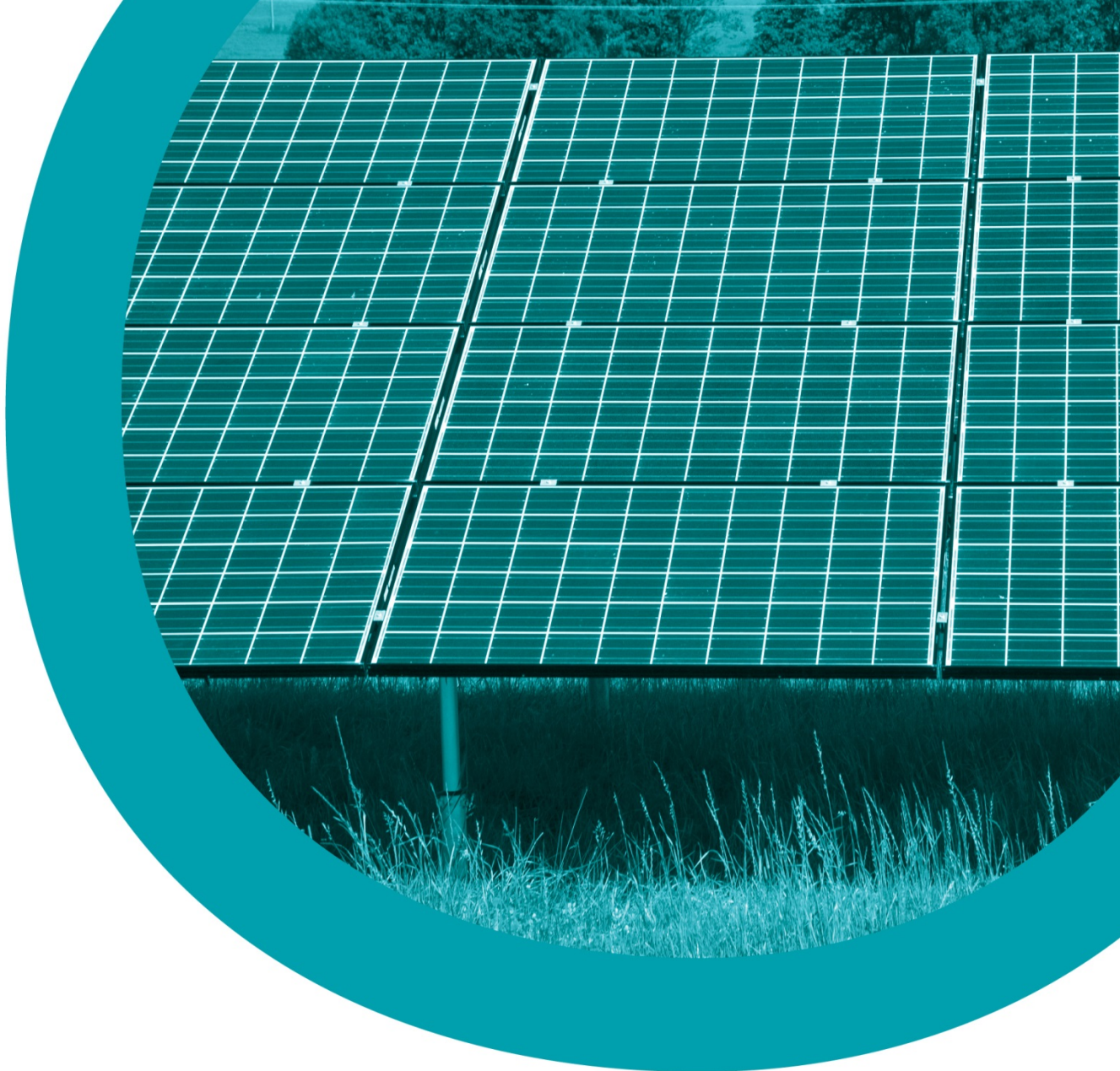




*Illustration only

Mynydd y Gwhryd Solar Farm Environmental Report

Applicant: Awel Aman Tawe

Date: May 2020

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1. INTRODUCTION

1.1 Forward

- 1.1.1 This Environmental Report (ER) accompanies a planning application for a solar farm, including battery storage, electrical and associated civils infrastructure, that is up to 2.23MegaWatts (MW) in capacity on land known as Mynydd Gwyrhyd, a moorland area situated between the villages of Tairgwaith/Gwaun Cae-Gurwen and Cwm-twrch Uchaf that is marked by two operational community wind turbines, owned and operated by Awel Aman Tawe (AAT). *Figure 1-1 Site Location Map* demonstrates the position of the proposed solar energy development, which would be to the south of the community turbines on land gently sloping southwards to the River Egel.
- 1.1.2 Prepared by Dulas Ltd on behalf of the applicant, Awel Aman Tawe, this ER presents a full description of the proposed scheme, the relevant planning policy framework, and the results of the assessment of potential environmental effects arising from the proposed solar energy scheme. The ER is structured to present in the initial chapters the planning policy framework (Ch. 2), under which the proposed scheme will be determined by the planning authority, and a full description of the project (Ch. 3).
- 1.1.3 Subsequent chapters (Ch. 4 – 11) present the findings and conclusions of the environmental assessments conducted in regard to the development site in order to provide the evidence base necessary to allow the planning authority to make an informed decision on the proposed development.
- 1.1.4 In association with the planning forms, plans and this Environmental Report, a Design and Access Statement is also submitted to support the planning application.

1.2 General Description of Scheme and Benefits

- 1.2.1 The proposed development comprises a ground-mounted photovoltaic (PV) solar farm located on approximately 4 hectares (ha) of agricultural grazing and semi-improved land directly to the south of the wind farm infrastructure.

- 1.2.2 The scheme would comprise a series of rows of solar arrays, each comprising tables for the mounting of solar panels. Solar photovoltaic panels provide a method of generating electrical power by converting solar irradiation into Direct Current (DC) electricity using silicon semiconductor materials. Each panel is typically composed of multiple silicon solar cells.
- 1.2.3 Individual PV panels are arranged in module units (tables) which are installed on a mounting structure, which itself would be formed of metal frames anchored to the ground using pile driven foundations. Panels have a typical design life of up to 30 years. Multiple module tables are connected to form solar arrays, which are themselves connected to units containing inverters/transformers. The inverters change the Direct Current (DC) to Alternating Current (AC), a conversion that is required to export the electricity to the existing on-site substation servicing the wind farm. The substation houses the switchgear and control systems necessary to export the generated power to the local electricity network.
- 1.2.4 The description of the development for the purposes of the planning application is:
- Solar farm comprising the construction and operation of multiple solar PV arrays mounted on metal frames across a 4 ha site, inclusive of a single inverter/ transformer unit, a temporary construction area and ancillary facilities, drainage swale, boundary security fence with CCTV units, an access track, all associated works and landscape enhancement measures.*
- 1.2.5 *Figure 1-2 Site Layout* illustrates an overview of the proposed solar farm layout.
- 1.2.6 The solar farm will generate an estimated 2,219 MWh annually, which is sufficient to power the equivalent domestic electricity requirements of approximately 672 homes annually. This will also result in annual offsetting reductions in carbon dioxide emissions associated with conventional power generation equivalent to approximately 630 tonnes annually based up the latest Government conversion factor of 0.283 kg of CO₂ saving per kW hour generated.
- 1.2.7 The proposed development site (the 'Site') is not located within any recognised national area protected for landscape, ecology, hydrology or archaeology. The Welsh Government's predictive Agricultural Land Quality tool indicates that the Site is covered by Grade 5 very poor quality agricultural land. It is proposed that the land will continue to

be utilised underneath the solar panels when the site is operational in order to graze sheep.

1.3 Pre-Application Consultations

EIA Screening

- 1.3.1 A request for an EIA Screening Opinion was submitted to Neath Port Talbot Council (NPTC) in 2018 by Local Energy on behalf of the Applicant. In June 2018, NPTC determined that the development is not an EIA development and that the application need not be accompanied by an Environmental Statement (ref P2018/0502).
- 1.3.2 The Screening Opinion of NPTC is presented in Appendix 1-1.

Pre-Application Planning Advice

- 1.3.3 Subsequent to the Screening Opinion, a request for pre-application advice was submitted to NPTC to inform the scope of this Environmental Report. A response from NPTC was received on 26th July 2018, and is presented in Appendix 1-2. In summary, the Council advised the following:
- 1.3.4 Submission requirements were confirmed as set out in the table below; alongside each requirement is a description of the assessment / report in which such information is presented:

Table 1: NPTC Planning Requirements

Planning Requirement	Relevant Report / Chapter
Pre-Application Consultation (PAC) Report ('Major' development)	See <i>Pre-Application Consultation (PAC) Report</i> submitted with the planning documents
Design and Access Statement (see TAN 12 Design, Appendix 1)	See <i>Design and Access Statement (DAS)</i> submitted with the planning documents
Surface Water Drainage Strategy	See chapter 7 of this Environmental Report
Transport Assessment	See chapter 8 of this Environmental Report
Landscape and Visual Impact Assessment with photomontages from critical view points	See chapter 4 of this Environmental Report and the photomontages submitted with the application plans and illustrations
ASIDOHL2 assessment with particular consideration given to the visual	Following consultation with the Gwent Glamorgan Archaeological Trust there was

impact of the proposal	consensus that an ASIDOHL would not be required (email correspondence from Judith Doyle (GGAT) 14 August 2018) (see Appendix 1-3)
Ecology surveys to include: ◇ Extended Phase 1 habitat survey ◇ A biodiversity record search from the South East Wales Biodiversity Records Centre (SEWBReC) ◇ An assessment of the impacts upon areas identified as sites of importance for nature conservation (SINC) and all areas that would meet the criteria of a SINC ◇ An assessment of ecosystem resilience ◇ An assessment of impacts upon bird habitat ◇ Proposals for mitigation/compensation for any of the above	See chapter 5 of this Environmental Report
Archaeological desk-based assessment and mitigation strategy	See chapter 6 of this Environmental Report.
Coal mining report and risk assessment	Following consultation with the Coal Authority the applicant was advised that a Coal Mining Risk Assessment would not be required as the scheme was not located in a high risk area (email correspondence from Chris McArthur 14 th September 2018) (see Appendix 1-4).
An assessment of the impact the development would have upon the Sandstone resource	Following consultation with Alan Rees, the Minerals & Waste Planning Enforcement Officer for NPTC the applicant was advised that an assessment of effects to the sandstone resource would not be required (verbal confirmation from Alan Rees only – no written correspondence received).

Pre-Application Consultation (Major Development)

- 1.3.5 Details of the Pre-Application Consultation are set out in the PAC Report submitted with the planning application.

1.4 The Applicant and the Socio-economic Benefits of the Proposed Scheme

- 1.4.1 Awel Aman Tawe (AAT) is a community energy charity founded in 1998 working to make a difference to the lives of people at the top of the Swansea and Amman Valleys. The charity raises awareness of the importance of clean energy in the fight against climate change and has developed community renewable energy schemes, energy efficiency programmes, and innovative arts activities.
- 1.4.2 The charity's objectives are as follows:
- To advance the education of the public, in particular but not exclusively in energy efficiency and renewable resources for the public benefit;
 - The preservation and conservation of the environment through the promotion and use of renewable energy and energy saving measures;
 - The relief of poverty;
 - To conduct research and development relating to the utilisation of energy conservation practices and renewable energy technologies and to use the research for the public benefit;
 - To provide or assist in the provisions of recreational facilities in the interests of social welfare with a view to advancing education and improving the conditions of life for those for whom the facilities are primarily intended;
 - The relief of unemployment for the public benefit, in particular but not exclusively by the provision of advice, training and support for the unemployed;
 - The relief of sickness and preservation and protection of good health among people residing permanently or temporarily in south wales and further afield;
 - The promotion of the arts, culture and heritage; and
 - Such other charitable purposes as may from time to time be determined.
- 1.4.3 The charity developed the community owned, Mynydd y Gwrhyd wind farm, which was commissioned in January 2017. Awel y Gwryd CIC is a Special Purpose Vehicle set up by Awel Aman Tawe, in order to construct, operate and maintain the wind farm. Awel Coop,

a Community Benefit Society wholly owns Awel y Gwryd CIC and currently has around 1000 members, including some local schools. Any surplus generated by the wind farm enables Awel Aman Tawe to continue their important work and support local projects.

1.4.4 The existing wind farm is connected to the local distribution network and can export up to 4.7 MW of electricity at any time. Due to the variable nature of the wind, the amount of electricity generated by the wind farm fluctuates and therefore there are periods when the wind farm is not exporting 4.7 MW and there is spare capacity available within the grid connection. In order to maximise the efficiency of the grid connection and the productivity of the site, Awel Aman Tawe are developing a proposal to install a solar array of around 2.23 MW capacity (DC) and battery storage alongside the existing wind farm. In addition to increasing efficiency of the site and grid connection, Awel Aman Tawe's aim is to develop an energy demonstration site, which can be used as an educational resource.

1.4.5 As with the existing wind farm, any surplus income generated from the solar farm or battery storage will be used to enable Awel Aman Tawe to further their social, economic and environmental objectives. Typically, the wider socio-economic benefits of a development proposal are not material considerations under the land-use planning system and are not accorded weight in the decision-making process. However, in 2013 the then Minister for Housing and Regeneration, Carl Sargeant, issued a letter to all local authority cabinet members with responsibility for planning (Ref: SF/CS/4145/13, dated 18 December 2013) explaining the necessity to promote community renewable energy projects in the interests of clean energy generation and local community sustainability. Specifically, the Minister instructs local authorities as follows:

"In making their decisions on any renewable energy application I expect local planning authorities to conform to the legal requirement to take decisions in line with their development plan unless material considerations indicate otherwise. Furthermore, in assessing planning applications for renewable energy projects, the economic and job creation benefits associated with any development should be fully factored into, and given weight in, the decision making process as set out in Chapter 7 of Planning Policy Wales."

1.4.6 Subsequent to this statement, Welsh Government, under the auspices of Minister Lesley Griffiths (2017), announced a policy target for the achievement of 1 GW of locally owned renewable energy in Wales by 2030. This was followed by a Policy Statement on Local

Ownership published in early 2020 setting out the intentions and definitions of local ownership. The policy aims to retain social and economic benefits from future energy developments located in Wales whereby all new energy projects in Wales are now required to include at least an element of local ownership. Whilst the social and economic benefits of local ownership are not, as previously explained, material considerations in the planning process, they do make a significant contribution to both the ambitious carbon reduction targets set out in the Environment Act Wales 2016 and contribute towards the well-being goals set out in the Well Being of Future Generations Act 2015, both of which place a duty and responsibility on local authorities to create a more sustainable future for Wales.

- 1.4.7 The above statement is a clear instruction to local authorities that the socio-economic benefits, as well as the clean energy benefits, of community energy schemes should be influential in decision-making on new development proposals that fall within the category of community or local energy. The Mynydd y Gwyhryd would be a 100% wholly owned community energy project.

2. PLANNING POLICY CONTEXT

2.1 Introduction

- 2.1.1 The policy and planning policy framework relevant to the proposed Mynydd y Gwhryd Solar Farm is summarised in this section. Included are a brief overview of national policy on renewable energy and the need underpinning new clean energy development, and a description of the relevant Neath Port Talbot Local Development Plan policies to this development / location.
- 2.1.2 The purpose of this chapter is to set the policy context to this proposed development and the planning policies considered throughout the undertaking of the design and environmental assessments contained herein.
- 2.1.3 The chapter does not appraise the proposed solar farm scheme against the policies and guidance in the relevant planning policy framework, or attempt to take into account all other material considerations (for example appeal decisions, weight attributable to national energy policy) which would be relevant to the determination of this proposal.

2.2 UK and Welsh National Planning Policy

Relevant Planning Policy Framework

- 2.2.1 The relevant planning and energy policy framework to the application includes the following:
- Relevant UK and Welsh Government renewable energy policy; and
 - Relevant national planning policy produced by the Welsh Government (WG).

UK and Welsh Government Renewable Energy Policy

UK Renewable Energy Policy

- 2.2.2 There have been very few positive developments to the UK's energy policy in recent years in support of decarbonising the power generation sector. Since the Low Carbon Transition Plan and the Renewable Energy Strategy in 2009 and the road-mapping referenced below there have been no new policy introductions on energy in the UK, and very little impetus

has been applied to increasing the penetration of low carbon energy in the UK fuel mix as part of the UK's ambitious targets on greenhouse gas reductions.

- 2.2.3 Some progress is being made on large-scale energy storage and continuation of the regulatory support for offshore wind, but on the whole the last 5 years have seen a significant dip in Governmental support that has proved challenging to the renewables sector. As a result of the dilution of policy and subsidy support, investment in new renewables has seriously dipped (by as much as 55% in 2017), there is a serious reduction in the volume of new development proposals, and as a nation the UK is now at the point of falling behind its target trajectory of greenhouse gas reductions. The current hiatus in policy development in the energy sector is expected to have damaging effects to power generation decarbonisation, cause greater insecurity to energy supplies and substantially reduce the positive contribution of renewables to the UK economy.
- 2.2.4 In 2017 UK Government published its **Clean Growth Strategy** setting out how it expects to meet the nation's legally binding climate goals. The strategy covers the fourth and fifth carbon budgets, spanning 2023-2027 and 2028-2032, by when the UK must cut its greenhouse gas emissions to 57% below 1990 levels.
- 2.2.5 Among the stated objectives of the strategy are a push to increase energy efficiency in homes and business, the development of green financing capabilities, formulating new subsidies for renewable power for 2019 projects (primarily offshore), the continuation of support for nuclear power, and stimulation measures for the decarbonisation of transport. However, little detail or substance is provided and it is necessary to await the further evolution of the strategy before it is possible to gauge whether it will have a positive impact on renewable energy or not. Criticism from some quarters levelled at the Clean Growth Strategy is that it offers nothing new and is merely a rehash of previous commitments.
- 2.2.6 Following delay in the publication of the clean growth strategy by over a year and without, as yet, any details to back up the ambition to cut carbon emissions from the transport, heat and industrial sectors, the Committee on Climate Change (CCC) has warned that the proposed strategy is not sufficiently "urgent" and currently the plan leaves a "significant" looming gap between expected emissions and legislated carbon

targets from the 2020s. It is argued that it will be necessary for new policies need to be in place by 2020 in order to avoid a 'climate policy cliff edge'.

- 2.2.7 Despite the concerns on the current Government performance, recent YouGov surveys continue to show consistently high levels of public support for the use of renewable energy. Data in November 2017 from the Government's Energy and Climate Change Public Attitudes Tracker shows that public support for renewable energy technologies remains high and continues to grow, with 82% of respondents expressing support (up from 77% in the most previous survey). Only 3% of the public is opposed to the deployment of renewable energy, with 1% strongly opposed.
- 2.2.8 This contrasts sharply with support for other technologies. 33% of the public is reported to support nuclear energy, with 25% opposed. Only 13% of the public support the extraction of shale gas, with 36% opposed.
- 2.2.9 Background primary legislation for the UK on climate changes includes the *Climate Change Act*, which was passed in 2008 restating the UK Government's commitment to renewable energy in the move towards a low carbon economy. The Act looks ahead to reductions in UK carbon dioxide emissions by 2050 of 80% and makes these legally binding on the Government. A new system of annual open and transparent reports to Parliament was introduced with the Committee on Climate Change providing an independent progress report to which the Government must respond (the first of their reports was issued in October 2009) (Committee on Climate Change, 2009). This will ensure that the Government is held to account on its progress towards each five year carbon budget, and towards the 2020 and 2050 targets. As part of the Act, the Government is committed to more investment in renewable energy to provide business and industry confidence for investment decisions.
- 2.2.10 The Energy Act (2008) was introduced in November 2008 to implement the legislative aspects of the *Energy White Paper 2007* (DECC, 2007b). The Act was developed to ensure UK legislation supports the long term delivery of energy and climate change strategies as set out in the *Climate Change Act* (2008). Among its provisions are changes to the *Renewables Obligation*, including the introduction of 'banding', and the introduction of tariffs for renewable electricity.

