outlined in the IEMA Guidelines and is stated in Table 7-1 of **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**.

Link Sensitivity

- 9.7.8 The road link sensitivity has been based upon the worst-case sensitivity of the whole link considering the criteria outlined in Table 7-1 of **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**. The links are represented by the ATC locations.

Table 9-10 – Link sensitivity

ATC	Link description	Sensitivity
4.1	A487 west of A498	Low
4.2	A498 south of A487	Low
4.3	A498 north of A487	Medium
4.4	A497 south of A498	Very Low
4.5	Penamser Road	Medium
4.6	Brittania Terrace/A497	Low
4.7	A487 west of Minffordd Roundabout	Low
4.8	Church Street	Medium
4.9	A498 east of Church Street Junction	Low
4.10	Porthmadog High Street	Medium
4.11	A487 west of Porthmadog High Street Junction	Low
4.12	A487 east of High Porthmadog Street Junction	Low
4.13	Unnamed Road (north of Porthmadog Roundabout)	Low

Magnitude

- 9.7.9 The link sensitivities outlined above have been used to assess the significance of the impact of the proposed works by combining the magnitude of change. The impact magnitude criteria is outlined in Table 7-2 of **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**.

Significance

- 9.7.10 The significance of effects considering the sensitivity of the receptor, and the magnitude of impact are defined as beneficial or adverse and stated in Table 7-3 of **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**. Effects predicted to be 'major' or 'moderate' are considered 'significant' whilst effects predicted to be 'minor' or 'negligible' are considered 'not significant'.

Trip Generation

- 9.7.11 This section outlines the forecasted vehicle trips to be generated by the proposed works during the construction and operation. It is important to highlight that there is limited data in the industry standard Trip Rate Information Computer System (TRICS) database for standalone cabling upgrades, and a first principles approach has been adopted to estimate the anticipated vehicle trip generation. This methodology relies on professional

judgement and input from the project team. The forecasted vehicle trips for each phase are based on the peak activity levels expected throughout the 40-month construction period. The peak of construction in terms of generated trips is projected to occur between Months 1 – 40 of the construction programme.

- 9.7.12 For the purposes of the assessment, the peak construction year is expected to be **2028**, which has been incorporated into the assessment.

Construction Staff

- 9.7.13 The current estimate is that a peak 28 FTE workers will be on-site per day at Glaslyn. These numbers include workers associated with the replacement of the existing cross-site cables and those associated with the installation of the new cross site cables.
- 9.7.14 In order to minimise the number of vehicle trips generated, car-sharing measures will be promoted by the contractor during peak construction stages. For the purposes of this assessment, it is assumed that a proportion of workers will participate in car-sharing schemes, based on the traffic distribution information derived from the population data (**Table 9-12**). The percentage of workers that may engage in car-sharing has been estimated based on a review of other similar schemes and professional judgement.
- 9.7.15 It is assumed that approximately 50% of the workforce (14 out of 28 workers) will participate in car-sharing. This estimate is informed by car-sharing uptake observed at other relevant infrastructure projects. A realistic car-sharing ratio of 1.5 workers per vehicle has been applied. This results in an estimated 10 one-way daily car movements for the car-sharing workers.
- 9.7.16 For the remaining 14 workers who do not engage in car-sharing, it is assumed they will travel individually by private vehicles. Adding these 14 movements to the 10 movements generated by car-sharing workers results in a total of 24 one-way daily vehicle movements, per day, for the workforce.
- 9.7.17 For the purposes of this assessment, it is assumed that the proposed works will generate a total of 48 two-way daily vehicle movements (24 in and 24 out).

Construction HGVs

- 9.7.18 In terms of HGVs, it is estimated there would be a peak of up to 100 two-way HGV movements (including waste removal) per day (50 inbound and 50 outbound). These numbers include all HGVs associated with works at Glaslyn.

9.7.19

- 9.7.20 **Table 9-11** provides a summary of the 24-hour AADT trip generation by vehicle type, presenting the number of private vehicles, HGVs and the total (two-way). This table outlines the overall traffic impact associated with the proposed works across a full 24-hour period.

Total Vehicles

- 9.7.21 The total daily number of vehicles expected are shown in the table below.

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

Vehicle type	In	Out	Total (two-way)
Cars	24	24	48
HGVs	50	50	100
Total	74	74	148

Vehicle Distribution

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

Construction Staff

9.7.23 Construction staff will be encouraged to take the most direct route to the Glaslyn works site using ‘higher’ order roads, such as A and B classified roads.

9.7.24 Workers will park in the designated parking areas in the site compounds during the construction. During operation, parking will be available in the CSEC compounds and at appropriate parking places along the cable route for visual inspections, as required.

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

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

Table 9-12 – Worker distribution*

Town	Population	Distance (km)	Distance (squared)	Population/ distance (squared)	Distribution
Aberystwyth	16,413	94.6	8,951	1.8	2%
Anglesey	69,291	61.5	3,778	18.3	20%
Caernarfon	9,827	31.1	964	10.2	11%
Colwyn Bay	10,576	77.6	6,015	1.8	2%
Prestatyn	16,680	103.6	10,737	1.6	2%
Mold	9,891	96.2	9,258	1.1	1%
Bangor	15,060	45.5	2,073	7.3	8%
Llandudno	19,716	77.7	6,040	3.3	4%
Conwy	15,725	69.0	4,765	3.3	4%

Town	Population	Distance (km)	Distance (squared)	Population/ distance (squared)	Distribution
Oswestry	17,509	97.2	9,445	1.9	2%
Barmouth	1,988	33.1	1,099	1.8	2%
Criccieth	1,738	8.7	75	23.0	25%
Pwllheli	3,622	22.4	500	7.2	8%
Blaenau Ffestiniog	3,449	20.3	411	8.4	9%

* Note, the numbers have been rounded to the nearest whole number

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

Construction HGVs

- 9.7.28 Construction HGVs will travel to the Glaslyn works site firstly via the SRN, then use the most appropriate route to avoid unnecessary routing through local villages and rural areas.
- 9.7.29 HGVs have been distributed across the road network based on the routing set out below. The vehicle routing plan showing the routing strategy for HGVs is shown in **Figure 4.9.4**. Further details are also shown in **Volume 8, Appendix 4.9.A: Traffic Flow Diagrams**.
- A487 from the west – 67%.
 - A487 from the east – 33%.
- 9.7.30 Travelling from the SRN to the Glaslyn works site, HGVs will take the following routes to access each access point as shown in **Figure 4.9.4**:
- 9.7.31 Glaslyn works site Access Point 1 – A498:
- HGVs travelling east on the A487 will take the third exit at the A487/A498 roundabout, then travel south on the A498 to the Glaslyn works site access.
 - HGVs travelling west on the A487 will take the first exit at the A487/A498 roundabout, then travel south on the A498 to the Glaslyn works site access.
- 9.7.32 Glaslyn works site Access Point 2 – Porthmadog High Street:
- HGVs travelling east on the A487 will take the third exit at the Porthmadog Roundabout onto Porthmadog High Street, then travel south to the Glaslyn works site access.
 - HGVs travelling west on the A487 will take the first exit at the Porthmadog Roundabout, then travel south on Porthmadog High Street to the Glaslyn works site access.
- 9.7.33 Glaslyn works site Access Point 3 – Unnamed Road west of Quarry Lane and Osmond Terrace junction:

- HGVs travelling east on the A487 will take the third exit at the Minffordd Roundabout, then travel south on A497 to the Glaslyn works site access.
- HGVs travelling west on the A487 will take the second exit at the Minffordd Roundabout, then travel south on A497 to the Glaslyn works site access.

Trip Assignment

Construction Staff Assignment

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

Table 9-13 – Trip generation overview

Town	Total workers	Private car vehicles	Car share vehicles	Total car journeys
Aberystwyth	1	1	0	1
Anglesey	6	3	2	5
Caernarfon	3	1	1	2
Colwyn Bay	1	1	0	1
Prestatyn	1	1	0	1
Mold	0	0	0	0
Bangor	2	1	1	2
Llandudno	1	0	1	1
Conwy	1	1	1	2
Oswestry	0	0	0	0
Barmouth	0	0	0	0
Criccieth	7	4	2	6
Pwllheli	2	0	1	1
Blaenau Ffestiniog	3	1	1	2
Total	28	14	10	24

- 9.7.35 The traffic movements have been distributed across the ATC locations in the Study Area based on the distribution parameters outlined in **Section 9.7**. The daily two-way movements are presented in **Table 9-14**. These are also shown in traffic flow diagrams provided in **Volume 8, Appendix 4.9.A: Traffic Flow Diagrams**.
- 9.7.36 The distribution is based on the access arrangements outlined earlier in **Section 9.7**.

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

ATC Link	Daily two-way	
	All vehicles	HGV
4.1 A487 west of A498	93	63
4.2 A498 south of A487	49	33
4.3 A498 north of A487	0	0
4.4 A497 south of A498	5	0
4.5 Penamser Road	0	0
4.6 Brittonia Terrace/A497	41	28
4.7 A487 west of Minffordd Roundabout	38	31
4.8 Church Street	0	0
4.9 A49 east of Church Street Junction	0	0
4.10 Porthmadog High Street	47	33
4.11 A487 west of Porthmadog High Street Junction	77	52
4.12 A487 east of Porthmadog High Street Junction	57	41
4.13 Unnamed Road (north of Porthmadog Roundabout)	0	0

9.7.37 It is considered that individual junction assessments are not required at these locations as the volume of traffic expected during the network peak hours (e.g. 8.00 am – 9.00 am and 5.00 pm – 6.00 pm) would be zero.

9.8 Potential Effects

9.8.1 The anticipated effects resulting from the increases in traffic associated with the construction, operation and maintenance of the proposed works are outlined as follows.

Construction

9.8.2 The peak construction traffic generated by the proposed works is anticipated to be between **Months 1 and 40**, with Month 6 of construction potentially occurring as early as **2026**.

9.8.3 Access to the Glaslyn works site has been modelled at three points, as outlined in **Section 9.7**. These include: A498, Porthmadog High Street and Brittonia Terrace/A497. Both staff vehicles and HGVs will use these access points.

9.8.4 Remaining access points outlined in the proposed works will predominantly be used on an ad hoc basis with minimal numbers of worker and HGV arrivals/departures and have not been modelled for the purposes of this assessment.

9.8.5 The proposed increase in two-way vehicle movements across the day (24 hours) in terms of actual increases and percentage increases relative to the future baseline traffic flows are presented in the tables below at each link location.

9.8.6 **Table 9-15** provides an overview of the total percentage increase for total vehicles and HGVs on each of the links associated with the proposed works during the peak construction year (**2028**).

Table 9-15 – 2028 future year flows AADT (two-way)

24 Hour AADT						
ATC	Link	Base	Development	Total	All vehicles % increase	HGV % increase
4.1	A487 west of A498	7,163	93	7,256	1.3%	31.6%
4.2	A498 south of A487	4,549	49	4,598	1.1%	26.6%
4.3	A498 north of A487	1,762	0	1,762	0.0%	0.0%
4.4	A497 south of A498	7,071	5	7,076	0.1%	0.0%
4.5	Penamser Road	5,235	0	5,235	0.0%	0.0%
4.6	Brittania Terrace/A497	5,256	41	5,297	0.8%	35.5%
4.7	A487 west of Minffordd Roundabout	13,884	38	13,922	0.3%	12.6%
4.8	Church Street	2,702	0	2,702	0.0%	0.0%
4.9	A498 east of Church Street Junction	1,880	0	1,880	0.0%	0.0%
4.10	Porthmadog High Street	8,623	47	8,670	0.5%	17.0%
4.11	A487 west of Porthmadog High Street Junction	11,552	77	11,628	0.7%	13.4%
4.12	A487 east of Porthmadog High Street Junction	9,303	57	9,359	0.6%	13.4%
4.13	Unnamed Road (north of Porthmadog Roundabout)	182	0	182	0.0%	0.0%

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

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

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

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

- While none of the links have an overall percentage increase in vehicles over 30%, two of the assessed links would experience an increase in the number of HGVs of more than 30% during an average day (ATC 4.1 and ATC 4.6), which are highlighted

in **bold**. Specifically, at ATC 4.1, the number of HGVs is expected to increase by 32%, while at ATC 4.6, an increase of 36% is projected.

- The proposed works are anticipated to have the largest proportional increase in daily traffic levels at ATC 4.1 (A487 west of A498), with a 1% increase in average daily traffic.
- ATC 4.1 (A487 west of A498) is predicted to experience the highest levels of additional traffic associated with the proposed works during the construction period. On an average day, it is expected that 93 construction related vehicles, including private vehicles and HGVs, will travel along the local road network to arrive at the proposed works, contributing to the notable overall increase in AADT on the road network.
- It is also expected that an additional 77 construction related vehicles will travel along the A487 west of Porthmadog High Street Junction (ATC 4.11) resulting in a 1% increase in overall traffic on the link.

9.8.9 The following sections summarise the likely effect on receptors in terms of total construction traffic, severance, pedestrian amenity, fear and intimidation and highway safety.

9.8.10 **Table 9-16** indicates the magnitude of impacts measured against the criteria set out in Table 7-2 of **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**.

9.8.11 For the purposes of the highway safety analysis, all links estimated to experience increases in total traffic flows above 30% have been analysed further on a case-by-case basis. However, no links displayed an increase of over 30%.

Table 9-16 – Magnitude of impact (construction) – 2026 AADT

ATC Link		Sensitivity	All traffic increase %	HGV increase %	Construction traffic	Severance of communities	NMU amenity	Fear and intimidation	Road vehicle driver and passenger delay	Accidents and Safety
4.1	A487 west of A498	Low	1.3%	31.6%	Very Low	Low	Very Low	Low	Very Low	Very Low
4.2	A498 south of A487	Low	1.1%	26.6%	Very Low	Low	Very Low	Low	Very Low	Very Low
4.3	A498 north of A487	Medium	0.0%	0.0%	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
4.4	A497 south of A498	Very Low	0.1%	0.0%	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
4.5	Penamser Road	Medium	0.0%	0.0%	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
4.6	Brittania Terrace/A497	Low	0.8%	35.5%	Very Low	Low	Very Low	Low	Very Low	Very Low
4.7	A487 west of Minffordd Roundabout	Low	0.3%	12.6%	Very Low	Very Low	Very Low	Low	Very Low	Very Low
4.8	Church Street	Medium	0.0%	0.0%	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
4.9	A498 east of Church Street Junction	Low	0.0%	0.0%	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low

ATC Link	Sensitivity	All traffic increase %	HGV increase %	Construction traffic	Severance of communities	NMU amenity	Fear and intimidation	Road vehicle driver and passenger delay	Accidents and Safety
4.10 Porthmadog High Street	Medium	0.5%	17.0%	Very Low	Very Low	Very Low	Low	Very Low	Very Low
4.11 A487 west of Porthmadog High Street Junction	Low	0.7%	13.4%	Very Low	Very Low	Very Low	Low	Very Low	Very Low
4.12 A487 east of Porthmadog High Street Junction	Low	0.6%	13.4%	Very Low	Very Low	Very Low	Low	Very Low	Very Low
4.13 Unnamed Road (north of Porthmadog Roundabout)	Low	0.0%	0.0%	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low

- 9.8.12 As shown in **Table 9-16**, none of the assessed links are predicted to experience either a medium or high magnitude of impact in any of the assessment criteria categories.
- 9.8.13 Given the assessment results, no links require adjustments based on baseline traffic flows or professional judgement as none exhibit conditions indicative of a medium or high magnitude of impact.
- 9.8.14 With reference to Table 7-2 (significance of effects matrix) in in **Volume 8, Appendix 1.4.A: Topic Assessment Methodology** in combination with the above impact magnitudes and applied sensitivity of the transportation links, proposed works traffic and transport-related significance of effects are detailed in **Table 9-18** during the peak construction year (**2028**) in the average annual day.

Table 9-17 – Summary of the assessment (significance of effect) – 2028 + construction AADT

ATC Link	Construction traffic	Severance of communities	NMU amenity	Fear and intimidation	Road vehicle driver and passenger delay	Accidents and safety	Overall significance
4.1 A487 west of A498	Negligible – Not Significant	Minor– Not Significant	Negligible – Not Significant	Minor– Not Significant	Negligible – Not Significant	Negligible – Not Significant	Not Significant
4.2 A498 south of A487	Negligible – Not Significant	Minor– Not Significant	Negligible – Not Significant	Minor– Not Significant	Negligible – Not Significant	Negligible – Not Significant	Not Significant
4.3 A498 north of A487	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Not Significant
4.4 A497 south of A498	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Not Significant
4.5 Penamser Road	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Not Significant
4.6 Brittanias Terrace/A497	Negligible – Not Significant	Minor– Not Significant	Negligible – Not Significant	Minor– Not Significant	Negligible – Not Significant	Negligible – Not Significant	Not Significant
4.7 A487 west of Minffordd Roundabout	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Minor– Not Significant	Negligible – Not Significant	Negligible – Not Significant	Not Significant
4.8 Church Street	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Not Significant
4.9 A498 east of Church Street Junction	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Not Significant
4.10 Porthmadog High Street	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Minor– Not Significant	Negligible – Not Significant	Negligible – Not Significant	Not Significant

ATC Link	Construction traffic	Severance of communities	NMU amenity	Fear and intimidation	Road vehicle driver and passenger delay	Accidents and safety	Overall significance
4.11 A487 west of Porthmadog High Street Junction	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Minor– Not Significant	Negligible – Not Significant	Negligible – Not Significant	Not Significant
4.12 A487 east of Porthmadog High Street Junction	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Minor– Not Significant	Negligible – Not Significant	Negligible – Not Significant	Not Significant
4.13 Unnamed Road (north of Porthmadog Roundabout)	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Not Significant

- 9.8.15 As shown in **Table 9-17**, none of the links assessed are predicted to experience a significant effect across any of the assessment criteria.

A498 Crossing – HDD Option

- 9.8.16 If the HDD option was taken forward, the impact would be the same as stated above [i.e. the current assessment] due to the same number of construction HGV trips proposed as the open cut construction method. With a HDD option, there are fewer traffic management requirements (e.g. road/lane closures).

Summary

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

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

Phase	Potential impacts	Duration	Embedded mitigation	Likely significance of effect
Construction	Construction Traffic Increase Negligible or minor adverse at all links.	Short Term Temporary (construction phase only)	Embedded mitigation is described in Section 9.9	Not significant at all locations.
	Severance of Communities Negligible or minor adverse at all links.	Short Term Temporary (construction phase only)	Embedded mitigation is described in Section 9.9	Not significant at all locations.
	NMU Amenity Negligible or minor adverse at all links.	Short Term Temporary (construction phase only)	Embedded mitigation is described in Section 9.9	Not significant at all locations.
	Fear and Intimidation Negligible or minor adverse at all links.	Short Term Temporary (construction phase only)	Embedded mitigation is described in Section 9.9	Not significant at all locations.
	Road vehicle driver and passenger delay Negligible or minor adverse at all links.	Short Term Temporary (construction phase only)	Embedded mitigation is described in Section 9.9	Not significant at all locations.
	Road user and pedestrian safety Negligible or minor adverse at all links.	Short Term Temporary (construction phase only)	Embedded mitigation is described in Section 9.9	Not significant at all locations.
Operation and Maintenance	The traffic levels associated with operation and maintenance phase of the proposed works will be low. Operation and maintenance effects are expected to be negligible.			

9.9 Mitigation and Residual Effects

Embedded Mitigation

- 9.9.1 The proposed works have been designed, as far as practicable, to avoid and reduce impacts and effects on Traffic and Transport through the process of design development, and by embedding measures into the proposed works design. In addition, how the proposed works are constructed, operated and maintained would be appropriately controlled to manage and minimise potential environmental impacts.
- 9.9.2 Embedded measures that are part of the standard practice and proposed design have been incorporated into the assessment to ensure that likely environmental effects are realistic. This approach avoids assessing scenarios that do not account for these practical measures, providing a more accurate reflection of expected impacts.

Measures Embedded into the Design

- 9.9.3 The specific measures embedded into the proposed works design are outlined below with respect to the construction and operation/maintenance.

Construction Phase

- 9.9.4 During the construction the following embedded mitigation measures will be included:
- Establish appropriate access points to facilitate vehicle movements into the proposed works, where necessary.
 - Any access points requiring the creation of a junction bell mouth would be designed in accordance with the relevant standards outlined in the DMRB CS 123 Geometric Design of At-Grade Priority and Signal-Controlled Junctions (Ref 9.6), and in consultation with the local highway authority. This would help mitigate any potential safety risks associated with construction activities.
 - Swept path analysis for AILs and HGVs would be carried out to ensure suitable routeing.
 - HGVs and AILs will follow the designated routes as shown in **Figure 4.9.4**.
 - Utilising internal routes in the proposed works to avoid using the existing road network where practicable.
 - Traffic management would be employed where construction vehicles need to interact with the public road network, including providing adequate visibility splays between construction traffic and other road users. Measures such as advanced signage to notify the public of works, and manned controls at crossing points (e.g. marshals) will be implemented. Construction traffic generally will give priority to other road users, and the same approach will apply where construction traffic intersects with PROWs.
 - Restricting HGV movements to certain routes as follows: A487 – A498; A487 – Porthmadog High Street; A487 – Britannia Terrace/A497.
 - Route a proportion of inbound staff vehicles via A487 – A498; A487 – Porthmadog High Street; A487 – Britannia Terrace/A497.

- Restricting HGV movements to ensure arrivals and departures between 9.00 am – 5 pm to avoid increasing traffic levels on the surrounding highway network during the typical weekday peak hours.
- Implementing a Delivery Management System to control the bookings of HGV deliveries from the start of the construction period. This would be used to regulate the arrival times of HGVs via timed delivery slots, as well as to monitor compliance with HGV routing. In addition, adequate space would be made available in the Glaslyn works site to ensure no queuing back onto the surrounding road network occurs.
- Implementing a monitoring system to record the route of all HGVs travelling to and from the Glaslyn works site, to record any non-compliance with the agreed routing strategy/delivery hours and to communicate any issues to the relevant suppliers to ensure the correct routes and times are followed.
- Construction staff (e.g. non-HGV vehicles) would be directed to take the most direct route to the proposed works using 'higher' order roads, such as A and B classified roads or the SRN.
- Encouraging construction workers to car share to reduce single occupancy car trips would promote the benefits of car sharing, such as reduced fuel costs and an environmental impact. A car share system would be implemented to match potential sharers and to help staff identify any colleagues who could potentially be collected along their route to/from the Glaslyn works site.
- Providing limited (but sufficient) on-site car and cycle parking to accommodate the expected parking demand of workers on the Glaslyn works site.
- A specialised haulage service would be employed to allow ALLs to transport components with the necessary escort, permits and traffic management, with the contractor consulting the relevant highways authorities to ensure the correct permits are obtained. The police will be given advanced notification under the Road Vehicle Authorisation of Special Types Order 2003 (Ref 9.11).

Additional Mitigation and Enhancement Measures

- 9.9.5 Additional mitigation measures would only be required where significant effects are identified following the application of embedded mitigation measures. No significant impacts have been identified.

Residual Effects

- 9.9.6 This section summarises the residual effects of the proposed works on Traffic and Transport following the implementation of embedded and additional mitigation.

Construction Phase

- 9.9.7 Based on the outcome of the assessments, no significant adverse effects are anticipated at any of the assessed links. Despite HGV traffic levels at some links being expected to increase by more than 30%, none of the links will experience increases substantial enough to result in significant impacts.
- 9.9.8 Throughout the 24-hour period during construction, it is anticipated that the links presented in **Table 9-19** will experience notable increases in HGV traffic.

Table 9-19 – 24-hour period traffic increases by link (2028)

24 Hour AADT						
ATC	Link	Base	Development	Total	All vehicles % increase	HGV % increase
4.1	A487 west of A498	7,163	93	7,256	1.3%	31.6%
4.6	Brittania Terrace/A497	5,256	41	5,297	0.8%	35.5%

9.9.9 Despite the notable increases in HGV traffic, **Table 9-19** suggests that the overall magnitude of impact (based on the magnitude of impact criteria in Table 7-2 of **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**) on the road network will be low at both ATC 4.1 and ATC 4.6 during an average day.

Summary

9.9.10 **Table 9-20** provides a summary of the residual effects in relation to Traffic and Transport.

Table 9-20 – Residual effects – Traffic and Transport (construction phase)

Receptor	Description of impacts including duration	Embedded mitigation	Significance of effect with embedded mitigation	Additional mitigation/enhancement measures	Residual effect
Road Links	Increase in construction traffic (medium-term, temporary).	Various traffic management measures to be implemented (Section 9.9); access points to the Glaslyn works site.	Negligible/Minor Adverse (All links) – Not Significant.	None identified.	Negligible/Minor Adverse (All links) – Not Significant.
Road Links	Increase in construction HGV traffic (medium-term, temporary).	Various traffic management measures to be implemented (Section 9.9); access points to the Glaslyn works site.	Negligible/Minor Adverse (All links) – Not Significant.	None identified.	Negligible/Minor Adverse (All links) – Not Significant.
Road Links	Severance during construction (medium-term, temporary).	Various traffic management measures to be implemented (Section 9.9); access points to the Glaslyn works site.	Negligible/Minor Adverse (All links) – Not Significant.	None identified.	Negligible/Minor Adverse (All links) – Not Significant.
Road Links	Driver delay during construction (medium-term, temporary).	Various traffic management measures to be implemented (Section 9.9); access points to the Glaslyn works site.	Negligible/Minor Adverse (All links) – Not Significant.	None identified.	Negligible/Minor Adverse (All links) – Not Significant.