- 2.2.11 The 2011 **Renewables Roadmap** (DECC, 2011a) identifies the actions required to set the UK on a path to achieving the deployment of renewable energy, required under the *Renewable Energy Strategy* (DECC, 2009), set out below.
- 2.2.12 Whilst on and offshore wind, marine energy, biomass electricity and heat, heat pumps and renewable transport are expected to be core to the deployment of renewables in attaining the capacity targets required by 2020, solar PV is identified as making a contribution to the targets alongside hydro and geothermal heat and power. In a case study on solar PV, the Roadmap 2011 identifies that “*The Government believes that solar PV could potentially have a role to play in larger-scale renewables deployment in the future.*” (DECC, 2011a, page 15, paragraph 3).
- 2.2.13 Under the Roadmap, the UK Government expects to remove the key barriers impeding the deployment of renewable energy and will monitor the effectiveness of the Roadmap deployment plan and prepare iterative, annually updated Roadmaps across all technologies in order to review progress and introduce other technologies as they are required.
- 2.2.14 Accordingly, the *Roadmap* was updated in 2013, when it was reported that renewable electricity has seen dramatic growth since the Roadmap was published in 2011. Some of the headlines of the update are as follows:
- Renewable energy continues to support economic growth through green jobs and investment. Since 2010, £31 billion worth of private sector investment in renewable electricity has been announced with the potential to support over 35,000 jobs across the UK.
 - The UK has made progress against the 15% target introduced under the 2009 RES. In 2012, 4.1% of UK energy consumption came from renewable sources, up from 3.8% in 2011.
 - Renewable electricity capacity grew by 38% to 19.5 GW in Quarter 2 of 2013 with growth being seen across the majority of sectors.
 - Electricity generation from renewable sources for the period July 2012 to June 2013 reached 47.5 TWh, increasing by 24% compared to the same period the year before.
 - Renewables’ share of electricity generation was a record 15.5% in Quarter 2 of 2013.

- The *Renewables Obligation* (RO) and *Feed in Tariffs* (FITs) scheme continue to play a crucial role in supporting the accelerated deployment of commercial and small scale renewable electricity capacity in the UK.
- DECC surveys have shown consistently high levels of public support for the use of renewable energy.

2.2.15 In 2009 the UK Government issued the **Renewable Energy Strategy** (RES) 2009. Whereas the Government had been working towards a UK 2020 target of 20% of electricity coming from renewable sources, the adopted scenario in the RES is that this figure is now to be raised dramatically. The Government has signed up to the EU requirement that 15% of all energy consumed in the UK should be from renewable sources by 2020.

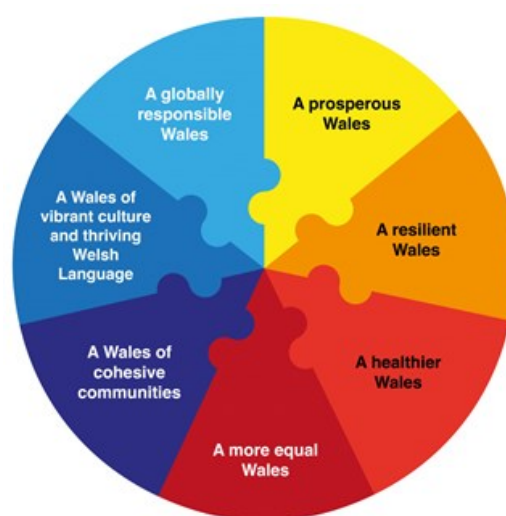
Wales Devolved Primary Legislation

2.2.16 In April 2015 the Welsh Assembly passed into law **The Wellbeing of Future Generations (Wales) Act**, which is primary legislation requiring all Wales' based public bodies - such as local authorities, health boards etc - to put long-term sustainability at the forefront of their thinking, and to work with other organisations and the public to prevent and tackle ongoing social, environmental and economic problems. The Act was decided upon following an extensive consultation period known as the National Conversation. It passed into law in April 2015.

2.2.17 In order to create a more sustainable Wales, public bodies must work towards seven Well-being Goals and enact the five Ways of Working, shown in the attached image. One fundamental challenge in Wales which is a focus of the Act is dealing with climate change and the potential impact upon the prosperity and quality and life in Wales.

2.2.18 Further relevant recent legislative introductions for Wales include:

- The Environment Act 2016 – which sets in place an obligation on Welsh Government to reduce greenhouse gas emissions by 80% against 1990 levels by 2050.



- The Planning (Wales) Act 2015 – which gives Ministers the power to determine strategic energy projects 10 - 50MW
- Wales Act 2016 – which will further enable Ministers in 2019 to determine energy projects up to 350MW onshore alongside new electricity distribution infrastructure up to 132kW.

Policy Statement, Lesley Griffiths 2017

- 2.2.19 Welsh Government does not have devolved powers on energy policy and is therefore unable to take an independent approach to supporting a local carbon economy. In essence energy policy and regulation, including financial support mechanisms, are determined in Westminster. Planning policy, a matter under devolved powers to the Welsh Ministers, is therefore a fundamental mechanism by which Welsh Government can steer the nation to a low carbon future.
- 2.2.20 It is anticipated therefore that Lesley Griffiths, Cabinet Secretary for Energy, Planning and Rural Affairs, sees planning policy as central to the realisation of new Welsh targets, announced in September 2017, for the generation of 70% of electricity consumption from renewable energy by 2030. Currently, renewables generates 32% of consumed electricity. Her statement outlined the following ambitions for Wales: The ability to meet our needs from clean energy is the foundation for a prosperous low carbon economy. *“This is why I am today announcing targets to focus action across the country and to capture the benefits for Wales. Firstly, I am setting a target of Wales generating 70 per cent of its electricity consumption from renewable energy by 2030. Secondly, I am setting a target for one Gigawatt of renewable electricity capacity in Wales to be locally owned by 2030. Finally, by 2020 I expect new renewable energy projects to have at least an element of local ownership. I believe these are stretching but realistic targets which will help us to decarbonise our energy system, reduce long-term costs and deliver greater benefits to Wales.”* These ambitious targets will require the delivery of significant volumes of new renewables capacity which would require processing through the Welsh planning regime.
- 2.2.21 The Policy Statement on Local Ownership was published in early 2020 by said Minister, which requires that all new development proposals for clean energy should maintain a degree of local ownership.

Energy Wales: A Low Carbon Transition (2012)

- 2.2.22 Policy document, *A Low Carbon Transition*, issued in March 2012, sets out the Welsh Government's vision for a sustainable low-carbon economy. Principally the policy statement makes commitments in several areas, including the following considered relevant to this potential scheme:
- 2.2.23 Improving the planning and consenting system for energy developments by simplifying the process by April 2013, ensuring statutory agencies improve their services to developers and pressing for greater devolution of energy consenting powers.
- 2.2.24 Putting in place an improved energy infrastructure and an energy programme to deliver on the Welsh Government's energy agenda.
- 2.2.25 Ensuring that Wales benefits economically from energy developments through intervention is supply-chain development, business support, skills and training, procurement, innovation, research and development.
- 2.2.26 On the basis of this policy document, the Welsh Government is continuing to place considerable emphasis on the drive to make Wales a low carbon economy.

Welsh Planning Policy on Renewable EnergyPlanning Policy Wales 2018 (ed. 10)

- 2.2.27 Planning Policy Wales (PPW) was originally brought out in 2002 and has been through several reissues. The currently PPW was published in November 2018 (Edition 6). The PPW is supported in Wales by topic based Technical Advice Notes, which are addressed further below.
- 2.2.28 PPW sets out current land use policy for Wales and it provides the strategic policy framework for the effective preparation of local planning authorities' development plans. PPW 2018 is considered instrumental by the Welsh Government in achieving those ambitions set out within the Low Carbon Revolution Statement described above.
- 2.2.29 Chapter 12.8 addresses sustainable energy, and reinforces the Assembly Government's commitments to renewable electricity production targets for Wales by formally incorporating the figures in the 2010 *Energy Policy Statement*, removing the figures of 4TWh per annum by 2010 and 7TWh per annum by 2020, and replacing them with an

aspiration for a total of 2000MW of installed capacity for onshore wind by 2015/17, with a further 6000MW of offshore wind by 2015/16.

Technical Advice Note 8 (TAN8) 2005

- 2.2.30 Technical Advice Note 8 (2005): Renewable Energy provides technical advice to supplement the policy set out in PPW. No guidance on large ground-mount solar is included in the TAN.

2.3 Neath Port Talbot Local Development Plan

Neath Port Talbot CBC Local Development Plan (2011-2026) (January 2016)

- 2.3.1 A series of policies are presented in the Neath Port Talbot Local Development Plan, adopted in 2016, against which new development proposals will be considered. These policies include:

- **Strategic Policies**

- Policy SP1, Climate Change: clause 4 of this policy sets out that “*Provision will be made for the County Borough’s appropriate contribution to renewable and low carbon energy generation*”, whilst also identifying that increased flood risk will be addressed through avoiding development on land at risk to flooding and the fragmentation of habitats will be minimised.
- Policy SP2, Health.
- Policy SP3, Sustainable Communities: this policy supports the delivery of sustainable, healthy and cohesive communities, including the conservation of the countryside.
- Policy SP14, The Countryside and Undeveloped coast: specifying the protection of landscapes and agricultural land from inappropriate development outside settlement limits and the protection of Special Landscape Areas.

- Policy SP15, Biodiversity and Geodiversity: whereby important habitats, species and sites of geological interest will be protected, conserved, enhanced and managed
 - Policy SP17, Minerals: includes for the safeguarding of coal resources.
 - Policy SP18, Renewable and Low Carbon Energy: whereby the council sets out that a proportionate contribution to meeting renewable energy targets will be made whilst balancing the effects upon the environment and communities.
 - Policy SP20, Transport Network: the criteria among which state that development will be restricted that would have an unacceptable impact on highway safety and requiring new development proposals to be designed to provide safe and efficient access and promote sustainable transport.
 - Policy SP21, Built Environment and Historic Heritage: under which the built environment and historic heritage will be conserved through, among other criteria, safeguarding features of historic and cultural importance, and inclusive of landscape of historic importance.
- **Topic based Policies**
 - Policy SC1, Settlement limits: outside of settlement limits (which is the case with this scheme) development is permitted where under clause 10 it is associated with energy infrastructure.
 - Policy EN2, Special Landscaped areas: in which it is stated that *“Development ... will only be permitted where it is demonstrated that there will be no significant adverse impacts on the features and characteristics for which the SLA has been designated.”*
 - Policy EN6, Important Biodiversity and Geodiversity sites: whereby such sites will be protected from development except where development could not reasonably be located elsewhere and where the benefits of development outweigh the natural heritage importance of the site.
 - Policy EN7, Important Natural Features: under which development proposals are required to avoid adverse effects to natural features such as trees,

woodlands and hedgerows, and where removal if avoidable mitigation measures are agreed with the planning authority.

- Policy M1, Development in mineral safeguarding areas: whereby any development within mineral safeguarding areas (which is the case with this development) will only be permitted under certain circumstances
- Policy RE1, Criteria for assessment of renewable and low carbon energy development: which states under clause 4 that all renewable energy proposal must demonstrate that measures have been taken to minimise impacts upon visual amenity and the natural environment; there will be no unacceptable impacts upon residential amenity; the development will not compromise highway safety; it will not interfere with Utility and safeguarding systems; and proposals for site restoration are considered satisfactory.
- Policy TR2, Design and Access of New Development: where development proposals will be permitted where the safety and use of the highways network is not compromised and Transport Assessments are provided with applications.
- Policy BE1, Design: for which all development proposals are expected to demonstrate high quality design that “... *fully takes into account the natural, historic and built environmental context and contributes to the creation of attractive, sustainable places*”.

2.3.2 The following **Supplementary Planning Guidance** would also be material considerations for any new development proposal:

- Renewable and low carbon energy (July 2017): see relevant details below.
- Design (July 2017): this SPG provided detailed guidance on how the Council seeks to implement the BE1 design policy, inclusive of focussing on the design principles of several criteria.
- Landscape and Seascape (May 2018): which sets out guidance on conducting landscape and visual assessments, including visualisation tools, how to account for landscape in the design process, and detailed guidance on Special Landscape Areas (SLAs). Any proposals within SLAs need to demonstrate there will be no significant

adverse impacts on the features and characteristics for which the SLA has been designed. The features of the Mynydd y Garth SLA, in which the development is located, are described as follows:

- SLA1 includes the upland moorland plateau of Mynydd y Garth, Cefn Gwrhyd and Mynydd Carnllechart.
- The upland plateau is dominated by pennant sandstone and underlying Productive Coal Formation, up to 357m AOD.
- The land cover is predominantly grazed pasture with deciduous tree cover especially along riparian corridors.
- Restricted access to the area provides a remote, exposed yet settled and tranquil feel.
- It has a high scenic upland mosaic landscape quality with panoramic views out from higher elevations. It is relatively unspoilt with a strong sense of place which adds to the integrity and coherence of the landscape.
- The landscape bears evidence of evolution over millennia to include: prehistoric cairns, ancient field systems, trackways, industrial spoil heaps and small pockets of afforestation which combine to evoke a timeless quality of great scenic, cultural value and strong cultural identity. Gwrhyd road has a local dialect meaning the Long Man which is a possible reference to a prehistoric burial site.
- The post medieval boundary stones and sheep folds are features of the upland which is one of the three most important and significant funerary and ritual landscapes in south Wales. The criteria to be considered in the design phase include: character and appearance; wider context; materials and landscaping; highway safety and amenity; retention of important features; community safety; integrated transport and linkages; resource efficiency; drainage systems; and inclusive design.
- It is one of the key non forested areas within the County Borough that is classified as “tranquil” but which has seen considerable erosion in area of tranquillity since 1997.

- Biodiversity and Geodiversity (May 2018): the general principles to be applied in planning and development include:
 - *Anticipate all potential biodiversity impacts of a development proposal as early as possible in the planning process;*
 - *Protect designated sites, protected species, priority habitats and species;*
 - *Ensure development does not lead to a net loss of biodiversity;*
 - *Identify opportunities for a development to contribute towards a net gain for biodiversity and protection of geodiversity;*
 - *Take account of indirect and cumulative impacts;*
 - *Recognise the importance of, and protect wildlife corridors and stepping stones;*
 - *Prevent and aim to reverse habitat fragmentation and species population isolation.*

Neath Port Talbot CBC Renewable and Low Carbon Energy: Supplementary Planning Guidance (July 2017)

- 2.3.3 Under Section 3 of the SPG on renewable and low carbon energy, those planning matters that will be considerations for new development proposals are described in detail. These matters include landscape and visual amenity; cultural and historic heritage impacts, biodiversity, grid connections, mitigation measures, potential conflicts with coal resources, and the design principles applied in minimising visual intrusion.
- 2.3.4 Section 5 addresses community benefits, explaining through reference to Planning Policy Wales that the principle of community benefits is supported but that these are not material considerations unless meeting the tests of Circular 13/97 *Planning Obligations*. Whilst the history of wind development in the County has precipitated local guidance on community benefits, such funds are not a mandatory requirement of developers and explains that they are voluntary contributions only. Paragraph 5.0.9 explains that the viability of new schemes is less certain as subsidies reduce, inferring that making monies available for such funds becomes more challenging. A developer will be expected to demonstrate to the Council why community benefits are not provided if this is the case.

3. DESCRIPTION OF PROPOSED DEVELOPMENT

3.1 Introduction

- 3.1.1 This section of the Environmental Report describes the construction, operation and decommissioning stages of the proposed Mynydd y Gwhryd Solar Farm, the boundary of which is located on land known as Mynydd Gwyrhyd, a moorland area situated between the villages of Tairgwaith/Gwaun Cae-Gurwen and Cwm-twrch Uchaf (see *Figure 1-1*).
- 3.1.2 Included herein are details of the likely construction programme of the scheme, the components of construction activities, resource requirements, transportation details, site operation and site decommissioning details. It is recommended that this report is read in conjunction with the Mynydd y Gwhryd Solar Farm Design and Access Statement, which describes the design principles that have underpinned the selection, evolution, design and specification of the solar farm scheme.
- 3.1.3 Following is a Glossary of Terms referenced in this section:

Table 3-1 **Glossary of Terms**

Abbreviation	Full Text
AC	Alternating Current
AOD	Above Ordnance Datum
CO ₂	Carbon Dioxide
DC	Direct Current
DAS	Design and Access Statement
ER	Environmental Report
GIS	Geographical Information System
Ha	Hectares
kWh	Kilowatt hour
MW	Megawatt
PV	Photovoltaic
NPTCBC	Neath Port Talbot County Borough Council

3.2 Overview of the Development

- 3.2.1 The proposed scheme principally comprises a series of solar arrays hosting multiple solar panels that are connected to the local grid via the existing wind farm substation. The arrays are raised on mounting frames, which are pile-driven into the ground. The arrays are accessed by a site track which would be utilised for construction and operation &

maintenance. The solar farm will generate electricity from the sunlight, and the electricity will be fed into the local distribution network for consumption in the local region.

- 3.2.2 The height of the ground across the proposed development area for the solar farm ranges between 290m to 320m Above Ordnance Datum (AOD). The location of the proposed development boundary for the solar farm is shown on the on *Figure 1-1 Site Location*.
- 3.2.3 The entire land-take requirement for the solar farm site within the planning boundary is approximately 3.39 hectares (ha), including all infrastructure, spacing between the solar arrays, access track, cable trench for the grid connection, and land required temporarily for the construction compound. The physical footprint of the new infrastructure such as switchgear/substation, inverters and cabling is approximately 916 sqm ha. The area of the solar arrays is not included in this calculation as grassland will continue to grow and be grazed as per current agricultural practices.
- 3.2.4 The planning application for the proposed Mynydd y Gwhryd solar farm seeks permission for the optimal capacity of scheme at the site. Such a scheme would approximate to 2.23MW, representing an annual electricity output of 2,219,505kWh (2219.5MWh), a calculation based upon solar irradiation levels for south Wales utilising PV Sol proprietary software, which itself draws upon long term (20 year) solar insolation records from weather recording stations in the region.
- 3.2.5 The maximum scale solar farm will be made up of approximately 6,972 solar panels. Individual PV solar panels will be arranged in module units typically made up of around 3 x 7 panels one above another in a landscape orientation on a mounting structure. The mounting system will be metal frame structures, which are expected to be anchored to the ground using piles. At this time there is no expectation of requirement for concrete foundations.
- 3.2.6 Solar panels will be installed in multiple rows which will be connected to the inverters/transformers, of which there will be 1 unit, containing up to 2 inverters, the location of which is shown on *Figure 1-2 Site Layout*. The inverter converts the solar current from Direct Current (DC) to Alternating Current (AC). The inverter in turn is connected via underground cable to the existing wind farm substation.
- 3.2.7 Battery storage will also be incorporated into the electrical configuration of the scheme. This will enable storage of generated power at times when the grid may be curtailed or

there is excess output, which can then be distributed back to the grid at other times when the restrictions do not apply. This allows a smoother delivery of exported power onto the grid.