Receptor	Description of impacts including duration	Embedded mitigation	Significance of effect with embedded mitigation	Additional mitigation/enhancement measures	Residual effect
Pedestrians and Cyclists	NMU amenities during construction (medium-term, temporary).	Various traffic management measures to be implemented (Section 9.9); access points to the Glaslyn works site.	Negligible/Minor Adverse (All links) – Not Significant.	None identified.	Negligible/Minor Adverse (All links) – Not Significant.
Pedestrians and Cyclists	Fear and intimidation during construction (medium-term, temporary).	Various traffic management measures to be implemented (Section 9.9); access points to the Glaslyn works site.	Negligible/Minor Adverse (All links) – Not Significant.	None identified.	Negligible/Minor Adverse (All links) – Not Significant.
Road Users	Road safety during construction (medium-term, temporary).	Various traffic management measures to be implemented (Section 9.9); access points to the Glaslyn works site.	Negligible/Minor Adverse (All links) – Not Significant.	None identified.	Negligible/Minor Adverse (All links) – Not Significant.
Road Users	Road safety during construction (medium-term, temporary).	Various traffic management measures to be implemented (Section 9.9); access points to the Glaslyn works site.	Negligible/Minor Adverse (All links) – Not Significant.	None identified.	Negligible/Minor Adverse (All links) – Not Significant.

9.10 Summary

- 9.10.1 This chapter of the ES presents the findings of an assessment of the likely significant effects of Traffic and Transport as a result of the proposed works.
- 9.10.2 The assessment of effects concludes that following implementation of embedded mitigation, impacts would not be significant at any of the assessed links. None of the links are predicted to experience substantial increases in total traffic volumes that would lead to adverse effects. Despite high increases in HGV volumes at ATC 4.1 and ATC 4.6, the impact is not expected to be significant due to an acceptable sensitivity at each link.
- 9.10.3 At all remaining assessed links, the increase in total vehicle and HGV numbers is below a level that requires detailed assessment. Given that these links generally experience moderate baseline traffic flows, the projected increase in vehicle numbers is considered minimal, such that the magnitude of the impact is considered low, and the resulting effects are assessed as 'Not Significant'.
- 9.10.4 No further mitigation measures, beyond those already mitigated, are deemed necessary, as the predicted impacts are within acceptable limits for the Study Area. This conclusion reinforces that the proposed works would not materially affect traffic conditions or road safety across the assessed network.

10. Air Quality and Emissions

10.1 Introduction

- 10.1.1 This chapter presents an assessment of the likely Air Quality and Emissions effects that could arise from the construction, operation and maintenance of the works at Glaslyn as described in **Chapter 2: Glaslyn Cables Works**.
- 10.1.2 This chapter describes the baseline conditions currently existing within the Study Area (as defined in **Section 10.3**), the scope of the assessment, the potential effects, the mitigation measures required to avoid, reduce or offset any significant negative effects, and the likely residual effects after these mitigation measures have been adopted.
- 10.1.3 This chapter is supported by a number of figures and appendices as listed below:
- **Figure 4.10.1: Construction Dust Assessment.**
 - **Volume 8, Appendix 1.1.A: Legislation, Policy and Guidance.**
 - **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**
 - **Volume 8, Appendix 4.11.A: Construction Noise and Vibration Calculations and Results.**
- 10.1.4 Other chapters that are useful to review in association with this chapter are as follows:
- **Chapter 5: Ecology and Nature Conservation.**
 - **Chapter 9: Traffic and Transport.**

10.2 Legislation and Planning Policy

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

Legislation

- 10.2.2 The following legislation is relevant to Air Quality and Emissions:
- The Environment Act 1995 (Ref 7.3).
 - The Environment (Wales) Act 2016 (Ref 5.4).
 - The Environment Act 2021 (Ref 4.2).
 - Environment (Air Quality and Soundscapes) (Wales) Act 2024
 - The Air Quality (Wales) Regulations 2000 (Ref 10.1).
 - The Air Quality Standards (Wales) Regulations 2010 as amended (Ref 10.3).
 - The Non-Road Mobile Machinery (Type-Approval and Emission of Gaseous and Particulate Pollutants) Regulations 2018 (Ref 10.4).
 - Well-being of Future Generations (Wales) Act 2015.

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

Table 10-1 – Relevant air quality standards and objectives

Pollutant	Averaging Period	Value (micrograms per metre cubed ((µg/m³))
Nitrogen Dioxide (NO ₂)	Annual mean	40
	1-hour mean (not to be exceeded more than 18 times per year)	200
Particulate Matter (PM) ₁₀	Annual mean	40
	24-hour mean (not to be exceeded more than 35 times per year)	50
PM _{2.5} (particulate matter with a diameter <2.5 µm)	Annual mean	20
	Annual mean (by 2040)	10
	Interim target (by end of January 2028)	12

National Policy

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

- PPW – Edition 12 (Ref 4.5).
- Future Wales: The National Plan (Ref 4.4).
- The Clean Air Plan for Wales: Healthy Air, Healthy Wales 2020.
- The 2007 Air Quality (England) Strategy England, Scotland, Wales and Northern Ireland (Ref 10.2).

Local Policy

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

- Anglesey and Gwynedd Joint Local Development Plan 2011 – 2026 (Ref 4.11)

Guidance

10.2.6 The following guidance is relevant to Air Quality and Emissions:

- IAQM Guidance on the assessment of dust from demolition and construction (Ref 5.28).
- IAQM and Environmental UK (EPUK) Land-Use Planning & Development Control: Planning For Air Quality (Ref 10.6).

10.3 Study Area

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

construction period, noting that operational phase impacts have been scoped out of the assessment (see **Section 10.5**).

- 10.3.2 The methodological approach to defining the spatial extent of the Study Area for air quality has been informed by the IAQM and Environmental Protection UK (Ref 10.6, Ref 10.7 and Ref 10.8). An area within 10 km of the Glaslyn works site has been considered with respect to published baseline information on existing air quality. The following Study Areas have been used where an assessment of dust emissions generated by construction activities is required:
- 10.3.3 An amenity or human health sensitive receptor within:
- 250 m of the limits of construction activity within the Glaslyn works site; or
 - 50 m of the construction route on the public highway, up to 500 m from the Glaslyn works site entrance(s).
- 10.3.4 An ecological receptor within:
- 50 m of the limits of construction activity within the Glaslyn works site; or
 - 50 m of the construction route on the public highway, up to 500 m from the Glaslyn works site entrance(s).
- 10.3.5 The Study Area is effectively 250 m from the Glaslyn works site and this is illustrated in **Figure 4.10.1**, along with surrounding air quality-related constraints.

Sensitive Receptors

Dust Soiling Receptors

- 10.3.6 Dust soiling receptors are land uses that are susceptible to harm to amenity from the deposition of dust to property. 2,575 receptors which will have sensitivity to dust soiling impacts have been identified within 250 m of the Glaslyn works site. Some of these receptors, such as residential properties, car showrooms and long stay car parks, have high sensitivity whereas the rest, including receptors such as playing fields and farmland, have lower sensitivity.

Receptors Sensitive to the Human Health Impact of PM₁₀

- 10.3.7 Receptors sensitive to human health impacts are land uses where members of the public are considered to be present for a period of time comparable to the averaging periods of the short-term PM₁₀ air quality objective (24-hours). 2,575 receptors have been identified within 250 m of the Glaslyn works site which will have sensitivity to human health impacts of increased PM₁₀ caused by the construction dust. Some of these receptors have high sensitivity such as residential properties or schools, whereas the rest have lower sensitivity such as parks, shops and bus shelters.

Ecological Receptors

- 10.3.8 Ecological receptors are designated nature conservations sites and priority habitats. Four National Designations have been identified within 250 m of the Glaslyn works site which will have potential sensitivity to the impacts of dust settling either directly (through smothering or changes in acidity) or indirectly through increased stresses on plant-life. These designations are:

- The Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC.
- The Glaslyn SSSI.
- The Ysbyty Bron y Garth SSSI.
- The Tyn-Llan SSSI.

10.3.9 The Meirionnydd Oakwoods and Bat Sites SAC is in the Glaslyn SSSI. Sections of those National Designations are in the Glaslyn works site, as are sections of the Ysbyty Bron y Garth SSSI. The Tyn-Llan SSSI is approximately 50 m north-west of an access road into the Glaslyn works site.

10.4 Assumptions and Limitations

10.4.1 The construction dust assessment methodology is informed by numerous factors, including estimates of construction activities, vehicle movements and number of plant at each worksite, the area of ground to be worked, and the volume of structures erected. Where exact construction data or information is required to inform the construction dust assessment is not available at the time of submission, precautionary assumptions have been made to ensure the potential for impact is not under-estimated.

10.5 Baseline

Dust Deposition

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

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

Summary of Data Sources

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

- North Wales Authorities Collaborative Project 2023 Air Quality Progress Report (Ref 10.9).
- Mapped estimates of background concentrations provided by Defra's UK Air Information Resource (UK-air) (Ref 10.10)
- Designated ecological sites provided by Natural England's MAGIC maps (Ref 7.48).

Pollutant Concentrations

- 10.5.4

The Study Area for the air quality assessment covers an area within the local authority area of Gwynedd Council.
- 10.5.5

As part of LAQM duties, local authorities are required to monitor pollutant concentrations. There are no Gwynedd Council 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.
- 10.5.6

The UK-AIR website provides data for background concentrations of Nitrogen Oxides (NO_x), Nitrogen Dioxide (NO₂), PM₁₀ and PM_{2.5}. These background concentrations represent 1 km² grid squares. **Table 10-2** shows the range in estimated background concentrations within the Study Area in 2024. As expected for all pollutants, background concentrations in the Study Area are low, due to the predominantly rural nature of the area.

Table 10-2 – Defra mapped pollutant background concentrations for the Glaslyn works site (µg/m³)

NO ₂ (µg/m ³)	NO _x (µg/m ³)	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)
2.68 – 3.90	3.30 – 4.84	8.02 – 10.83	5.15 – 6.12

Future Baseline

- 10.5.7

Assuming that the consented EVIP THH is present in the future baseline scenario, there is the potential for emissions associated with that development to contribute to the future baseline conditions at receptors located close to that site. However, that consented development has been through the planning process and its works will be subject to standard best practice control measures to reduce emissions to air. As such, future baseline conditions are assumed to be similar to the existing baseline conditions, although concentrations of NO₂ and NO_x are expected to fall in future years, due to decarbonisation of the transport and energy sectors. This decrease is likely to be larger in urban areas and smaller in rural areas.

10.6 Scope of Assessment

- 10.6.1

This section describes the scope of the assessment of effects on Air Quality and Emissions.
- 10.6.2

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

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

Receptor	Scoped in/out per phase		Justification
	Construction	Operation	
Human health and amenity – dust	In	Out	Construction activities have the potential to generate emissions of dust and fine PM. Coarser particles have potential to harm the amenity of people close to the proposed works, through deposition and the soiling of property. The finer particles have potential to harm human health by increasing public exposure to the pollutants PM ₁₀ and PM _{2.5} .
Human health and amenity – construction traffic emissions	Out	Out	Construction plant, mobile machinery and construction traffic will generate combustion emissions which have the potential to harm human health. Air quality impact pathways to include construction site emissions and construction road traffic emissions, with the latter screened out of detailed assessment using the IAQM/EPUK (Ref 10.6) – A peak of 100 two-way HGV movements per day and an annual average of <100 two-way HGV movements does not have the potential to contribute to a significant effect in the context of the proposed works and wider Study Area – and DMRB screening criteria.
Ecological receptors	In	Out	Construction plant, mobile machinery and construction traffic will generate combustion emissions which have the potential to harm sensitive habitats. The pollutants NO _x , nitrogen deposition and acid deposition are known to harm the functional viability of some plant species and wider habitats. Construction dust emissions can smother vegetation and affect the rate of photosynthesis.
All		Out	Operational emissions will be limited to intermittent and short-term maintenance activities; these emissions are not capable of contributing to significant effects on local air quality.

10.7 Methodology

- 10.7.1 Details of the technical methods used to determine the baseline conditions, sensitivity of receptors, magnitude of effects and the significance criteria that have been used for the

Air Quality and Emissions assessment can be found in **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**.

10.8 Potential Effects

- 10.8.1 The anticipated effects resulting from the loss or change to Air Quality and Emissions elements and features during construction, operation and maintenance of the proposed works are outlined below.

Construction

- 10.8.2 The sources of potential Air Quality and Emissions effects during the construction phase that will be assessed in this assessment include:
- Construction dust emissions.
 - Site plant emissions.
- 10.8.3 Construction traffic emissions would also be considered in an air quality assessment. However, these emissions have been scoped out of this assessment as the anticipated number of vehicle movements is not expected to exceed the IAQM/EPUK screening criteria (set out in **Table 10-3**) used to suggest when significant air quality effects could potentially occur. **Table 9-14** shows that the Wider Works will generate fewer than 100 two-way HGV movements per average day on any link during the works.

Construction Dust Emissions

- 10.8.4 The assessment considers the potential impact for the area surrounding the Glaslyn works site.
- 10.8.5 As described in **Section 10.5** and **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**, the construction dust and particulate matter assessment follows the step-by-step approach set out in relevant IAQM guidance (Ref 5.28). This process is summarised in the sub-sections below.

Step 1: Screen the Requirements for a Detailed Assessment

- 10.8.6 Step 1 of the IAQM construction dust guidance (Ref 5.28) is to screen the requirement for a more detailed assessment. According to the guidance, no further assessment is required if there are no receptors within a specified distance of the works. The screening distances set by the IAQM guidance are:
- Receptors sensitive to amenity and human health impacts within 250 m of the construction Glaslyn works site or within 50 m of a public road used by construction traffic that is within 500 m of the Glaslyn works site entrance.
 - Nature conservation receptors in 50 m of the construction Glaslyn work site or within 50 m of a public road used by construction traffic that is within 500 m of the Glaslyn works site entrance.
- 10.8.7 **Figure 4.10.1** shows a 250 m buffer from the edge of the Glaslyn works site in which human health and amenity receptors may be impacted by construction activities. Whilst the surrounding areas of the proposed works are predominantly rural, the proposed works do pass close to populated areas of Porthmadog, to the west of Minffordd, and Tremadog.

- 10.8.8 With regards to National Designations for nature conservation, there is one SAC, the Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites and three SSSIs, the Glaslyn SSSI, Ysbyty Bron y Garth SSSI and Tyn-Llan SSSI, within 50 m of the Glaslyn works site.
- 10.8.9 Due to the presence of the high sensitivity amenity, human health sensitive receptors and the ecologically sensitive Nature Designations in the screening distances set by the guidance, the more detailed assessment of construction dust impacts is required and is set out below.

Step 2: Assess the Risk of Dust Impacts

Step 2A: Determine the Dust Emissions Magnitude

- 10.8.10 Step 2A requires the determination of the dust emission magnitude, as set out in **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**. The guidance states magnitude is based on the scale of the anticipated works involving the following activities:
- demolition;
 - earthworks;
 - construction (i.e. the building and erection of structures); and
 - trackout (the deposition of dust and particulate matter onto public roads by construction vehicles).
- 10.8.11 The dust emission magnitude should be classified as Small, Medium or Large.
- 10.8.12 Construction activities associated with the proposed works are described in **Chapter 2: Glaslyn Cables Works**. Works are the demolition of the Garth CSEC, construction of replacement Glaslyn cables, works to redundant cables including sections to be left *in situ* and sections to be removed, trench works and earthworks associated with access road construction and the construction of the new Minffordd CSEC.
- Demolition
- 10.8.13 The existing Garth CSEC will be removed as part of the works. For the purpose of this assessment, the volume of demolition is considered to exceed the 75,000 m³ guide set out in the IAQM guidance (Ref 5.28), to suggest the dust emissions magnitude effect for demolition is **Large**.
- Earthworks
- 10.8.14 The Glaslyn works site is anticipated to require earthworks associated with the removal, storage and handling of topsoil, associated with the direct burial of cables in excavated trenches, and targeted sections of HDD. For the purpose of this assessment, the area of earthworks is considered to exceed the 110,000 m² guide set out in the IAQM guidance (Ref 5.28), to suggest the dust emissions magnitude effect for earthworks is **Large**.
- Construction
- 10.8.15 Construction works at the Glaslyn works site include activities associated with the laying of haul access roads, the installation of ducting and joint bays, cable installation and the installation of equipment and the erection of structures within the Minffordd CSEC. For the purpose of this assessment, the volume of construction work is considered to

contain a total volume that exceeds the 750,000 m³ guide set out in the IAQM guidance (Ref 5.28), to suggest the dust emissions magnitude for construction is **Large**.

Trackout

- 10.8.16 Trackout is associated with the deposition of mud and potentially dusty material onto the public network from construction vehicles leaving site. On average, there is anticipated to be 50 outward construction related HGV (all vehicles >3.5 tonnes) movements per day, which is the uppermost value set by the IAQM guidance (Ref 5.28) to represent a medium emissions magnitude. However, to provide a precautionary assessment, the dust emission magnitude for trackout is assigned as Large.

Step 2B: Determine the Sensitivity of the Area

- 10.8.17 Step 2B of the IAQM construction dust guidance (Ref 5.28), as described in **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**, requires the determination of the sensitivity of the area to construction dust impacts. According to the guidance, this is based on the sensitivity of individual receptors, the proximity and number of those receptors to the works, background PM₁₀ concentrations and site-specific factors, such as local terrain, meteorology and natural and existing windbreaks.
- 10.8.18 To aid the determination of sensitivity, **Table 10-4** summarises the distribution of receptors sensitive to dust soiling and **Table 10-5** presents the distribution of receptors which are sensitive to the health effects of PM₁₀. **Table 10-6** presents the distribution of nature conservation sites.

Table 10-4 – Receptors sensitive to dust soiling

Receptor sensitivity	Distance from the Glaslyn works site			
	0 – 20 m	20 – 50 m	50 – 100 m	100 – 250 m
High	221	550	785	2,575
Medium	0	0	0	1
Low	0	0	1	0

Table 10-5 – Receptors sensitive to human health effects from PM₁₀

Receptor sensitivity	Distance from Glaslyn works site			
	0 – 20 m	20 – 50 m	50 – 100 m	100 – 250 m
High	221	550	785	2,575
Medium	0	0	0	0
Low	0	0	0	0

Table 10-6 – Receptors sensitive to ecological impacts

Receptor sensitivity	Distance from Glaslyn works site	
	0 – 20 m	20 – 50 m
High	1	0
Medium	2	1
Low	0	0

- 10.8.19 There are more than 200 high sensitivity amenity receptors within 20 m of the Glaslyn works site. In line with the IAQM construction dust guidance (Ref 5.28), this equates to an area of **High** sensitivity for dust soiling amenity impacts.
- 10.8.20 There are also more than 200 high sensitivity human health receptors within 20 m of the Glaslyn works site. These receptors are exposed to background PM₁₀ concentrations that are estimated to be below 24 µg/m³, as shown in **Table 10-2** –. In line with the IAQM guidance (Ref 5.28), this number of receptors combined with the PM₁₀ concentrations presented equates to a Medium area of sensitivity for human health impacts.
- 10.8.21 With regards to nature conservation sites, there is one high sensitivity receptor and two medium sensitivity receptors within 20 m of the Glaslyn works site. This equates to an area of **High** sensitivity to ecological impacts.
- Step 2C: Determine the Risk of Dust Impacts
- 10.8.22 Step 2C of the IAQM construction guidance (Ref 5.28) concerns the determination of the risk of dust impacts, which is informed by the dust emission magnitude identified in Step 2A and the sensitivity of the area identified in Step 2B.
- 10.8.23 The risk from dust impacts for dust soil amenity and human health impacts are shown in **Table 10-7**.

Table 10-7 – Risk of dust impacts

Potential impact	Demolition	Earthworks	Construction	Trackout
Dust Soiling	High Risk	High Risk	High Risk	High Risk
Human Health	High Risk	Medium Risk	Medium Risk	Medium Risk
Ecology	High Risk	High Risk	High Risk	High Risk

Construction Site Plant and Non-Road Mobile Machinery (NRMM) Emissions

- 10.8.24 According to the IAQM guidance (Ref 10.6) exhaust emissions from on-site plant (and NRMM) and the Glaslyn works site traffic are unlikely to make a significant impact on local air quality, and in the vast majority of cases they will not need to be quantitatively assessed. This is considered to be the case for the construction of the proposed works, due to the transient and intermittent nature of emissions from site plant and NRMM, operating as and when and where required,
- 10.8.25 A review of the number and location of site plant and NRMM machines required for the Glaslyn works (as presented in **Volume 8, Appendix 4.11.A: Construction Noise and Vibration Calculations and Results**) suggests that the effect of impacts will not be

significant on the receptors considered in this assessment, in line with the IAQM guidance (Ref 10.6), for the following reasons:

- The good standard of baseline air quality.
- The transient and intermittent nature of emissions.
- The limited duration of time in which site plant and NRMM emissions will be present near sensitive receptors.
- The distance between emission sources and the nearest high sensitivity receptors at the majority of locations.
- The effectiveness of standard practice emission control measures, including:
 - Use of plant with low NO_x, PM₁₀ and PM_{2.5} emissions.
 - Prohibiting unnecessary idling.
 - Prohibiting unnecessary NRMM movements; and
 - Keeping plant and NRMM in a good state of repair.

A498 Crossing – HDD Option

- 10.8.26 If the HDD option was taken forward, the impact may be lower than that stated above as the magnitude of dust emissions from earthworks and construction may reduce. However, overall the risk of dust impacts would remain the same as demolition and trackout would still be high risk.

10.9 Mitigation and Residual Effects

Mitigation

Step 3: Determine the Level of Mitigation

- 10.9.1 As discussed in **Section 10.77**, the construction dust assessment follows a step-by-step approach to determine the level of mitigation required to ensure that a significant effect will not occur. Step 3 of the IAQM guidance relates to the level of mitigation required following consideration of the risk of impacts identified during Step 1 and Step 2, which are described in **Section 10.8**.
- 10.9.2 The following mitigation measures are highly recommended by the IAQM and will be adopted during the proposed works:
- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
 - Display the name and contact details of person(s) accountable for air quality and dust issues on the Glaslyn works site.
 - Display the head or regional office contact information.
 - Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the local authority. The level of detail will depend on the risk and will include as a minimum the highly recommended measures in this document. The desirable measures will be included as appropriate

for the site. The DMP may include monitoring of dust deposition, dust flux, real time PM₁₀ continuous monitoring and visual inspections.

- Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
- Make the complaints log available to the local authority when asked.
- Record any exceptional incidents that cause dust and air emissions, either on- or off-site, and the action taken to resolve the situation in the log book.
- Hold regular liaison meetings with other high risk construction sites within 250 m of the Glaslyn works site, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/deliveries which might be using the same strategic road network routes.
- Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This would include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100 m of the Glaslyn works site, with cleaning to be provided if necessary.
- Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked.
- Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
- Agree dust deposition, dust flux, or real-time PM₁₀ continuous monitoring locations with the local authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction.
- Plan site layout so that machinery and dust causing activities are away from receptors, as far as is possible.
- Erect solid screens or barriers around dusty activities or the Glaslyn works site that are at least as high as any stockpiles on site.
- Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.
- Avoid site runoff of water or mud.
- Keep site fencing, barriers and scaffolding clean using wet methods.
- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.
- Cover, seed or fence stockpiles to prevent wind whipping.
- Ensure all vehicles switch off engines when stationary - no idling vehicles.

- Avoid where practicable the use of diesel or petrol powered generators and use mains electricity or battery powered equipment.
- Impose and signpost a maximum-speed-limit of 15-mph on surfaced and 10-mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).
- Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.
- Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).
- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
- Use enclosed chutes and conveyors and covered skips.
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
- Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.
- Avoid bonfires and burning of waste materials.
- Ensure effective water suppression is used during demolition operations. Handheld sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition, high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.
- Avoid explosive blasting, using appropriate manual or mechanical alternatives.
- Bag and remove any biological debris or damp down such material before demolition.
- Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).
- Ensure effective water suppression is used during demolition operations. Handheld sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition, high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.
- Avoid explosive blasting, using appropriate manual or mechanical alternatives.
- Bag and remove any biological debris or damp down such material before demolition.

- Re-vegetate earthworks and exposed areas or soil stockpiles to stabilise surfaces as soon as practicable.
- Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.
- Only remove the cover in small areas during work and not all at once.
- Avoid scabbling (roughening of concrete surfaces) if possible.
- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
- Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.
- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.
- Avoid dry sweeping of large areas.
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
- Record all inspections of haul routes and any subsequent action in a site log book.
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).
- Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
- Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permit.
- Access gates to be located at least 10 m from receptors where possible.

10.9.3 A schedule of environmental commitments will be presented within the CEMP (**Volume 8, Appendix 4.2.A: Outline Construction Environmental Management Plan**).

Residual Effect

10.9.4 Step 4 of the IAQM construction dust guidance (Ref 5.28) is to determine whether the effects, after the application of the identified level of mitigation (Step 3 – **Section 10.9**), are significant. The IAQM guidance (Ref 5.28) states that:

“For almost all construction activity, the aim should be to prevent significant effects on receptors through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be ‘not significant’”.

10.9.5 The implementation of the identified dust mitigation in **Section 10.9** will result in the residual effects from the proposed works being **Negligible and not significant**.