- 3.2.8 Access to the site will be from the A474 to the west of the site. Vehicles will utilise the existing track to the wind farm, which is adjacent to the solar farm site.
- 3.2.9 Such tracks, which have sufficient width currently, may require some minor upgrading to comprise crushed stone over geotextile membrane. With a typical running width of 3.5m the track will accommodate all articulated loads and construction machinery through to the construction compound and into the site. New tracks within the site itself will be required to access, construct and maintain the inverter/transformer unit, and to enable on-going maintenance of the fields. Access tracks will be constructed as per the specification in *Figure 3-1*.
- 3.2.10 A temporary construction compound will be required for the construction phase only, the location of which is adjoining the site track from the farm through to the main development site. The compound will be required to provide materials and plant storage, some parking and welfare facilities during the construction phase. Following the construction phase, this compound will be removed and the area fully reinstated to grassland.
- 3.2.11 See the Mynydd y Gwhryd Solar Farm Design and Access Statement for an understanding of the design and constraints parameters that have informed the evolution and final arrangement of the proposed scheme.
- 3.2.12 In summary the principal components of the proposed scheme and the associated landtake requirements are as follows:
- Area within planning red line: 39864sqm (3.99ha)
 - Length of Fence: 31627sqm (3.16ha)
 - Track area: 724sqm (0.07ha)
 - Track length: 222m
 - No. of tables: 332
 - Area of single table in plan: 31.3sqm

- Total area covered by tables: (332no. x 31.1sqm =) 10392sqm (1.04ha)
- Footprint area of inverters: 35.4sqm
- Footprint area of battery storage/conversion units: 138sqm
- Footprint of outdoor education centre: 20sqm
- Footprint of temporary construction compound.: 1082sqm
- Total area of utilised land = 916sqm

3.3 Construction Phase

Construction Programme

3.3.1 An indicative installation timetable is included in Table 3.2 below. The installation programme may potentially be affected by weather conditions and the availability of plant and materials but it is anticipated that the overall construction period will last approximately 12 weeks, with some elements of the construction activities overlapping.

Table 3-2 **Indicative Construction Timetable (weeks)**

Task	1	2	3	4	5	6	7	8	9	10	11	12
Ecological Protection												
Site Security and Setup												
Preparing access and internal tracks												
Structure												
PV Array Construction												
Grid Connection Works												
Large Components												
CCTV & other Security Measures												

Task	1	2	3	4	5	6	7	8	9	10	11	12
Commissioning and Testing												
Site Closure												

Site Tracks and Access

- 3.3.2 During construction all heavy commercial vehicles will approach the site from the A474, and will enter the site through an existing entrance, which was previously modified as part of the wind farm planning application.
- 3.3.3 The existing track along the Gwrhyd Road to the wind farm will be used. An additional 222m of new track will require laying, which would remain in situ for the duration of the development to allow continued access for operation & maintenance vehicles. Following creation of the track, reseeding and restoration practices will soften the finished effect of the track within two years. A typical cross-section of the proposed track is included in *Figure 3-1*.
- 3.3.4 Sediment control measures will be deployed during the works to ensure minimal impact to any on-site drainage ditches, where necessary. It is recommended that formulation of a Construction Environmental Management Plan (CEMP), which includes pollution prevention measures, should be a pre-commencement condition to a planning permission.

Temporary Construction Compound and Fencing

- 3.3.5 The construction compound will cover approximately 1,082m² in total and will be utilised solely for the duration of the construction phase. The location is shown in *Figure 1-2*. The construction compound will be temporarily surfaced as required using hardcore over a geotextile membrane, or other proprietary temporary surface matting, and fenced for security purposes. It will accommodate areas for the storage of plant and materials, as well as temporary site cabins and welfare facilities.

- 3.3.6 During the early phase of installation, temporary fencing may be located around other aspects of the site in order to ensure public protection from excavated areas and to secure on-site machinery and equipment.

Solar Panel Design and Mounting System

- 3.3.7 It is proposed that high quality poly-crystalline silicon photovoltaic modules or similar would be installed at the solar farm, harnessing the diffuse nature of light and direct sunlight. Each panel is expected to measure approximately 1m x 1.67m. The solar cells are expected to be dark blue/black in colour and the panels would have an anti-reflective coating to maximise light absorption and minimise glare or reflection.
- 3.3.8 The final selection of the specific PV panels will depend upon panel availability, cost and commercial preference at the time of site procurement, if permission is granted. A drawing of a panel is included in *Figure 3-2* and following is an illustration of a typical solar panel:

Plate 1: Typical Solar Panel



- 3.3.9 The final design of the module units, rows and arrays will depend on the modules selected and detailed design of the scheme. However, in general the individual panels are expected to be arranged in module units comprising 3 panels in landscape orientation, one above the other, by 7 panels wide, joined together by the mounting frame, with

multiple module units connected to form rows or arrays. Each row would be elevated above ground on the mounting frame, with the bottom (southern) edge at a height of 1m above ground level and the top (northern) edge at a height of 2.6m (depending on site specific ground conditions). The module units would be orientated south, and are expected to have an inclination/angle of 30 degrees in order to optimise the installed capacity within the available site.

- 3.3.10 The metal mounting frame would be installed on piles across the site, as demonstrated in *Figure 3-2 Indicative Panel and Table Array*. The piles are driven into the ground up to a depth of 1.5m using a hydraulic ram, although depths may differ slightly depending on ground conditions. It is unlikely that concrete foundations for the mounting frames will be required. The construction piling process for the entire site is expected to take no more than three weeks. Following is an illustration of a typical metal mounting system:

Plate 2: Standard Metal Mounting Frame



- 3.3.11 The mounting frames are usually fabricated from extruded aluminium, and the piles will be galvanised steel.

Inverter, Transformer and Switchgear Station

- 3.3.12 Series of solar panel arrays are connected to an inverter/transformer station, with a single station anticipated for this development, located as shown on *Figure 1-2*. The

station is likely to house up to 2 inverters/1 transformer depending on the final capacity of scheme delivered; included within the station will be switchgear equipment necessary for the connection to the local distribution network.

- 3.3.13 The station will be housed in a single prefabricated container, approximately 15.5m long, 2.2m wide and 2.5m high, raised upon metal feet and located upon a concrete plinth.
- 3.3.14 Electrical cabling departs via the transformer to the existing on-site substation facility.
- 3.3.15 It is proposed that the external finish of the inverter station would be an appropriate shade of green.
- 3.3.16 The location of the inverter station unit is central to the site, in order to reduce its' prominence and minimise electrical losses, and is shown on *Figure 1-2*. The arrangement for a typical station containing the inverters, transformer and switchgear is shown in *Figure 3-3* and *Figure 3-4*.

Battery Storage

- 3.3.17 The development proposal includes for the incorporation of battery storage units at the site. The battery storage units (6.1m long x 2.9m high x 2.4m wide) will enable more consistent export of power to the local electricity grid by storing energy at times when the grid is unable to accept generated power and exporting the power when the grid network is operating normally. During periods of grid limitations typically generated power would have to be dumped; but a storage system allows the retention of generated power for exported at a later time thereby giving more consistency to power delivery and carbon offsetting.
- 3.3.18 The proposed storage will be housed in sealed containers and would be likely to compose lithium-ion batteries which are designed to have a long lifespan without maintenance and which have a high energy density and efficiency. The battery enables the conversion of electrical energy into chemical potential energy for storage. When the energy is required for use, this energy is converted back from chemical energy into electrical energy and release back into the grid. Power Conversion Units (12.2m long x 3.4m high x 2.4m wide) will also be required alongside the battery containers. It is expected that there will be 5 battery storage units and 2 power conversion units.

- 3.3.19 A typical drawing of a battery storage unit is shown in *Figure 3-5* and a typical Power Conversion Unit in *Figure 3-6*.

On- and Off-site Electricity Cabling

- 3.3.20 The modules generate Direct Current (DC) electricity. DC cabling will be supported by the mounting structure along the back of each row of panels and will run underground between rows and to the inverter substation. At the inverter station the DC current will be converted to Alternating Current (AC) by carefully specified inverters, which would then be relayed on to the existing on-site substation which forms the starting point of connection to the distribution network, again using underground cabling to the final Point of Connection (PoC).
- 3.3.21 Underground cables will be laid in a trench at a depth of no greater than 1.0m, specifically dug for this purpose and reinstated once construction of the solar farm is completed. The specification for the cable trench is in accordance with the DNO requirements. *Figure 3-7 Cable Trench Cross Section* demonstrates the indicative cable trench designs for the on-site cabling arrangements throughout the development site.

Fencing and Security Measures

- 3.3.22 Appropriate security to the site during operation will be required to protect the public from exposure to the dangers of electrical equipment. Accordingly, a security fence will be installed around the site in which the PV arrays and other site infrastructure are located. Fencing will be approximately 2.5m in height and is expected to consist of wooden posts and wire mesh as shown on *Figure 3-8 Security Fence and Camera*. There will be a number of securely locked gates in the fence, to allow access for maintenance vehicles, operatives and the landowner.
- 3.3.23 The fencing will be installed on piled ground posts, with some occasional concrete footings for anchoring of the structure.
- 3.3.24 Gaps underneath the fence will be allowed on occasions around the site perimeter fence to allow small mammals to enter/exit the site area.

- 3.3.25 Infrared CCTV cameras, coloured green if required, will also be installed around the site. The indicative locations of these are shown on *Figure 1-2*. These will be mounted at a height of 2.8m on posts at locations within the security fence. Their locations will be agreed with a security expert prior to installation and will be positioned solely to look inwards towards the solar site and will be incapable of viewing any private residences. A typical pole mounted CCTV unit schematic is shown in *Figure 3-8*.
- 3.3.26 There will be no security lighting as the security cameras are motion activated infra-red cameras to ensure security and safety.

Substation and Grid Integration

- 3.3.27 The electricity generated by the solar farm will be relayed from the inverter/transformer station via underground cable to the existing wind farm substation. Thereafter the existing underground cable will export the generated power to grid network.

Plate 3: Existing Wind Farm Substation Building



Community Education Facility (CEF)

- 3.3.28 The proposed development includes for the provision of an on-site renewables community educational facility (CEF) for visits to the solar farm and wind energy project by school and wider public groups. The purpose of the CEF would be to host such groups

in a covered environment at which representatives of AAT would present factual information on the renewable energy infrastructure across the Site, explain how the technologies operate, how they are connected to the grid, and how such infrastructure is part and parcel of community action on replacing fossil fuel power and as a measure to help in efforts to combat climate change.

- 3.3.29 The CEF, located close to the existing substation with clear views over the solar arrays and the wind turbines (see *Figure 1-2*) would be constructed from local, sustainable building materials in a design that is visually appealing and conducive the requirements of all groups, including those with disabilities. Included within the facility would be a seating area and information panels. An illustration of such a facility is presented in Plate 4 below. At this current time a planning drawing of the facility has not be prepared, but the Applicant would be pleased to agree to a pre-commencement condition to a planning consent requiring approval of an appropriate facility design with the planning authority.

Plate 4: Illustration of Typical Educational Facility for Schools and the Wider Public



Copywrite: Down to Earth

Construction Practices and Sequencing

- 3.3.30 The construction works will be undertaken by an engineering contractor that is experienced in the construction of solar farms or similar projects. Consequently, the

installer will be familiar with the on-site requirements described above and with the most effective methods of installation. The contractor will be required to demonstrate experience of methods of construction that are safe, efficient, and which minimise the impact on the environment. All construction works will be carried out in accordance with CIRIA's guidance document Environmental Good Practice on Site (Fourth Edition), British Standard (BS) 5228-1 and BS5228-2:2009, and Part 4: 1992: Noise and Vibration Control on Construction and Open Sites.

3.3.31 The stages for construction of the solar farm are as follows:

- Construction team **briefing workshop** on best practice and environmental protection, including the necessity for caution such as construction under or close to overhead electricity lines and the strict management of construction vehicles into and out of the site;
- Establish any **ecological protection measures** required, e.g. drain protection, protection of hedgerows and on-site habitats. Such measures are likely to include fencing and site notices;
- Preparing **site access and internal tracks**: following an inspection of existing farm tracks, widening and strengthening of such tracks using geotextile membranes and crushed aggregates;
- **Site security and setup**: establish the construction compound with associated facilities, and install temporary security fencing to ensure public safety and to securitise on-site stored materials. Geotextile membranes overlain with crushed aggregate are likely to be required within the compound to ensure adequate ground conditions for construction vehicles and staff. Welfare facilities will be stand-alone and would not need to be connected to any established utilities;
- **PV Array Construction and Cabling**: specialised drilling machinery will install the ground screws upon which the mounting systems are erected. Above-ground electrical cabling and the solar panels are then installed on the metal mounting frames. Cable trenches are excavated to a depth of 1 metre which then enable the electrical connection of the arrays through underground cables to the inverter stations and thence on to the transformer/ switchgear housings;

- Required areas for the inverters and switchgear housings are **excavated and concrete plinths** laid. The pre-fabricated units are erected and electrical infrastructure installed;
- **Grid connection works** to the distribution operator substation are then undertaken, including cabling, plinth and further pre-fabricated building. From the substation the connection to the distribution network will be enabled by the operator;
- **CCTV & other security measures**, including permanent on-site fencing around the scheme, will be installed;
- The solar farm will then undergo **testing and subsequent commissioning**, resulting in first export to the distribution grid;
- **Site reinstatement and closure**: the temporary construction elements of the scheme will be removed and the site reinstated in accordance with the practices described in the agreed pre-commencement Construction Environmental Management Plan.

3.3.32 If it proves to be necessary to store diesel fuels and oils on site during construction, this will be within a bunded area in accordance with the provisions of an agreed pre-commencement Construction Environmental Management Plan (CEMP). The CEMP would be expected to describe the proposed practices and measures to be incorporated into construction practices for the scheme. The balance of plant contractor will be required to conform to these practices as part of the installation contract, and any further measures as prescribed by the planning authority.

Site Reinstatement and Habitat Improvements

3.3.33 Following completion of the construction works, the temporary site compound and storage area will be removed and the land returned to its current usage. Any trenches dug for cabling purposes will be back filled and reinstated.

3.3.34 Any temporary track way matting, temporary fencing etc. used during construction would be removed and the land reseeded with a grass seed mix or allowed to reinstate to its former condition as appropriate.

3.3.35 The whole site will be cleared of contractors' materials, plant and equipment, and waste materials associated with the solar farm. Areas of ground affected during the

construction will be reinstated with topsoil and reseeded as necessary. Details of the site reinstatement practices should be set out in the CEMP. In addition, improved habitats for biodiversity and site screening will be delivered in accordance with the specifications sets out in the Chapter 5, Preliminary Ecological Appraisal of this Environmental Report.

Construction Noise

- 3.3.36 On account of the remote location of the proposed scheme and the short duration of construction activities, potential construction noise levels are not anticipated to breach statutory thresholds and there will be no incidence to residential amenity in the local area. Please see Chapter 10 for further details.

Vehicle Movements during Construction

- 3.3.37 Based on experience of similar developments, indicative estimates of the likely heavy goods vehicle loads associated with construction and reinstatement of the development have been estimated as a worse-case. The expected vehicle movements and proposed traffic management measures are included in Chapter 8 of this ER.

3.4 Operational Phase

Site Operation

- 3.4.1 During the daylight hours, the panels on the solar farm generate a direct current that is transferred to the inverter/transformer stations from where, as an alternating current, it is stepped up to the required frequency for export to the distribution network. This power will be used by businesses and consumers for their electrical requirements. The solar farm will cease operation in the night-time although the battery storage facility may release power to the grid outside of daylight hours.
- 3.4.2 The solar farm encompasses no moving parts or obtrusive features during operation; it is in essence a static development that quietly and efficiently will generate power from the sun.
- 3.4.3 Maintenance of the solar array will comprise of the following activities:

- Supplementary grass cutting (if sheep grazing does not suffice to keep grass sufficiently short);
- Maintenance of drainage features;
- Reading of the electricity meter; and
- Replacement of any damaged panels (rare) and washing of panels (typically twice a year). Any cleaning of panels would employ environmentally friendly detergents that would not damage the environment.

3.4.4 As there will be no waste produced during the operational phase of the solar farm, no on-site waste storage or waste collection is required during the operational phase.

3.4.5 Given the requirements for operation and maintenance, traffic generation during the operational phase will be minimal.

3.4.6 The site will be securely fenced and monitored with security cameras in order to prevent unauthorised access and to ensure public safety. There will be no security lighting on site, in order to minimise the impact on wildlife and avoid effects to visual amenity.

Operational Noise

3.4.7 Due to the remote location of the proposed scheme and very limited operational noise (in proximity to the inverter units) only during daylight hours levels, the scheme will be operated without incidence to residential amenity. Please see Chapter 10 for further details.

Monitoring and Performance

3.4.8 The solar farm installation will be designed to be operated remotely with only occasional visits for operation and maintenance purposes. A visual inspection of the system is expected to be carried out twice a year, and the arrays will be cleaned with de-ionised water as necessary. Periodic testing of the systems will occur in line with statutory requirements and the operator's own procedures. Throughout the operational period of the solar farm the output will be remotely monitored to ensure that the arrays are performing as they should.

3.4.9 In order to ensure the effectiveness of the solar farm for energy generation across its lifetime, the applicant will put in place an Operation and Maintenance (O&M) contract with providers in the region. The essential elements of the O&M contract are likely to entail the following:

- Ensure only qualified personnel carry out O&M activities;
- Procure and make available materials (including spare parts), electricity supplies and communications requirements at the site in order to ensure the ongoing effective operation and control of the solar farm;
- Monitor the solar farm for its safety, performance and production in order to keep the scheme operational with the best possible performance;
- Make good any repairs or replacements to components of the scheme within a reasonable timeframe; and
- Be responsible for the care and security of the site in order to protect the on-site solar infrastructure and ensure public protection.

3.5 Decommissioning Statement

3.5.1 PV panels typically have a design life of around 30 years and the scheme would be operated for as long as the planning permission allows up to this limit.

3.5.2 Following the operational phase, the operator would either seek to repower the site (entailing new generating infrastructure) through a new planning permission, where national and local policy is still supportive of such schemes, or the scheme would be decommissioned and the site returned to its former use. The proposed development is designed such that it can be easily decommissioned and elements of the site infrastructure recycled. The value of the reusable or recyclable materials, including the high grade aluminium frames, will contribute significantly towards decommissioning costs. In addition, funds would be accrued by the operator to ensure that sufficient finance is available to cover the costs of decommissioning.

3.5.3 The scheme comprises numerous recyclable materials, including glass, semiconductor material, steel, aluminium and copper. When the solar plant reaches the end of its operational life, these component parts can be dismantled and recycled.

3.5.4 Decommissioning of the solar farm would proceed in reverse order to the installation process, as follows:

- The solar farm will be disconnected from the electricity distribution network.
- The following items shall be disconnected/dismantled and processed through an approved recycling/disposal operator:
 - PV modules
 - Site aboveground and underground electrical interconnection and distribution cables
 - Aluminium racking
 - Steel support posts
 - Electrical and electronic devices, including transformers and inverters
 - Fencing
- Access roads can remain on site should the landowner choose to retain them, or be removed and the gravel reused either on or off site.
- PV Module Collection and Recycling: recycling will recover a large percentage of the glass, and ferrous and non-ferrous metals used in solar modules. This process ensures compliance with the EU Directive 2012/19/EU on Waste Electrical and Electronic Equipment (WEEE) and The Waste Electrical and Electronic Equipment Regulations 2013 (as amended).
- Cabling: the cabling is installed underground and it is preferable to avoid disturbance and environmental impacts through leaving it in situ.
- Racking Structure Removal and Recycling: The racking structure consists of aluminium horizontal base rails and steel posts. All of these materials can be recycled and/or reused. Removal of the aluminium racking is straightforward, with simple primary fixings. The steel posts are pile driven and can be extracted quickly and safely.
- Substation Building: the concrete base and brick/composite structure that houses the substation will be demolished and removed.