10.10 Summary

- 10.10.1 Existing air quality in the Study Area is of a good standard, with pollutant concentrations well within the air quality objective values set for the protection of human health. Much of the land in and around the Glaslyn works site is rural. There are some dust and air quality sensitive receptors in or close to the Glaslyn works site that could be adversely impacted by the construction of the proposed works.
- 10.10.2 The assessment has followed the IAQM guidance on assessing construction site air quality impacts. It has determined that, implementing the mitigation measures identified the magnitude of impacts will be negligible and not significant.
- 10.10.3 The impact of NRMM emissions is anticipated to be not significant. This is due to the good standard of baseline air quality, the transient and intermittent nature of emissions from the source, the limited duration of time in which such machinery will be operational, and the effectiveness of standard practice emissions control measures which will be implemented.
- 10.10.4 Construction road traffic emissions and operational road traffic emissions impacts were screened out of the assessment. The increase in traffic during both construction and operation are such that there is no potential for them to contribute to a significant effect on local air quality.

11. Noise and Vibration

11.1 Introduction

- 11.1.1 This chapter presents an assessment of the likely Noise and Vibration effects that could arise from the construction, operation and maintenance of the works at Glaslyn as described in **Chapter 2: Glaslyn Cables Works**.
- 11.1.2 This chapter describes the baseline conditions currently existing within the Study Area (as defined in **Section 11.3**), the scope of the assessment, the potential effects, the mitigation measures required to avoid, reduce or offset any significant negative effects, and the likely residual effects after these mitigation measures have been adopted.
- 11.1.3 This chapter is supported by figures and appendices as listed below:
- **Figure 4.11.1: Noise Monitoring and Sensitive Receptor Locations.**
 - **Volume 8, Appendix 1.1.A: Legislation, Policy and Guidance.**
 - **Volume 8, Appendix 1.4.A: Topic Assessment Methodology.**
 - **Volume 8, Appendix 3.11.A: Baseline Noise Monitoring.**
 - **Volume 8, Appendix 4.11.A: Construction Noise and Vibration Calculations and Results.**
- 11.1.4 Other chapters that are useful to review in association with this chapter are as follows:
- **Chapter 5: Ecology and Nature Conservation.**
 - **Chapter 9: Traffic and Transport.**

11.2 Legislation and Planning Policy

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

Legislation

- 11.2.2 The following legislation is relevant to the Noise and Vibration:
- Control of Pollution Act 1974 (Ref 8.9).
 - Environmental Protection Act 1990 (Ref 7.1).

National Policy

- 11.2.3 The following national planning policy is relevant to Noise and Vibration:
- PPW – Edition 12 (Ref 4.5).
 - Future Wales: The National Plan 2040 (Ref 4.4).

11.3 Study Area

11.3.1 The Study Area has been defined to include construction noise and vibration receptors likely to be at risk from possible direct and indirect impacts that might arise from the proposed works. For construction noise effects, the area for which impacts are expected is considered to be 300 m from the Glaslyn works site, based on guidance in BS 5228-1:2009+A1:2014 (Ref 11.1), which states construction noise predictions are generally reliable up to 300 m. For construction vibration, it is expected that receptors at a distance of at least 100 m would not experience perceptible levels of vibration. This Study Area is referenced from the DMRB LA 111 (Ref 11.2), which, although the document is aimed at road projects, is considered reasonable to reference in the absence of any other guidance on construction vibration.

11.4 Assumptions and Limitations

- 11.4.1 The measured ambient $L_{Aeq,T}$ noise level has been used to define construction noise assessment criteria at sensitive receptors. As it is not possible to measure noise levels at every sensitive receptor, a number of locations have been selected to provide an indication of the likely levels of baseline noise that sensitive receptors may experience. Where there is uncertainty over whether noise measurements are representative of a sensitive receptors, a conservative approach has been taken by applying noise data from a measurement location that is judged as being quieter. This approach ensures that the application of construction noise criteria (defined from ambient noise measurements) is suitably conservative.
- 11.4.2 Construction noise predictions have been carried out using plant lists provided by the Contractor. Noise predictions were carried out to represent a conservative scenario where all construction plant is operational on-site. Consequently, noise predictions may overestimate construction noise levels and can be considered as worst-case.

11.5 Baseline

11.5.1 Details of the technical methods used to determine the baseline conditions, can be found in **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**. Results of the baseline monitoring methodology are presented **Table 11-1**. Details of results are presented in **Volume 8, Appendix 3.11.A: Baseline Noise Monitoring**.

Table 11-1 – Baseline monitoring results

Location Description		Measured baseline ambient sound level		
		$L_{Aeq,12h}$ dB	$L_{Aeq,4h}$ dB	$L_{Aeq,8h}$ dB
LT4.1	South of Tremadog, approximately 70 m north of the A487.	63	60	54
LT4.2	North-west of Porthmadog, approximately 360 m north of the A487.	53	46	46

Location Description		Measured baseline ambient sound level		
		L _{Aeq,12h} dB	L _{Aeq,4h} dB	L _{Aeq,8h} dB
LT4.3	North of Minffordd, approximately 200 m south of the Porthmadog Bypass	50	48	41
ST4.1	South of Wern Manor, approximately 190 m north of the A497	58	-	-
ST4.2	To the north-east of Porthmadog, adjacent to Madog Street	58	-	-

11.5.2 Sensitive receptors were identified within the Study Area using Addressbase Plus data. Sensitive receptor locations are illustrated in **Figure 4.11.1**. A summary of sensitive receptors identified for the noise and vibration assessment is presented in **Table 11-2**. These receptors are of Medium sensitivity (as per Table 9-1 of **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**).

Table 11-2 – Sensitive receptors

Receptor type	Sensitivity	Number of receptors in Study Area
Residential	Medium	920
Educational	Medium	4
Hotel	Medium	13
Medical	Medium	2
Place of Worship	Medium	4

Future Baseline

11.5.3 The EVIP would not contain significant plant or equipment that would generate either noise or vibration. As such, it would not contribute to future baseline conditions in the local area.

11.5.4 No other new developments are planned near the Glaslyn works site that would result in a material change to baseline ambient noise conditions at identified sensitive receptors. Assumptions made regarding baseline noise conditions are applicable to the future baseline.

11.6 Scope of Assessment

11.6.1 This section describes the scope of the assessment of effects on Noise and Vibration.

- 11.6.2 **Table 11-3** summarises the potential Noise and Vibration receptors that have been reviewed and states whether they have been included or excluded from the Noise and Vibration assessment. Justifications are provided where receptors have been both included and excluded from the assessment.

Table 11-3 – Scope of Noise and Vibration assessment

Receptor	Scoped in/out per phase		Justification
	Construction	Operation	
Noise and vibration sensitive receptors	In	Out	There are multiple sensitive receptors within the Study Area which have the potential to experience construction related noise and vibration effects. In addition, there are four footpaths and two bridleways within the Glaslyn works site, and NCR 8 runs through the centre of the Glaslyn works site. No operational effects are anticipated.

11.7 Methodology

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

11.8 Potential Effects

- 11.8.1 Construction works that may result in potential adverse Noise and Vibration effects at sensitive receptors have been identified as Noise Generating Activities (NGA) as follows:
- NGA1 – Preliminary works, establishment of compounds, construction of access roads.
 - NGA2 – CSEC enabling works and revised EVIP THH construction.
 - NGA3 – Glaslyn Cables installation and decommissioning, open cut cable laying.
 - NGA4 – HDD crossings (assessed during the night-time period at residential and hotel receptors and evening at all other receptors that would not be occupied at night as a worst-case).
 - NGA5 – Garth CSEC removal.
 - NGA6 – Land reinstatement, removal of temporary haul access roads and reinstatement of topsoil.
 - NGA7 – Demobilisation, removal of the construction compounds.

Construction Noise

- 11.8.2 The potential construction impacts from the proposed works are assessed with the criteria presented in Annex E of BS 5228-1 as set out in Table 9-2 of **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**. The ‘ABC Method’ has been adopted for the purposes of this assessment, as it takes into consideration the context of existing noise levels experienced at a residential property.
- 11.8.3 Results of baseline monitoring presented in **Table 11-1** indicate that daytime category A is the appropriate set of assessment criteria. The exception to this is receptors that experience baseline noise conditions representative of levels measured at LT4.1 (see **Table 11-1**), which are equivalent to category C. To allow for a simpler assessment method, all daytime noise levels are assessed using category A criteria. However, context on the identification of any significant effects is provided if noise data from position LT4.1 is representative of a receptor experiencing a significant effect.
- 11.8.4 Summaries of construction noise predictions at different receptor types are presented as described in **Tables 11-4** below. Full results of construction noise predictions are presented in **Volume 8, Appendix 4.11.A: Construction Noise and Vibration Calculations and Results**.

Table 11-4 – Predicted daytime construction noise levels at residential receptors

Predicted daytime construction noise level LAeq,T dB	NGA1	NGA2	NGA3	NGA5	NGA6	NGA7
>80	0	0	0	0	0	0
75-80	0	0	0	0	0	0
70-75	2	0	0	0	0	0
65-70	11	4	0	0	0	10
60-65	28	4	7	1	5	21
<60	879	912	913	919	915	889

Table 11-5 – Predicted daytime construction noise levels at educational receptors

Predicted daytime construction noise level LAeq,T dB	NGA1	NGA2	NGA3	NGA5	NGA6	NGA7
>80	0	0	0	0	0	0
75-80	0	0	0	0	0	0
70-75	0	0	0	0	0	0
65-70	0	0	0	0	0	0
60-65	1	0	0	0	0	0

<60	3	4	4	4	4	4

Table 11-6 – Predicted daytime construction noise levels at hotel receptors

Predicted daytime construction noise level LAeq,T dB	NGA1	NGA2	NGA3	NGA5	NGA6	NGA7
>80	0	0	0	0	0	0
75-80	0	0	0	0	0	0
70-75	0	0	0	0	0	0
65-70	0	0	0	0	0	0
60-65	1	0	0	0	0	0
<60	12	13	13	13	13	13

Table 11-7 – Predicted daytime construction noise levels at medical receptors

Predicted daytime construction noise level LAeq,T dB	NGA1	NGA2	NGA3	NGA5	NGA6	NGA7
>80	0	0	0	0	0	0
75-80	0	0	0	0	0	0
70-75	0	0	0	0	0	0
65-70	0	0	0	0	0	0
60-65	0	0	0	0	0	0
<60	2	2	2	2	2	2

Table 11-8 – Predicted daytime construction noise levels at place of worship receptors

Predicted daytime construction noise level LAeq,T dB	NGA1	NGA2	NGA3	NGA5	NGA6	NGA7
>80	0	0	0	0	0	0
75-80	0	0	0	0	0	0
70-75	0	0	0	0	0	0

Predicted daytime construction noise level LAeq,T dB	NGA1	NGA2	NGA3	NGA5	NGA6	NGA7
65-70	0	0	0	0	0	0
60-65	0	0	0	0	0	0
<60	4	4	4	4	4	4

Table 11-9 – Predicted NGA4 night-time construction noise levels

Predicted night-time construction noise level LAeq,T dB	Residential	Hotel
>75	0	0
70-75	0	0
65-70	0	0
60-65	2	0
55-60	1	0
50-55	34	0
45-50	415	4
40-45	424	6
<40	44	3

Table 11-10 – Predicted NGA4 evening construction noise levels

Predicted night-time construction noise level LAeq,T dB	Educational	Medical	Place of worship
>60	0	0	0
55-60	0	0	0
50-55	1	0	0
<50	4	2	4

NGA1

11.8.5 Daytime construction noise levels of between 70 and 75 dB LAeq,T are predicted at the following residential receptors:

- Gwynfryn Ffordd Glanrafon, Porthmadog, LL49 9PP.

- Talarwen, Porthmadog, LL49 9PP.
- 11.8.6 Construction noise levels of between 70 and 75 dB $L_{Aeq,T}$ are identified as a High impact and a Major Adverse effect, which is significant.
- 11.8.7 Daytime construction noise levels of between 65 and 70 dB $L_{Aeq,T}$ are predicted at the following residential receptors:
- Penmount, Porthmadog, LL49 9PP.
 - Ty Gerddi, Maes Gerddi, Porthmadog, LL49 9LE.
 - 76 Maes Gerddi, Porthmadog, LL49 9LE.
 - 26 Maes Gerddi, Porthmadog, LL49 9LE.
 - 14 Maes Gerddi, Porthmadog, LL49 9LE.
 - 11 Maes Gerddi, Porthmadog, LL49 9LE.
 - 10 Maes Gerddi, Porthmadog, LL49 9LE.
 - 8 Maes Gerddi, Porthmadog, LL49 9LE.
 - 7 Maes Gerddi, Porthmadog, LL49 9LE.
 - 3 Maes Gerddi, Porthmadog, LL49 9LE.
 - 18 Glaslyn Street, Porthmadog, LL49 9EG
- 11.8.8 Construction noise levels of between 65 and 70 dB $L_{Aeq,T}$ are identified as a Medium impact and a Moderate Adverse effect, which is significant.
- 11.8.9 The remaining 907 residential receptors and all other receptor types are predicted with daytime noise levels below 65 dB $L_{Aeq,T}$, which is, at worst, a Minor Adverse effect and not significant.

NGA2

- 11.8.10 Daytime construction noise levels of between 65 and 70 dB $L_{Aeq,T}$ are predicted at the following residential receptors:
- 6 Osmond Terrace, Minffordd, Penrhyndeudraeth, LL48 6HW.
 - 4 Osmond Terrace, Minffordd, Penrhyndeudraeth, LL48 6HW.
 - 3 Osmond Terrace, Minffordd, Penrhyndeudraeth, LL48 6HW.
 - Glandon, Minffordd, Penrhyndeudraeth, LL48 6HP.
 - Y Graig, Minffordd, Penrhyndeudraeth, LL48 6HP.
 - Gwynfryn Ffordd Glanrafon, Porthmadog, LL49 9PP.
 - Lloc Meurigl, Minffordd, Penrhyndeudraeth, LL48 6HS.
- 11.8.11 Construction noise levels of between 65 and 70 dB $L_{Aeq,T}$ are identified as a Medium impact and a Moderate Adverse effect, which is significant.
- 11.8.12 The remaining 913 residential receptors and all other receptor types are predicted with daytime noise levels below 65 dB $L_{Aeq,T}$, which is, at worst, a Minor Adverse effect and not significant.

NGA3

- 11.8.13 All receptors are predicted with daytime noise levels below 65 dB $L_{Aeq,T}$, which is, at worst, a Minor Adverse effect and not significant.

NGA4

- 11.8.14 Unattended monitoring at LT4.1 and LT4.2 provide an indication of night-time noise levels in Porthmadog. As a conservative approach, the lower noise levels from LT4.2 have been referenced when defining night-time construction noise criteria. Night-time noise levels of 46 dB $L_{Aeq,8h}$ align with category B from Table 9-2 of **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**.
- 11.8.15 Night-time construction noise levels of greater than 55 dB $L_{Aeq,T}$ are predicted at the following residential receptors:
- Gwynfryn Ffordd Glanrafon, Porthmadog, LL49 9PP.
 - Talarwen, Porthmadog, LL49 9PP.
 - Penmount, Porthmadog, LL49 9PP.
- 11.8.16 Night-time construction noise levels of above 55 dB $L_{Aeq,T}$ are identified as a High impact and a Major Adverse effect, which is significant.
- 11.8.17 Forty three residential properties are identified as experiencing night-time construction noise levels of between 50 and 55 dB $L_{Aeq,T}$. Noise levels of this magnitude are identified as a Medium impact and a Moderate Adverse effect, which is significant. Whilst these are too numerous to list in this chapter, detailed results of construction noise predictions are presented in **Volume 8, Appendix 4.11.A: Construction Noise and Vibration Calculations and Results**.
- 11.8.18 The remaining 874 residential receptors and 13 hotel receptors are predicted with night-time noise levels below 50 dB $L_{Aeq,T}$, which is, at worst, a Minor Adverse effect and not significant.
- 11.8.19 All other receptors (educational, medical and places of worship) that may be occupied during the evening and not at night, category A from Table 9-2 of **Volume 8, Appendix 1.4.A: Topic Assessment Methodology** is applied with reference to evening baseline noise measurements at LT4.2. Construction noise levels at all receptors are below the evening noise threshold of 55 dB $L_{Aeq,T}$. These noise effects are, at worst, a Minor Adverse effect and not significant.

A498 Crossing – HDD Option

- 11.8.20 The crossing at the A498 was assessed as open cut as part of NGA3; however, there is an option for the A498 crossing to be HDD. The nearest sensitive receptor to the likely HDD pit locations is approximately 250 m to the south of the western HDD area. Noise levels at this residential property due to HDD activities are predicted to be 51 dB $L_{Aeq,T}$. At all other receptors, predicted HDD noise is below 50 dB $L_{Aeq,T}$.
- 11.8.21 If the HDD option was taken forward, one receptor would be affected by noise levels of magnitude identified as a Medium impact and a Moderate Adverse effect. The remaining residential receptors and hotel receptors are predicted with night-time noise levels below 50 dB $L_{Aeq,T}$, which is, at worst, a Minor Adverse effect and not significant.

NGA5

- 11.8.22 All receptors are predicted with daytime noise levels below 65 dB $L_{Aeq,T}$, which is, at worst, a Minor Adverse effect and not significant.

NGA6

- 11.8.23 Daytime construction noise levels of between 65 and 70 dB $L_{Aeq,T}$ are predicted at the following residential receptors:
- Ty Gerddi, Maes Gerddi, Porthmadog, LL49 9LE.
 - 76 Maes Gerddi, Porthmadog, LL49 9LE.
 - 14 Maes Gerddi, Porthmadog, LL49 9LE.
 - 13 Maes Gerddi, Porthmadog, LL49 9LE.
 - 11 Maes Gerddi, Porthmadog, LL49 9LE.
 - 10 Maes Gerddi, Porthmadog, LL49 9LE.
 - 9 Maes Gerddi, Porthmadog, LL49 9LE.
 - 8 Maes Gerddi, Porthmadog, LL49 9LE.
 - 7 Maes Gerddi, Porthmadog, LL49 9LE.
 - Gwynfryn Ffordd Glanrafon, Porthmadog, LL49 9PP.
- 11.8.24 Construction noise levels of between 65 and 70 dB $L_{Aeq,T}$ are identified as a Medium impact and a Moderate Adverse effect, which is significant.
- 11.8.25 All other receptors are predicted with daytime noise levels below 65 dB $L_{Aeq,T}$, which is, at worst, a Minor Adverse effect and not significant.

NGA7

- 11.8.26 Daytime construction noise levels of between 65 and 70 dB $L_{Aeq,T}$ are predicted at the following residential receptors:
- Gwynfryn Ffordd Glanrafon, Porthmadog, LL49 9PP.
 - Talarwen, Porthmadog, LL49 9PP.
- 11.8.27 Construction noise levels of between 65 and 70 dB $L_{Aeq,T}$ are identified as a Medium impact and a Moderate Adverse effect, which is significant.
- 11.8.28 The remaining 918 residential receptors and all other receptor types are predicted with daytime noise levels below 65 dB $L_{Aeq,T}$, which is, at worst, a Minor Adverse effect and not significant.

Summary of Construction Noise Effects

- 11.8.29 A summary of the number of properties predicted to experience significant construction noise along with the construction activity that causes significant effects is presented in **Table 11-11**.

Table 11-11 – Summary of significant construction noise effects

Noise generating activity	Number of receptors experiencing significant effects		Construction noise activity
	Major adverse	Moderate adverse	
NGA1	2	4	Set up of compound immediately west of the Welsh Highland Heritage Railway. Construction of haul road north of Maes Gerddi
NGA2	0	7	Minffordd CSEC enabling works
NGA3		None	-
NGA4	3	43	Night-time HDD activities
NGA5		None	-
NGA6	0	10	Reinstatement of haul road north of Maes Gerddi -
NGA7	0	2	Demobilisation of compound immediately west of the Welsh Highland Heritage Railway

Construction Vibration

11.8.30 It is generally accepted that, without a highly detailed understanding of the media, waveform, and frequency distribution, ground-borne vibration prediction methods are “*beset with complexities and uncertainties*” (Ref 11.2). Typical construction and working routines are unlikely to generate levels of vibration at local receptors at a level where cosmetic damage would be expected; however, ground-borne vibration may be substantial enough to result in adverse effects for occupants of affected buildings. The level of impact at different receptors will be dependent upon several factors including distance between the works, ground conditions and the specific activities being carried out. This section assesses construction vibration effects based on the highest vibration generating activity likely to occur during each NGA.

NGA1, NGA2, NGA3, NGA6

11.8.31 The highest levels of Peak Particle Velocity (PPV) vibration that would be generated would be the use of vibratory rollers. Vibratory rollers may generate significant levels of vibration (i.e. exceeding 1.0 mm/s) at receptors within 25 m. No receptors are identified with 25 m of a works area; however, two receptors are identified within 25 m of a haul road where vibratory rollers may be used. The receptors are:

- Ty Gerddi, Maes Gerddi, Porthmadog, LL49 9LE.
- 76 Maes Gerddi, Porthmadog, LL49 9LE.

11.8.32 The two receptors identified above are close enough such that medium ground-borne impacts may occur, which is equivalent to a Moderate Adverse effect. Significant ground-borne vibration effects may occur at the two receptors identified above if vibratory rollers are used during NGA1 and/or NGA6.

- 11.8.33 No significant ground-borne vibration effects are expected due to NGA2 or NGA3.

NGA4

- 11.8.34 HDD activities would generate similar levels of vibration to bored piling. Bored piling calculations, are presented in **Volume 8, Appendix 4.11.A: Construction Noise and Vibration Calculations and Results**. These calculations are based on analysis of data from Table D.6 of BS 5228-2 (Ref 11.3). Calculations indicate that the 1 mm/s threshold of significance would be exceeded at receptors within 15 m of HDD compounds and the 0.3 mm/s adverse effect threshold would be exceeded at receptors within 40 m of HDD compounds.
- 11.8.35 No receptors are within 15 m of an HDD compound and vibration at nearby sensitive receptors from HDD activities would be not significant. All other receptors are further than 15 m from an HDD compound and would experience, at worst, a Minor Adverse effect and not significant.

A498 Crossing – HDD Option

- 11.8.36 The nearest sensitive receptor to the likely HDD pit locations is approximately 250 m to the south of the western HDD area. At this distance, vibration would not be perceptible and no additional vibration effects new identified. As such, vibration effects remain as not significant.

NGA5, NGA7

- 11.8.37 Surface plant, such as cranes, compressors and generators, are not recognised as sources of high levels of ground-borne vibration. Reference to Figure C2 of 'Control of Vibration and Noise During Piling' (Ref 11.4) confirms that PPVs significantly less than 5 mm/s are generated by such machinery, even at distances of only 10 m. For example, the indication is that a bulldozer would generate a PPV of approximately 0.6 mm/s and a 'heavy lorry on [a] poor road surface' would generate a PPV of less than 0.1 mm/s at 10 m. These values are below the threshold of significant vibration effects of 1.0 mm/s (see **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**) where it is likely that vibration in residential environments will result in complaints but can be tolerated if prior warning and explanation is given to residents. No significant vibration effects are expected due to NGA5 or NGA7.

Construction Traffic Noise

- 11.8.38 Potential changes in road traffic noise from road links as a result of the proposed works have been considered by calculating the Calculation of Road Traffic Noise (Ref 11.5) Basic Noise Level (BNL) and comparing the change.

11.8.39 **Table 11-12** presents the results of the assessment. Road traffic flow data used in BNL calculations are presented in **Volume 8, Appendix 4.11.A: Construction Noise and Vibration Calculations and Results**.

Table 11-12 – Construction traffic noise assessment

Road link	2028 baseline BNL dB	2028 baseline + construction traffic BNL dB	Change in noise dB
A487 west of A498	65.5	65.8	+0.3
A498 south of A487	63.5	63.7	+0.2
A498 north of A487	59.5	59.5	0.0
A497 south of A498	65.4	65.4	0.0
Penamser Road	62.8	62.8	0.0
Brittania Terrace/A497	62.7	62.9	+0.2
A487 west of Minffordd Roundabout	68.3	68.4	+0.1
Church Street	59.9	59.9	0.0
A498 east of Church Street Junction	59.6	59.6	0.0
Porthmadog High Street	64.9	65.1	+0.2
A487 west of Porthmadog High Street Junction	67.6	67.7	+0.1
A487 east of Porthmadog High Street Junction	66.7	66.8	+0.1
Unnamed Road (north of Porthmadog Roundabout)	48.1	48.1	0.0

- 11.8.40 Potential increases in traffic noise are an indirect result of construction activities associated with the proposed works. Although construction traffic will continue to operate for the duration of the construction programme, the construction traffic noise assessment accounts for peak periods of traffic. The change in noise due to construction traffic has been assessed with reference to the methodology presented in **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**.
- 11.8.41 The largest increase in traffic noise due to construction traffic is 0.3 dB. This is equivalent to a Negligible impact and a Negligible effect at Medium sensitivity receptors. An effect of this magnitude is not significant.

11.9 Mitigation and Residual Effects

Section 61 Prior Consent

- 11.9.1 Prior to commencement of work, the contractor will submit an application for prior consent to carry out noisy work under Section 61 of the Control of Pollution Act 1974 (Ref 8.9) to demonstrate that noise and vibration has been minimised as far as reasonably practicable. The Section 61 application will set out the specific method of working, the actual working hours required, noise (and if necessary, vibration) monitoring locations, details of communication measures and the mitigation measures implemented to minimise noise and vibration impacts. As required by the Control of Pollution Act 1974 (Ref 8.9), Best Practicable Means (BPM) will be employed and demonstrated through the construction programme, the method used to construct the proposed works and noise (and vibration) predictions to the local authority in the Section 61 consent application. Should the contractor fail to follow the agreed methodology set out in the Section 61 application, the Local Authority will have the power to request the contractor to cease works and review methodology.

Best Practicable Means

- 11.9.2 Measures to control noise as defined in Annex B of BS 5228-1 (Ref 11.1) and measures to control vibration as defined in Section 8 of BS 5228-2 (Ref 11.3) will be adopted where reasonably practicable. These measures represent BPM and will be secured within a CEMP for the construction phase. BPM that will be implemented during construction works and secured through the CEMP are presented below:

- All appropriate processes, procedures and measures will be in place to minimise noise before works begin and throughout the construction programme.
- All contractors to be made familiar with current legislation and the guidance in BS 5228 (Parts 1 and 2) (Ref 11.1 and Ref 11.3) which would form a prerequisite of their appointment.
- Noise and vibration will be controlled at source (e.g. the selection of inherently quiet plant and low vibration equipment) through a review of the construction programme and methodology to consider quieter methods and consideration of the location of equipment on-site and control of working hours.
- Modern plant that complies with applicable UK noise emission requirements will be used.
- Hydraulic techniques for breaking concrete will be used in preference to percussive techniques.
- Drop heights of materials will be minimised.
- Plant and vehicles will be sequentially started up rather than all together.
- Off-site pre-fabrication where reasonably practicable.
- Regular and effective maintenance by trained personnel will be carried out to keep plant and equipment working to manufacturer's specifications.
- All construction plant and equipment to be properly maintained, silenced where appropriate, operated to prevent excessive noise and switched off when not in use.

- Loading and unloading of vehicles, dismantling of site equipment or moving equipment or materials around the Glaslyn works site to be conducted in such a manner as to minimise noise generation.
- All vehicles used on-site shall incorporate reversing warning devices as opposed to the typical tonal reversing alarms to minimise noise disturbance.
- Provision of information to the relevant local authority and local residents to advise of potential noisy works that are due to take place.
- Unnecessary revving of engines will be avoided, and equipment will be switched off when not in use.
- Plant will always be used in accordance with manufacturers' instructions. Care will be taken to site equipment away from noise-sensitive areas. Where possible, loading and unloading will also be carried out away from such areas.

Communication Strategy

- 11.9.3 The effect of noise and vibration on nearby sensitive receptors can be minimised through a good communication strategy. Prior to works being carried out, liaison will be carried out with occupiers of sensitive receptors that may be adversely affected by construction noise and vibration. Providing information of construction works and notice of when high noise and/or vibration generating activities are taking place can reduce adverse effects. All communications will contain contact details of persons to whom to direct any questions or complaints. The spatial coverage of communications will be agreed with the Local Authority through the Section 61 process.

Screening

- 11.9.4 BS 5228-1 (Ref 11.1) assumes an approximate attenuation of 5 dB when the top of the plant is just visible to the receiver over the noise barrier, and of 10 dB when the noise screen completely hides the sources from the receiver. Temporary barriers should be used to screen receptors experiencing significant effects.
- 11.9.5 Temporary barriers would be used to screen construction noise emissions as follows:
- At the compound to the west of the Welsh Highland Heritage Railway during all works.
 - At Minffordd CSEC during enabling works.
 - South of the haul road to the north of Maes Gerddi.
- 11.9.6 It is assumed that temporary barriers could screen line-of-sight from construction activities to sensitive receptors and would provide at least 5 dB attenuation. Moderate Adverse effects identified during NGA1, NGA2, NGA4, NGA6 and NGA 7 would be reduced to Minor Adverse and not significant.
- 11.9.7 Locations, heights and alignments of barriers will be included in the CEMP.
- 11.9.8 Additional mitigation to address Major Adverse effects identified at NGA1 and NGA4 are provided in the following sections.

NGA1

- 11.9.9 Noise emissions during compound activities at the compound to the west of the Welsh Highland Heritage Railway set are predicted to be at 65 dB $L_{Aeq,T}$ at Talarwen,

Porthmadog, LL49 9PP and 66 dB $L_{Aeq,T}$ at Gwynfryn Ffordd Glanrafon, Porthmadog, LL49 9PP for a duration of approximately five weeks. Example Method 2 from Appendix E of BS 5228-1 provides identification of the duration of time that should be accounted for when identifying a significant construction noise effect, as follows:

“Noise levels generated by site activities are deemed to be potentially significant if the total noise (pre-construction ambient plus site noise) exceeds the pre-construction ambient noise by 5 dB or more, subject to lower cut-off values of 65 dB, 55 dB and 45 dB $L_{Aeq, T}$ from site noise alone, for the daytime, evening and night-time periods, respectively; and a duration of one month or more”.

- 11.9.10 The construction noise predictions are near the threshold of significance (65 dB $L_{Aeq,T}$) and the duration of effects lasts for slightly longer than the one-month period identified. Occupiers of nearby properties will be notified of the timings and duration of construction activities, which can make people more tolerable of construction noise. Taking into context that construction noise predictions are worst-case and would vary for the duration of works and the 5-week duration of effect over the 3-year construction programme, residual noise effects due to compound set-up are not significant.

NGA4

- 11.9.11 As HDD is static works, temporary barriers will be set up close to the drilling rig to maximise their effectiveness at attenuating noise emissions. This barrier set up would completely screen the drilling rig from sensitive receptors. Additionally, other plant such as mixers, generators and pumps can be similarly screened and a reduction in HDD noise of 10 dB at receptors would be achieved. Temporary barriers would sufficiently reduce HDD noise at sensitive receptors such that the 50 dB $L_{Aeq,T}$ threshold would only be exceeded by up to 2 dB at two receptors.
- 11.9.12 To be effective at reducing noise from HDD activities, barriers would be installed as close as practicable to HDD sites. Assuming that barriers would reduce noise by a minimum of 5 dB, significant noise effects at night would be avoided at all sensitive receptors with the exception of those listed in 11.8.15. Residual significant effects at five receptors near the compound immediately west of the Welsh Highland Heritage Railway are identified if night-time HDD activities are required.
- 11.9.13 Significant noise effects are identified if HDD activities are required to take place at night. Night-time working will only be required when it is unreasonable for HDD operations to stop. For example, it is bad practice to stop any HDD operations during the drilling process as this increases the likelihood of a bore collapse or a frac-out on resumption of drilling. The implementation of extended working hours when it comes to HDD operations is to avoid potential environmental harm that may occur due to a bore collapse or a frac-out.
- 11.9.14 Where practicable, HDD operations will be scheduled such that the specific tasks can be worked on and completed during core working hours. New HDD tasks will not be commenced where it is not feasible to complete during core working hours. However, on longer drills where each operation (drilling and reaming) will occur over multiple days, 24-hour working may be required. Ultimately, night-time working requirements would not be normal working practice and will be determined by on-site ground conditions.
- 11.9.15 Communication would be provided to occupants of affected properties as far as reasonably practicable before any out of core work hours. When accounting for this along with the fact that the construction significance threshold exceedances are small,

out of core work hours activities would not be typical, residual construction noise effects are not identified as significant.

Construction Vibration

- 11.9.16 Significant vibration effects may occur due to the use of vibratory rollers along haul routes. It is anticipated that these activities would be short in duration and unlikely to affect individual receptors for longer than a day. For PPV level above 1.0 m/s, BS 5228-2 (Ref 11.3) states that:

11.9.17 "It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents".

- 11.9.18 For PPV vibration levels exceeding 1.0 mm/s, prior warning will be provided on the timings and duration of vibration generating activities. Given the short duration of these activities (i.e. less than a day) affecting individual receptors, prior warning is considered sufficient to offset significant effects. Accordingly, at this stage, it is anticipated that vibration at nearby sensitive receptors would be not significant.

Noise Monitoring

- 11.9.19 The need for noise and vibration monitoring and potential monitoring locations will be identified in the Section 61 application and will be the subject of discussion between the contractor, the NGET and the local authority prior to submission of the Section 61.

11.10 Summary

- 11.10.1 Given the application of mitigation measures to be secured in the CEMP, proposed works would not result in any significant noise and vibration effects.

12. Socio-Economics

12.1 Introduction

- 12.1.1 This chapter presents an assessment of the likely Socio-Economic effects that could arise from the construction, operation and maintenance of the works at Glaslyn as described in **Chapter 2: Glaslyn Cables Works**.
- 12.1.2 This chapter describes the baseline conditions currently existing within the Study Area (as defined in **Section 12.3**), the scope of the assessment, the potential effects, the mitigation measures required to avoid, reduce or offset any significant negative effects, and the likely residual effects after these mitigation measures have been adopted.
- 12.1.3 This chapter is supported by figures and appendices as listed below:
- **Figure 4.12.1: Socio-Economic Land Use Receptors.**
 - **Figure 4.12.2: 60-minute Drive Time from the Glaslyn Works Site.**
 - **Figure 4.12.3: Public Rights of Way.**
 - **Volume 8, Appendix 1.1.A: Legislation, Policy and Guidance.**
 - **Volume 8, Appendix 1.4.A: Topic Assessment Methodology.**
 - **Volume 8, Appendix 4.12.A: Socio-Economic Land Use Receptors.**
- 12.1.4 Other chapters that are useful to review in association with this chapter are as follows:
- **Chapter 9: Traffic and Transport.**
 - **Chapter 15: Cumulative Effects.**

12.2 Legislation and Planning Policy

- 12.2.1 This section summarises the legislation and planning policy framework that is relevant to Socio-Economics. Details are in **Volume 8, Appendix 1.1.A: Legislation, Policy and Guidance**.

Legislation

- 12.2.2 The following legislation is relevant to Socio-Economics:
- Environment (Wales) Act 2016 (Ref 5.4).
 - The Planning (Wales) Act (2015) (Ref 12.1).
 - Well-being of Future Generations (Wales) Act (2015) (Ref 12.2).
 - Health and Well-being Impact Assessment for the Planning (Wales) Bill (2015) (Ref 12.3).

National Policy

12.2.3 The following national policy is relevant to Socio-Economics:

- PPW – Edition 12 (Ref 4.5).
- The UK's Modern Industrial Strategy (Ref 12.4).
- Building Better Places (Ref 12.5).
- Ten Point Plan for a Green Industrial Revolution (Ref 12.6).
- Future Wales: The National Plan 2040 (Ref 4.4).
- Stronger, Fairer, Greener Wales - Net Zero Skills Action Plan (Ref 12.7).
- Net Zero Wales Carbon Budget 2 (2021-25) (Ref 12.8).
- Welcome to Wales - Priorities for the Visitor Economy 2020-25 (Ref 12.9).
- Welsh Government Economic Resilience and Reconstruction Mission (Ref 12.10).
- UK's Integrated National Energy and Climate Plan (Ref 12.11).

Regional Policy

12.2.4 The following regional policy is relevant to Socio-Economics:

- North Wales Regional Economic Framework (2022) (Ref 12.12).
- A Growth Vision for the Economy of North Wales (2016) (Ref 12.13).
- North Wales Energy Strategy (Ref 12.14).

Local Policy

12.2.5 The following local policy is relevant to Socio-Economics:

- Anglesey and Gwynedd Joint Local Development Plan 2011 – 2026 (Ref 4.11).
- Anglesey and Gwynedd Well-being Plan 2023-28 (Ref 12.15).
- Eryri Local Development Plan 2016 – 2031 (Ref 4.13)
- Eryri Local Development Plan Review Report 2023 (Ref 12.16).

Guidance

12.2.6 The following guidance is also relevant to Socio-Economics:

- TAN 23: Economic Development (Ref 12.17).
- Additionality Guide (4th Edition) (Ref 12.18).
- The Green Book – Appraisal and Evaluation in Central Government (Ref 12.19).

12.3 Study Area

12.3.1 The impacts of the proposed works with respect to Socio-Economics are considered at varying spatial levels according to the likely extent of the effect under consideration. This approach is consistent with the Homes and Communities Agency (HCA), now known as Homes England, guidance entitled 'Additionality Guide, A Standard Approach

to Assessing the Additional Impact of Projects, 4th Edition' (Ref 12.18). This guidance is applicable in Wales as well as England, as it follows principles outlined in His Majesty's Treasury's Green Book, which is used across the UK for project appraisal and evaluation. **Table 12-1** presents the different components of the Socio-Economics assessment of effects, the geographical scale at which each component is assessed, and the rationale behind these geographical scales.

Table 12-1 – Assessment of effects Study Areas

Impact	Geographic Study Area	Rationale for Study Area
Employment generation during construction phase, and the operational and maintenance phase (direct, indirect and induced impacts). Skills and training Gross Value Added	60-minute drive area (Principal Economic Impact Area).	Research by Chartered Institute of Personnel and Development (CIPD) found that 90% of national employees commuted for 60 minutes or less each way. This was reported by CIPD in the 2018 Employee outlook 'Employee views on working life'. The 60-minute drive area represents the principal labour market catchment area for the proposed works.
Temporary accommodation services	30-minute and 60-minute drive area.	Professional judgement and experience from other proposed developments in the UK.
PRoW and Recreational Routes	Within and up to 500 m radius from the Glaslyn works site.	Professional judgement and experience from other proposed developments in the UK.
Agricultural land holdings (farms)	Within and up to 500 m radius from the Glaslyn works site.	Professional judgement and experience from other proposed developments in the UK.
Community facilities	Within and up to 1 km radius from the Glaslyn works site.	Professional judgement and experience from other proposed developments in the UK.
Other private and community assets (residential properties, business premises, visitor attractions, development land)	Within and up to 500 m radius from the Glaslyn works site.	Professional judgement and experience from other proposed developments in the UK.

12.4 Assumptions and Limitations

- 12.4.1 The assessment has been carried out against a benchmark of current Socio-Economic baseline conditions prevailing around the proposed works, as far as possible within the

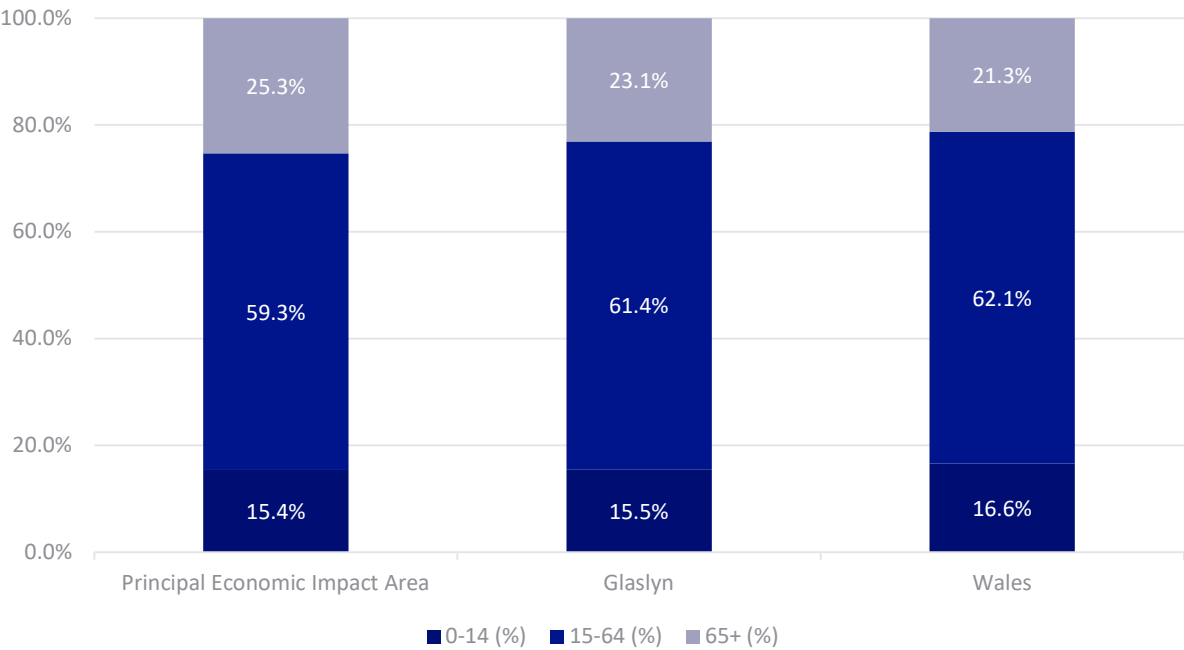
limitations of such a dataset. The most recently available data sources have been used in this chapter, although baseline data can be subject to a time lag between collection and publication.

12.5 Baseline

- 12.5.1
- This section first describes the population and the economy local to the Glaslyn works site (**Figure 4.12.1**). The baseline is described relative to three geographies. The Principal Economic Impact Area is defined as a 60-minute drive time from the Glaslyn works site; this consists of 180 Lower Layer Super Output Areas (LSOAs) and as shown in **Figure 4.12.2** this takes in most of Gwynedd, small parts of Powys, large sections of the Isle of Anglesey, large sections of Conwy and sections of Denbighshire. Data is also provided for Gwynedd local authority and for the national comparator, Wales.
- 12.5.2
- The section goes on to identify Socio-Economic assets and resources local to the Glaslyn works site (within a 500 m or 1 km radius as appropriate) which could be affected by the proposed works either directly (i.e. via land take) or indirectly (i.e. via severance associated with transport impacts). The land use receptors identified include PRoW, open spaces, community facilities, residential properties, visitor attractions, business premises, agricultural land holdings, and development land.

Population Demographics

- 12.5.3
- The 2021 Census provides data on the population of the Principal Economic Impact Area (60-minute drive time) and the comparator geographies (Ref 12.20). The Principal Economic Impact Area had a population of 297,517 in 2021, while Gwynedd’s population was smaller (117,393). The Principal Economic Impact Area constituted approximately 9.6% of Wales’ population (3,107,494) (Ref 12.21). In the Principal Economic Impact Area, 25.3% of the population were aged over 65, a higher proportion than Gwynedd (23.1%) and Wales (21.3%). The Principal Economic Impact Area had a smaller proportion of working age residents (59.3%) than Gwynedd (61.4%) and Wales (62.1%). The Principal Economic Impact Area had a smaller proportion of working age residents (59.3%) than Gwynedd (61.4%) and Wales (62.1%) **Plate 12-1** displays the population age profile across the three geographies.



Economic Activity

12.5.4 **Table 12-2** displays economic activity rates across the three geographies using Census 2021 data (Ref 12.22). The Principal Economic Impact Area has the smallest proportion of economically active individuals (55.3%) of the three geographies. Of those who are economically active, all three geographies had a similar proportion of unemployed individuals (3.1% in the Principal Economic Impact Area and Wales, 3.2% in Gwynedd). 28.1% of the Principal Economic Impact Area's population worked full-time, compared to 28.0% in Gwynedd and 32.2% in Wales.

Table 12-2 – Economic Activity

	Principal Economic Impact Area	Gwynedd	Wales
Economically Active (%)	55.3	56.1	56.6
Employee: Part-time (%)	13.3	13.5	13.0
Employee: Full-time (%)	28.1	28.0	32.2
Self-employed (%)	10.9	11.2	8.3
Unemployed (%)	3.1	3.2	3.1
Economically inactive (%)	44.7	43.9	43.5

Source: Office for National Statistics, (2022); Census 2021. * Economic activity rate is the proportion of working aged people (i.e. people aged 16-64) who are active or potentially active members of the labour market (i.e. people who are employed or unemployed). Examples of people who may not count as economically active include students, early retirees, carers and people with a long-term sickness or disability. Note: some columns on the table may not sum due to rounding.

Qualifications

12.5.5 **Table 12-3** categorises the over 16 population of the Principal Economic Impact Area and the comparator geographies according to the highest level of qualification they have achieved, using 2021 Census data (Ref 12.23). 33.9% of the Principal Economic Impact Area are qualified to level 4+, greater than the average across Wales (31.5%) but less than that in Gwynedd (34.5%). Of the three geographies, the Principal Economic Impact Area had the highest proportion of individuals with apprenticeships (6.0%). Generally, the Principal Economic Impact Area is less qualified than Gwynedd, but more qualified than Wales as a whole.

Table 12-3 – Highest level of qualification

	Principal Economic Impact Area	Gwynedd	Wales
No qualifications (%)	17.1	16.3	19.9
Level 1 and entry level qualifications (%)	8.0	7.6	8.7
Level 2 qualifications (%)	14.5	14.6	14.4
Apprenticeship (%)	6.0	5.8	5.6

	Principal Economic Impact Area	Gwynedd	Wales
Level 3 qualifications (%)	17.7	18.8	17.2
Level 4 qualifications+ (%)	33.9	34.5	31.5
Other qualifications (%)	2.7	2.5	2.7

Note: Some columns on the table may not sum to 100% due to rounding.

Employment by Industry

12.5.6 The 2021 Census provides data on employment by industry, classifying industries by their Standard Industrial Classification (SIC) (Ref 12.24). In the Principal Economic Impact Area, the largest industry is Q: human health and social activities (17.3% of employment); this is also the largest industry in Gwynedd (16.6%) and Wales (17.0%). Industry G: Wholesale and retail trade; repair of motor vehicles and motor cycles is the second largest industry in all three geographies. Industry P: Education is the third largest industry in all three geographies. In general, the distribution of employment across industries is relatively similar between all three geographies. Industry I: Accommodation and food service activities has a greater proportion of employment in Gwynedd (8.5%) compared to the Principal Economic Impact Area (7.9%); Wales has the lowest proportion of all three geographies (5.2%). **Table 12-4** provides further data on employment distribution by industry for all three geographies.

Table 12-4 – Employment by industry

	Principal Economic Impact Area	Gwynedd	Wales
A Agriculture, forestry and fishing (%)	3.8	3.9	1.8
B Mining and quarrying (%)	0.3	0.3	0.2
C Manufacturing (%)	5.2	5.2	8.7
D Electricity, gas, steam and air conditioning supply (%)	0.8	0.9	0.7
E Water supply; sewerage, waste management and remediation activities (%)	1.1	1.3	1.0
F Construction (%)	9.2	9.7	8.6
G Wholesale and retail trade; repair of motor vehicles and motor cycles (%)	13.9	13.3	14.5
H Transport and storage (%)	3.3	2.9	3.8
I Accommodation and food service activities (%)	7.9	8.5	5.2
J Information and communication (%)	2.2	2.3	2.7
K Financial and insurance activities (%)	1.1	0.8	2.9

	Principal Economic Impact Area	Gwynedd	Wales
L Real estate activities (%)	1.5	1.5	1.3
M Professional, scientific and technical activities (%)	4.0	3.6	4.4
N Administrative and support service activities (%)	4.3	4.3	4.2
O Public administration and defence; compulsory social security (%)	8.7	8.4	9.2
P Education (%)	10.5	11.4	9.6
Q Human health and social work activities (%)	17.3	16.6	17.0
R, S, T, U Other (%)	4.8	5.2	4.2

Gross Value Added (GVA)

12.5.7 The Office for National Statistics published data on GVA in 2024 for the year 2022 (Ref 12.25). Gwynedd's GVA per person (£22,206) was lower than the average across Wales (£23,804)⁸. **Table 12-5** presents the composition of GVA by industry in Gwynedd and Wales (Ref 12.26). The largest industry by GVA in Gwynedd was Industry Q: Human health and social work activities (14.4%), followed by Industry L: Real estate activities (marginally lower at 14.3%). Wales had a notably larger industry by GVA in Industry C: Manufacturing (15.4%) compared to Gwynedd (3.5%). Gwynedd however had a much larger Industry I: Accommodation and food services (8.4%) compared to Wales (3.7%).

Table 12-5 – GVA by industry

	Gwynedd	Wales
A Agriculture, forestry and fishing (%)	4.3	1.6
B Mining and quarrying (%)	N/A	0.3
C Manufacturing (%)	7.5	15.4
D Electricity, gas, steam and air conditioning supply (%)	3.5	1.4
E Water supply; sewerage, waste management and remediation activities (%)	N/A	1.8
F Construction (%)	7.7	6.4
G Wholesale and retail trade; repair of motor vehicles and motor cycles (%)	8.8	10.0

⁸ Data presented at local authority level as this is the most granular data available.

	Gwynedd	Wales
H Transport and storage (%)	1.2	2.9
I Accommodation and food service activities (%)	8.4	3.7
J Information and communication (%)	3.1	2.9
K Financial and insurance activities (%)	0.5	6.1
L Real estate activities (%)	14.3	11.2
M Professional, scientific and technical activities (%)	2.0	4.1
N Administrative and support service activities (%)	1.4	3.2
O Public administration and defence; compulsory social security (%)	10.1	8.7
P Education (%)	9.0	6.3
Q Human health and social work activities (%)	14.4	11.1
R Arts, entertainment and recreation (%)	2.2	1.2
S Other service activities (%)	1.7	1.6
T Activities of Households (%)	0.1	0.1

Note: Columns may not add up to 100% due to rounding. Data for Gwynedd is published with industries A and B combined, as well as industries D and E combined. Therefore, the proportions of these industries are represented together under industry A and industry D.

Deprivation

- 12.5.8 The 2019 Welsh Index of Multiple Deprivation presents deprivation data at LSOA level (Ref 12.27). There are 1,909 LSOAs across Wales; the average rank of the LSOAs comprising Gwynedd was 1,080 (with 1 being the most deprived). Scores are also given for each LSOA, with 0 being the least deprived and 100 the most deprived. The average score across the Gwynedd LSOAs was 16.8. Furthermore, the median deprivation decile for Gwynedd's LSOAs was 6; this indicates that the average LSOA in Gwynedd is less deprived than 60% of LSOAs in Wales. Overall, therefore, Gwynedd is relatively less deprived on average.