- 3.5.5 The ecological management areas would be retained on an ongoing basis in the interests of continuing biodiversity enhancement.
- 3.5.6 Decommissioning will require up to 6 weeks to complete, at which stage agricultural practices will be able to resume across the site area.

3.6 Safety

- 3.6.1 Prior to commencement of the construction works the appointed Contractor will be required to prepare a construction phase Health and Safety Plan to integrate with the pre-construction information prepared by the Applicant.
- 3.6.2 The Health and Safety Plan will address the safety of local residents and the public. Such a plan is likely to explain that the construction site is to be secured when it is not manned, that excavations are secured against potential intrusion by the public, and the public is kept at a safe distance during the solar farm installation.
- 3.6.3 Emergency services vehicle access will be addressed within the Plan drawn up between the Contractor and the Applicant. The Contractor shall liaise with all of the Emergency Services prior to works commencing to ensure that an approved emergency plan is in place and access for emergency services vehicles will be maintained at all times during the construction period. If mobile phone communications are to be used the Contractor will be required to verify that a good signal is available at all times.

4. LANDSCAPE AND VISUAL ASSESSMENT

4.1 Introduction

- 4.1.1 This landscape and visual assessment (LVA) has been undertaken by Viento Environmental Limited, a landscape practice and environmental consultancy based in Shrewsbury, Shropshire. Viento Environmental Limited has conducted assessments on over twenty-five solar farm applications across the United Kingdom and Ireland over the last five years and specialises in the assessment of renewable energy proposals including wind farms, solar farms and anaerobic digestion facilities, having worked on over one hundred renewable energy projects in the last fifteen years.
- 4.1.2 This chapter presents the findings of an LVA that has been undertaken to identify the likely effects of the proposed Mynydd y Gwryd Solar Farm on the landscape character and visual amenity of the locality.
- 4.1.3 The assessment has concentrated on a 3.0km radius study area for landscape character, landscape designations and visual amenity. This is a development of limited height and extent within a landscape of undulating topography and with frequent forestry plantations, as such a 3.0km radius study area is considered sufficient to identify all likely significant effects on landscape and visual amenity (see **Figure 4-2**). Initially, a 5.0km radius study area was identified, but further investigation noted that the screening effects of topography local to the site determined that a 3.0km radius study area would be sufficient (see **Figure 4-1** identifying a 5.0km radius study area) for conducting a robust assessment.
- 4.1.4 This assessment is illustrated by **Figures 4-1 – 4-12** and supporting information is provided in **Appendices 4-1 – 4-2**. All references are listed at the end of this chapter.

4.2 Method of Assessment

Assessment Approach

- 4.2.1 The assessment has examined the effects of the proposed solar scheme in the context of the existing landscape and visual baseline within 3.0km of the proposed site centre. The

study area and viewpoint locations have been chosen through consultation with Neath Port Talbot Council ('the Council').

- 4.2.2 There are no other operational or permitted solar farm developments within the study area, nor are there known to be any other proposed solar farms within the study area. However, there are a few other renewable energy developments within the study area. Mynydd y Gwrhyd Wind Farm comprises two wind turbines, each approx. 100m to tip, the closest of which is located approximately 0.2km northeast of the proposed solar farm. In addition, a single wind turbine 86.5m to tip is located approximately 1.5km southwest of the proposed solar farm, with a second much smaller 27m to tip turbine located close by at Perthi-gwynion Farm, also 1.5km from the proposed site. Mynydd y Betws Wind Farm is located approximately 3.5km west of the proposed solar farm, beyond the study area, and comprises 16 wind turbines.

Good Practice Guidance and Data

- 4.2.3 The methodology used in this study conforms to the *Guidelines for Landscape and Visual Impact Assessment, Third Edition* (LI/IEMA, 2013) (GLVIA3). The assessment has drawn on information provided within the local development plans that cover the study area (see list of references) and the landscape character assessments which cover the study area (see list of references).
- 4.2.4 GLVIA3 recommends that for non-EIA development, an assessment of significance is not required and that the assessment should also be proportionate to the scale of the project and the nature of its likely effects. The term 'significant' has been used within this assessment and in this context refers to effects which are material to the determination of the application.

Assessment Process

- 4.2.5 The assessment has involved information review, consultations, fieldwork observations and photography, and computer-based data processing and analysis, and has been undertaken in several stages, as presented in the following sections of this chapter:
- Predicted effects and mitigation – a review of the visual characteristics of the proposed development to identify the aspects with the potential to give rise to

landscape and visual effects and a description of the measures that have been incorporated into the design to mitigate these effects.

- Landscape and visual context – a review of the existing landscape and visual baseline of the study area, to identify landscape character, landscape designations and visual receptors in the study area as well as any other solar farms within the baseline.
- Visual analysis – visibility analysis using computer-generated zones of theoretical visibility (ZTVs) to identify the locations in the study area from where the Mynydd y Gwryd Solar Farm could, in theory, be visible (based on topography only), and a viewpoint analysis to predict the changes to views as a result of the proposed development from a selection of viewpoints that represent the main visual receptors in the study area.
- Landscape assessment – an assessment of the potential effects of the proposed development on landscape fabric, landscape character and landscape designations in the landscape study area.
- Visual assessment – an assessment of the potential effects of the proposed development on the visual amenity of receptors in the visual study area.
- Conclusions – a summary of the findings of the landscape and visual assessments.

Prediction Methodologies

- 4.2.6 The prediction methodologies for the viewpoint analysis, landscape assessment and visual assessment are provided at the beginning of each of these sections.

4.3 Predicted Effects and Mitigation

- 4.3.1 A detailed description of the proposed development and information on the installation of the various components of this proposed development are provided within Chapter 3.
- 4.3.2 It is the visual appearance of the proposed development and associated activities, and any proposed changes to the existing landscape fabric, that are the main aspects of the development with the potential to affect landscape and visual amenity and these are

summarised below for each of the three distinct phases of the development – the construction, operational and decommissioning phases.

Construction Phase

- 4.3.3 The construction phase would be approximately 12 weeks (depending on weather conditions), and the activities and temporary features with the potential to affect landscape character and/or visual amenity would include:
- Construction of a new site access track through the solar arrays (approximately 222m long and 5.2m wide).
 - Creation of temporary construction compound.
 - Installation of security fencing around the site with one entrance gate/access point and CCTV cameras on posts at strategic points within the fencing.
 - Installation of the solar arrays (including fixed metal mounting frames and solar panels).
 - Excavation and construction of foundations and plinths for the battery storage containers, power conversion units and inverter/ transformer housings.
 - Construction of an outdoor education facility.
 - Installation of the battery storage containers, power conversion units and inverter/ transformer housings.
 - Excavation of cable trenches.
 - The presence of the HGV deliveries to site and movement of vehicles on-site.
 - Testing and commissioning of the solar panels and electrical infrastructure.
 - Reinstatement works around areas disturbed by the works and any site enhancement works, including the proposed planting measures.
- 4.3.4 The visual effects of the various aspects of the construction phase would be temporary, intermittent and short-term with each aspect lasting only part of the 12 week construction programme.
- 4.3.5 As the site is currently pastureland, there would be limited loss of ground vegetation as a result of the temporary construction activities. Ground disturbance would be minimised

by good site management with full reinstatement over all temporarily disturbed and excavated areas.

- 4.3.6 The likely effects of the construction phase on the existing landscape fabric of the site are considered in the Landscape Assessment below.

Operational Phase

- 4.3.7 The main elements that would be visible over the anticipated 30-year operational life of the proposed development would be:

- On-site access and maintenance track.
- Solar panels - black/dark blue in colour, with anti-reflective coating to maximise light absorption and minimise glare or reflection. Individual solar panels are likely to be arranged in module units typically made up of 6 panels in a landscape orientation at an approximate angle of 30° on a mounting structure. This will be a fixed metal frame, which will be anchored to the ground using piles. Each row would be elevated above the ground on the mounting frame, with the modules being approximately 1.0m above ground level at the bottom edge and a maximum of 2.6m high at the top edge of the panels. The panels would be positioned in regular rows facing south as per the layout plan submitted as part of the application. These rows would be spaced approximately 5-6.5m apart.
- Inverter/transformer cabins – there are two options for this structure. Option 1: a combined unit measuring 12.2m long by 2.4m wide and 3.4m tall, finished in mid to dark green colour or similar. Option 2: separate inverter and transformer units, with the inverter measuring 6.1m by 2.4m wide (not including vents) and 3.4m tall, and the transformer measuring 2.2m by 4.0m and 2.7m tall. Both would be finished in mid to dark green colour or similar.
- Power conversion unit – two container units, measuring approximately 12.2m by 2.4m and 3.4m tall, finished in mid to dark green colour or similar.
- Battery storage container - five container units, approximately 6.0m long by 2.4m wide and 3.4m high, finished in mid to dark green colour or similar.

- Outdoor education centre – a circular, grass roofed structure approximately 3-4m in diameter and 2.5m – 3m in height, constructed from natural materials such as wood.
- Perimeter security fencing consisting of posts and wire mesh, similar in appearance to deer fencing, approximately 2-2.5m high and with one access gate (approximately 4-5m wide).
- Infrared CCTV cameras, mounted at a maximum height of 2.8m on posts within the security fencing.
- Periodical visits to the site for operational and grounds maintenance purposes - approximately 6 visits per year typically involving a commercial van type vehicle.
- Planting proposals – along the existing field boundary to the south of the proposal, a belt of mixed native shrubs are proposed, such as hawthorn and holly.

4.3.8 From a landscape and visual perspective, the number of visual elements present over the anticipated 30-year operational phase has been minimised by siting the solar arrays on land adjacent to existing forestry, by siting the inverter/ transformer cabins within the centre of the proposed development and by siting the battery storage and power conversion units adjacent to the existing substation.

4.3.9 Therefore, the aspects that are likely to give rise to significant effects on landscape character and visual amenity during the operational phase are the solar panels and mounting structures, inverters/transformers, power conversion units and battery storage containers, and these are considered in the Landscape and Visual Assessments below.

Decommissioning Phase

4.3.10 The decommissioning phase would be undertaken over a period of up to 6 weeks, and the activities and temporary features which would be visible on the site would include:

- The presence of HGV deliveries collecting materials and components from the site and the movement of vehicles on-site.

- Dismantling and removal of the solar arrays, inverters/ transformers, power conversion units, battery storage containers and associated fencing. Excavation and removal of associated hardstanding areas/plinths (where applicable).
- Reinstatement works over the other areas disturbed by the works.

4.3.11 The effects on landscape and visual amenity during the decommissioning phase would be minimised by the limited duration of the works, by removing above ground structures and materials where applicable, and by restoring the ground disturbed by the works.

4.4 Landscape and Visual Context

4.4.1 The proposed development site is located on pasture land near Mynydd Uchaf and set between the villages of Cwmgors (located approximately 2.2km west of the proposed site) and Pen-Rhiw-fawr (approximately 2.0km to the east). There are few residential properties nearby; the closest is Pen-y-waun (approximately 0.4km to the south). Other properties at greater distances are Fforch Egel Farm (1.0km to the south) and Blaen-egel-fawr (1.1km to the southwest). The site is accessed via a private track, with the nearest public road located approximately 1.2km to the southwest. The nearest public footpath is situated approximately 100m southwest of the site and runs along a track and through forestry near Pen-y-waun. However, it should be noted that site work found that the route of the track is entirely blocked by forestry.

4.4.2 The landform across the site slopes gradually down to the southeast from heights of approximately 310m AOD down to 290m AOD. This forms a small part of a long ridge of high land with Mynydd Uchaf the nearest high point at 357m AOD, approximately 1.1km to the west. This high ridge continues to the north and northeast around Penlle'r-fedwen at 320m AOD and to the west of Pen-Rhiw-fawr at 331m AOD and then curls southeast to form a second ridge at Cefn Gwrhyd and Graig Ddu at 282m and 296m AOD respectively. A further area of high land extends into the southwest of the study area along Mynydd y Garth at a height of 321m AOD. Between this high land in the centre of the study area, a green valley is formed with large amounts of vegetation (some of which is plantation forestry) and a few isolated residential properties. A disused pit is also evident on the valley slopes. The majority of the settlement is concentrated on the edges of the study

area, on lower ground beyond the high land, located in association with the main transport routes.

- 4.4.3 Woodland cover is absent from the highest land within the study area, although much woodland and forestry can be found in the valleys and valley slopes. A significant area of tree cover is situated close to the site around Blaen-egel Wood and Fforch Egel Farm, part of which is coniferous forestry, but part is deciduous woodland. Forestry is also located adjacent to the Bryn-melyn Pit east of the site. Additional deciduous woodland is located across the valley floor near Rhyd-yr-egel, and along the route of the River Egel through the valley. At greater distances from the site, further deciduous woodland is found within the west of the study area associated with the landfill west of the A474 and at Cwm Du in the south. A large area of coniferous forestry is found on the slopes of Mynydd Allt-y-grug in the southeast of the study area.
- 4.4.4 There are distant views to the south from several parts of the study area, including areas adjacent to the site. However, views of the main settlements are not available due to the nature of the local topography. Furthermore, views to the north are also largely contained by the high land around Mynydd Uchaf and Penlle'rfedwen. Several distant wind farms to the west and southeast are visible from some high points within the study area.

Landscape Fabric

- 4.4.5 The proposed development would be located within three fields of rough pasture. Post and wire fencing forms the existing field boundaries to the site field. Therefore, the only landscape element within the site is the pastureland itself.

Landscape Character

- 4.4.6 The site is located within Neath Port Talbot County Borough, with the 3km radius study area also contained almost entirely within this borough. A very small part of the western edge of the study area is located within Carmarthenshire County Council area.
- 4.4.7 Natural Resources Wales (NRW) has produced a landscape character map for the whole of Wales, with 48 national landscape character areas (NLCAs) defined. NRW has also provided detailed descriptions of each NLCA (NRW, 2014). The proposed development

and the study area would be entirely located within NLCA 37 – South Wales Valleys, as indicated on **Figure 4-3**.

4.4.8 The NRW NLCA describes the key characteristics of the South Wales Valleys as:

- **Extensive Upland plateaux** – typically wild and windswept, often with unenclosed tracts, running roughly north-south as ‘fingers’ parallel between intervening deep valleys.
- **Numerous steep-sided valleys** - typically aligned in parallel, flowing in southerly directions, shaped by southward flowing glaciers, leaving behind distinctive corrie ('cwm') and crag features. Major rivers include the Tawe, Taff and Rhymney.
- **Ribbon urban and industrial areas in valleys** – in places extending up valley sides and to valley heads. The area is sometimes regarded as being part of a ‘city region’. Middle and eastern valleys tend to be the most heavily and continuously developed, e.g Rhondda Valley. The uplands by comparison have little or no settlement.
- **Extensive remains of heavy industry** – with a mix of derelict, preserved and largely redeveloped areas, notably for coal mining. Preserved as heritage (World Heritage Site) at Blaenafon this typically includes old railway alignments, buildings and former tips.
- **Contrast of urban valley activity next to quiet uplands** – urban areas typified by busy roads, new developments, traffic noise, night lighting relative to the adjacent wilder, remoter, quieter uplands.
- **Large blocks of coniferous plantation and deciduous woodland fringes** – covering many steep hillsides and hilltops, most notably in the middle to western portion of the area, providing a softer contemporary landscape where there was once industry.
- **Heather, rough grassland and steep bracken slopes** – dominate many plateaux and are grazed mainly by sheep. Much is common land.
- **Improved pastures on some lower valley sides** - grazed by sheep and some dairy cattle.

- **Field boundaries** - dry stone walls mark the boundary of common land while fields on lower slopes are bounded by dense hawthorn hedges, interspersed with swathes of broadleaved woodland.
- **Transport routes restricted to valleys** – the intervening topography makes valley to valley travel difficult, except at heads and bottoms of valleys. Occasionally there are roads that climb steeply over passes with dramatic views and ‘hair pin’ bends.
- **Iconic cultural identify** – many popular images of a tough, rugby-playing, religious, radically-minded society still remain associated with the South Wales Valleys, however today’s post-industrial, internet-connected reality is somewhat different.

4.4.9 In addition, the five separate LANDMAP layers have also been considered and identified covering the site as follows:

- Cultural – NPTCL044 - Western High Ridge: Mynydd y Garth, Cefn (overall evaluation – high),
- Geological – NPTGL010 - Upper Clydach valley (overall evaluation – high),
- Historic – NPTHL041 - Clydach Cwm Du (overall evaluation – high),
- Landscape Habitats – NPTLH013 - Mosaic (overall evaluation – high),
- Visual and Sensory – NPTVS541 - Cefn Gwrhyd - enclosed (overall evaluation – high).

4.4.10 Neath Port Talbot LANDMAP Landscape Assessment (NPTCBC, White Consultants, 2004) is a detailed landscape assessment across the borough utilising the five LANDMAP layers and identifying 53 Landscape Character Areas (LCAs). Those covering the site and study area are illustrated in **Figure 4-4**.

4.4.11 The site itself is located entirely within LCA 28 – Slopes of Cefn Gwrhyd and Cwm Egel. Detailed extracts describing this LCA are contained in **Appendix 4-1**. A summary and key characteristics are set out below. Key characteristics include:

- Rolling Upland valleys ranging from approximately 250m AOD to approximately 100m AOD.

- Grazed pasture with significant deciduous tree cover.
- Hedgerows are the dominant field boundaries on the lower ground, with stone walls at higher elevations.
- Tracks and single, minor roads provide access to a scattering of farmsteads.
- Extensive areas of SSSI at Gwrhyd Meadows and Coed Cwm Du.
- Two large, regular blocks of coniferous plantation have strong visual impact.
- Scattering of disused mines and quarry workings.
- Remote yet settled and tranquil landscape.

4.4.12 The area is described as “... *landcover is predominantly grazed pasture with deciduous tree cover a significant element especially along riparian corridors. Many hedges are outgrown throughout the lower ground, leaving trees with fences as definitions of the field pattern. Walls are present on higher ground and these are also generally in poor state of disrepair. In the lower, more settled areas, there is a scattering of farmsteads and around these boundaries are generally more intensively maintained. There are two large, regular blocks of coniferous plantation, which create a contrast to the grain of the landscape. On higher ground encroachment of bracken has occurred adding to an impression of reduced management. There are a number of disused mines and quarry workings scattered through this landscape, creating locally both disruption and visual interest. There is only one minor road which passes through the area and numerous others that terminate at farmsteads. This restricted access provides a sense of remoteness to a settled and tranquil landscape.*”

4.4.13 As set out above and also within the LANDMAP Landscape Assessment report, the LANDMAP aspect layers covering this area are predominantly evaluated as ‘high’. LANDMAP uses four evaluation levels: outstanding, high, moderate and low.

4.4.14 A further five LCAs are located within the study area and extracts describing these LCAs are contained within **Appendix 4-1**, with a summary of the key characteristics of each set out below.

4.4.15 It is useful to note that the landscape character methodology for this assessment uses five sensitivity levels (High, high/medium, medium, medium/low and low) and so the equivalent sensitivity level for each LCA is contained in brackets in italics below).

4.4.16 **LCA 29 – Mynydd Uchaf, Mynydd Garth and Cefn Gwrhyd:**

- Open upland common land ranging from approx. 150m to 357m AOD.
- Simple sheep grazed landcover.
- Visual link from surrounding valleys.
- Mountain fence is predominantly broken drystone wall reinforced with post and rail fence.
- One of the three most important and significant funerary and ritual landscapes in Glamorgan.
- SSSI upland heath habitats.
- Gwrhyd Chapel.
- Overall LANDMAP evaluation generally high. (*High/ medium within this assessment.*)

4.4.17 **LCA 30 – East Pit:**

- Extensive opencast mining.
- Remnants of Habitats and Archaeological site persist.
- Screening mounds with decorative planting.
- Overall LANDMAP evaluation generally medium. (*Medium within this assessment.*)

4.4.18 **LCA 31 – Cwm Aman:**

- Open upland valley ranging from 100m AOD to approx. 200m AOD.
- Predominantly grazed pasture with increasing coverage of coarse grasses.
- Fields enclosed primarily by overgrown hedges.
- Disturbance from opencast reclaimed evident infringement of East Pit works.
- High percentage of Welsh speakers.

- The Character of the Settlements of Lower Brynamman and Cwmllynfell is typical of forming mining villages.
- Overall LANDMAP evaluation generally medium. (*Medium within this assessment.*)

4.4.19 LCA 32 – Cwm Gors/ Gwaun Cae Gurwen/ Abernant:

- Upland valley ranging from 250m AOD to 150m AOD.
- Predominantly grazed, with invasive bracken, scrub and coarse grasses.
- River corridor runs through the valley with significant riparian vegetation.
- High percentage of Welsh speakers.
- Disused mineral tramroads, levels and quarries and former colliery.
- Settlements of Gwaun Cae Gurwen and Cwmgors stretch along the A474.
- Overall LANDMAP evaluation generally high. (*High/ medium within this assessment.*)

4.4.20 LCA 33 – Cwm Twrch:

- Upland valley ranging from approx. 280m AOD to 100m AOD.
- Enclosed upland grazing, bounded by outgrown hedges.
- Significant deciduous cover through lower reaches contains views.
- Small settlements and dwellings line the A4068.
- Pockets of localised disturbance created by disused mine works.
- Overall LANDMAP evaluation generally high to medium. (*High/ medium within this assessment.*)

4.4.21 Detailed descriptions for the five LCAs within 3.0km of the proposed development, as defined within the Neath Port Talbot LANDMAP Landscape Assessment covering the study area, are provided in **Appendix 4-1** and an assessment of the effects of the proposed development on the character of these character units is provided in the Landscape Assessment below.

Landscape Designations

4.4.22 There are no national landscape designations in the 3.0km radius study area. However, **Figure 4-3** indicates the location of the Brecon Beacons National Park approximately 3.5km northeast of the site at its closest point.

4.4.23 Within the Neath Port Talbot Local Development Plan (2011-2026) (January 2016) Special Landscape Areas have been designated as a local landscape designation under Policy EN2 which states:

“Development ... will only be permitted where it is demonstrated that there will be no significant adverse impacts on the features and characteristics for which the SLA has been designated.”

4.4.24 There are six areas designated as SLAs within Neath Port Talbot borough. One of these SLAs is located across the site and the study area: SLA 1 Mynydd y Garth.

4.4.25 Supplementary Planning Guidance (SPG) *Landscape and Seascape* (May 2018) sets out guidance on conducting landscape and visual assessments and detailed guidance on SLAs. The features of the Mynydd y Garth SLA, in which the site is located, are described as follows:

- SLA1 includes the upland moorland plateau of Mynydd y Garth, Cefn Gwrhyd and Mynydd Carnllechart.
- The upland plateau is dominated by pennant sandstone and underlying Productive Coal Formation, up to 357m AOD.
- The land cover is predominantly grazed pasture with deciduous tree cover especially along riparian corridors.
- Restricted access to the area provides a remote, exposed yet settled and tranquil feel.
- It has a high scenic upland mosaic landscape quality with panoramic views out from higher elevations. It is relatively unspoilt with a strong sense of place which adds to the integrity and coherence of the landscape.
- The landscape bears evidence of evolution over millennia to include: prehistoric cairns, ancient field systems, trackways, industrial spoil heaps and small pockets

of afforestation which combine to evoke a timeless quality of great scenic, cultural value and strong cultural identity. Gwrhyd road has a local dialect meaning the Long Man which is a possible reference to a prehistoric burial site.

- The post medieval boundary stones and sheep folds are features of the upland which is one of the three most important and significant funerary and ritual landscapes in south Wales. The criteria to be considered in the design phase include: character and appearance; wider context; materials and landscaping; highway safety and amenity; retention of important features; community safety; integrated transport and linkages; resource efficiency; drainage systems; and inclusive design.
- It is one of the key non forested areas within the County Borough that is classified as “tranquil” but which has seen considerable erosion in area of tranquillity since 1997.

4.4.26 This is discussed in more detail in relation to the proposed development later within this chapter. Further information on planning policy is contained within Chapter 2.

Visual Receptors

4.4.27 The visual receptor locations within the 3.0km radius study area are visible on **Figures 4-1 and 4-2** and include:

- Settlements – the villages of Cwmgors, Gwaun-Cae-Gurwen, Tairgwaith, Cwmllynfell, Ystradowen, Cwm-twrch-Uchaf and Pen-Rhiw-fawr.
- Individual residential properties – scattered houses and farmsteads.
- Local public rights of way – footpaths, bridleways and byways open to all traffic (BOATs).
- Public highways – including the A474, A4068 and a network of local roads.

4.4.28 The Countryside and Rights of Way (CRoW) Access Lands Maps accessed through the NRW website ¹ have been checked and show several areas of access land within 3.0km of the site. These areas are illustrated on **Figure 4-3**. The closest of these is across Mynydd Uchaf, approximately 50m north of the proposed development at its closest point. This

¹ <http://lle.gov.wales>

area extends across Mynydd Uchaf, through Penlle'rfedwen and Cefn Gwrhyd. A further area of access land covers Mynydd y Garth, with a further area extending across parts of the opencast workings in the north of the study area around Taigrwaith.

4.5 Visual Analysis

Theoretical Visibility Analysis

- 4.5.1 The Zone of Theoretical Visibility (ZTV) for the proposed development has been generated using a computer-based inter-visibility package, the Ordnance Survey Digital Terrain Model (DTM) with height data at 5m intervals and a model of the proposed solar panels. This ZTV is illustrated within **Figure 4-2**. For this exercise, three points within the development boundary were used denoting the broadest extents and/or the highest points of the development as targets for the ZTV. These points and their height above ground level (AGL) are listed on **Figure 4-2** for reference. The ZTV extends out beyond the 3.0km radius from the proposed development centre in order to illustrate the potential visibility of the proposal over an area beyond the study area.
- 4.5.2 It is important to note that the ZTVs are based on bare terrain data and do not take into account the screening effects of minor topographic features, vegetation such as woodland, forestry and hedgerows, or built structures, and therefore tends to over-emphasise the extent of potential visibility, providing a worst case scenario. In reality, these surface features would fragment and reduce the extent of most of these zones of theoretical visibility, and may also reduce the amount of the proposed development visible from any given location.
- 4.5.3 The ZTV suggests that potential visibility of the proposed development would be extremely limited, with the majority of the study area gaining no visibility of the proposal due to the screening effects of intervening topography. However, parts of the landscape immediately surrounding the site and extending across land to the south would potentially gain views of the proposed development. The potential views of the proposal would be contained within the valley by the sloping topography.
- 4.5.4 It should also be noted that the ZTV does not illustrate the decrease in the scale of the proposed development with increased distance from the solar farm, and also takes no

account of surface features such as vegetation and built form. As a result, fieldwork and the viewpoint analysis are essential as a way of verifying the ZTV and undertaking a thorough assessment.

Viewpoint Analysis

Viewpoint Locations

- 4.5.5 Five viewpoints were selected in consultation with the Council as representing some of the most open and/or key locations or receptors within the 3.0km radius study area. Fieldwork found extremely few locations where open views towards the site were available due to the recurrent screening effects of intervening elements. These viewpoints are shown on the Landscape Character Plan and on the ZTV (**Figures 4-2 – 4-4**).
- 4.5.6 Figures illustrating each of the five viewpoint panoramas are provided in **Figures 4-5 – 4-7**. These five viewpoints are illustrated through labelled photographic panoramas which indicate the broad view from each location and other key features of the view. The viewpoints are also illustrated by photomontages and wireframes in **Figures 4-8 – 4-12**. These viewpoint illustrations show single frame images of the existing view towards the proposed site, they then show a wireframe view of the proposed solar farm on the bare earth terrain. This is to indicate how the topography between the viewpoint and the site may affect the potential visibility of the proposal. The final image in the viewpoint sequence illustrates the photomontage view of whether the proposal would be visible in the current context of existing screening (vegetation, forestry, built form and topography). In addition, some of the viewpoints (Viewpoints 1, 4 and 5 (**Figures 4-8, 4-11 and 4-12**)) indicate through a further photomontage the planting proposed as part of the application at approximately 5 years growth.
- 4.5.7 A detailed description of the viewpoints and the potential changes that would occur at each location through the introduction of the proposed development are contained within **Appendix 4-2**.
- 4.5.8 These findings are summarised below in **Table 4-1**. The findings in **Table 4-1** take into account the screening effects of intervening topography, existing vegetation and built form and assume excellent visibility conditions. These findings separate the potential

effects at the end of the construction period with those five years post construction to clearly indicate the change in potential effects arising as a result of the proposed planting. This assessment is based on a timeframe approximately five years post construction in order to assume the growth of the new planting to approximately 2.5m in height.

- 4.5.9 Those landscape and visual effects that would potentially be significant in accordance with the methodology set out within **Appendix 4-2** are highlighted in grey in **Table 4-1** below. As this shows, none of the landscape and visual effects would potentially be significant from any of the viewpoints.

Table 4-1 Summary of Landscape and Visual Effects

Viewpoint Information				Landscape Assessment			Visual Assessment		
No	Location	NGR	Distance / direction to site	LCA (sensitivity)	Magnitude of change	Effects on landscape character	Receptors (sensitivity)	Magnitude of change	Effects on visual amenity
1	Track by Pen y Waun	272670 210110	0.3km/ N	LCA 28 (high/medium)	Slight adverse	Moderate adverse	A few residents (High)	Slight	Moderate+
							Walkers (High/ medium)		Moderate
Five years post construction:				LCA 28 (high/medium)	Negligible adverse	Moderate/ minor+ adverse	A few residents (High)	Negligible	Moderate
							Walkers (High/ medium)		Moderate/ minor+
2	Mynydd Uchaf	272165 210400	0.5km/ E	LCA 29 (high/ medium)	Negligible adverse	Moderate/ minor+ adverse	Walkers (High/ medium)	Negligible	Moderate/ minor+
Five years post construction:				LCA 29 (high/ medium)	Negligible adverse	Moderate/ minor+ adverse	Walkers (High/ medium)	Negligible	Moderate/ minor+
3	Footpath SW of Fforch Egel Farm	272720 209320	1.1km/ N	LCA 28 (high/ medium)	None	None	Walkers (High/ medium)	None	None

Five years post construction:				LCA 28 (high/medium)	None	None	Walkers (High/ medium)	None	None
4	Footpath across Cefn Gwrhyd	273100 209215	1.3km/ N	LCA 29 (high/medium)	Negligible adverse	Moderate/ minor+ adverse	Walkers (High/ medium)	Negligible	Moderate/ minor+
Five years post construction:				LCA 29 (high/medium)	Negligible adverse	Moderate/ minor+ adverse	Walkers (High/ medium)	Negligible	Moderate/ minor+ adverse
5	Local road on Cefn Gwrhyd	273030 208775	1.7km/ N	LCA 29 (high/medium)	Slight adverse	Moderate adverse	Motorists (Medium)	Slight	Moderate/ minor+
Five years post construction:				LCA 29 (high/medium)	Slight adverse	Moderate adverse	Motorists (Medium)	Slight	Moderate/ minor+

Findings of Viewpoint Analysis

- 4.5.19 The site is located within large rough pasture fields bounded by post and wire fencing and on land sloping down into a valley. The high land on the top of the valley sides encloses the valley and screens it from longer distance views. As a result, the visibility of the proposal is contained within this valley landscape, and the good levels of vegetation in the form of deciduous woodland and coniferous forestry within the valley itself also serve to limit the visibility of the proposal from several parts of the valley. Consistently the five viewpoints (**Figures 4-5 – 4-7**) show good levels of vegetation within the existing views where the proposed development would often be partially screened even from views local to the site.
- 4.5.20 The viewpoint analysis has indicated no significant effects on landscape character or visual amenity from any of the five viewpoints, which include some of the closest publicly available vantage points from footpaths and residential properties in the vicinity of the site.
- 4.5.21 A more detailed discussion of the likely effects on landscape character and on the visual amenity of receptors is provided in the following section below.

4.6 Landscape Assessment

- 4.6.1 This assessment draws on the review of the predicted effects of the development, the landscape fabric of the site, the key characteristics of the LCAs, the purposes/objectives of the landscape designations, the viewpoint analysis and fieldwork observations, and discusses the significance of the predicted effects on:
- Landscape fabric of the site,
 - Landscape character,
 - The purposes of landscape designations.

Effects on Landscape Fabric

Prediction Methodology

- 4.6.2 Landscape fabric is composed of the physical components of the landscape (eg landform, land cover and landscape elements and features). Developments can bring about both direct and indirect effects on landscape fabric. Direct effects occur where changes to the fabric of the landscape arise as the result of physical disturbance, for example, the loss of landscape elements such as hedgerows, walls and trees. Indirect effects are consequential changes that are separated from the source of the change in a temporal or spatial manner, for example changes in vegetation downstream as the result of modifications to surface water patterns upstream in a catchment area.
- 4.6.3 This assessment of effects on landscape fabric considers the existing landscape fabric of the site and the predicted effects of the development, and makes a judgement as to whether there are likely to be any significant beneficial or adverse changes to landscape fabric based on the following two definitions:
- Significant beneficial effects on landscape fabric - could occur where important/ mature/ diverse/ distinctive components, which had previously been lost or degraded as the result of agricultural operations or other development, would be added, reinstated or improved.
 - Significant adverse effects on landscape fabric - could occur where existing important/ mature/ diverse/ distinctive components would be permanently lost (or long term temporarily lost) and the effects cannot be adequately mitigated.

Construction Phase

- 4.6.4 There would be very limited adverse effects on landscape fabric during the construction phase as the site is mainly open grassland and no mature vegetation would be removed to accommodate the proposed development. The only grassland lost would be to accommodate the access track, battery storage, inverter/transformer and power conversion units, equal to 916 sqm within a total area of grassland within the planning boundary equal to 3.99ha. Some areas of additional grassland will be subject to

construction traffic and on-site workers, but the grassland would not be removed and would restore fairly rapidly after construction is concluded.

- 4.6.5 Therefore, overall there would not be any significant (adverse or beneficial) effects on landscape fabric as a result of the construction phase.

Operational Phase

- 4.6.6 Once the construction phase has been completed, there would be a long-term loss of pastureland along the new site access track and beneath the inverters/ transformers, the battery storage containers and the power conversion units, equal to 916 sqm within a total area of grassland within the planning boundary equal to 3.99ha. However, the very limited areas affected are currently pastureland and so no important, mature, diverse or distinctive landscape components (such as hedgerows, trees etc) would be lost. Pastureland would remain intact below and between the solar panels. Furthermore, as part of the application, native planting would be introduced along approximately 150m length of existing field boundary to the south in the form of an 8m wide belt of hawthorn and holly. Therefore, overall there would be a slight beneficial effect on landscape fabric as a result of the operational phase. This planting would be retained throughout the operational life of the development.

Decommissioning Phase

- 4.6.7 There would be minimal disturbance of landscape features (again approx. 916 sqm) during this phase and there would be reinstatement of the ground over all ground disturbed by the works. The new planting as part of the application would remain after the decommissioning phase of the development. Therefore, there would be no significant adverse effects on landscape fabric during the decommissioning phase.

Effects on Landscape Character

Prediction Methodology

- 4.6.8 Landscape character is composed of physical, biological, historical and social components, combined with aesthetic and perceptual factors. This assessment of effects on landscape character considers the existing landscape character of the site and study area and the

predicted effects of the development, and assesses the area within which there is likely to be a significant change to landscape character, based on the following two definitions:

- Significant beneficial effects on landscape character - are likely to occur where the proposed development would materially enhance the quality (condition) of the landscape, would complement the existing character and/or where particularly valued characteristics, previously lost or degraded, would be reinstated.
- Significant adverse effects on landscape character - are likely to occur where the proposed development would become a key characteristic of the landscape, would contrast with the existing character, and/or where existing key characteristics would be permanently (or long-term temporarily) lost or changed and cannot be adequately mitigated.

4.6.9 The long-term addition of a renewable energy development into a landscape that is not currently characterised by built form will usually have an appreciable effect on the character of at least a localised area within that landscape. However, in this case this is an area of landscape that is partially characterised by built form, as will be discussed later in this section.

4.6.10 Whether such effects would be significant depends on the sensitivity of the landscape resource and the scale or magnitude of landscape effects, as predicted in the viewpoint analysis. Therefore, the findings of the viewpoint analysis are examined together with other fieldwork observations so as to determine the degree and extent of likely significant effects of the proposed development on landscape character within the various landscape character units in the study area.

4.6.11 Landscape units are often relatively large geographical areas and the screening effects of topography and vegetation will vary across each unit, so that the predicted extent of significant effects on landscape character will almost always be intermittent. However, with increasing distance from the proposed site, the proposed development will have a decreasing effect on landscape character and there will come a point where there are few or no further significant landscape effects. This is defined as the extent of the significant effects on landscape character.

Effects on the Landscape Character of the Site

- 4.6.12 There would be some short-term effects on the character of the site as a result of the construction phase, with the various activities lasting for only small parts of the overall timescale. The presence of construction machinery and activities would be transient (temporary, short-term and reversible) and ground and vegetation disturbance would be limited. Therefore, the effects of the construction phase would not result in a significant beneficial or adverse effect on the landscape character of the site.
- 4.6.13 The main effects on the landscape character of the site would occur during the operational phase as a result of the presence of the solar farm and associated elements. These parts of the proposed development would be located within the Slopes of Cefn Gwrhyd & Cwm Egel LCA - LCA28.
- 4.6.14 The elements of the proposal most likely to be visible across the surrounding area would be the solar panels, inverter/transformer buildings, power conversion units and battery storage containers, all of which would become key characteristics of the site landscape and, although few existing key characteristics would be lost or changed, they would contrast with the existing character such that these built forms would result in a significant adverse change to the character of the site landscape.
- 4.6.15 The decommissioning phase would be very short-term, ground disturbance would be very limited in extent and there would be the removal of the built form and the reinstatement of the ground on completion of the works, which should largely return the site to its current character. Therefore, the decommissioning phase would result in a significant beneficial effect on the landscape character of the site relative to the operational phase but no change in character relative to the current landscape character of the site.
- 4.6.16 However, it would be impossible to site a solar farm of this scale in Wales without significantly affecting the character of at least the site. The key issue is how far this change in landscape character would extend and whether this change would be acceptable.
- 4.6.17 As noted in paragraph 4.3.9 above, the aspects of the development that are likely to give rise to significant adverse effects on landscape character (and visual amenity) during the operational phase are the solar array panels, inverters/ transformers, power conversion

units and battery storage containers, and the effects of the presence of these features on the character of the wider landscape are considered below.