Local Accommodation Capacity

- 12.5.9 Analysis of the hotel, bed and breakfast and inns accommodation sector has been carried out to consider the likely capacity in the context of potential demand from the construction workforce. Data on the number of rooms available within a 30 and 60-minute drive area in the hotel, bed and breakfast and inns accommodation sector has been sourced from CoStar, a property resource website (Ref 12.28). Typical room occupancy is sourced from the Welsh Government's accommodation occupancy survey for 2023 (Ref 12.29). 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. This number has been adjusted in **Table 12-6** and **Table 12-7** to reflect the typical availability based on seasonal occupancy rates.

Table 12-6 – Accommodation capacity within a 30-minute drive time

Month	Typical room occupancy (%)	Inventory rooms	Rooms available after existing demand
January	47	815	432
February	56	815	359
March	59	815	334
April	63	815	302
May	69	815	253
June	71	815	236
July	76	815	196
August	80	815	163
September	75	815	204
October	66	815	277
November	56	815	359
December	60	815	326

Source: CoStar (2024), VisitWales (2024)

Table 12-7 – Accommodation capacity within a 60-minute drive time

Month	Typical room occupancy (%)	Inventory rooms	Rooms available after existing demand
January	47	4,965	2,631
February	56	4,965	2,185
March	59	4,965	2,036
April	63	4,965	1,837
May	69	4,965	1,539
June	71	4,965	1,440
July	76	4,965	1,192
August	80	4,965	993
September	75	4,965	1,241
October	66	4,965	1,688
November	56	4,965	2,185
December	60	4,965	1,986

Source: CoStar (2024), VisitWales (2024)

PRoW and Recreational Routes

- 12.5.10 There are six PRoW that cross and partially run within the Glaslyn works site:
- Porthmadog No 10 bridleway.
 - Porthmadog No 37 bridleway.
 - Porthmadog No 6 footpath.
 - Dolbenmaen No 107 footpath.
 - Porthmadog No 8 footpath.
 - Porthmadog No 11 footpath.
- 12.5.11 These are shown in **Figure 4.12.3: Public Rights of Way**
- 12.5.12 Thirty-two more PRoW are within 500 m of the Glaslyn works site; these are identified in **Volume 8, Appendix 4.12.A: Socio-Economic Land Use Receptors**.
- 12.5.13 The Gwynedd long distance trail coastal path is also within 500 m of the Glaslyn works site.
- 12.5.14 There is one informal recreational route within 500 m of the Glaslyn works site: the Cob Crwn hiking area. There is also a NCR 8 which crosses and partially runs within the Glaslyn works site.

Open Space

- 12.5.15 There are 18 dedicated open spaces within 500 m of the Glaslyn works site which are identified in **Volume 8, Appendix 4.12.A: Socio-Economic Land Use Receptors**. Three of these are in the Glaslyn works site:
- Ysgol Eifionydd Playing Field.
 - Porthmadog Eisteddfod Stone Circle Park.
 - Bodawen Playground west of Porthmadog Roundabout and east of Stone Circle Park.
- 12.5.16 Small parts of the Eryri National Park are also within 500 m of the Glaslyn works site, as well as the Traeth Glaslyn North Wales Wildlife Trust Nature Reserve.

Community Facilities

- 12.5.17 There are 38 community facilities within 1 km of the Glaslyn works site which are identified in **Volume 8, Appendix 4.12.A: Socio-Economic Land Use Receptors**. One of these community facilities is within the Glaslyn works site:
- Ysgol Eifionydd Secondary School (only sections of the car park, playground and sports field are within the Glaslyn works site).

Residential Properties

- 12.5.18 There is one residential property within the Glaslyn works site, specifically at the location of the former Porthmadog golf range.
- 12.5.19 Within 500 m of the Glaslyn works site, residential properties are predominantly in the town of Porthmadog, the village of Minffordd, the village of Tremadog and the village of Penmorfa; within these settlements, houses and flats are relatively densely distributed.

- 12.5.20 Outside of these areas, there are sparsely distributed residential properties within 500 m of the Glaslyn works site; however, the vast majority are in the settlements listed above.

Visitor Attractions

- 12.5.21 There are two visitor attractions in the Glaslyn works site:
- The Welsh Highland Heritage Railway, the UK's longest heritage railway that runs for 25 miles from Caernarfon, past the foot of Snowdon and the village of Beddgelert, then through the Aberglaslyn Pass and Porthmadog.
 - Running in parallel, the Ffestiniog Railway, the world's oldest narrow gauge railway travelling 13.5 miles from the harbour in Porthmadog to the slate-quarrying town of Blaenau Ffestiniog.
- 12.5.22 Small parts of the Eryri National Park are within 500 m of the Glaslyn works site. It is likely that many visitors use Porthmadog and the area around the Glaslyn works site as a base location to visit the national park.

Business Premises

- 12.5.23 169 businesses have been identified within 500 m of the Glaslyn works site which are identified in **Volume 8, Appendix 4.12.A: Socio-Economic Land Use Receptors**. One of these, the Hochtief Site Office for the EVIP project, is in the Glaslyn works site. The other businesses are predominantly in the town of Porthmadog, the villages of Minffordd, Tremadog and Penmorfa.

Agricultural Land Holdings

- 12.5.24 There are 14 agricultural land holdings within the Glaslyn works site. These agriculture holdings are a mix of livestock (sheep and cows) and arable farming.

Development Land

- 12.5.25 Development land refers to sites on which there are planning applications and planning permissions, or which are allocated for development with the Local Plan. The assessment considers the potential for the proposed works to conflict with, hinder or otherwise adversely affect development land within or nearby to the Glaslyn works site.
- 12.5.26 There are no cumulative developments within 500 m of the Glaslyn works site, however, there is one development 560m south-east of the Glaslyn works site, this is the erection of eight new flexible business/industrial units with associated parking and landscaping. This development has been approved with conditions.
- 12.5.27 There are no housing allocations within 500 m of the Glaslyn works site. There is one safeguarded employment site in Minffordd approximately 450 m south-east from the Glaslyn works site at the Snowdonia Business Park.
- 12.5.28 Mineral Safeguarding Areas also cross the Glaslyn works site, however this is where the existing cables are being decommissioned. One mineral Buffer Zone crosses the Glaslyn works site near Minffordd. Two more Mineral Safeguarding Areas are within 500 m of the Glaslyn works site.

Future Baseline

- 12.5.29 2030 is considered as the baseline year, as it represents a practical timeframe for planning and decision-making while maintaining reasonable degree of accuracy and

reliability. The future baseline is anticipated to be largely the same as the existing baseline for Socio-Economics and land use. However, it would be reasonable to expect that the population will increase. According to ONS population projections (Ref 12.29), the population of Gwynedd is forecasted to increase from 124,936 in 2021 to 128,250 in 2030, representing a 2.7% increase. The overall population of Wales is forecasted to grow at a higher rate of 3.9%, from 3,107,494 in 2021 to 3,229,297 in 2030. These projections were last updated in 2021 and are based off 2018 data which use assumed levels of future fertility, mortality and migration. The projections did not consider the findings of the Census 2021.

12.6 Scope of Assessment

- 12.6.1 This section describes the scope of the assessment of effects on Socio-Economics.
- 12.6.2 **Table 12-8** summarises the potential Socio-Economic receptors that have been reviewed and states whether they have been included in or excluded from the Socio-Economic assessment. Justifications are provided where receptors have been both scoped in and scoped out of the assessment.
- 12.6.3 All operational phase effects have been scoped out of the assessment as the magnitude of the proposed works during operation is unlikely to cause significant effects.

Table 12-8 – Scope of the Socio-Economic assessment

Receptor	Scoped in/out per phase		Justification
	Construction	Operation	
Employment generation during construction phase and operational and maintenance phase (direct, indirect and induced impacts)	In	Out	The proposed works will require a construction workforce which could be large relative to the Principle Economic Impact Area. Employment impacts during construction are likely to be beneficial with the potential to be significant. The proposed works are unlikely to generate operational phase jobs. .
Skills and training	In	Out	The proposed works are likely to generate a construction workforce which may benefit from training programmes provided by NGET.
Gross Value Added	In	Out	GVA generated is proportionate to the size of the construction workforce; as for employment impacts, GVA effects during construction are anticipated to have the potential to be beneficial and significant. However, for operation they are not likely to be significant and have been scoped out.

Receptor	Scoped in/out per phase		Justification
	Construction	Operation	
Local accommodation facilities	In	Out	The construction workforce could be large enough to put pressure on the local temporary accommodation sector with the potential for significant adverse effects.
PRoW and Recreational Routes	In	Out	The construction of the proposed works may result in closures and diversions of PRoWs and recreational routes within the Glaslyn works site. Six PRoW lie within the Glaslyn works site and there is potential for significant adverse effects. The operation of the proposed works is not likely to cause significant impacts to PRoW as permanent land take and operational phase traffic is minimal.
Other private and community assets (residential properties, business premises, community facilities, open space, agricultural land holdings, development land)	In	Out	There is the potential for significant direct effects on other private and community assets due to land take in construction. There is also potential for significant adverse indirect effects on access to private and community assets due to traffic related impacts. Due to the nature of the operational works, direct and indirect effects on private and community assets are unlikely to be significant.

12.7 Methodology

- 12.7.1 There is currently no statutory guidance on the methodology for undertaking assessments of Socio-Economic effects. There is no accepted definition of what constitutes a likely significant (or not significant) Socio-Economic effect. It is recognised that 'significance' reflects the relationship between the scale of impact (magnitude) and the sensitivity (or value) of the affected resource or receptor. The significance criteria for Socio-Economic effects has been assessed using the expert judgement of authors with professional experience in Socio-Economics.
- 12.7.2 Details of the technical methods used to determine the baseline conditions, sensitivity of the receptors, magnitude of effects and the significance criteria that have been used for the Socio-Economics assessment can be found in **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**.

12.8 Potential Effects

- 12.8.1 The potential impacts and effects of the proposed works have been assessed using the methodology as detailed in **Section 12.6** of this chapter and **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**. Only construction impacts are assessed as operational impacts were scoped out in **Section 12.6** of this chapter.

Employment Generation (Indirect, Direct and Induced Impacts)

- 12.8.2 The estimated construction period is expected to last approximately 40 months from Q1 2026 to Q2 2029. The likely effects will be of a medium-term temporary nature. Although the jobs generated are temporary, they represent a positive economic effect for a substantial period.
- 12.8.3 NGET estimates that the proposed works will require an average of seven gross direct FTE construction jobs on-site per day during this construction period, with a peak workforce of 28 in May 2027. This is based on the construction activities required and will fluctuate during the period being both higher and lower than average at times.

Leakage

- 12.8.4 Leakage effects are the benefits to those outside the Principal Economic Impact Area, defined as a 60-minute drive time area.
- 12.8.5 The HCA Additionality Guide (Ref 12.19) provides standards (or ‘ready reckoners’) for leakage. Within the context of a construction project in the Study Area, the ‘very high’ leakage factor of 75% is considered appropriate. It is estimated that 25% of construction staff could be sourced from within a 60-minute drive time area (Principal Economic Impact Area). This will be subject to labour availability and take-up at the time of construction; however, it is a reasonable assumption on which to base this assessment. As such, 75% of construction staff would be likely to reside outside of this Study Area. This indicates that a large proportion of employment opportunities will be taken up outside the Principal Economic Impact Area. This high level of leakage has been identified due to the specialised nature of the construction roles and the limited population in the Principal Economic Impact Area.
- 12.8.6 An adjustment of 75% has been applied to the estimated seven gross direct construction jobs on-site on average during the construction period to estimate the jobs created within the 60-minute drive time area. On this basis it is estimated that the proposed works will create 1.8 jobs for residents within the Study Area during construction.

Displacement

- 12.8.7 Displacement measures the extent to which the benefits of a development are offset by reductions in output or employment elsewhere. Any additional demand for labour cannot simply be treated as a net benefit since it has the potential to displace workers from other positions and the net benefit is reduced to the extent that this occurs.
- 12.8.8 Construction workers typically move between construction projects when delays occur or to help the workforce meet construction deadlines. Due to the flexibility of the labour market, construction labour force displacement has been assumed to be low.
- 12.8.9 The HCA Additionality Guide (Ref 12.19) provides standards (or ‘ready reckoners’) for displacement. Within the context of a construction project in the Study Area, a low

displacement factor for 25% is considered appropriate according to the HCA Additionality Guide. Applying this level of displacement to the total seven gross direct jobs results in a total net direct employment figure of 1.3 FTE jobs per annum in the Principal Economic Impact Area during the construction period.

Multiplier Effect

- 12.8.10
- In addition to the direct employment generated by the construction associated with proposed works, there will be an increase in local employment arising from indirect and induced effects of the construction activity. Employment growth will arise locally through manufacturing services and suppliers to the construction process (indirect or supply linkage multipliers). Additionally, it is assumed that part of the income of the construction workers and suppliers will be spent in the Gwynedd area, generating further employment (in terms of induced or income multipliers).
- 12.8.11
- The effect of the multiplier depends on the size of the geographical area that is being considered, the local supply linkages and income leakage from the area. The HCA Additionality Guide (Ref 12.19) provides ‘ready reckoner’ composite multipliers (the combined effect of indirect and induced multipliers) to account for this. For the Principle Economic Impact Area, a multiplier effect of 1.3 has been considered appropriate which equates to 0.4 FTE indirect and induced jobs per annum in the Study Area.

Net Construction Employment

- 12.8.12
- Table 12-9** – presents the temporary annual employment generated by the proposed works accounting for leakage, displacement and multiplier effects. The proposed works will support, on average, seven total net jobs per day during the construction period. Of these, two jobs will be expected to be taken-up by residents within the Study Area.

Table 12-9 – Net additional construction employment per annum from the proposed works

	Principal Economic Impact Area (60-minute drive time area)	Outside the Principal Economic Impact Area	Total
Gross Direct Employment	1.8	5.3	7.0
Displacement	0.4	1.3	1.8
Net Direct Employment	1.3	3.9	5.3
Indirect and Induced Employment	0.4	1.2	1.6
Total Net Employment (rounded)	2	5	7

Note: Calculations may not sum up correctly due to rounding.

- 12.8.13
- The sensitivity of the local workforce to employment changes has been assessed as medium, as the unemployment rate in the Principal Economic Impact Area is in line with the national average, however economic activity is lower, as detailed in **Section 12.5**. The direct, indirect and induced employment, expenditure and upskilling created from the construction of the proposed works must be judged in the context of the labour pool of construction workers in the Principal Economic Impact Area (approximately 12,000 workers) (Ref 12.24). Taking this into account, the impact of construction employment

generation in the Principal Economic Impact Area has been assessed as having a magnitude of low, which results in a **minor beneficial** effect (not significant).

Skills and Training

- 12.8.14 Based on information provided by NGET, it has been assumed that Murphy, an engineering and construction company, will be recruiting and supplying 100% of the construction workforce for the Glaslyn works. Murphy's 2024 Annual Report lays out a commitment (Ref 12.30) to have a minimum of 10% of employees being emerging talent (apprenticeships, graduates and university placement students) by 2026 (currently at 8.85%). In 2024, Murphy recruited their largest-ever cohort of apprentices, at 158. In 2024, Murphy spent £5,800,000 on learning and development, including 23,000 training days. Murphy's approach to upskilling its employees is likely to provide benefits and training opportunities to those employed on the proposed works, including workers living locally. Furthermore, Murphy is partnered with Speakers for Schools, a UK-wide youth charity aiming to help students in their careers through virtual work experience and insights into different sectors across the UK. This could lead to partnerships with local schools around the Glaslyn works, benefiting the younger population.
- 12.8.15 On this basis, the magnitude of the beneficial impact on skills and training in the construction phase is assessed to be low. In line with typical practice as set out above, Murphy can be expected to provide training opportunities for employees of the proposed works; however, no confirmed plans are available specific to the proposed works at the time of writing. As described in **Section 12.5**, the qualifications of the working age population in the Principle Economic Impact Area are better than in Wales on average, but worse than the average qualifications in Gwynedd. The population is assessed to be of medium sensitivity. Overall, this results in a **minor beneficial** effect (not significant).

Gross Value Added

- 12.8.16 Applying the average gross direct value added per construction worker in the Study Area to the total number of construction workers generated from the proposed works gives the total GVA arising from the construction period. Note that this has been calculated based on the compound average GVA per worker in the construction sector in Gwynedd as data is published at this level rather than the more granular, LSOA-derived, Study Area.
- 12.8.17 In Gwynedd, the average GVA per worker in the construction sector was approximately £80,000 in 2022, calculated by dividing the GVA of the Gwynedd construction industry (£200 million in 2022) (Ref 12.25) by the number of construction workers stated in the Business Register and Employment Survey (2,500 in 2022) (Ref 12.31). By applying this figure to the total gross construction workers generated by the proposed works⁹ (seven workers) it is estimated that construction activity will contribute approximately £560,000 to the national economy, of which approximately £140,000 would likely be within the Study Area, as shown in **Table 12-10** –.

⁹ As a worst case scenario, indirect and induced employment are not considered. It is likely that these jobs would be in non-construction industries with a much lower GVA per worker e.g. retail.

Table 12-10 – Gross direct value added per annum from the proposed works during the construction phase

	Study Area (60-minute drive time area)	Outside Study Area	Total
GVA during the construction phase (£)	140,000	420,000	560,000

- 12.8.18 The sensitivity of the Study Area economy to direct GVA generation from the construction phase of the proposed works has been assessed as high, as Gwynedd's GVA per person (£22,206) was slightly lower than the average across Wales (£23,804). The magnitude of the impact to the Study Area has been assessed to be very low, given the relatively small scale of the GVA generated compared to total Gwynedd GVA. Based on this, the impact of GVA generation during construction on the Study Area is assessed to be **minor beneficial** (not significant).

Local Accommodation Facilities

- 12.8.19 Analysis of the hotel, bed and breakfast and inns accommodation sector has been carried out to assess the likely capacity against the demand from the potential peak construction workforce of 28.
- 12.8.20 The analysis indicates, considering existing seasonal demand and typical occupancy levels, that capacity is sufficient and that the workforce can be accommodated within existing provision in a 60-minute drive time radius of the proposed works. This is shown in

- 12.8.21 **Table 12-11.** Analysis indicates that during peak seasonal occupancy (August), there would be 965 rooms (19% of the 4,965 total rooms) available after accounting for the peak construction workforce of 28. This is a worst-case scenario, given that approximately 25% of the workforce would likely be living within a 60-minute drive time of the site and be home-based (i.e. would live sufficiently close-by to return home in the evenings rather than needing overnight accommodation).
- 12.8.22 Further analysis to identify accommodation within a 30-minute drive time radius indicates that at peak seasonal occupancy in August, there would be sufficient capacity to cater for the peak workforce of 28 FTE workers. This is shown in **Table 12-12**. There would be 135 rooms (17% of the total 815 rooms) available after accounting for the peak workforce.
- 12.8.23 In summary, this analysis demonstrates that at peak workforce employment and typical seasonal occupancy levels, 100% of the proposed works' construction workers could be accommodated within a 60-minute drive time and a 30-minute drive time of the site. Overall, given that there is sufficient capacity to accommodate the full peak workforce, there is assessed to be **no effect** on local accommodation facilities.

Table 12-11 – Accommodation capacity within 60-minute drive time radius

Month	Typical room occupancy (%)	Rooms available after existing demand	Peak construction workers	Remaining rooms available	Remaining rooms Available (%)
January	47	2,631	28	2,603	52
February	56	2,185	28	2,157	43
March	59	2,036	28	2,008	40
April	63	1,837	28	1,809	36
May	69	1,539	28	1,511	30
June	71	1,440	28	1,412	28
July	76	1,192	28	1,164	23
August	80	993	28	965	19
September	75	1,241	28	1,213	24
October	66	1,688	28	1,660	33
November	56	2,185	28	2,157	43
December	60	1,986	28	1,958	39

Source: CoStar (2024), VisitWales (2024) AECOM (2024).

Table 12-12 – Accommodation Capacity Within 30-minute Drive Time Radius

Month	Typical room occupancy (%)	Rooms available after existing demand	Peak construction workers	Remaining rooms available	Remaining rooms available (%)
January	47	432	28	404	50
February	56	359	28	331	41
March	59	334	28	306	38
April	63	302	28	274	34
May	69	253	28	225	28
June	71	236	28	208	26
July	76	196	28	168	21
August	80	163	28	135	17
September	75	204	28	176	22
October	66	277	28	249	31
November	56	359	28	331	41

Month	Typical room occupancy (%)	Rooms available after existing demand	Peak construction workers	Remaining rooms available	Remaining rooms available (%)
December	60	326	28	298	37

Source: CoStar (2024), VisitWales (2024) AECOM (2024)

PRoW and Recreational Routes

- 12.8.24 There is potential for changes to journey times, local travel patterns, and certainty of routes for users to arise from the closures and diversions of PRoWs. The majority of PRoWs within the Glaslyn works site will be retained during the construction phase and will not be diverted; effects have only been assessed for PRoWs that will experience either temporary closures or diversions. As noted in **Section 12.5**, there is an extensive network of PRoW in the Study Area, including six PRoW that cross the Glaslyn works site.
- 12.8.25 In general, where a PRoW crosses the Glaslyn works site, it will be fenced off with Heras type temporary fencing to create a designated crossing point. To install the ducts, there may be a requirement to temporarily create a diversion to the PRoW for a short duration as the installation team conduct their work activities.
- 12.8.26 However, for the NCR 8, due to the complexity of this crossing point (cycle route, drainage ditch, status and duration) a more extensive diversion will be required, in the form of a temporary surfaced track to the west of its current location over the full extent of the Glaslyn works. The route will be subject to consultation and obtaining the necessary consents from Cyngor Gwynedd.
- 12.8.27 Given that there is a large network of PRoWs within the Study Area that could be used as substitutes in the case of PRoW closure, the sensitivity of PRoW is assessed to be low. While the scale of impact may not be extensive, factors such as potential disruptions to access, usage patterns, or environmental considerations are still considered, magnitude is assessed to be low, which results in a **minor adverse** effect (not significant).

Private and Community Assets (Residential Properties, Business Premises, Community Facilities, Open Space, Visitor Attractions and Agricultural Land Holdings)

Permanent Land Take

- 12.8.28 There are no residential properties, business premises, community facilities, open spaces or visitor attractions within the Glaslyn works site which would need to be demolished or which would be permanently displaced in whole or in part by the proposed works.
- 12.8.29 Sensitivity of residential properties, business premises, community facilities, open spaces and visitor attractions is assessed to be medium due to their relative importance and moderate potential for substitution. Magnitude of impact is assessed to be very low as there are no private or community assets that will be demolished or permanently displaced in whole or in part by the proposed works. Impacts on private and community assets from permanent land take are assessed to be negligible (not significant).

- 12.8.30 There is potential for permanent impacts on agricultural land holdings during the construction of the proposed works. Raised link boxes will be required to be installed in some locations on agricultural land. Where this occurs, the area will be fenced off and compensation will be provided as part of the easement. Agricultural land will also be acquired at Wern and Minffordd for the proposed works, where appropriate compensation will also be provided. Sensitivity is assessed to be medium due to the importance of farms to the local economy and the number of farms surrounding the Glaslyn works site. Magnitude is assessed to be low, as appropriate compensation will be provided as part of the easement for any adverse impacts on agriculture land. The effect is assessed to be minor adverse (not significant).

Temporary Land Take

- 12.8.31 There are nine receptors which would experience temporary land take: the Hochtief Site Office for the EVIP project, the Ysgol Eifionydd playing field, the Ysgol Eifionydd Secondary School car park, the Bodawen Playground, the Porthmadog Eisteddfod Stone Circle Park, a home at the former Porthmadog Golf Range, the Porthmadog Caravan Site off Snowdon Street and the railway used by the Welsh Highland Heritage Railway and the Ffestiniog Heritage Railway. Agricultural land holdings may also experience temporary land take.
- 12.8.32 The Bodawen Playground is west of Porthmadog roundabout and is on the field of the Porthmadog Eisteddfod Stone Circle Park. This playground will be closed for approximately two years whilst the cables beneath the playground are removed and replaced. Upon completion of the proposed works, the current facilities will be reinstated to its original condition. Sensitivity is assessed to be medium as Porthmadog Park is approximately 1 km away and provides a playground that can act as a substitute for users of the Bodawen Playground. Magnitude is assessed to be low as the impact isn't permanent, recovery is possible and the current facilities will be improved upon completion of the proposed works. The effect is assessed to be **minor adverse** (not significant).
- 12.8.33 Sections of the Porthmadog Stone Circle Park itself will need to be temporarily closed during construction. With regards to the stones themselves, if it possible for them to be left in then they will be fenced off. If removal is necessary, only the stones close to the works will be removed. They will be carefully stored and subsequently reinstated post construction. Sensitivity is assessed to be medium as Porthmadog Park is a viable substitute for park users approximately 1 km away. Magnitude is assessed to be low, as recovery back to the previous use is possible and the works will involve the removal of only some of the stones, if any at all. The effect is assessed to be **minor adverse** (not significant).
- 12.8.34 The railway that is used by the Welsh Highland Heritage Railway and the Ffestiniog Heritage Railway is east of High Street in Porthmadog. The railway will be closed for 8 weeks and compensation will be paid for the loss of service appropriate to when the works can be done. The works will be scheduled to avoid peak visitor times and minimise impacts. Sensitivity is assessed to be medium as there are alternative attractions for visitors wishing to explore the area, including the Snowdonia National Park. Magnitude is assessed to be low as the works are for a short period, recovery is possible and compensation will be provided for the loss in service. The effect is assessed to be **minor adverse** (not significant).
- 12.8.35 Sections of the car park in the Ysgol Eifionydd Secondary School will be temporarily closed and fenced off to accommodate minor works to the existing cable. Works may

include the use of an excavator. Sensitivity is assessed to be low, as only sections of the car park will be closed off and alternative parking areas are available nearby. Magnitude is assessed to be low as the school itself will not be closed and the works are very limited. The effect is assessed to be **minor adverse** (not significant).