Effects on the Character of the Wider Landscape

- 4.6.18 As identified within the viewpoint analysis, there would be no significant effects on landscape character from any of the viewpoints, which are all located at a distance of 0.3km or greater from the site.
- 4.6.19 As identified within the Neath Port Talbot LANDMAP Landscape Assessment, LCA28 and LCA29 have both been identified broadly as high sensitivity. Within LANDMAP this is the second highest evaluation level out of four levels, with the levels ranging from outstanding as the highest, then high, medium and low.
- 4.6.20 However, it is worthwhile to note that this assessment uses five sensitivity levels; high, high/medium, medium, medium/low and low. As a result, LCA28 and LCA29 have been accorded a high/medium sensitivity level within this assessment, which equates with the LANDMAP sensitivity level for these two LCAs.
- 4.6.21 Therefore, as set out within **Table 2** of **Appendix 4-2**, for significant effects to occur on the landscape character of LCA28 or LCA29, a substantial or very substantial magnitude of change would need to occur. The viewpoints are all located within these two LCAs, with no potential visibility of the proposal found within any other LCA within the study area, as indicated on **Figure 4-4**. The viewpoints are located at a range of distances from the site: between 300m and 1.7km and consistently indicate that a slight or negligible magnitude of change is expected, which is well below the levels required to result in a significant effect on landscape character.
- 4.6.22 This can in part be explained by the context within which the site is situated. The proposal would be located within an area which is not an untouched upland landscape. Indeed it is an attractive and scenic area with pleasant contrasts between smooth upland plateaus and intimate and well vegetated valleys. However, the area does show clear markers of human influence, inclusive of the disused pit close to the site contrasting with the smooth lines of the surrounding upland, the angular lines of conifer blocks at odds with the softer lines of deciduous woodland, and the intrusion of pylons and wind turbines. These elements combine with the result that this low level and compact

proposed development would – from some locations - be a discernible addition to the landscape of LCA28, but would not be a dominant or jarring element. The proposal would not remove any of the key characteristics identified for this LCA, which are:

- Rolling Upland valleys ranging from approximately 250m AOD to approximately 100m AOD.
- Grazed pasture with significant deciduous tree cover.
- Hedgerows are the dominant field boundaries on the lower ground, with stone walls at higher elevations.
- Tracks and single, minor roads provide access to a scattering of farmsteads.
- Extensive areas of SSSI at Gwrhyd Meadows and Coed Cwm Du.
- Two large, regular blocks of coniferous plantation have strong visual impact.
- Scattering of disused mines and quarry workings.
- Remote yet settled and tranquil landscape.

4.6.23 As mentioned above, the character of the site landscape would be significantly affected by the proposed development. However, due to the nature of the local landform, the woodland and conifer blocks local to the site and the limited height of the proposed development, any significant effects on landscape character would be contained within the site and within approximately 150m of the landscape surrounding the site. The addition of the planting proposals to the south of the site would also assist with reducing these significant effects even further over time.

Effects on Landscape Designations

4.6.24 There are no national landscape designations in the 3.0km radius study area. However, **Figure 4-3** indicates the location of the Brecon Beacons National Park beyond the study area, approximately 3.5km northeast of the site at its closest point. As shown in Figure 4-3 there would be no visibility of the solar farm to the National Park and no adverse effects are anticipated.

4.6.25 As set out previously within paragraph 4.4.23 Policy EN2 states:

“Development ... will only be permitted where it is demonstrated that there will be no significant adverse impacts on the features and characteristics for which the SLA has been designated.”

- 4.6.26 Paragraph 4.4.25 above also sets out the features of the Mynydd y Garth SLA, in which the site is located.
- 4.6.27 Paragraph 4.6.22 above sets out the key characteristics of the landscape local to the site and notes that these would not be removed or altered as a result of the introduction of the proposed development. In addition, set out above within paragraph 4.6.28 are the features of the Mynydd y Garth SLA, none of which would be significantly affected by the introduction of the proposed development. This has been reiterated by the extremely limited potential visibility of the proposal, as illustrated in **Figure 4-2** and by the five viewpoints, each of which indicates that no significant effect on landscape character would result from the introduction of the proposal. As a result, it is considered that the proposed solar farm would comply with SLA policy.

4.7 Visual Assessment

Prediction Methodology

- 4.7.1 Visual amenity arises from a visual receptor's experience of the visual world around them and the value they place on a particular view or views. It is possible for a development to result in a significant change in the view from a particular location without resulting in a significant effect on the visual amenity of any receptors if, for example, the location is not accessible to receptors or if the view is acknowledged as having limited value.
- 4.7.2 For the purposes of this assessment, the predicted changes in views have been examined and significant effects on visual amenity have been identified where the proposed development would result in a significant effect on the primary view(s) at a location or along a route and the view(s) is/are valued and can be appreciated by receptors who are at that location for purposes that include the appreciation of the view(s).
- 4.7.3 Significant effects on visual amenity can be perceived as beneficial, adverse or neutral and this depends largely on the perceptions and opinions of the individual receptors and, to a certain extent, on the type of development proposed. The polarisation of public

opinion on renewable energy is such that it is difficult to define significant changes in a view as having a definitely beneficial or definitely adverse effect on visual amenity for all members of the public who may experience that view.

4.7.4 Accordingly, the assessment identifies whether the predicted effects on visual amenity would be significant or not significant and, whilst it is expected that these significant effects would be placed on the negative side of the planning balance, it is important that the broad range of public opinions on such effects is also taken into account in the decision making process.

4.7.5 This assessment draws on the predicted effects of the development, the viewpoint analysis and fieldwork observations, and discusses the significance of the predicted effects on the visual amenity of receptors at a range of visual receptor locations within the study area. Within this study area these include settlements, individual residential properties, local public rights of way and public highways.

Settlements

4.7.6 The viewpoint analysis found no significant effects on visual amenity for any high sensitivity receptors such as residents within their properties. The ZTV of the study area, illustrated in **Figure 4-2**, indicates that the proposal would be completely screened by topography from all settlements within the study area. As a result, no impacts on residents within these settlements would occur as a result of the proposed solar farm.

Individual Residential Properties

4.7.7 There are a few residents within farmsteads and individual properties within the vicinity of the proposed development. These include the closest at Pen-y-waun (approximately 0.4km to the south) and other properties at greater distances are Fforch Egel Farm (1.0km to the south) and Blaen-egel-fawr (1.1km to the southwest).

4.7.8 The ZTV in **Figure 4-2** indicates that topography would screen views of the proposal from both Blaen-egel-fawr and Fforch Egel Farm, and fieldwork has confirmed that in addition coniferous forestry is located in the intervening landscape between each property and the site, adding a further layer of screening.

4.7.9 Pen-y-waun is located to the south of the site, and is the closest property to the proposal site. The original farm buildings are now derelict and the residents currently reside in a caravan whilst they build their permanent home on the land holding. Viewpoint 1 is located on this land holding, just to the north of the position of the as yet unbuilt permanent dwelling. The viewpoint panorama shows the location of the caravan, positioned adjacent to existing woodland and with limited views north. Viewpoint 1 is located in a slightly more open position, adjacent to the route of a public footpath through the land holding. At a distance of 0.3km from the proposed development, the photomontages indicate that initially the solar farm will be visible, although partially screened by intervening vegetation on Pen-y-waun land. The visibility of the solar farm in the context of the existing wind farm would result in a slight magnitude of change and a moderate+ impact on the visual amenity of residents, which would not be significant. Planting proposals have been included with the application so as to further soften views of the proposal from this nearby property. These proposals include for a native belt of shrubs including hawthorn and holly along an intervening field boundary to the south of the site and a montage indicating the change in visibility at 5 years post construction has been included, where approximately 2.5-3m height is expected for this native planting. As a result, this planting would soften the visibility of the proposal from this locality to a negligible magnitude of change and a moderate impact, which would not be significant for these residents. It is also worth noting that the landform slopes down into the valley to the west and south of this residence, opening up panoramic views in these directions, which are currently the primary views.

Local Public Rights of Way

4.7.10 The nearest public footpath is situated approximately 100m southwest of the site and has a route along a track and through forestry near Pen-y-waun. However, it should be noted that site work found that the route of the footpath is entirely blocked by forestry to the south of Pen-y-waun and so only a short stretch is accessible. Viewpoint 1 illustrates the types of views available from the closest parts of the footpath to the site where a moderate or moderate/minor+ impact would occur for walkers, with no significant impacts expected. It is worth noting that views from the footpath are currently partly

characterised by wind turbines, both nearby at Mynydd y Gwryd Wind Farm but also further afield at Perthi-gwynion.

- 4.7.11 Other footpaths local to the site are represented by Viewpoints 3 and 4 at distances of 1.1km and 1.3km from the site, respectively as some of the closest public rights of way to the site located outside of woodland and forestry areas. As mentioned above, other sections of footpath in the vicinity of the site are generally located within woodland, although the dense forestry does not allow access along the routes. Viewpoint 3 illustrates the wealth of mature vegetation within the valley and the screening effects this vegetation can have, including screening the majority of Mynydd y Gwryd Wind Farm as well as entirely screening the proposed solar farm. Fieldwork was unable to find any location along this section of footpath between Fforch Egel Farm and the pond to the southwest where the proposed development would be visible. Viewpoint 4 (**Figure 4-6 and 4-11**) is located on the slopes of Cefn Gwryd and illustrates well the significant amount of vegetation on the valley floor and western slopes. The viewpoint is taken from a moderate elevation and so allows some more open views towards the site, where the solar farm would be seen in the context of the existing wind turbines and substation, where a negligible magnitude of change and a moderate/minor+ impact would occur, which would not be significant for walkers. The solar farm would be a low elevation development, limited in extent, occupying a limited proportion of panoramic views and would be seen in the context of existing man made features including the disused pit to the east.
- 4.7.12 Other footpaths within the valley would generally be located at greater distances from the site and follow routes along the lower slopes of the valley where intervening topography, woodland and forestry has been found to regularly screen views of the proposal. As the ZTV in **Figure 4-2** indicates, visibility of the proposed development would be extremely limited within the study area, with only a handful of footpaths with potential visibility of the proposal.

Public Highways

- 4.7.13 Public highways in the study area include the A474, A4068 and a network of local roads. As indicated in **Figure 4-2**, the proposal would only potentially be visible from Gwryd

Road across Cefn Gwrhyd, along an approximately 1.5km stretch of the road at a distance of approximately 1.5km from the proposal at its closest point. Potential visibility from the majority of other roads in the study area would be entirely screened by topography.

- 4.7.14 Viewpoint 5 (**Figures 4-7 and 4-12**) illustrates the view of the proposal from Gwrhyd Road, from the high point of the route at a distance of 1.7km from the proposal. At this location the entire solar farm would be discernible, seen in the context of the existing wind farm and disused pit, and as part of wide views incorporating a number of other wind turbines and pylons. The proposal would be discernible as a low elevation development, limited in extent and seen in association with other existing development where a moderate/minor+ impact would occur for motorists. This would not be a significant impact for these receptors where the focus is on following the route of the road and the proposal would be visible to the side of the direction of travel, where speed would be steady to swift.

4.8 Conclusions

- 4.8.1 This assessment has examined the likely effects of the proposed development on the landscape and visual amenity of the site and surrounding area within a 3km radius of the centre of the site.
- 4.8.2 Due to the nature of the local landform and the low elevation of the proposed development, visibility of the solar farm would be extremely limited, particularly when the good levels of mature local vegetation are considered.
- 4.8.3 The significant adverse effects of this proposed development would be limited to:
- Landscape character - the landscape on and around the site within approximately 0.15km of the proposed development.
- 4.8.4 Any impacts on landscape character would be extremely limited and contained due to the careful siting of the solar farm, with no significant effects on the features or characteristics for which the Special Landscape Area was designated within which the site is located.
- 4.8.5 There would not be any significant effects on landscape fabric or on the visual amenity of any residents, walkers or motorists through the area.

- 4.8.6 The five viewpoints have illustrated the very limited visibility of the proposed development, as well as the extremely limited impacts on visual receptors, with the majority of views of the proposal resulting in minor impacts or no visibility of the proposal.

4.9 References

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Landscape Institute and Institute of Environmental Management and Assessment (2013) Guidelines for Landscape and Visual Impact Assessment, 3rd Edition

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Welsh Government (2016) Planning Policy Wales, Edition 9

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5. PRELIMINARY ECOLOGICAL APPRAISAL

5.1 Introduction

- 5.1.1 Amber Environmental Consultancy Ltd was commissioned by Awel Aman Tawe in August 2018 to undertake an extended Phase 1 habitat survey of land at Mynydd y Gwrhyd to inform the design and planning aspects of a potential community solar farm located to the south of the Awel Wind Farm.
- 5.1.2 The development site (the 'Site') comprises several sloping rush dominated fields occasionally mowed and grazed by sheep adjacent to the common land where the community wind farm has been built. There are two ditches running through and around the boundary of the Site and a small pond in the south west corner. The fields are adjacent to the sub-station and one turbine, and have a central grid reference of SN 72620 10558. The Site will be accessed by the track constructed for the wind farm. Photographs of the Site can be found in Appendix 5-2.
- 5.1.3 The Site has previously been surveyed by Pryce Consultant Ecologists in 2003 for the construction of the wind farm which was completed in 2016. Wind farm and track construction was supervised by Siân Musgrave as Ecological Clerk of Works (ECOW).
- 5.1.4 A Phase 1 habitat survey was undertaken by Barry Stewart and Siân Musgrave on 8th August 2018. A re-assessment of ecological features was also undertaken in order to help inform the design of the scheme and provide mitigation as necessary.

5.2 Extended Phase 1 Survey

Desk Study

- 5.2.1 In order to compile background information on the Site and its immediate surroundings, South East Wales Biodiversity Records Centre (SEWBReC) supplied information for the Site and a 1km surrounding buffer, including:
- Sites with statutory designations
 - Sites with local designations

- Records of notable and protected species

Vegetation Survey

5.2.2 The aims and objectives of this study were:

- To identify the habitat and vegetation types occurring within the survey site
- To assess the potential impact of the proposal on these habitats and vegetation types
- To identify mitigation opportunities for habitat conservation, where necessary, to reduce the impacts of the development.

Survey Methodology

5.2.3 The vegetation types present within the site were assessed by Barry Stewart and Siân Musgrave using the methodology based on that described in the Handbook for *Phase 1 habitat survey – a technique for environmental audit* (Joint Nature Conservation Committee, 2010).

5.2.4 The abundance of species within each habitat type was determined using the DAFOR scale where D = Dominant, A = Abundant, F = Frequent, O = Occasional and R = Rare. The prefix L indicates 'Locally' e.g. LF = Locally Frequent.

5.2.5 Where possible, stands of vegetation and habitats have also been described and evaluated using the National Vegetation Classification (NVC), widely used by Natural Resources Wales and other wildlife organisations as well as ecological consultants to provide a scientific basis for the description and evaluation of habitats. Searches were made for uncommon, rare and statutorily protected plant species, those species listed as protected in the Wildlife and Countryside Act 1981 and indicators of important and uncommon plant communities.

5.2.6 The survey also included searches for invasive species, including those listed on Schedule 9 of the Wildlife and Countryside Act 1981, namely Japanese Knotweed *Fallopia japonica*, Indian Balsam *Impatiens glandulifera* and Giant Hogweed *Heracleum mantegazzianum*.

5.2.7 The results of the survey are presented at Figure 5-1 under the Survey Results section below and descriptions of each habitat type are given below. Species lists were compiled in the form of target notes (TN) in order to describe particular features of interest. These

lists are reproduced at Appendix 5-1, but key and noteworthy species are detailed in the relevant sections of this evaluation. Only vernacular names of vascular plants are given in the main text (the scientific names are provided at Appendix 5-1), but only the scientific names of lower plants are used in the main text. The survey was carried out on 8th August 2018 in suitable weather. Photographic illustrations of the Site are presented in Appendix 5-2.

- 5.2.8 Other than a 0.3 ha area in the extreme north of the site, where access was restricted around the ruined buildings for safety reasons, the remaining 8.7 ha of the study site were accessed and surveyed.

Species

- 5.2.9 All habitats present on the site were searched for signs of any faunal activity e.g. the presence of badger setts, mammal tracks and holes, herpetofauna basking or under refugia, waterbodies suitable for amphibians etc. Mature trees were visually examined from the ground to identify features with the potential to support birds, roosting bats, deadwood invertebrates, bryophytes, etc. Birds, reptiles and invertebrates were recorded whilst undertaking the habitat survey.

5.3 Survey Results

Desk study results

Protected Sites:

- 5.3.1 SEWBreC identified one statutory site some 17 km to the south-west: *Bury Inlet Special Protection Area (SPA) / Special Area of Conservation (SAC) / Site of Special Scientific Interest (SSSI)*.
- 5.3.2 One local wildlife site or Site of Interest for Nature Conservation (SINC) was identified by SEWBreC as being within a 1km radius of the site: *Tiroedd Comin Cwm Amman Uchaf*.

Protected Species:

- 5.3.3 SEWBreC returned a total of 44 records of protected and priority species for the area. The majority were birds such as Lesser Redpoll, Skylark, Golden Plover, Cuckoo, Linnet,

Dunnock and Song Thrush, with one record for Common Lizard 500+ metres from the site and one record for Bluebell. Barn Owl and Red Kite might hunt over the area as the site is within their flight range.

5.3.4 There were 21 records of other species of conservation concern, all birds, including Meadow Pipit, Swallow, Coal Tit, Goldcrest, Wheatear, Redstart, Willow and Garden Warblers, Jack Snipe and Woodcock.

5.3.5 There were 6 records of species of local conservation concern, the nearest being 160m away from the site, all of which are bryophytes except for one vascular plant.

Vegetation Survey results

5.3.6 The survey produced the species totals given in Table 5-1 for the main plant taxonomic groups and a full list of all records is provided at Appendix 5-1. It is standard practice to use italicised scientific names of lower plants including bryophytes (mosses and liverworts), which are used preferentially in the main text, although vernacular names are also provided in Appendix 5-1:

Table 5-1: Species totals for taxonomic groups recorded during the survey:

Taxonomic group	Total species
Vascular plants	106
Bryophytes (mosses & liverworts)	41
Lichens	1

Marshy grassland:

5.3.7 The most extensive vegetation type recorded within the study area was marshy grassland which comprised 6.7 ha (74%) of this 9.0 ha site. The areas shown by **TN12**, **TN14** and **TN16** on Figures 5-1 and 5-2 illustrate the extent of this vegetation, which in NVC terms equates to M23b *Juncus effusus/acutiflorus-Galium palustre* rush-pasture, *Juncus effusus* sub-community as shown on Figure 5-2. It is likely that historically the Site has been subjected to significant agricultural improvements leading to Soft Rush becoming

dominant on these poorly drained soils. Other major components recorded in this community were *Calliergonella cuspidata*, Common Bent, *Rhytidiadelphus squarrosus*, Velvet Bent and Yorkshire-fog, with locally frequent *Aulacomnium palustre*, Carnation Sedge, Common Bird's-foot Trefoil, Creeping Buttercup, Mat-grass, Sweet Vernal-grass. Species of local interest noted included Star Sedge and Whorled Caraway, both at low abundance.

- 5.3.8 The area of disturbed marshy grassland adjacent to the turbine footprint shown by **TN3** showed signs of recovery to M23b. In addition to the principal species listed above were several ruderals indicative of the recent soil disturbance, such as Broad-leaved Dock, Greater Plantain, Marsh Thistle and Spear Thistle.