- 12.8.36 The Ysgol Eifionydd Secondary School playing field will be closed for a maximum of 2.5 years during the construction period to accommodate excavating works to install cables. After the construction phase, the field will be returned to its previous use. Sensitivity is low given the proximity to the Porthmadog Football Club grounds approximately 450 m away. Magnitude is assessed to be medium, as the playing field will not be usable for up to 2 years, however recovery is possible to return it to its previous use and the facility may be improved. The effect is assessed to be **minor adverse** (not significant).
- 12.8.37 The residence in the former Porthmadog Golf Range has the potential to be affected by the construction work, for example through access restrictions, disruption or disturbance to the individual(s) living there. If impacts occur, compensation will be provided in the form of an easement payment or temporary accommodation depending on the severity of the works. Sensitivity is assessed to be low, as only one premises is affected. Magnitude is assessed to be low, as mitigation or compensation will be implemented if appropriate and land will be able to be returned to its previous use. The effect is determined to be **minor adverse** (not significant).
- 12.8.38 Porthmadog Caravan Site off Snowden Street has the potential to be affected by the construction works associated with the removal of the existing cables. The works will last for a minimal length of time, approximately one to two days, with potentially one to two vehicles passing through the site during this time. Appropriate compensation will be paid by the Applicant for the access and disruption to the site. Sensitivity has been assessed to be medium, as the caravan site contains a number of pitches. Magnitude has been assessed to be low, as the works will be minimal and only last for a short duration. Furthermore, compensation will be paid as appropriate. The effect is determined to be **minor adverse** (not significant).
- 12.8.39 There is potential for impacts from temporary land take during construction on agricultural land holdings around the Glaslyn works site. The Applicant will carry out pre-construction meetings with landowners at risk of impact to gather information on farming practices. This information will be used to develop appropriate mitigation to avoid impacts where possible. Where mitigation is not possible, the Applicant will provide compensation on a proven loss basis. Sensitivity is assessed to be medium due to the importance of farms to the local economy and the number of farms surrounding the Glaslyn works site. Magnitude is assessed to be low, as where possible mitigation will be put in place to avoid impacts, with compensation being provided where this is not possible. The effect is assessed to be **minor adverse** (not significant).
- 12.8.40 The Hochtief site office for the EVIP project is in the Glaslyn works site. The Applicant will co-ordinate with the EVIP scheme to ensure any potential disruption to its activities are anticipated and mitigated. The sensitivity of the Hochtief office is medium and the magnitude of impact is low, resulting in a **minor adverse** (not significant) effect.

Severance

- 12.8.41 There is potential for severance impacts arising from construction of the proposed works to impact on the use of residential properties, business premises, community facilities, open spaces, visitor attractions and agricultural land holdings. **Chapter 9: Traffic and Transport** assesses community severance impacts at road links due to increased traffic volume from the proposed works. The assessment finds that impacts

on links range from Negligible to Minor Adverse, with all effects related to severance being not significant.

- 12.8.42 Sensitivity of private and community assets is assessed to be medium due to their relative importance and moderate potential for substitution. Magnitude is assessed to be low as no significant severance impacts are found in **Chapter 9: Traffic and Transport**. Impacts on private and community assets from severance associated with the construction phase of the proposed works are assessed to be **minor adverse** (not significant).

A498 Crossing – HDD Option

- 12.8.43 If the HDD option was taken forward, the impacts assessed relevant to Socio-Economics would stay the same.

Development land

- 12.8.44 There are no planning applications, permissions or allocations affected either directly (due to land take) or indirectly (due to severance) during the construction of the proposed works and thus no effects are expected to arise.

12.9 Mitigation and Residual Effects

- 12.9.1 No additional mitigation or enhancement measures are required, due to no significant adverse effects associated with Socio-Economics being identified.
- 12.9.2 No likely significant residual effects of the proposed works on Socio-Economics receptors are found.

12.10 Summary

- 12.10.1 The baseline analysis in **Section 12.5** shows that the economic characteristics of the Principal Economic Impact Area are broadly in line with Gwynedd and Wales. The Glaslyn works site has a range of receptors relevant to Socio-Economics nearby including residential, recreational, business, agriculture and tourist uses.
- 12.10.2 On the basis of the rationale noted in **Section 12.6**, all potential Socio-Economic impacts associated with operation have been scoped out. Construction phase impacts are temporary and range from minor beneficial in terms of job opportunities to minor adverse in relation to temporary land take of open spaces and diversions or disruption of PRoW.

13. Climate Change

13.1 Introduction

- 13.1.1 This chapter assesses the potential effects of climate change and the vulnerability of the proposed works at Glaslyn to climate-related impacts during construction, operation, and maintenance, as described in **Chapter 2: Glaslyn Cables Works**.
- 13.1.2 This chapter describes the baseline conditions currently existing within the Study Area (as defined in **Section 13.3**), the scope of the assessment, the potential effects, the mitigation measures required to avoid, reduce or offset any significant negative effects, and the likely residual effects after these mitigation measures have been adopted.
- 13.1.3 The assessment is consistent with the ruling by the Supreme Court in the Finch Case (Ref 13.1), in that it addresses all relevant direct and indirect environmental impacts, whether these are upstream or downstream of the proposed works.
- 13.1.4 This chapter is supported by a number of appendices as listed below:
- **Volume 8, Appendix 1.1.A: Legislation, Guidance and Policy.**
 - **Volume 8, Appendix 1.4.A: Topic Assessment Methodology.**
 - **Volume 8, Appendix 4.13.A: Climate Change Risk Assessment.**
- 13.1.5 Other chapters that are useful to review in association with this chapter are as follows:
- **Chapter 5: Ecology and Nature Conservation.**
 - **Chapter 7: Geology, Hydrogeology, Land Use and Agriculture (Soils).**
 - **Chapter 8: Water Quality, Resources and Flood Risk.**
 - **Chapter 9: Traffic and Transport.**
 - **Chapter 10: Air Quality and Emissions.**
 - **Chapter 14: Materials and Waste.**

13.2 Legislation and Planning Policy

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

Legislation

- 13.2.2 The following legislation is relevant to Climate Change:
- United Nations Framework Convention on Climate Change (UNFCCC) Paris Agreement (Ref 13.2).
 - EIA Directive 2014/52/EU (Ref 13.3)
 - UK Nationally Determined Contribution (Ref 13.4).

- Climate Change Act 2008 (as amended) (Ref 13.5).
- The Climate Change (Interim Emissions Targets) (Wales) (Amendment) Regulations 2021 (Ref 13.6).
- Environment (Wales) Act 2016 (Ref 5.4).
- Well-being of Future Generations (Wales) Act 2015 (Ref 12.2)

13.2.3 To align with the requirements of 2017 TCP EIA Regulations (Ref 3.1) and The Electricity Works (Environmental Impact Assessment) (England and Wales) Regulations 2017 (Ref 3.2), the climate assessment is required to consider the following aspects:

- Greenhouse Gas (GHG) Assessment – considers the impact on the climate of GHG emissions arising from the proposed works during its lifetime. This considers the proposed works in the context of the UK and Welsh carbon budgets and how it would affect the ability of the Government to meet its carbon reduction targets.
- Climate Change Risk Assessment (CCRA) – considers the resilience of the proposed works to climate change impacts, including how the proposed works is designed to reduce its vulnerability to the projected impacts of climate change.
- In-combination Climate Change Impact (ICCI) Assessment – the combined impact of the proposed works and future climate change on receptors in the surrounding environment.

National Policy

13.2.4 The following national policy is relevant to Climate Change:

- Working Together to Reach Net Zero: All-Wales Plan April 2022 Update (Ref 13.7).
- PPW – Edition 12 (Ref 4.5).
- Future Wales: The National Plan 2040 (Ref 4.4).

Guidance

13.2.5 The following guidance is relevant to Climate Change:

- IEMA – Environmental Impact Assessment Guide to: Climate Change Resilience and Adaption (Ref 13.8).
- IEMA – Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance – 2nd Edition (Ref 13.9).

13.3 Study Area

GHG Assessment

13.3.1 The Study Area for the GHG assessment includes:

- Direct GHG emissions arising through works on proposed works site as a result of the site clearance and remediation, construction, operation and maintenance within the Glaslyn works site.
- Indirect GHG emissions occurring outside the Glaslyn works site include emissions from embodied carbon in materials, transportation, and both upstream and

downstream activities (such as well-to-tank processes, transmission and distribution losses, and the processing and disposal of waste).

CCRA

- 13.3.2 The CCRA Study Area encompasses the temporary and completed works that make up the proposed works.

ICCI

- 13.3.3 The Study Area for the ICCI assessment is determined by the EIA topic assessments, as described in other chapters of this ES and will be reported accordingly. Relevant topic chapters may include:

- **Chapter 4: Landscape and Visual Amenity.**
- **Chapter 5: Ecology and Nature Conservation.**
- **Chapter 6: Historic Environment.**
- **Chapter 7: Geology, Hydrogeology, Land Use and Agriculture (Soils).**
- **Chapter 8: Water Quality, Resources and Flood Risk.**
- **Chapter 9: Traffic and Transport.**
- **Chapter 10: Air Quality and Emissions.**
- **Chapter 11: Noise and Vibration.**
- **Chapter 12: Socio-Economics.**
- **Chapter 14: Materials and Waste.**

13.4 Assumptions and Limitations

GHG Assessment

- 13.4.1 Granular activity data required for a quantitative GHG assessment was not available to inform the assessment. Consequently, a qualitative approach was adopted to identify GHG emission sources. Further details on the approach taken for the qualitative GHG Assessment are provided in **Volume 8: Appendix 1.4.A: Topic Assessment Methodology**.
- 13.4.2 While upstream and downstream emissions, such as those from raw material extraction, transport, maintenance, and end-of-life disposal, are considered in the qualitative assessment, they have not been quantified due to data limitations.

CCRA

- 13.4.3 The start date of the CCRA will be the start of the construction period. In line with the construction programme, the construction phase of the proposed works is assumed to be from 2026 to 2029.
- 13.4.4 For the purposes of the CCRA a reference operational period of 40 years was assumed, in accordance with asset lifespans.

- 13.4.5 The CCRA has been carried out using the most up to date, reliable and publicly available climate data. Information has also been taken from NGET internal documents and wider ES chapters.
- 13.4.6 Climate change projections, by their very nature, are associated with a range of assumptions and limitations. There are inherent uncertainties associated with climate projections. Climate projections are not predictions of the future but are rather a projection based on the best available data and science.
- 13.4.7 For climate projections, UKCP18 data was collected for periods between 2010 – 2039, 2040 – 2069, and 2070 – 2099 to adequately account for both short-term construction phase and long-term operational period.
- 13.4.8 A ‘high’ emissions scenario, Representative Concentration Pathway (RCP) 8.5 has been used in the assessment. This scenario is applied at the 10%, 50% and 90% probability levels to assess the potential impacts of climate change during the construction and operation of the proposed works.

13.5 Baseline

Existing Baseline

GHG Assessment

- 13.5.1 For the GHG assessment, the existing baseline is the current conditions at the Glaslyn works site. The current baseline consists of the carbon stock and sources of GHG emissions within the Glaslyn works site of existing on-site activities.
- 13.5.2 The Glaslyn works site encompasses the existing 132 kV cables owned by SP Energy Networks and the 400 kV cables owned by NGET, which surface at the existing Wern CSEC and Garth CSEC. The current land use in this area is primarily dedicated to the operation and maintenance of existing transmission and distribution infrastructure, which is at the western and eastern extents of the proposed works site.

CCRA and ICCI Assessment

- 13.5.3 The CCRA and ICCI assessments consider how resilient the proposed works and surrounding environment are to the current and projected future climate hazards. The receptor for the CCRA is the construction and operation of the proposed works, including its assets and associated end users. For the ICCI assessment receptors are as defined in the applicable technical chapters of this ES.
- 13.5.4 The current baseline for the CCRA and ICCI assessments is based on historic climate data obtained from the Met Office website recorded at the closest meteorological station to the Glaslyn works site (Cwmystradllyn) (Ref 8.15). This is approximately 6 km north-west from the Glaslyn works site, with the baseline or historic time period being 1981 to 2010, as detailed in

Table 13-1 – Historical climate data for the proposed works

Climatic Variable	Baseline Data 1981-2010
Mean annual maximum temperature (°C)	12.43
Mean annual minimum temperature (°C)	6.29
Mean summer maximum daily temperature (°C)	17.95
Mean winter minimum daily temperature (°C)	2.17
Warmest month on average (°C)	18.66
Warmest month on average (Month)	August
Coldest month on average (°C)	1.76
Coldest Month on average (Month)	February
Frost days per annum	No data recorded
Mean average rainfall levels (mm)	1,944.48
Mean summer rainfall (mm)	143.46
Mean winter rainfall (mm)	176.42
Wettest month on average (mm)	220.02
Wettest month on Average (month)	October
Driest month on average (mm)	104.71
Driest month on average (month)	May

- 13.5.6 Qualitative information for other climate variables such as heatwaves, snowfall and storms were also obtained and summarised below.
- Heatwaves: Annually, the Royal Meteorological Society publishes a report on the State of the Climate to highlight how the UK's weather and climate have deviated from historical averages. Since 1884, the top 10 warmest years in the UK have all occurred after 2002 (Ref 13.10).
 - Snowfall: The Met Office states that there is high confidence that spring snow cover extent in the Northern Hemisphere has decreased substantially since 1978 and that the number and severity of snow events have generally declined since the 1960s (Ref 13.11).
 - Storms: The Met Office states that there are no studies so far providing a link between changes in UK storminess and climate change (Ref 13.12). This is because of the difficulty in detecting windstorms which means there is a lack of observed trends. However, solely focusing on wind speed, the State of the UK Climate 2023 report (Ref 13.11) highlights that from 1969 to 2023, the UK annual mean wind speed demonstrates a downward trend, consistent with that observed globally.
 - Landslides: Research shows that based on the British Geological Survey's National Landslide Database, there has been 2735 previous landslides in Wales up until 2023, of which 182 are dated (Ref 13.13).
- 13.5.7 In addition to historic climate data being obtained, information was also gathered on extreme weather events that have occurred at or near the proposed works within the

last five years (2019 – 2024). Collecting this information allows the current climate conditions experienced in an area to be taken into consideration, as well as the predicted impact climate change could have on exacerbating these risks. The non-exhaustive list of past extreme events includes:

- Storm Darragh (December 2024): Strong winds, heavy rain, and snow to Wales, caused significant transport disruption, power outages, and fatalities. A rare red alert for wind was issued, warning of potential life-threatening conditions (Ref 13.14).
- Storm Bert (November 2024): A multi-hazard storm brought strong winds, heavy rain, and snow causing disruption to road and rail transport. Several areas in Wales also faced severe flooding and landslides (Ref 13.15).
- Heatwave (July 2024): Hot temperatures and dry conditions experienced across the UK, with temperatures over 25°C in Wales. Following the heatwaves, the Met Office issued a yellow alert across the UK including North Wales for thunderstorms and heavy rainfall (Ref 13.16).
- Storm Ciaran (November 2023): The area close to the proposed works experience extreme rainfall and strong winds, leading to widespread flooding across parts of Wales, including Porthmadog (Ref 13.17).
- Cold days (later November 2023): Porthmadog experienced consecutive cold days with minimum temperatures reaching between -1°C to -3°C (Ref 13.18).
- Unseasonably mild autumn (November 2022): Temperatures in Porthmadog reached 21.2°C on November 13, 2022 (Ref 13.19).
- Storm Arwen (November 2022): Strong winds and heavy rainfall led to power outages and damage across parts of Wales, including Porthmadog (Ref 13.20).
- Landslide (2018): 30 tonne landslide left dozens of people cut off on Garth Road leading to Pen-y-Banc between Porthmadog and Borth-y-Gest, with some residents not able to leave their properties. The electricity board were also involved due to potential damage to their underground power cables (Ref 13.21).

Future Baseline

GHG Assessment

- 13.5.8 The future baseline for assessing the impact of the proposed works on climate change is based on a 'business as usual' scenario, where the proposed works are not built. In this scenario, the future baseline assumes the continued operation and maintenance of the existing Glaslyn Cables and associated transmission and distribution infrastructure.

CCRA and ICCI assessment

- 13.5.9 The future baseline for the CCRA and ICCI assessments is based on UK Climate Projection 2018 (UKCP18) data from the Met Office (Ref 13.22) for the 25 km grid squares in which the Glaslyn works site is located.
- 13.5.10 This projection data provides probabilistic indications of how global climate change is likely to affect areas of the UK using pre-defined climate variables and time periods. Projected climate data is presented in **Table 13-2**. Climate parameters considered in the CCRA including the following:
- Mean annual temperature.

- Mean summer temperature.
- Mean winter temperature.
- Number of frost days per annum.
- Maximum summer temperature.
- Minimum winter temperature.
- Mean annual precipitation.
- Mean summer precipitation.
- Mean winter precipitation.
- Extreme weather events (e.g. storms).

13.5.11 The historic and future baseline for the site location is presented in **Table 13-2** below.

Table 13-2 – Climate change baseline and projection data, 50% probability (10% and 90% probability in parentheses)

Climatic Variable	Baseline Data (Cwmystradllyn)	Projection (Change)				Projected Trend	Source
		1981-2010	2010-2039	2040-2069	2070-2099		
Temperature							
Mean annual maximum daily temperature (°C)	12.43	+0.71 (+0.25 to +1.19)	+1.73 (+0.78 to +2.70)	+3.46 (+1.84 to +5.13)	No projection data is available beyond 2100, trend towards increasing temperatures is expected to continue.	↑	UKCP18 (Ref 13.22)
Mean summer maximum daily temperature (°C)	17.95	+0.70 (-0.02 to +1.49)	+1.89 (+0.31 to +3.55)	+4.33 (+1.43 to +7.24)		↑	UKCP18 (Ref 13.22)
Mean winter minimum daily temperature (°C)	2.17	+0.59 (-0.08 to +1.30)	+1.59 (+0.40 to +2.86)	+2.93 (+1.00 to +5.08)		↑	UKCP18 (Ref 13.22)
Highest temperature for baseline period (°C)	18.66 (August)	N/A				N/A	UKCP18 (Ref 13.22)
Lowest temperature	1.76 (February)	N/A				N/A	UKCP18 (Ref 13.22)

Climatic Variable	Baseline Data (Cwmystadrlllyn)	Projection (Change)				Projected Trend	Source
	1981-2010	2010-2039	2040-2069	2070-2099	Beyond 2100		
for baseline period (°C)							
Precipitation							
Mean annual rainfall (mm)	1944.48	+0.90% (-3.67 to +5.67)	+1.50% (-5.05 to +8.52)	+3.17% (-7.00 to +13.83)	No projection data is available beyond 2100, however there is potential for a continued slight increase in rainfall annually with a potential decreasing trend in summer rainfall and an increasing trend in winter rainfall.	↑	UKCP18 (Ref 13.22)
Mean summer rainfall (mm)	143.46	-4.88% (-17.19 to +7.18)	-15.46% (-35.47 to +4.31)	-30.84% (-53.89 to -4.65)		↓	UKCP18 (Ref 13.22)
Mean winter rainfall (mm)	176.42	+2.90% (-5.52 to +12.09)	+9.11% (-3.37 to +24.15)	+18.66% (-2.09 to +43.16)		↑	UKCP18 (Ref 13.22)
Wettest month on average (mm)	220.02 (October)	N/A				N/A	UKCP18 (Ref 13.22)
Driest month on average (mm)	104.71 (May)	N/A				N/A	UKCP18 (Ref 13.22)
Sea Level Rise							
Sea level rise (m) (See Note 1)	No data recorded	+0.06 (See Note 2)	+0.24 (See Note 3)	+0.39 (See Note 4)	+0.72 (See Note 5)	↑	NASA IPCC (Ref 13.23)

Climatic Variable	Baseline Data	Projection (Change)				Projected Trend	Source
	(Cwmystadrlllyn)	1981-2010	2010-2039	2040-2069	2070-2099		
Note 1: Baseline used in NASA tool is 1995-2014. There is no actual set value for 0 m sea level. Note 2: The sea level rise projection data differs from the other variables in that it is given for the 2020 decade, rather than the 30-year period that centres around the 2020s (2010-2039). The scenarios used for sea level rise are the IPCC's latest 6th Assessment Report Scenarios SSP5-8.5 (very high GHG). Data was collected for Holyhead, as this is the closest data point available to the proposed works. Note 3: The sea level rise projection data differs from the other variables in that it is given for the 2050 decade, rather than the 30-year period that centres around the 2050s (2040-2069). The scenarios used for sea level rise are the IPCC's latest 6th Assessment Report Scenarios SSP5-8.5 (very high GHG). Data was collected for Holyhead, as this is the closest data point available to the proposed works. Note 4: The sea level rise projection data differs from the other variables in that it is given for the 2080 decade, rather than the 30-year period that centres around the 2020s (2070-2099). The scenarios used for sea level rise are the IPCC's latest 6th Assessment Report Scenarios SSP5-8.5 (very high GHG). Data was collected for Holyhead, as this is the closest data point available to the proposed works. Note 5: The sea level rise projection data differs from the other variables in that it is given for the 2100 decade. The tool also provides scenarios up to 2150. However, in this case the 2100 decade was selected. The scenarios used for sea level rise are the IPCC's latest 6th Assessment Report Scenarios SSP5-8.5 (very high GHG). Data was collected for Holyhead, as this is the closest data point available to the proposed works.							

- 13.5.12 Some of the key trends that were identified from collected quantitative data were an increase in temperature variables, a decline in summer rainfall and an increase in winter rainfall, for all future time periods.
- 13.5.13 Qualitative climate projection data was also gathered, which is summarised below:
- Heatwaves: Under a high emissions scenario, it is estimated that by the end of the 21st century, all areas of the UK are projected to be warmer with hotter and drier summers likely to become more common (Ref 13.24). According to the World Bank's Think Hazard Tool, the heatwave hazard for the area including the Glaslyn works site is classified as 'Low' (Ref 13.25).
 - Snow fall: The Met Office project under a moderate and high emissions scenario that regional and local projections show a decrease in falling and lying snow across the UK for the period 2061-2080 relative to the 1981-2000 baseline (Ref 13.25).
 - Drought: The Met Office has projected a trend towards drier summers on average, with the trend being stronger under a high GHG emission scenario compared to a low one. However, it is the distribution of rainfall throughout the seasons that will determine UK drought risk (Ref 13.26).
 - Frost days per annum: Reports have shown that the number of frost air and ground frost days has decreased since the 1960s. Combined with detailed studies, these long-term trends point to a long-term warming trend of the UK's climate and a reduction in cold events (Ref 13.22).
 - Sea level rise: The Met Office predicts sea levels may rise by 98 cm by the end of the 21st century under a high emissions scenario (Ref 13.28). According to the World Bank's Think Hazard Tool, the coastal flood hazard for the area including the Glaslyn works site is classified as 'High' (Ref 13.25).
 - Storms: The Met Office projects that climate change will likely lead to more frequent and intense winter storms in the UK, driven by factors such as rising sea surface temperatures and changes in the jet stream. While past data shows no clear trend in storm frequency or intensity, future projections indicate an increase in severe storms, particularly during winter, with stronger winds and heavier rainfall, which could also worsen coastal flooding due to rising sea levels (Ref 13.27).
 - Wildfires: Climate projections indicate that wildfire risk may increase in future decades. UK Climate Projections 2018 (UKCP18), indicate a large future increase in hazardous fire weather conditions in summer. At 2°C global warming, the probability of days with "very high" fire danger is predicted to double compared to the historical period of 1981-2010. This probability increases by a factor of 5 at 4°C of warming (Ref 13.29). According to the World Bank's Think Hazard Tool, the wildfire hazard for the area including the Glaslyn works site is classified as 'Medium' (Ref 13.25).
 - Landslides: According to the World Bank's Think Hazard Tool, the landslide hazard for the area including the Glaslyn works site is classified as 'Medium' (Ref 13.25).

13.6 Scope of Assessment

- 13.6.1 This section describes the scope of the assessment of effects on Climate Change.
- 13.6.2 **Table 13-3** summarises the potential Climate Change receptors that have been reviewed and states whether they have been included or excluded from the Climate

Change assessment. Justifications are provided where receptors have been both included and excluded from the assessment.

Table 13-3 – Scope of the Climate Change assessment

Receptor		Scoped in/out per phase		Justification
		Construction	Operation	
13.6.3				13.6.4
Global atmosphere (GHG Assessment)	In	In		A GHG Assessment has been scoped into the climate change assessment to evaluate the potential GHG emissions associated with the proposed works.
The proposed works (CCRA)	In	In		A CCRA has been scoped in to assess the potential climate risks associated with the proposed works.
As identified by each discipline in their assessment (ICCI Assessment).	Out	Out		It is not anticipated there will be any ICCIs on the receptors in the surrounding environment. An ICCI Assessment has been scoped out of the climate change assessment.

13.7 Methodology

- 13.7.1 The purpose of the climate assessment is to assess the potential effects of the proposed works on the climate and of climate change on the proposed works.
- 13.7.2 The methodology is provided for both the CCRA and GHG Assessments. It includes details of the technical methodology used to determine baseline conditions, receptor sensitivity, magnitude of effects, and significance criteria for the climate assessments. These details can be found in **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**.

13.8 Potential Effects

GHG Assessment

- 13.8.1 The GHG emissions are reported in line with the project lifecycle stages of the civil engineering works assessment, as outlined in the Publicly Available Guidance 2080:2023 Guidance (Ref 13.30). Additionally, the Royal Institution of Chartered Surveyors Guidance for whole life GHG assessments (Ref. 13.31) have been integrated to inform the scope and reporting framework of the GHG assessment.
- 13.8.2 As outlined in **Section 13.4**, granular activity data was not available to inform the GHG assessment. A qualitative approach has been used as an alternative to identify the magnitude of emissions.
- 13.8.3 **Table 13-4** qualitatively summarises the GHG emissions associated with the construction and operation of the proposed works.

Table 13-4 – Qualitative lifecycle GHG assessment of the proposed works

Lifecycle stage	Qualitative assessment	Estimated GHG % contribution to the proposed works
Pre-construction stage (A0)	The pre-construction stage is expected to contribute very minimally to the overall GHG emissions of the proposed works.	<1%
Product stage (A1 – A3)	The product stage considers emissions from raw material extraction, refining, and production phases. Based on previous GHG assessments, embodied GHG emissions from the product stage are predicted to be the largest source of GHG emissions over the life of the proposed works. According to a study conducted in China (Ref 13.32) on a 220 kV XLPE-insulated power cable with a 2500 mm² cross-section, the A1-A3 GHG emissions are approximately 148 tCO₂e per kilometre. For this assessment, the emission sources for a XLPE-insulated 220 kV power cable are assumed to be broadly comparable to those of a XLPE-insulated 400 kV cable. The primary contributors to these GHG emissions are copper and aluminium, while the remaining GHG emissions are attributed to the insulation and polyvinyl chloride (PVC) sheath. This study reflects conditions and emission factors specific to China, and variations are expected in the UK due to differences in energy mixes, supply chains, and manufacturing practices. It is anticipated that GHG emissions will be associated with the upgrade works at the Wern CSEC and the construction of the Minffordd CSEC. The raw materials expected to be used include aggregate, concrete and steel. GHG emissions relating to the product stage of the proposed works are likely to be controlled and reduced through various control mechanisms through the NGET's internal climate policies and national policy, as discussed below.	~60%
Transport of Construction Materials to Site (A4)	GHG emissions from the transport of construction materials primarily result from fuel consumption during delivery. Key contributing factors include the transport mode, the distance travelled, and the mass of the materials being transported. To minimise GHG emissions, materials will be sourced locally where possible, and logistics optimised to reduce journeys and improve efficiency.	~10%

Lifecycle stage	Qualitative assessment	Estimated GHG % contribution to the proposed works
	GHG emissions associated with the transport of construction materials for the proposed works are likely to be controlled and reduced through various mechanisms outlined in NGET's internal climate policies and relevant national policies, as discussed below.	
Construction – Installation stage (A5)	For projects of similar scale, GHG emissions from the construction phase are typically the second-largest contributor to overall emissions. The construction of the proposed works is expected to generate GHG emissions from on-site energy consumption, including machinery, vehicles, and generators, as well as from construction worker commuting. Activities such as trench excavation, cable laying, and backfilling will require the use of machinery, leading to GHG emissions from fuel consumption by construction equipment and on-site generators. The GHG emissions associated with construction worker commuting are anticipated to be minor. These GHG emissions depend on factors such as workforce size, travel distances, and transport modes, and they typically represent a small proportion of the total GHG emissions for similar projects. GHG emissions are also expected from the decommissioning and disposal of electrical assets, including the 132 kV and 400 kV cables, and the Garth CSEC. GHG emissions will arise from dismantling, transport, and waste processing activities. To mitigate these GHG emissions, waste generated during the construction phase will be managed in line with industry best practices and NGET's waste management strategy (Ref 13.33), prioritising reuse, recycling, and recovery. A CEMP will be prepared prior to construction, incorporating measures such as sourcing local materials to help reduce GHG emissions.	~20%
Operation stage (B1 – B7)	The operational stage of the proposed works is expected to be the third largest contributor to GHG emissions, primarily from maintenance activities, equipment replacement, transmission losses, and worker transport. However, energy consumption during operation is anticipated to be minimal, as the works are designed to transmit rather than consume electricity. Operational	~10%

Lifecycle stage	Qualitative assessment	Estimated GHG % contribution to the proposed works
	energy use will primarily support control systems and auxiliary services, which are designed to be energy-efficient and require only a small amount of power. As a result, associated emissions are expected to be negligible, particularly given the ongoing decarbonisation of the electricity grid. Consequently, operational emissions are unlikely to materially affect the overall GHG profile of the proposed works. While these direct emissions are unlikely to affect the UK's or Wales's net-zero targets, the proposed works are expected to have wider indirect benefits by enabling greater expansion of onshore and offshore renewables. This will support the continued decarbonisation of the UK power grid by increasing the generation of low-carbon electricity. Operational efficiency will be maintained through regular equipment inspections, with replacement of components carried out as required to prevent deterioration.	
13.8.4	As detailed in Table 13-4 , it is estimated that the bulk of emissions (estimated around 90%) from the proposed works will come from the A0 – A5 life cycle stages.	
13.8.5	NGET is committed to achieving carbon neutrality across all its construction projects by 2025/26 (Ref 13.34), focusing on reducing the carbon intensity of construction materials and the phasing out of diesel-powered construction plant. In addition, NGET has committed to phasing out the sending of waste to land fill by 2028 (Ref 13.35).	
13.8.6	The Transport Decarbonisation Plan (TDP) (Ref 13.36) aligns with the UK's carbon targets by placing a commitment to reduce transport GHG emissions in line with the 2050 net-zero target. The TDP outlines measures to support a shift towards low-carbon transportation, such as increasing the use of electric vehicles. GHG emissions from worker and materials transportation are anticipated to decrease in line with government policy in the TDP.	
13.8.7	The UK Government has published a Net Zero Strategy (Ref 13.37), which outlines plans to reduce GHG emissions across all sectors of the economy to meet the net-zero targets. This strategy includes for example, initiatives to decarbonise construction material supply chains. As a result, GHG emissions from maintenance activities, including component replacements, are expected to decrease.	
13.8.8	The proposed works will support the ongoing UK transition to net zero by providing the necessary infrastructure to support the increased transmission of low carbon electricity. As renewable energy generation increasingly replace higher-carbon energy sources, this aligns with the UK Government's goal of achieving a fossil fuel-independent electricity system by 2035.	

- 13.8.9 IEMA GHG Assessment guidance (Ref 13.9), states that assessing the significance of a projects impact on the climate should not just be based on the magnitude of emissions arising but on how these emissions align with national policies and the path towards net zero. The assessment must therefore determine whether the proposed works could negatively affect Wales and the UK's ability to meet legislated carbon budgets and net zero targets.
- 13.8.10 Based on a qualitative assessment, the magnitude of GHG emissions is not material in the context of the UK and Welsh carbon budgets. The proposed works are consistent with applicable UK and Welsh Government climate change policy and legislation. In accordance with the IEMA GHG Guidance (see **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**), the effect of GHG emissions associated with the proposed works is deemed **minor adverse** and not significant.
- 13.8.11 While not legally binding, NGET has also demonstrated a commitment to reduce GHG emissions through the setting of validated Science-Based Targets (Ref 13.38), aligning NGET with the Paris Commitment (Ref 13.2). These targets are as follows
- Scope 1¹⁰ and 2¹¹ GHG emissions: Reduce absolute scope 1 and 2 emissions by 60% by 2030 from a 2018 base year.
 - Scope 1 emissions from power generation: Reduce scope 1 GHG emissions by 90% per Megawatt hour (MWh) by 2030 and 92% per MWh by 2033, both from a 2018 base year.
 - Other Scope 1 and 2 emissions: Reduce all other absolute Scope 1 and 2 GHG emissions by 50% by 2030 from the 2018 base year.
 - Scope 3¹² emissions: Reduce Scope 3 GHG emissions from all generated and sold electricity by 86% per MWh by 2033 from a 2018 base year and reduce all absolute Scope 3 GHG emissions by 37.5% by 2033 from a 2018 base year.

CCRA

- 13.8.12 This section summarises the climate risks identified for the construction and operational phases of the proposed works. Most identified climate risks are associated with temperature and precipitation related changes, flooding, storm events, drought, and wildfires.
- 13.8.13 In accordance with IEMA CCRA Guidance (Ref 13.8), the likelihood and consequence of each identified climate risk during the construction phase (**Table 13-5**) and the operational phase (**Table 13-6**). Eleven of the 27 initial risk ratings risks were deemed to have a 'significant' impact on the proposed works: eleven occurring in the 2070 – 2099 period, and one each in the 2010 – 2039 and 2040 – 2069 periods.
- 13.8.14 Following additional adaptation measures, the CCRA identified seven significant residual effects across the operational phase of the proposed works (see **Section 0**). were assessed for their significance. Initial risk ratings were assigned considering the planned controls already in place for the proposed works (**Table 13-7**). For 'significant'

¹⁰ Scope 1: Direct emissions from sources that are owned or controlled by the organisation.

¹¹ Scope 2: Indirect emissions from the generation of purchased electricity, steam, heating, and cooling consumed by the reporting organisation.

¹² Scope 3: All other indirect emissions that occur in the value chain of the reporting company, both upstream and downstream.

risks, additional mitigation measures have been proposed, and residual risk ratings were subsequently determined.

- 13.8.15 Further details on the risk framework used in the CCRA are available in **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**. The complete list of planned controls and additional mitigation measures can be found in **Volume 8, Appendix 4.13.A: Climate Change Risk Assessment**.

Construction Risks

- 13.8.16 Nineteen climate risks were identified for the construction phase of the proposed works. **Table 13-5** summarises these risks and their initial and residual risk ratings for the 2010-2039 time period under RCP 8.5.
- 13.8.17 Effects that are deemed 'High' or 'Extreme' are considered significant (S) and effects assessed as 'Medium' and 'Low' are non-significant (NS).

Table 13-5 – Summary of risks during the construction phase of the proposed works

Potential Climate Hazards	Potential Impacts on the Proposed Works	RCP 8.5 (2010-2039)	
		Initial Risk Rating	Residual Risk Rating
Flooding (coastal, pluvial & fluvial)	Flooding can cause the construction site to become inundated, potentially damaging ground-level infrastructure, site access routes, and equipment. This can lead to delays and possible halts in construction activities, ultimately increasing financial costs.	NS	NS
	Extreme rainfall can cause rivers to overflow, flooding the construction site and damaging infrastructure, access routes, and equipment. This can lead to delays and increased costs.	NS	NS
	Coastal flooding from heavy rainfall and storm surges can damage infrastructure and equipment, causing delays and higher construction costs.	NS	NS
	Flooding can inundate the construction site, creating health and safety hazards for workers due to unsafe working conditions.	NS	NS
	Prolonged heavy rainfall can cause rivers or canals to overflow, flooding the construction site and saturating nearby land. This can trigger landslides, leading to damage, disruption, and increased construction costs.	NS	NS
	Flooding and heavy rainfall can lead to saturation and erosion of natural land, which may result in landslides. Landslides create hazardous environments for construction works, imposing a health and safety hazard.	NS	NS
	Flooding can cause the displacement of soils during construction resulting in damage to construction equipment and subsequent delays.	NS	NS

Potential Climate Hazards	Potential Impacts on the Proposed Works	RCP 8.5 (2010-2039)	
		Initial Risk Rating	Residual Risk Rating
Sea level rise	The construction site could become flooded. This can result in construction equipment becoming non-operational and damaged.	NS	NS
Extreme heat and heatwaves	Extreme heat events can disrupt construction activities due to health and safety concerns arising from unsuitable working conditions, such as the risk of sunstroke and dehydration among workers. These disruptions can lead to delays, resulting in increased financial costs.	NS	NS
Storm events	Excess dust generated on-site can lead to equipment requiring additional maintenance or repairs due to internal dust accumulation, potentially causing delays to construction activities.	NS	NS
	Storm events and strong winds can create dangerous working conditions for construction workers. This may lead to delays in construction activities if the site needs to be temporarily shut down.	NS	NS
	Storm events and strong winds can create hazardous conditions on construction sites, particularly in exposed or elevated areas, reducing visibility and endangering workers. This may require temporary site closures, causing delays and increased costs.	NS	NS
	Storm events and strong winds can disrupt construction activities as access roads may become blocked by debris, affecting the delivery of construction materials and personnel movement.	NS	NS
Drought	Drought conditions can hinder construction activities, particularly ground and excavation works, leading to delays and increased costs.	NS	NS

Potential Climate Hazards	Potential Impacts on the Proposed Works	RCP 8.5 (2010-2039)	
		Initial Risk Rating	Residual Risk Rating
Extreme cold	Extreme cold events can cause water tanks to freeze, disrupting the water supply to welfare facilities and potentially leading to temporary site closures.	NS	NS
	Extreme cold events can result in ground freezing, black ice forming and snowfall. This can lead to dangerous working conditions for staff.	NS	NS
	Extreme cold events can cause delays if earthworks cannot be carried out due to frozen soil.	NS	NS
Wildfires	Wildfires could result in asset damage and machinery repair or replacement.	NS	NS
	Wildfires could result in injury or fatality to personnel on site.	NS	NS

- 13.8.18 Initial risk ratings for all nineteen climate risks were assessed as ‘non-significant’, therefore all residual risk ratings were also determined as ‘non-significant’.

Operation Risks

- 13.8.19 Twenty-seven climate risks were identified for the operational phase of the proposed works. **Table 13-6** summarises these risks and their initial and residual ratings for three time periods (2010-2039, 2040-2069, and 2070-2099) under RCP 8.5.
- 13.8.20 Effects that are deemed ‘High’ or ‘Extreme’ are considered significant (S) and effects assessed as ‘Medium’ and ‘Low’ are non-significant (NS).

Table 13-6 – Summary of risks during the operational phase of the proposed works

Potential climate hazards	Potential impacts on the proposed works	RCP 8.5 (2010-2039)		RCP 8.5 (2040-2069)		RCP 8.5 (2070-2099)	
		Initial risk profile	Residual risk profile	Initial Risk Profile	Residual risk profile	Initial risk profile	Residual risk profile
Flooding (coastal, pluvial & fluvial)	Flooding can create health and safety hazards due to unsafe working conditions for maintenance staff.	NS	NS	NS	NS	S	S
	Flooding can impact the functioning of assets such as underground cables.	NS	NS	NS	NS	S	S
	Flooding can cause vegetation becoming uprooted which can result in asset damage.	NS	NS	NS	NS	S	S
	Prolonged heavy rainfall can trigger landslides, potentially damaging assets on vulnerable ground and reducing security of supply.	S	NS	S	NS	S	NS
Changes in precipitation (Extreme Rainfall)	Fluctuating soil moisture content can accelerate the degradation of soils. This can impact the stability of assets through the process of shrink-swell and ultimately cause asset damage.	NS	NS	NS	NS	S	NS
	Extreme rainfall can result in damage to on-site electrical equipment and underground cables, leading to power outages and potential damage.	NS	NS	NS	NS	S	S
Extreme heat and heatwaves	Extreme heat can cause cables to overheat and operate less efficiently. This may lead to blackouts, operational disruptions, and asset damage, resulting in increased financial costs.	NS	NS	NS	NS	NS	NS
	Extreme heat can cause cables to overheat and operate less efficiently. This could lead to	NS	NS	NS	NS	NS	NS

Potential climate hazards	Potential impacts on the proposed works	RCP 8.5 (2010-2039)		RCP 8.5 (2040-2069)		RCP 8.5 (2070-2099)	
		Initial risk profile	Residual risk profile	Initial Risk Profile	Residual risk profile	Initial risk profile	Residual risk profile
	blackouts, disruption to operations and asset damage. This could create health and safety hazards to members of the public and end users.						
	Extreme heat can cause discomfort to outdoor workers who may become dehydrated or suffer from other heat associated health risks.	NS	NS	NS	NS	NS	NS
Changing temperatures	Increasing temperatures can cause thermal expansion in underground cable conductors. Since cables are constrained by surrounding soil or ducting, this can lead to mechanical stress at joints and terminations. Heatwaves can also reduce heat dissipation, accelerating insulation wear, lowering capacity, and increasing failure risk.	NS	NS	NS	NS	S	S
	Increased temperatures can reduce capacity of underground cable systems. This can disrupt operations and increase financial costs.	NS	NS	NS	NS	S	S
	Freeze-thaw cycles can result in greater erosion of natural or non-natural surfaces (e.g. concrete foundations). This can reduce the stability of assets, which could lead to asset damage.	NS	NS	NS	NS	NS	NS
Increasing temperatures coupled with changing	Warmer temperatures and prolonged periods of heat, coupled with increased precipitation can alter the growing seasons and create optimal growing conditions. This impacts overhead lines	NS	NS	NS	NS	NS	NS

Potential climate hazards	Potential impacts on the proposed works	RCP 8.5 (2010-2039)		RCP 8.5 (2040-2069)		RCP 8.5 (2070-2099)	
		Initial risk profile	Residual risk profile	Initial Risk Profile	Residual risk profile	Initial risk profile	Residual risk profile
precipitation patterns	as an increased vegetation growing adjacent to the overhead lines can impact on minimum clearances. This can lead to asset damage.						
Drought	Drought can dry and shrink soil around underground cables, increasing thermal resistivity and reducing heat transfer. This lowers the cables' load capacity, potentially causing service disruptions.	NS	NS	NS	NS	NS	NS
	Drought conditions can cause soil surrounding terrestrial underground cables to dry out and shrink, leading to increased thermal resistivity, reduced heat transfer from cable to surrounding soil/backfill and a reduced current (load) carrying capacity. This can cause operational delays.	NS	NS	NS	NS	NS	NS
	Drought conditions can result in soil becoming dried out, resulting in trees becoming unstable and more likely to become uprooted and causing damage to overhead lines.	NS	NS	NS	NS	S	NS
	Drought conditions can cause earthing design parameters to be exceeded, potentially leaving exposed metal components inside and outside the site boundary live. This imposes a health and safety risk to maintenance staff.	NS	NS	NS	NS	NS	NS
	Foundations can become unstable due to dried out soils, which could result in asset damage to structures built on them.	NS	NS	NS	NS	NS	NS

Potential climate hazards	Potential impacts on the proposed works	RCP 8.5 (2010-2039)		RCP 8.5 (2040-2069)		RCP 8.5 (2070-2099)	
		Initial risk profile	Residual risk profile	Initial Risk Profile	Residual risk profile	Initial risk profile	Residual risk profile
Extreme cold	Extreme cold events can cause discomfort and hypothermia for staff performing outdoor maintenance. This may lead to delays and increased costs.	NS	NS	NS	NS	NS	NS
	Ice can accumulate on exposed electrical equipment at the Wern and Minffordd CSECs, potentially causing service disruptions and asset damage.	NS	NS	NS	NS	NS	NS
	Snow and frost can affect foundations, which when thawed can lead to ground instability causing asset damage and delays to operations.	NS	NS	NS	NS	NS	NS
Sea level rise	Long-term sea-level rise can create increased occurrences of coastal flooding and coastal erosion. Assets close to or along the coast may be at risk from sea level rise.	NS	NS	NS	NS	NS	NS
	Assets may become non-operational due to sea inundation, coastal erosion and flooding, potentially leading to a loss of system resilience and or a loss of supply.						
Storm events	Storm events and strong winds can cause damage to equipment. Debris can also cause access issues if roads become blocked off.	NS	NS	NS	NS	S	S
	Increased storm frequency can lead to an increase in lightning strikes. If lightning strikes electrical equipment, it could lead to power failures and a power surge. This can lead to	NS	NS	NS	NS	S	NS

Potential climate hazards	Potential impacts on the proposed works	RCP 8.5 (2010-2039)		RCP 8.5 (2040-2069)		RCP 8.5 (2070-2099)	
		Initial risk profile	Residual risk profile	Initial Risk Profile	Residual risk profile	Initial risk profile	Residual risk profile
	disruption to services and increased costs due to any damage and increased maintenance.						
	Storm events including lightning, strong winds and associated debris can create dangerous working conditions for maintenance staff.	NS	NS	NS	NS	NS	NS
Wildfires	Increasing temperatures, heatwaves and storms (including lightning) can cause wildfires, which can impact health and safety risks.	NS	NS	NS	NS	NS	NS
	Increasing temperatures, heatwaves and storms (including lightning) can cause wildfires, which can cause asset damage, impacting operations and increasing financial costs.	NS	NS	NS	NS	NS	NS

- 13.8.21 Eleven of the 27 initial risk ratings risks were deemed to have a 'significant' impact on the proposed works: eleven occurring in the 2070 – 2099 period, and one each in the 2010 – 2039 and 2040 – 2069 periods.
- 13.8.22 Following additional adaptation measures, the CCRA identified seven significant residual effects across the operational phase of the proposed works (see **Section 0**).

Planned controls

- 13.8.23 The proposed works will be designed and operated in accordance with the risks and mitigation measures outlined in NGET's Climate Resilience Strategy (Ref 13.39). This approach enables the proposed works to withstand the climatic conditions projected for the end of its design life. Additionally, a CEMP will be developed to incorporate measures aimed at reducing the impact of climate-related risks during the construction phase. For more information regarding additional mitigation measures see **Volume 8, Appendix 4.13.A: Climate Change Risk Assessment**.
- 13.8.24 **Table 13-7** below presents a summary and non-exhaustive list of the planned controls in place during the construction and operational phase of the proposed works to mitigate against climate change risks. These have been considered when allocating initial risk ratings. **Volume 8, Appendix 4.13.A: Climate Change Risk Assessment** provides more detail.

Table 13-7 – Planned controls for the construction and operational phase of the proposed works

Climate variable	Planned control
Construction	
Flooding (pluvial, fluvial and coastal)	A CEMP is to be developed by the principal contractor which outlines mitigation measures to appropriately manage the environmental impacts associated with the construction site.
Extreme heat and heatwaves	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.
Storm events	A Dust Management Plan will be developed for the construction period to minimise dust generated onsite. The plan would outline a number of dust mitigation measures that will be implemented on the construction site.
Operation	
Flooding (pluvial, fluvial and coastal)	An Operational Environmental Management Plan will be prepared, incorporating appropriate mitigation measures and emergency response plans to minimise the impacts of flood events during operation. The Minffordd CSEC includes an attenuation pond to manage surface water runoff and reduce flood risk by temporarily storing and gradually releasing excess rainwater. The attenuation pond is expected to reduce flood risk to nearby elements of the proposed works.
Drought	Trees and other vegetation in the areas surrounding key assets should be monitored and pruned to make sure there is a safe distance between the greenery and the asset.

Climate variable	Planned control
Sea level rise	A Health and Safety Plan will be in place detailing safety procedures, emergency plans, and guidelines to ensure the safety of staff and the public.

A498 Crossing – HDD Option

- 13.8.25 If the HDD option was taken forward, the impact would be the same as stated above, except that it would reduce earthworks requirements by removing the need for continuous trench excavation at the A498 crossing. This would result in a decrease in spoil generation, on-site handling, and haulage, thereby reducing GHG emissions associated with construction-stage activities.

13.9 Mitigation and Residual Effects

GHG Assessment

- 13.9.1 No significant residual impacts have been identified in the GHG Assessment. As a result, no additional mitigation has been identified. A CEMP will be produced before construction and include mitigation measures to reduce GHG emissions during construction. The standard measures typically implemented by NGET to reduce GHG emissions during the construction and operation phases of the proposed works are considered sufficient.

CCRA

- 13.9.2 The CCRA identified no significant climate risks during the construction phase of the proposed works (**Table 13-5**), therefore, no specific mitigation measures are required. The CCRA identified 11 significant climate risks during the operational phase of the proposed works (**Table 13-6**). Specific mitigation measures have been suggested and residual risk ratings have been allocated. **Volume 8, Appendix 4.13.A: Climate Change Risk Assessment** contains further details on each climate risk identified in the CCRA as well as additional mitigation measures.
- 13.9.3 **Table 13-8** summarises the residual risk profile for the operational climate related risks as detailed in **Table 13-6** above.

Table 13-8 – Residual risk profile

Risk Rating	RCP 8.5 (2010-2039)		RCP 8.5 (2040-2069)		RCP 8.5 (2070-2099)	
	Initial risk profile	Residual risk profile	Initial risk profile	Residual risk profile	Initial risk profile	Residual risk profile
Not significant (NS)	26	27	26	27	16	20
Significant (S)	1	0	1	0	11	7

- 13.9.4 Under the assumption that additional adaptation measures are implemented the risk rating declines, however where no additional measures are implemented the initial risk ratings will remain.
- 13.9.5 The CCRA identified nine significant residual effects across the operational phase of the proposed works. These significant ratings varied across flood related risks, temperature and precipitation related risks and storm events (see **Table 13-6**).
- 13.9.6 **Table 13-9** provides a summary of additional adaptation measures that NGET should consider to mitigate the seven significant residual effects identified for the operational phase of the proposed works. Further detail is provided in **Volume 8, Appendix 4.13.A: Climate Change Risk Assessment**.