Acid-neutral flush / mire:

- 5.3.9 The most ecologically important and sensitive vegetation recorded within the study area were the flushed mire / marshy grassland transitions which comprised 1.5 ha (17%) of the site. The area shown by **TN8** on Figures 5-1 and 5-2 illustrate the extent of the best example of this vegetation, which in NVC terms equates to M6c *Carex echinata-Sphagnum recurvum/ auriculatum* mire, *Juncus effusus* sub-community as shown on Figure 5-2. In addition to frequent Soft Rush, the most prominent species recorded were *Polytrichum commune*, Purple Moor-grass and *Sphagnum papillosum*. The site was ungrazed and lacked many of the species noted in the transitional community shown by **TN5**. Frequent components recorded in this community included *Aulacomnium palustre*, Carnation Sedge, Lesser Spearwort, Marsh-bedstraw, Purple Moor-grass, Sharp-flowered Rush, *Sphagnum inundatum*, *S. palustre*, *S. subnitens*, Velvet Bent and Whorled Caraway. An area of M25b *Molinia caerulea-Potentilla erecta* mire, *Anthoxanthum odoratum* sub-community was identified as shown by **TN6** with species noted of local interest here including Bog Pimpernel, Flea Sedge, Lousewort, Marsh Violet, Marsh Willowherb and Whorled Caraway.

Acid grassland:

- 5.3.10 A drier ridge at the bottom edge of the field supported a narrow strip of drier, tightly grazed acid grassland, as shown by **TN11** on Figures 5-1 and 5-2, which in NVC terms equates to *Agrostis canina-Nardus stricta* grassland. The sward was characterised by

locally abundant Soft Rush, but with frequent Common Bent, Heath Bedstraw, Mat-grass, *Rhytiadelphus squarrosus*, Sheep's-fescue, Velvet Bent, Wavy Hair-grass and Western Gorse.

Gravel access track:

- 5.3.11 The imported Limestone to make up the gravel access and parking area, shown by **TN1** and the disturbed edges at **TN2**, supported a moderately high level of ruderal species. Those recorded of local interest included Northern Yellow-cress, Red Goosefoot and Sticky Groundsel.

Ditches:

- 5.3.12 Two ditches cross the site, the main one, which was partially cleared in the upper section shown by TN4 on Figures 5-1 and 5-2. There was a high level of diversity recorded from both with the most significant species noted including *Atrichum crispum*, Marsh Violet, Sneezewort, three *Sphagnum* species and Whorled Caraway. The eastern boundary ditch supported a large colony of Bogbean, Lemon-scented Fern and a mix of ericaceous heath species.

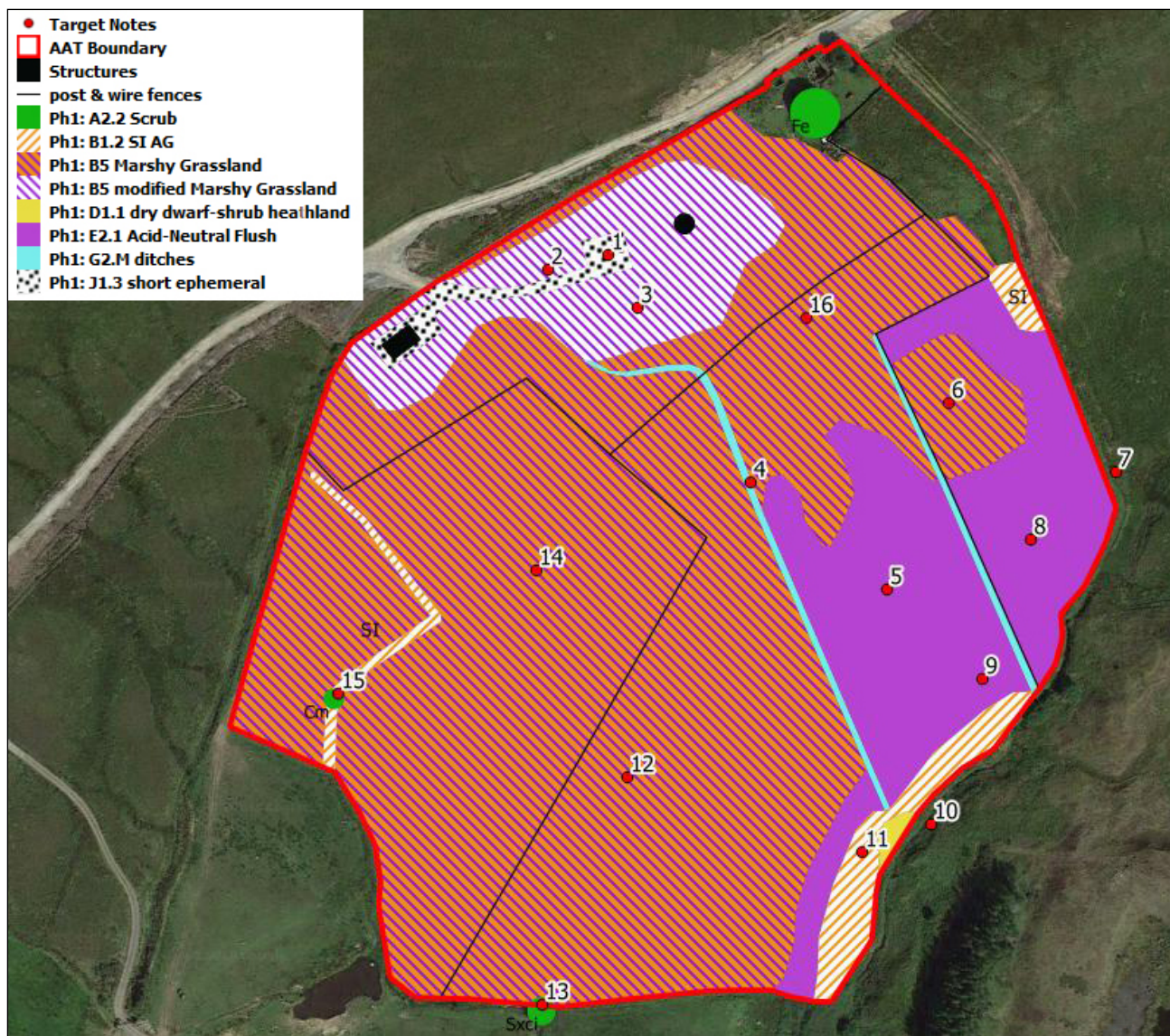
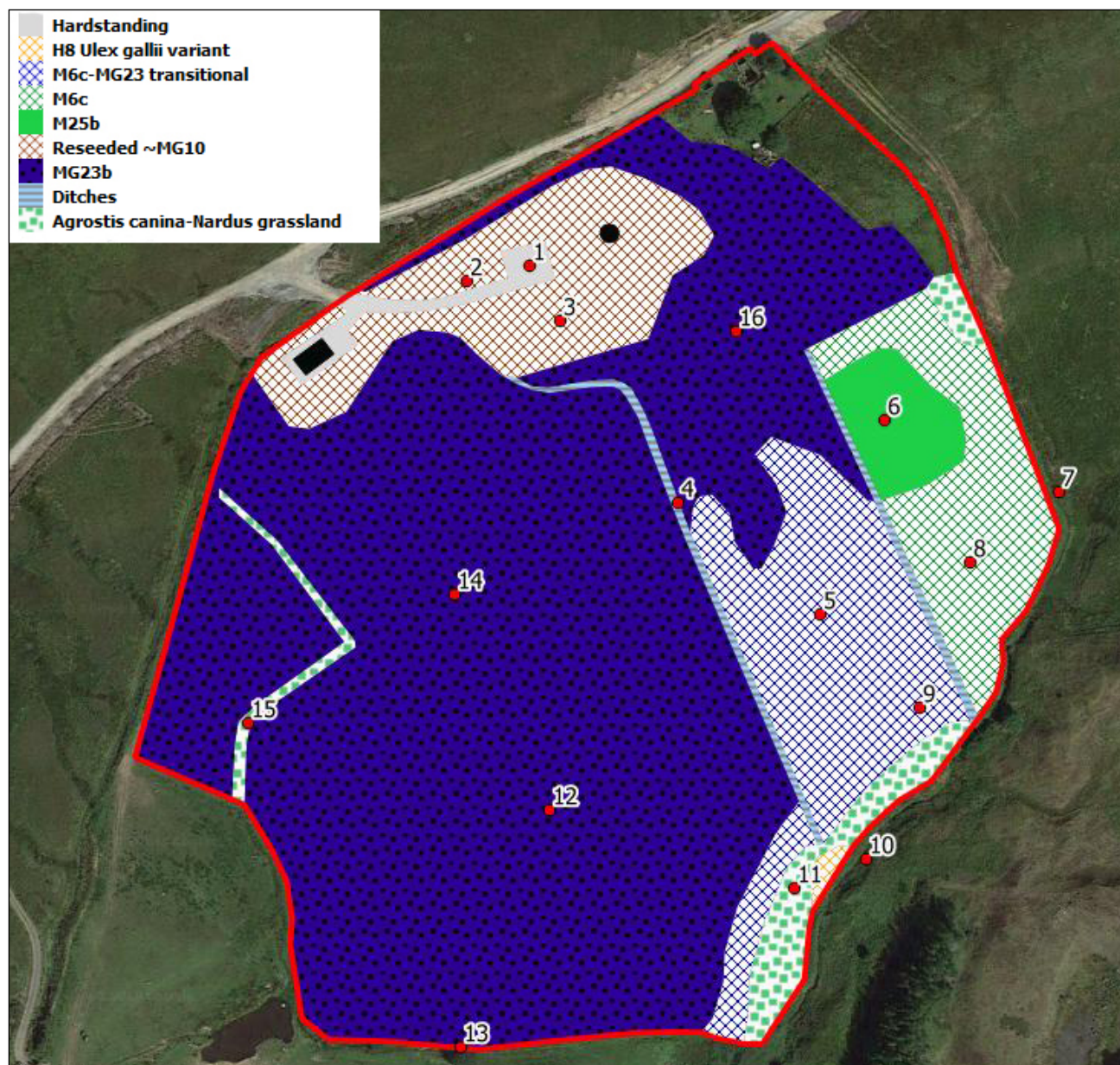
FIGURE 5-1: Phase 1 Vegetation Plan

FIGURE 5-2: National Vegetation Classification Plan

Species results

Bats:

- 5.3.13 All bats and their roosts are European Protected Species (EPS) and are fully protected by the Wildlife and Countryside Act 1981 (as amended), and the Conservation of Habitats and Species Regulations 2017.
- 5.3.14 SEWBRc holds no records of bats using the area.

5.3.15 Although there is suitable habitat for foraging over the marshy grassland and along the stream and ditch corridors, there are no suitable potential roost sites within or surrounding the Site. Any use by bats is likely to be seasonally limited due to the Site's altitude and exposure. There are no mature trees on site that have potential for roosting.

Badger:

5.3.16 Badgers and their setts are protected under the Protection of Badgers Act 1992 (as amended) and other UK legislation.

5.3.17 SEWBreC holds no records for badger on the Site or within a 1km radius of the site.

5.3.18 The area was searched for badger field signs including setts, well-worn paths and run-throughs, snagged hair, footprints, day nests, balled up bedding vegetation, foraging signs, dung pits and latrines.

5.3.19 No field signs were observed during the survey within the Site or within a 50m buffer.

Brown Hare:

5.3.20 Brown Hare are protected under the Wildlife and Countryside Act 1981 (as amended), and a UK Biodiversity Action Plan species.

5.3.21 SEWBreC holds no records for this species within a 1km radius of the Site.

5.3.22 No field signs such as 'forms', characteristic droppings or sightings of Brown Hare were noted during any site visits undertaken for this survey or previously whilst on site for works and monitoring purposes.

Birds:

5.3.23 SEWBreC has several records for birds on the site and from a 1km radius, mainly from the previous surveys completed in 2011. These records are mainly from the adjacent common land rather than the study site, and include protected and priority species under various pieces of legislation.²

² EC Birds Directive various Annex species (BDir), Wildlife and Countryside Act 1981 as amended (WCA), The Bonn Convention on the Conservation of Migratory Species of Wild Animals species (Bonn), The Bern Convention on the Conservation of European Wildlife and Natural Habitats (Bern), Convention on International Trade in Endangered Species (CITES), UK Red Data Book listing based on IUCN guidelines (RD1UK), Environment Act (Wales) Section 7 species (S7), UK Biodiversity Action Plan Priority Species (UKBAP), RSPB Welsh Red listed birds (not based on IUCN

- 5.3.24 Birds noted on-site whilst undertaking the survey included Red Kite (BDir1, WCA1.1, WCA9, Bonn, CITES, RD1 (UK), WBAm RSPB, UKBAm RSPB), with Goldfinch (Bern) and Meadow Pipit (Bern, WBAm RSPB, UKBAm RSPB) flying around the common and fields. During previous visits to the site, the common land adjacent has supported Wheatear, Swallow, Linnet and Meadow Pipit. Cuckoo was heard for several years in the adjacent woodland until it was clear felled in 2017.
- 5.3.25 No nests or remains of nests were found during the habitat survey, either in the single trees or in rush tussocks, and the site has since been closely mowed, and will be maintained at this level making it unsuitable for ground nesting birds such as Meadow Pipit and Skylark.

Reptiles:

- 5.3.26 All reptiles in the UK are protected by the Wildlife and Countryside Act 1981 (as amended).
- 5.3.27 SEWBRc holds one record for Common Lizard 500m+ from the Site, and one animal was seen during the habitat survey in August in the western part of the Site. A further site visit on a sunny September day noted two further Common Lizard in the southern field. Previous site visits over the last two years for works and monitoring have noted a total of four animals at one time on the common land adjacent.

Amphibians:

- 5.3.28 Great Crested Newts are protected under the Habitats Regulations as a European Protected Species.
- 5.3.29 SEWBRc holds no records for amphibians, although several ponds near the site were noted as having frog spawn and Palmate newts during the 2011 survey.
- 5.3.30 There is a small pond in the south-western corner of the Site with a larger pond fed by ditches in the field adjacent. The small pond acts as an overflow for the larger pond. Three frogs were noted during the habitat survey, spread across the Site.

criteria) (WBR RSPB), RSPB Welsh Amber listed birds (not based on IUCN criteria) (WBAm RSPB), RSPB UK Red listed birds (not based on IUCN criteria) (UKBR RSPB), RSPB UK Amber listed birds (not based on IUCN criteria) (UKBAm RSPB) and Local Biodiversity Action Plans (LBAP).

- 5.3.31 The ponds were assessed for likely use by Great Crested Newt (GCN) using the Amphibian and Reptile Groups of UK Habitat Suitability Index (HSI) which produces scores for ponds using ten criteria³. The small pond in the corner of the field scored 0.88 which falls within the excellent habitat suitability range. The larger pond adjacent scored 0.66 which falls within average range. However, it is extremely unlikely that GCN are using the ponds despite suitability as there are no known populations within the area (the only known populations in Neath Port Talbot are at Llandarcy and Margam), and previous surveys have found no sign of the species.
- 5.3.32 During previous visits for wind farm construction works and during monitoring in 2016 and 2017, numerous buckets of frogs and spawn were collected from the common (whilst constructing the road), ruts in the existing track and from ditches that were cleaned out. Palmate newts were also collected from the ditches on the boundaries of the fields in low numbers during works in 2016. It is likely that there is a good frog and palmate newt population within the scheme area as ditches run through and adjacent to the Site surrounded by marshy grassland, with ponds for breeding also available.

5.4 Assessment

- 5.4.1 A plan of the proposed solar farm and the panels to be used is shown in Figures 5-3 and 5-4 below. The solar farm has been designed to take the sensitive habitats on site into consideration. The panels will be sited on the western part of the Site on degraded marshy grassland and rush pasture, avoiding the ditches, pond and acid-neutral flush / mire.

³ Geographic location, Pond area, Pond drying, Water quality, Shade, Fowl, Fish, Pond count, Terrestrial habitat and Macrophytes.

Figure 5-3: Site plan

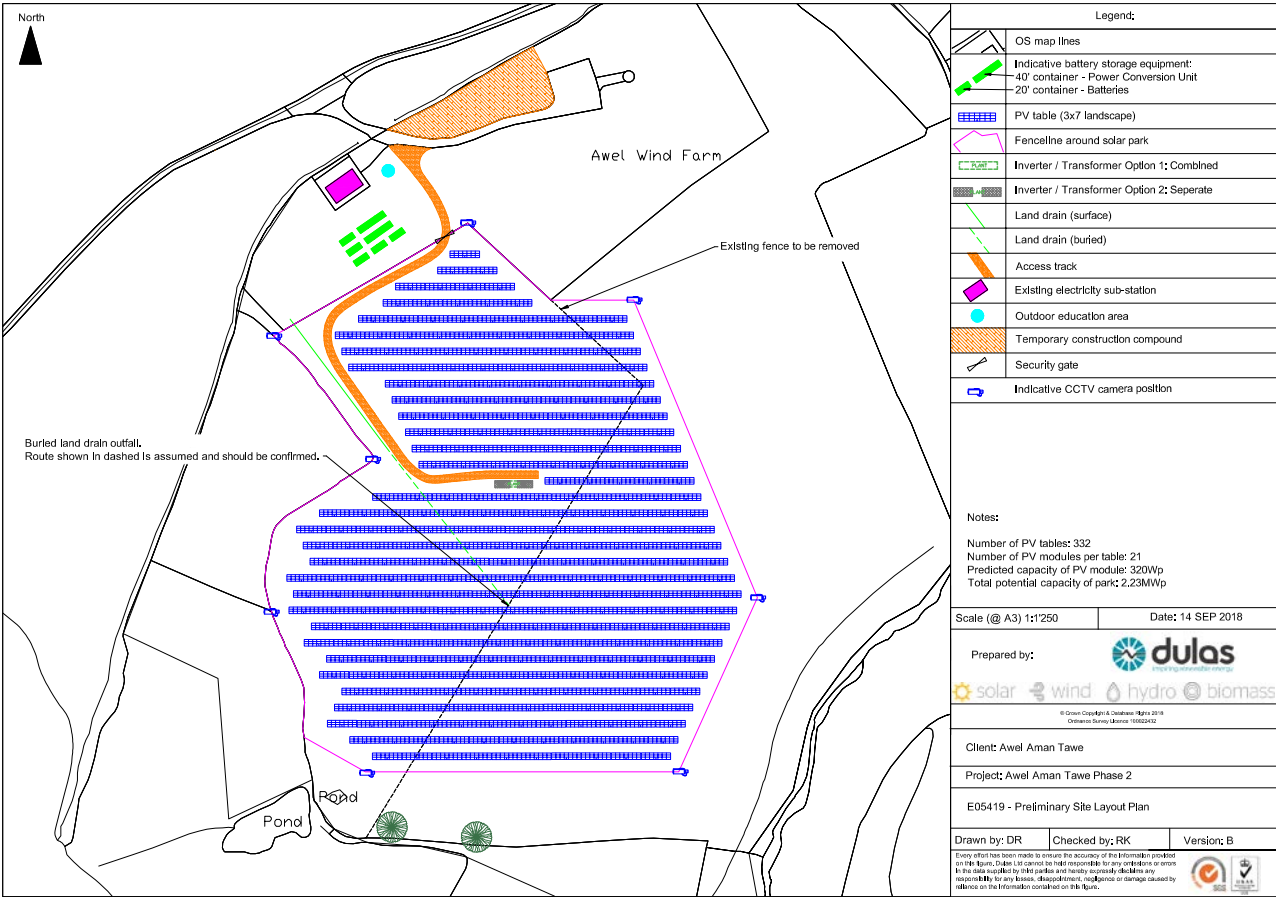
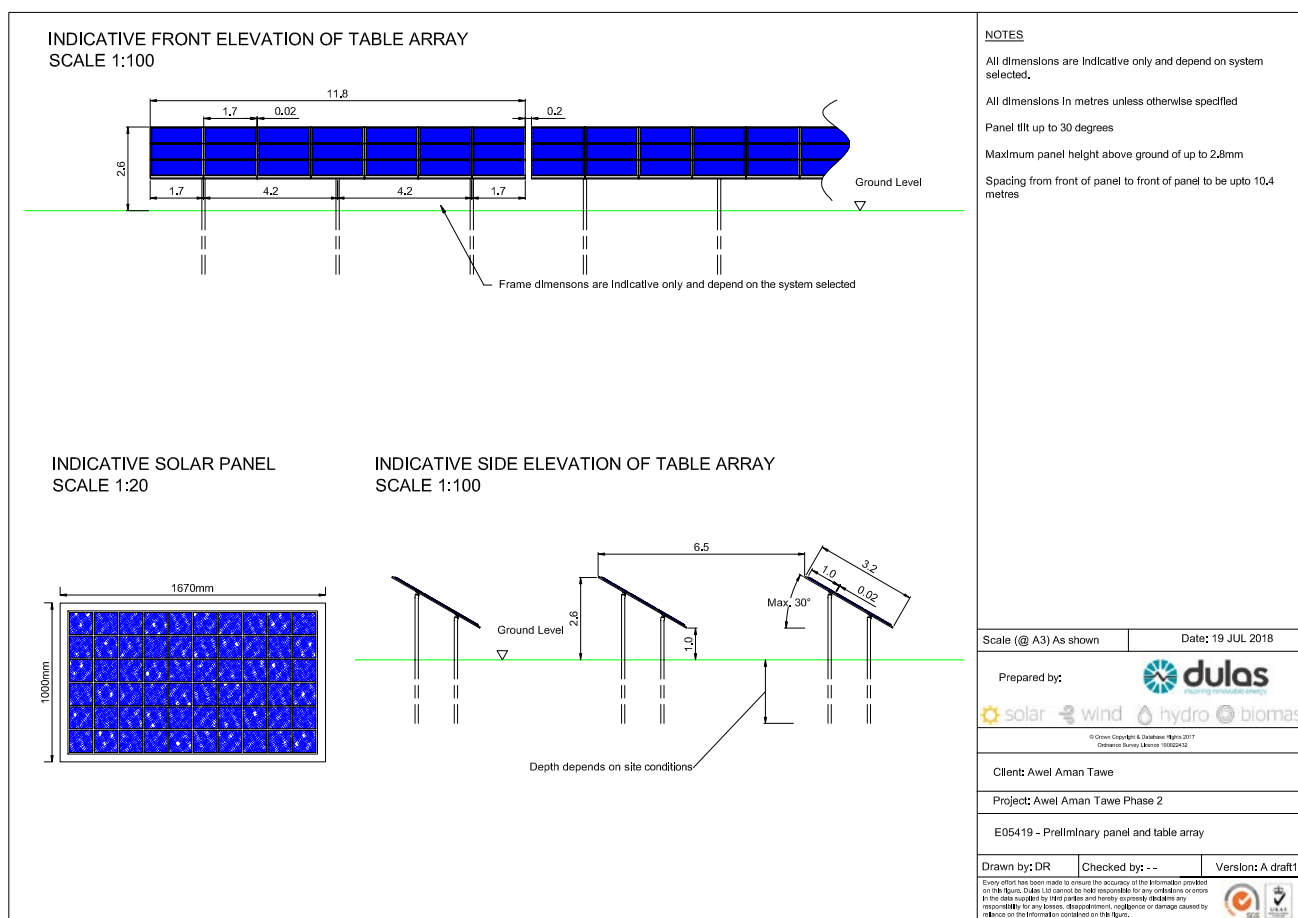