Table 13-9 – Additional Adaptation measures

Climate variable	Additional measures
Flooding (pluvial, fluvial and coastal)	Weather Monitoring: Forecasts should be regularly monitored to prepare for extreme weather events and implement contingency measures to minimise operational disruption. Flood Contingency Planning: Develop flood contingency plans for high-risk sites (e.g. CSECs), identifying vulnerable assets and installing temporary flood barriers where needed. Flood Defence Measures: Implement both temporary (e.g. earth bunds, flood doors, drainage systems, pumping stations, land management solutions) and permanent flood defences (e.g. flood storage reservoirs, bunding, natural land features). Vegetation and Land Management: Regular vegetation maintenance should be undertaken to protect infrastructure, and trees and hedges should be planted to increase water absorption and reduce surface water run-off. Underground Cable Protection: In flood-prone areas, upgrade or retrofit underground cables with mesh to stabilise surrounding soil during erosion or flooding events.
Extreme rainfall	Weather Monitoring: Forecasts should be regularly monitored to anticipate extreme weather events and implement contingency measures to minimise disruption to operations. Vegetation and Land Management: Planting fruit trees (of wild and local species) and hedges can help increase water absorption, catch rainfall, and reduce surface water run-off. Underground Cable Protection: Underground cables in areas susceptible to extreme precipitation should be upgraded or retrofitted with mesh to stabilise surrounding soil and prevent erosion-related impacts.

Climate variable	Additional measures
Changing temperatures	Weather Monitoring: The operator should monitor weather forecasts and plan operations accordingly to safeguard workers and infrastructure from extreme weather conditions. Overheating of Cables: Where necessary, underground cables should be watered to support cooling (e.g. via sprinkler systems), with temperature monitoring and de-loading used to manage thermal stress and reduce electricity losses. Thermal Resilience of Conductors: Install conductors with higher operating temperature limits to improve performance under extreme heat conditions.
Increasing temperatures coupled with changing precipitation patterns	Vegetation and Land Management: More frequent vegetation maintenance should be implemented, with regular monitoring and pruning of trees and surrounding greenery to ensure safe clearance around key infrastructure.
Storm Events (strong winds)	Weather Monitoring: The operator should use weather forecasts to inform short- to medium-term programme management, enabling proactive planning of works and timely implementation of mitigation measures to protect workers and infrastructure. Vegetation and Land Management: Frequent vegetation maintenance should be implemented to reduce the risk of damage to assets.

13.10 Summary

- 13.10.1 Overall, the GHG impact of the proposed works will be **Minor Adverse** and **Not Significant**. The proposed works will bring long-term benefits to the UK and Wales by upgrading energy-related infrastructure. This is essential for integrating new sources of renewable power and upgrading NGETs capacity to facilitate the electrification of the broader economy. This, in turn, will support the transition away from fossil fuels and help achieve net-zero emissions across Wales and the UK.
- 13.10.2 The CCRA identified 11 significant climate risks during the operational phase of the proposed works. The control measures and embedded adaptations outlined in **Section 13.9** have resulted in seven significant residual climate risks being identified. It can be concluded that the risk posed by climate change to the proposed works is **Significant**. Since significant residual climate risks have been identified for the 2070–2099 period, NGET should consider implementing the additional mitigation measures set out in **Table 13-9** and **Volume 8, Appendix 4.13.A: Climate Change Risk Assessment** to manage longer-term climate risks.

14. Materials and Waste

14.1 Introduction

- 14.1.1 This chapter presents an assessment of the likely Materials and Waste effects that could arise from the construction, operation and maintenance of the works at Glaslyn as described in **Chapter 2: Glaslyn Cables Works**.
- 14.1.2 This chapter describes the baseline conditions currently existing in the Study Area (as defined in **Section 14.3**), the scope of the assessment, the potential effects, the mitigation measures required to avoid, reduce or offset any significant negative effects, and the likely residual effects after these mitigation measures have been adopted.
- 14.1.3 The assessment has been carried out in accordance with current best practice guidance and is based on the methodology set out in the IEMA) Guide to Materials and Waste in Environmental Impact Assessment, Guidance for a Proportionate Approach (referred to herein as the 'IEMA Guidance') (Ref 14.1).
- 14.1.4 This chapter is supported by the appendices listed below:
- **Volume 8, Appendix 1.1.A: Legislation, Policy and Guidance.**
 - **Volume 8, Appendix 1.4.A: Topic Assessment Methodology.**

14.2 Legislation and Planning Policy

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

Legislation

- 14.2.2 The following legislation is relevant to Materials and Waste:
- Environmental Protection Act 1990 (as amended) (Ref 7.1).
 - The Hazardous Waste (England and Wales) Regulations 2005 (as amended) (Ref 14.2).
 - The Waste (England and Wales) Regulations 2011 (as amended) (Ref 14.3).
 - The Environmental Permitting (England and Wales) Regulations 2016 (as amended) (Ref 7.9).
 - Environment Act 2021 (Ref 4.2).
 - The Waste Separation Requirements (Wales) Regulations 2023 (Ref 14.4).

National Policy

- 14.2.3 The following national policy is relevant to Materials and Waste:
- PPW – Edition 12 (Ref 4.5).

- Beyond Recycling: A Strategy to Make the Circular Economy in Wales a Reality (Ref 14.5).
- Towards Zero Waste, One Wales: One Planet – The Overarching Waste Strategy Document for Wales (Ref 14.6).
- Towards Zero Waste, One Wales: One Planet – The Waste Prevention Programme for Wales (Ref 14.7).
- Future Wales: The National Plan 2040 (Ref 4.4).

Local Policy

14.2.4 The following local policy is relevant to Waste and Materials:

- Joint Anglesey and Gwynedd Local Development Plan 2011 – 2026 (Ref 4.11).
- Eryri Local Development Plan (2016-2031) (Ref 4.13).

Guidance

14.2.5 The following guidance is relevant to Waste and Materials:

- IEMA Guidance (Ref 14.1).
- Contaminated Land: Applications in Real Environments (CL:AIRE) Definition of Waste: Development Industry Code of Practice (DoW CoP), v2 (2011) (Ref 7.31).
- Waste and Resources Action Programme (WRAP) Designing Out Waste: A Design Team Guide for Civil Engineering (Ref 14.8).
- Separate Collection of Waste Materials for Recycling – A Code of Practice for Wales (Ref 14.9).

14.3 Study Area

14.3.1 The Study Areas for the assessment of impacts related to Waste have been defined in line with the IEMA Guidance (Ref 14.1). Two Study Areas are defined in the following sections:

- A Glaslyn works site Study Area: within which waste associated with the proposed works is generated.
- An expansive Study Area: within which landfills and other waste facilities that manage waste generated by the proposed works are likely to be located.

14.3.2 Together, the Glaslyn works site Study Area and expansive Study Area are referred to in this chapter as ‘the Study Areas’.

Glaslyn Works Site Study Area

14.3.3 The Glaslyn works site Study Area for construction and operational waste generation comprises the Glaslyn works site (**Figure 4.2.3**).

Expansive Study Area

14.3.4 The expansive Study Area for non-hazardous and inert waste management comprises the whole of Wales, within which waste management infrastructure (specifically landfill void capacity) is located. The expansive Study Area for non-hazardous and inert waste

management is defined based on professional judgement and informed by consideration of the proximity principle (waste should generally be managed as near as practicable to its place of production) and value for money.

- 14.3.5 The proximity principle “*must be applied in Wales when decisions are taken on the siting of appropriate waste facilities*”, as outlined in the Towards Zero Waste, One Wales: One Planet – The Overarching Waste Strategy Document for Wales (Ref 14.6).

14.4 Assumptions and Limitations

- 14.4.1 The assessment is based on information available at the time of writing. Detailed data on waste generated by the proposed works was not available and hence professional experience has been used to estimate the likely order of magnitude of waste generated.
- 14.4.2 It is not possible to reliably forecast any potential changes to landfill void capacity by the time of the proposed works’ construction and operation. Following precedent established through previous EIAs, landfill void capacity is assumed to remain the same as the current baseline.

14.5 Baseline

Existing Baseline

- 14.5.1 Baseline information for Waste has been reviewed and consists of:
- The non-hazardous and inert landfill void capacity for Wales (8.3 million cubic metres (m³) and 1.8 million m³ respectively).

Future Baseline

- 14.5.2 Considering the decline of landfill void capacity, forecasting into the future would lead to the inevitable conclusion that there would be no void space remaining. However, this is not a credible scenario as if there is still a need for landfill, then the Waste Planning Authority will need to consent new landfill void capacity to replace that which has been used up. Landfill void capacity is assumed to remain the same as the current baseline. However, although the current baseline is used in the assessment, a ‘very high’ sensitivity is applied to landfill void capacity recognising the potential for landfill void capacity to decline in future.

14.6 Scope of Assessment

- 14.6.1 This section describes the scope of the assessment of effects on Material and Waste.
- 14.6.2 For the purposes of this assessment, Materials and Waste comprise:
- The consumption of materials (key construction materials only).
 - The generation and management of waste during construction and operation.
- 14.6.3 The assessment of Materials and Waste takes into account the following:
- Waste producers have a legal duty of care to manage their waste in accordance with regulations and to ensure that any waste leaving the site where it is generated is transferred to a suitably licensed facility for further treatment or disposal.

- Facilities transferring, treating or disposing of waste must be either licensed or apply for an exemption from a licence, and impacts arising from the operation of waste management facilities are considered as part of the planning and permitting process for these facilities themselves.
- As part of their planning function, Waste Planning Authorities (WPAs) are required to ensure that sufficient land is available to accommodate facilities for the treatment of all waste arising in the area, either within the WPA area, or through export to suitable facilities in other areas.
- Mineral Planning Authorities are similarly required to ensure an adequate supply of minerals, sufficient to meet the needs of national and regional supply policies, and local development needs.

14.6.4 **Table 14-1** summarises the potential Materials and Waste receptors that have been reviewed and states whether they have been included or excluded from the assessment. Justifications are provided where receptors have been both included and excluded from the assessment.

Table 14-1 – Scope of the Waste and Materials assessment

Receptor	Scoped in/out per phase		Justification
	Construction	Operation	
Waste arising from extraction, processing and manufacture of construction components and products	Out	Out	This assumes that these products and materials are being developed in a manufacturing environment with their own waste management plans, facilities, and supply chain, which are potentially in different regions of the UK or the world and outside of the geographical scope of this study.
Other environmental impacts associated with the management of waste from the proposed works on-site (e.g. on water resources, air quality, noise) and off-site transport of materials and waste	Out	Out	Assessed in other relevant chapters (e.g. Water Quality, Resources and Flood Risk, Air Quality, Noise or Traffic)
Changes to MSAs	Out	Out	Impacts upon MSAs are not assessed in this Materials and Waste assessment in accordance with the IEMA Guidance (Ref 14.1) but are considered in Chapter 7.

Receptor	Scoped in/out per phase		Justification
	Construction	Operation	
Changes to allocated or safeguarded mineral site	Out	Out	No allocated or safeguarded mineral or waste sites are in the Glaslyn works site.
Changes to allocated or safeguarded waste site	Out	Out	No allocated or safeguarded mineral or waste sites are in the Glaslyn works site.
Changes in demand for materials	Out		The scale of the proposed works (in terms of material demand) is very small when compared with the overall UK construction sector, and once constructed there will be minimal need for materials during operation. Using professional judgement, forecast effects are negligible.
Changes in available landfill void capacity (hazardous waste)	Out	Out	Although some hazardous waste will be generated from the proposed works (such as cable insulating oil and waste from construction plant maintenance), there are not expected to be any large-scale hazardous waste generating activities. The quantities of hazardous waste generated by the proposed works are very small when compared to overall hazardous waste generation in England and Wales, and using professional judgement forecast effects are negligible.
Changes in available landfill void capacity (non-hazardous waste)	In	Out	The majority of the waste generated by the proposed works will comprise non-hazardous waste during the construction phase and hence the potential for this to give rise to significant impacts is assessed.

14.7 Methodology

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

14.8 Potential Effects

Waste Receptor Sensitivity

- 14.8.1 Waste receptor sensitivity for non-hazardous landfill void capacity (the only receptor which has been scoped in) is determined as ‘very high’. Since there is no publicly available information on any potential changes to landfill void capacity at the time of the proposed works’ construction and operation, a worst-case scenario is considered. Landfill capacity is assumed to remain the same for the baseline, however a very considerable reduction in capacity cannot be excluded (>10% for non-hazardous and inert landfill) for the purpose of selecting sensitivity.

Waste Generation

- 14.8.2 **Table 14-2** summarises the types of waste that would be generated during the proposed works construction phase.

Table 14-2 – Waste types arising from the construction of the proposed works

Construction activity	Waste types generated
Decommissioning of existing cables	• Redundant cables. • Waste oil from cable insulation. • Vegetation clearance. • Concrete and steel from removal of joint bays, thermos-coupler bays, cable markers and cable bridges.
Garth CSEC decommissioning	• Redundant underground services, foundations, earthing and platform granular material.
Minffordd and Wern CSEC construction and cable installation	• Vegetation clearance. • Excess, offcuts and broken or damaged construction materials. • Surplus excavated material from construction of joint bays and cable trenches. • Waste drilling fluid and cuttings from HDD works. • Packaging from materials delivered to the Glaslyn works site. • Construction worker wastes from offices and welfare areas and canteens. • Waste oils from construction plant. • Aggregates, geotextile, geomembrane and fencing following decommissioning of the temporary construction compound. • Paints and coatings.

Impact and Significance

- 14.8.3 For non-hazardous waste, the threshold for a significant effect (based on a ‘very high’ sensitivity) is 1% of the inert and non-hazardous waste landfill void capacity in Wales which is equivalent to 101,000 m³.

- 14.8.4 Based on experience of a wide range of other projects of various types and scales, it is estimated that the overall quantities of non-hazardous waste generated are likely to fall well below this threshold of significance. This estimate is informed by the facts that:
- There is no demolition of large-scale structures or buildings.
 - Excavation will be limited to cable trenches and HDD rather than large-scale earthworks.
 - Construction of site compounds, roads and other infrastructure is small in scale compared to (for example) major road schemes or power stations and hence the associated waste generation is also expected to be small in scale.
 - Many of the waste streams are capable of being recycled and hence unlikely to be sent for landfill disposal.
- 14.8.5 The following approaches are expected to be followed for managing particular waste streams, where feasible, and will further reduce the quantity of waste requiring landfill disposal:
- Vegetation clearance waste will be sent for composting.
 - Metallic waste (including cable conductors, electrical equipment and constructional steel) will be sent for recycling.
 - Concrete and other inert waste will be used to produce recycled aggregate, either on-site or offsite.
 - Surplus excavated materials will be used to backfill trenches and elsewhere in the works.
 - Waste oil will be sent either for recovery or high-temperature incineration.

A498 Crossing – HDD Option

- 14.8.6 If the HDD option was taken forward, the impact would be the same as stated above.

14.9 Mitigation and Residual Effects

Embedded Measures

- 14.9.1 The proposed works has been designed, as far as possible, to avoid and minimise the impacts and effects on Materials and Waste. This has been achieved through the process of design development, and by embedding mitigation measures into the design of the proposed works.

Design

- 14.9.2 The following embedded mitigation measures have been incorporated into the proposed works' design principles:
- 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).
 - 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.

- Design for off-site construction: maximising the use of prefabricated structure and components, encouraging a process of assembly rather than construction where practicable.
- Design for the future (deconstruction and flexibility): identify how materials can be designed to be more easily adapted over an asset lifetime and how de-constructability and de-mountability of elements can be maximised at end of first life.
- Design for Waste and Material asset efficient procurement.

Construction

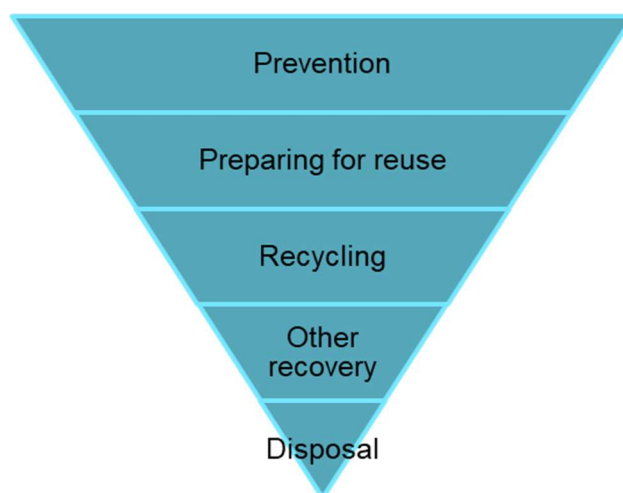


Plate 14-1 – The Waste Hierarchy (Ref 14.10)

- 14.9.3 The proposed works would aim to prioritise waste prevention, followed by preparing for reuse, recycling and other recovery and lastly disposal to landfill as per the waste hierarchy illustrated in **Plate 14-1**.
- 14.9.4 The following standard construction practices are relevant to this assessment:
- 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.

Additional Mitigation and Enhancement Measures

- 14.9.5 No significant effects have been identified and no additional mitigation or monitoring is proposed.
- 14.9.6 No enhancement measures related to Materials and Waste are proposed at this stage.

14.10 Summary

- 14.10.1 **Table 14-3** and summarises the residual effects of the proposed works in relation to Waste.

- 14.10.2 In summary, 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.

Table 14-3 – Summary of residual effects (construction)

Receptor	Sensitivity (value)	Description of impact	Classification of effect (prior to additional mitigation)	Additional mitigation/enhancement measure	Magnitude of impact after additional mitigation	Residual effect
Changes in available non-hazardous and inert waste landfill void capacity	Very High	Negligible	Slight adverse (not significant)	N/A	Negligible	Slight adverse (not significant)

15. In-combination Effects

15.1 Introduction

- 15.1.1 This chapter introduces the likely in-combination effects that could arise from the construction, operation and maintenance of the works at Glaslyn as described in **Chapter 2: Glaslyn Cables Works** and how it is assessed within this ES.
- 15.1.2 In-combination effects occur where a single receptor is affected by more than one type of effect arising from different aspects of the proposed works. An example of an in-combination effect would be where a local resident is affected by temporary visual effects of construction works, noise and traffic disruption during the construction of a scheme, with the resulting effect being greater than each individual effect alone.

15.2 Legislation and Planning Policy

- 15.2.1 This section summarises the legislation and planning policy framework that is relevant to the In-combination Effects assessment. Details are in **Volume 8, Appendix 1.1.A: Legislation, Policy and Guidance**.

Legislation

- 15.2.2 The following legislation is relevant to In-combination Effects:
- 2017 TCP EIA Regulations (Ref 3.1).
 - The Electricity Works (Environmental Impact Assessment) (England and Wales) Regulations (2017) (Ref 3.2).

National Policy

- 15.2.3 The national policy relevant to In-combination Effects is:
- PPW – Edition 12 (Ref 4.5).

15.3 Methodology

- 15.3.1 There is no established EIA methodology for assessing and quantifying the effects of a number of individual impacts on the same sensitive receptors. The methodology used to undertake the in-combination effects assessment is based on previous experience and professional judgement. A full description of the methodology used for in-combination effects is outlined in **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**.

15.4 Assessment

- 15.4.1 A full assessment of the potential in-combination effects is undertaken at a Project level and is discussed in **Volume 7: The Project and Cumulative Effects**.

16. Cumulative Effects

16.1 Introduction

- 16.1.1 This chapter introduces the likely cumulative effects that could arise from the construction, operation and maintenance of the works at Glaslyn as described in **Chapter 2: Glaslyn Cables Works** and how it is assessed within this ES.
- 16.1.2 Cumulative effects occur when two or more planned developments have an effect on the same receptor leading to an increase in the effect, and possibly an effect of greater significance. It is possible that individually the developments might not result in significant effects, but when considered together they could create significant effects on a shared receptor; this would typically result from an overall increase in the magnitude (scale, duration, etc.) of effects.

16.2 Legislation and Planning Policy

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

Legislation

- 16.2.2 The following legislation is relevant to Cumulative Effects:
- 2017 TCP EIA Regulations (Ref 3.1).
 - The Electricity Works (Environmental Impact Assessment) (England and Wales) Regulations (2017) (Ref 3.2).

National Policy

- 16.2.3 The national policy is relevant to Cumulative Effects:
- PPW – Edition 12 (Ref 4.5).

Guidance

- Planning Inspectorate (2024). Nationally Significant Infrastructure Projects: Advice on Cumulative Effects Assessment (Ref 16.1).

16.3 Study Area

- 16.3.1 This chapter has used a 2 km buffer from the Glaslyn works site has been implemented to assess the cumulative effects.

16.4 Methodology

- 16.4.1 A range of public sector and industry-led guidance is available on the approach to assessing in-combination effects but at present there is no single, agreed industry

standard method. Whilst the proposed works or the wider Project as a whole are not classed as a Nationally Significant Infrastructure Project, the approach to the assessment of in-combination effects broadly follows the Nationally Significant Infrastructure Projects: Advice on Cumulative Effects Assessment guidance (Ref 15.1). A full description of the methodology used for in-combination effects is outlined in **Volume 8, Appendix 1.4.A: Topic Assessment Methodology**.

16.5 Potential Effects

- 16.5.1 Only one additional development was identified within the 2 km Study Area, **Table 16-1** below presents other development to be taken forward in the assessment of cumulative effects. Details can be found in **Volume 7: The Project and Cumulative Effects**.

Table 16-1 – Short List of Other Developments within 2 km of the Glaslyn Works Site

Application Reference	Development Description	Location	Status	Distance from the Glaslyn Works Site
C23/0549/08/LL	Erect 8 new flexible business/industrial units (Use class B1, B2, B8) with associated parking and landscaping.	Land At Parc Busnes Eryri, Penrhyndeudraeth, LL48 6LD	Approved with conditions	560 m south-east of the Glaslyn works site, Minffordd

16.6 Summary

- 16.6.1 One proposed development was found within 2 km of the Glaslyn works site. This was the erection of eight new flexible business/industrial units with associated parking and landscaping.
- 16.6.2 No environmental support documents were submitted with the above application other than a tree implications plan, which indicated trees or groups of trees that would be removed as part of the development. Although the impacts of the development are currently unknown, it will be considered further in **Volume 7: The Project and Cumulative Effects**.

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Figures

Figure 4.2.1: Location of the Proposed Works

Figure 4.2.2: Existing Cables

Figure 4.2.3: Glaslyn Works Site

Figure 4.2.4: Wern Cable Sealing End Compound Layout

Figure 4.2.5: Minffordd Cable Sealing End Compound Layout

Figure 4.4.1: Landscape and Visual Impact Assessment Study Area

Figure 4.4.2: National Landscape and National Seascape Character Areas

Figure 4.4.3: Gwynedd Local Landscape Character Areas

Figure 4.4.4: Eryri National Park Local Landscape and Seascape Character Areas

Figure 4.4.5: LANDMAP Visual Sensory Landscape Character Areas

Figure 4.4.6: Landscape Relevant Statutory Designations and Recreational Routes

Figure 4.4.7: Landscape Relevant Non-Statutory Designations

Figure 4.4.8: Zone of Theoretical Visibility Wern Cable Sealing End Compound

Figure 4.4.9: Zone of Theoretical Visibility Minffordd Cable Sealing End Compound

Figure 4.4.10: Zone of Theoretical Visibility Glaslyn Works Site

Figure 4.4.11: Representative Viewpoint and Visual Receptor Locations

Figure 4.4.12: Baseline Photography

Figure 4.5.1: Statutory Designated Sites for Nature Conservation in the Wider Area (up to 30 km)

Figure 4.5.2: Statutory Designated Sites for Nature Conservation within 5 km

Figure 4.5.3: Non-Statutory Sites Designated for Nature Conservation within 2 km

Figure 4.5.4: Habitats of Principle Importance and Ancient Woodland within 2 km

Figure 4.7.1: Made Ground, Superficial Geology and Historic Borehole logs

Figure 4.7.2: Bedrock Geology

Figure 4.7.3: Hydrogeology

Figure 4.7.4: Groundwater Vulnerability

Figure 4.7.5: Potential Sources of Contamination

Figure 4.7.6: Historic Potential Sources of Contamination

Figure 4.7.7: Mining Quarrying and Mineral Resources

Figure 4.7.8: Surface Ground Workings

Figure 4.8.1: Site location

Figure 4.8.2: Zone of Influence

Figure 4.8.3: Route breakdown

Figure 4.8.4: Topographic overview

Figure 4.8.5: Hydrological overview

Figure 4.8.6: Water resources

Figure 4.8.7: Water dependant designated sites

Figure 4.8.8: Water Framework Directive waterbodies

Figure 4.8.9: Flood risk overview

Figure 4.9.1: Traffic and Transport Study Area and Traffic Survey Locations

Figure 4.9.2: Study Area Road Network

Figure 4.9.3: Traffic Accident Locations

Figure 4.9.4: Indicative Heavy Goods Vehicle (HGV) Routing

Figure 4.10.1: Construction Dust Assessment

Figure 4.11.1: Noise Monitoring and Sensitive Receptor Locations.

Figure 4.12.1: Socio-Economic land use receptors.

Figure 4.12.2: 60-minute peak hour drive time from the Glaslyn works site.

Figure 4.12.3: Public Rights of Way.