Figure 5-4: Panel/table design

Assessment criteria

- 5.4.4 Impact significance has been assessed for each of the features using a three stage process: an assessment of ecological value; an assessment of the magnitude of the likely impacts of the proposals; and a determination of impact significance based on a combination of ecological value and magnitude of impact.

Ecological Value

- 5.4.5 Each feature has been classified according to its nature conservation value using the examples provided in Table 5.2.

Table 5.2. Assessment of Ecological Value

Value	Examples
International	Internationally designated or proposed sites such as Ramsar Sites, Special Protection Areas, Biosphere Reserves and Special Areas of Conservation, or otherwise meeting criteria for international designation. Sites supporting populations of internationally important species.
National	Nationally designated sites such as Sites of Special Scientific Interest (SSSIs), or non-designated sites meeting SSSI selection criteria, National Nature Reserves (NNRs), Nature Conservancy Review (NCR) Grade 1 sites, viable areas of key habitats within the UK Biodiversity Action Plan. Sites supporting viable breeding populations of Red Data Book (RDB) species (excluding scarce species), or supplying critical elements of their habitat requirements.
Regional	Sites containing viable areas of threatened habitats listed in a regional Biodiversity Action Plan, comfortably exceeding Site of Importance for Nature Conservation (SINC) criteria, but not meeting SSSI selection criteria. Sites supporting viable populations of Nationally Scarce species or those included in the Regional Biodiversity Action Plan on account of their rarity, or supplying critical elements of their habitat requirements.
County	Sites meeting the criteria for a county or metropolitan area designation (such as SINC), which may include amenity and educational criteria in urban areas. Ancient semi-natural woodland. Designated Local Nature Reserves. Sites containing viable areas of any key habitat type identified in the Local Biodiversity Action Plan (LBAP). Sites supporting viable breeding populations of species known to be county/metropolitan rarities e.g. featuring in county 'red data book' or

	LBAP, or supplying critical elements of their habitat requirements.
District	Undesignated sites, or features considered appreciably to enrich the habitat resource within the context of the Borough or District, or included in the Borough or District LBAP. Amenity and educational functions will be recognised in urban areas. Sites with viable breeding populations of species listed as rare in the District or Borough LBAP or supplying critical elements of their habitat requirements.
Local	Undesignated sites, or features considered appreciably enriching the habitat resource within the context of the Parish or neighbourhood (e.g. a species-rich hedgerow).
Unimportant	Low-grade and widespread habitats

Magnitude of Impact

- 5.4.6 The magnitude of each predicted impact has been assessed on a scale of High, Medium, Low and Minimal according to the criteria provided in Table 5.3.

Table 5.3. Criteria for determining magnitude of impacts

Magnitude	Criteria
High	Loss of about 50% or more of the site area. Other effects (e.g. disturbance or damage arising from pollution) including indirect impacts having an adverse impact equivalent in nature conservation terms to a loss of >50% of the site area.
Medium	Loss affecting 20-49% of the site area. Other effects (e.g. disturbance or damage arising from pollution) including indirect impacts having an adverse impact equivalent in nature conservation terms to a loss of 20-49% of the site area.
Low	Loss affecting 4-19% of the site area. Other effects (e.g. disturbance or damage arising from pollution) including indirect impacts having an

	adverse impact equivalent in nature conservation terms to a loss of 4-19% of the site area.
Minimal	Loss affecting up to 4% of the site area. Other effects (e.g. disturbance or damage arising from pollution) including indirect impacts having an adverse impact equivalent in nature conservation terms to a loss of 4% of the site area.
Potential Net Gain	Mitigation will seek to increase the extent of existing habitats or replace lost habitats with larger areas of suitable habitats. Such areas will be established and, where significant species are to be displaced, will be in a state ready for colonisation prior to any proposed habitat disturbance.

Significance of Impact

5.4.7 Table 5.4. illustrates how significance has been assigned to the impact, based on a combination of the value of the feature being assessed. This has been expressed on a five-point scale ranging from Severe to Negligible as shown below. The higher the impact magnitude on a feature such as a site or species (e.g. Severe/Major), the more significant the impact.

Table 5.4. Criteria for determining significance of impacts

Impact Magnitude	Ecological Value						
	Inter-national	National	Regional	County	District	Local	Un-important
High	Severe	Major	Major	Major	Moderate	Minor	Minor
Medium	Major	Major	Moderate	Moderate	Moderate	Minor	Negligible
Low	Moderate	Moderate	Minor	Minor	Minor	Negligible	Negligible

Minimal	Minor	Minor	Negligible	Negligible	Negligible	Negligible	Negligible
No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact

Assessment of significance of impact on plants and habitats

Statutory Sites

Bury Inlet Special Protection Area (SPA) / Special Area of Conservation (SAC) / Site of Special Scientific Interest (SSSI)

- 5.4.8 The Burry Inlet is of European conservation significance, has been declared as a Special Protection Area (SPA) and Special Area of Conservation (SAC) under the Habitats Regulations. It is also protected under UK law as it is a Site of Special Scientific Interest. The closest point of the SAC from the study site lies 17 km to the south-west. No permanent watercourses occur on-site, but runoff from the Site enters the drainage system that ultimately feeds into the hydrological system of the Burry Inlet.

Potential Impact

Control and regulation of potential spillages of hazardous waste and/or sediment runoff during any construction phase will ensure that the risk of adverse impacts is minimised. It is considered highly unlikely that redevelopment of the Site would have a detectable level of impact on the water quality of the SAC/SPA. **MINOR IMPACT (International ecological significance, Minimal impact)**

- 5.4.9 No other statutory or non-statutory protected sites (including nature reserves or other sites of nature conservation interest) which might be adversely impacted by the proposed works occur within the survey site or its vicinity, the nearest SSSI being over 1km to the north on land well buffered, and not hydrologically connected, from the development.

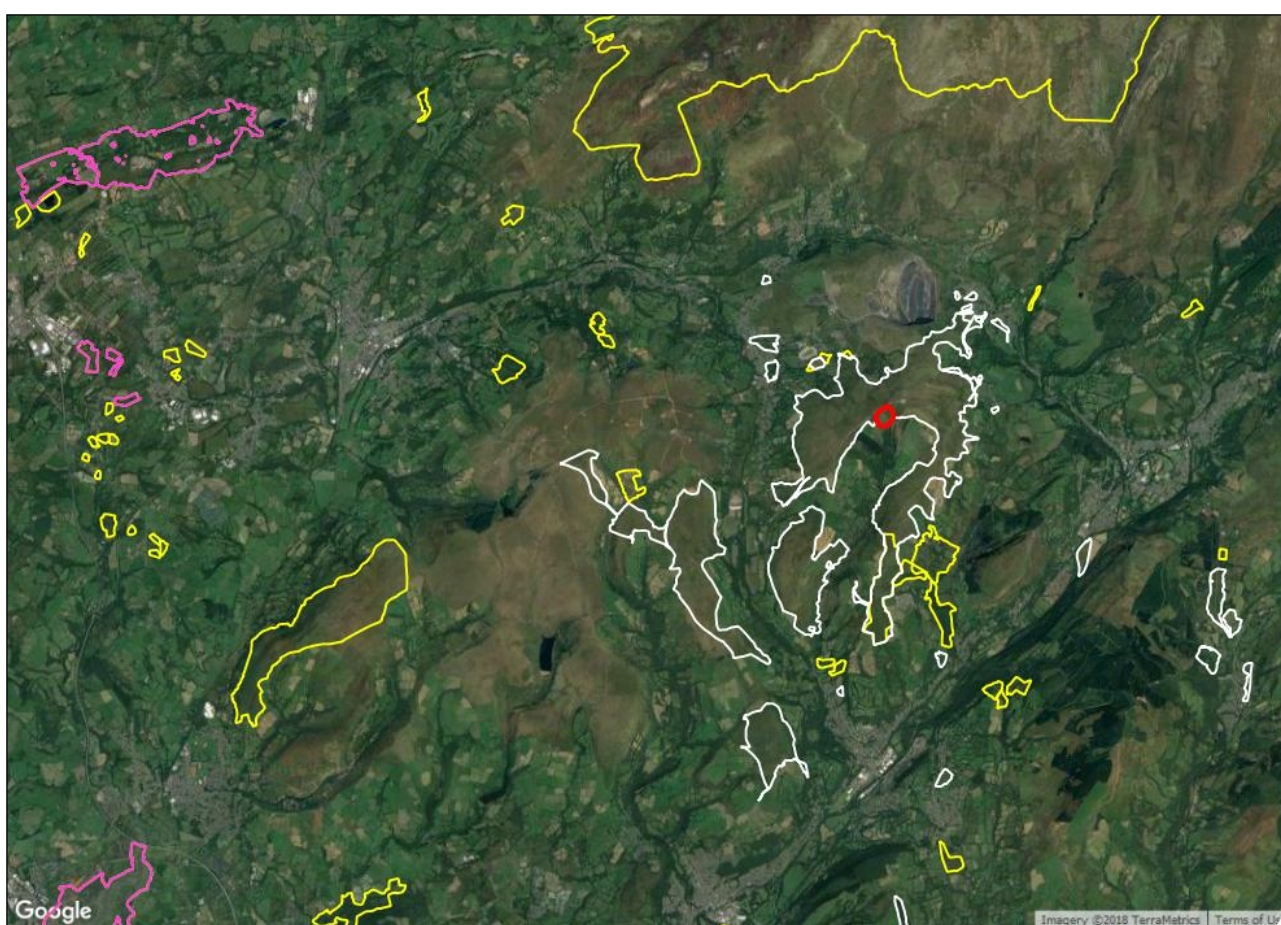
County Wildlife Sites

- 5.4.10 The study site lies immediately adjacent to a County Wildlife Sites (also known as Sites of Importance for Nature Conservation (SINCs)), this being ***Tiroedd Comin Cwm Amman Uchaf*** as shown on the map at Figure 5-5.

Potential Impact

Control and regulation of potential spillages of hazardous waste and/or sediment runoff during any construction phases, will ensure that the risk of adverse impacts is minimised. It is considered highly unlikely that development of the site would have a detectable level of impact on the water quality of the SINC as the hydrology of the site lies at a lower elevation. **NO IMPACT (County ecological significance, No impact)**

Figure 5-5. Plan showing context of study site (red line) with SINC (white lines), SSSI (yellow lines) and SACs (purple lines).



Habitats and vegetation

Habitats of European Significance:

5.4.11 No Annex 1 habitats as defined in the EC Habitats Directive occur within the study site.

Section 7 and UK BAP Habitats:

- 5.4.12 Habitats of Principal Importance for Conservation of Biological Diversity in Wales listed under Section 7 of the Environment (Wales) Act 2016 and UK Biodiversity Action Plan Priority Habitats present within the study site include Marshy grassland & rush-pasture.

Potential Impact

The potential impact on 6.7 ha (approx. 74% of the site) of the degraded marshy grassland and rush pasture will be from the construction of the solar farm, connections to the sub-station and associated infrastructure. When the initial works are completed the grassland will be restored as the cables will be undergrounded with the minimum of disturbance, the temporary compound reinstated and the panels will be approximately 1m above the grassland to allow sheep grazing underneath. The habitat will remain in situ and available. **MODERATE IMPACT (National ecological significance, Low impact)**

Mitigation

All cable trenches will be either moled or not left open overnight to prevent injury to animals. If unavoidable, a means of escape such as a plank will be employed. The panels will be at a height of approximately 1m at the lowest end to allow sheep grazing underneath in order to maintain the habitat.

Local BAP Habitats and Species:

- 5.4.13 No additional habitats and species of concern were recorded which have been adopted by Neath Port Talbot County Borough Council in order to facilitate their conservation at a local level and which are included in the county borough's Local Biodiversity Action Plan, nor will be affected by the scheme.

Protected Plant Species:

- 5.4.14 No protected plant species were recorded within the survey site.

Plants of European Significance:

- 5.4.15 No plant species of European significance were recorded within the survey site.

Section 7 and UK BAP Plant Species:

- 5.4.16 No plants within these categories were recorded within the survey site.

Assessment of significance of impact on fauna***Bats:***

- 5.4.17 No potential roost sites were identified on or near the Site, including mature trees. The Site may be used for foraging by bats, but this is likely to be seasonal given the altitude and exposure of the Site to adverse weather. The solar farm scheme will not affect the bat's ability to use the ditch and stream corridors, and any lighting (if used at all) in the scheme should follow the latest Bat Conservation Trust guidelines now available from their website. **Assessment: Minor adverse impact (International ecological significance, minimal impact).**

Badger:

- 5.4.18 No field signs or badger setts were found on the Site or within a 50m radius. There was no evidence that the Site is being used by badger for foraging. **Assessment: No impact (as species not using site).**

Brown Hare:

- 5.4.19 No field signs such as 'forms', droppings or sightings of Brown Hare were noted during several field visits over different times of the year. It is unlikely that this species is using the Site. **Assessment: No impact (as species not using site).**

Birds:

- 5.4.20 The western part of the Site where the solar farm is to be located has been recently closely mowed and is currently grazed by sheep. The remains of the rush tussocks are very short and offer no cover from predators. It is very unlikely that this area will be used by ground nesting birds such as Meadow Pipit and Skylark, as the habitat has been rendered unsuitable. It is understood that the site will be kept in this condition until works commence. The rest of the Site with more sensitive vegetation will be left untouched and available for ground nesting birds to access as required.

- 5.4.21 There are some single trees dotted around the boundaries of the site, but these are exposed and offer little cover or protection. No old nests were present in these trees.
- 5.4.22 As a precautionary measure, works should be undertaken outside of the bird nesting season (March – August). If works commence before the end of the nesting season, advice from a suitably qualified ecologist should be sought and a pre-works check undertaken. If any nests are found then a suitable buffer should be put in place and the nest left undisturbed until the eggs have hatched and birds fledged. **Assessment: Minor adverse impact (National ecological significance, minimal impact).**

Reptiles:

- 5.4.23 Common Lizards were seen on-site on two occasions in 2018, and in small numbers previously in 2016 and 2017 during works and monitoring visits. It is unlikely that other reptile species are using the Site, as none were seen during the wind farm construction and there are no records for the area of species such as slow worm, adder and grass snake. Due to the low numbers seen, it is recommended that the Site is rendered less suitable for reptiles by a two stage mowing regime which will encourage the animals to move away from the Site, and that construction is supervised by a suitably qualified ecologist who can catch and move animals to a safe area. They can re-colonise the site when works are completed as the habitat will return to a grazing regime with vegetation mosaics and edge effects around the bases of the panel mounts. **Assessment: Minor adverse impact (National ecological significance, minimal impact).**

Amphibians:

- 5.4.24 Common frogs and frogspawn were present in ditches, ruts and ponds during the wind farm construction, as were palmate newts in low numbers. Frogs were present in low numbers in the rush pasture during this survey. As there are ditches and ponds around the site boundary it is likely that these will be used by amphibians for breeding. The rush pasture provides ample terrestrial habitat for other life stages. It is recommended that as for reptiles, a two stage mowing regime is undertaken to minimise cover, and that a suitably experienced ecologist is present during construction in order to catch and move any animals that may be using the site. They can re-colonise the site when works are completed as the habitat will return to a grazing regime with vegetation mosaics and

edge effects around the bases of the panel mounts. **Assessment: Negligible adverse impact (Moderate local ecological significance, minimal impact).**

5.5 Mitigation and Recommendations

Pre-construction:

- 5.5.1 To avoid injury to reptiles and amphibians, a two stage mowing regime should be implemented whereby the vegetation is cut to 200mm and after a maximum of two days cut again to 50mm. The vegetation should be maintained at this height until construction starts.
- 5.5.2 All works should take place when amphibians and reptiles are active i.e. April to September rather than in the hibernation period.
- 5.5.3 Despite the Site being mowed rendering it unsuitable for use by ground nesting birds, as a precautionary measure works should be undertaken outside the breeding bird nesting season, or if unavoidable a pre-works check should be undertaken by a suitably qualified ecologist and appropriate measures taken. The more sensitive habitat in the north and east of the site will not be part of the scheme and therefore available for ground nesting birds.

During Construction:

- 5.5.4 Site works should be supervised by a suitably qualified ecologist who can provide advice and catch and move animals as required.
- 5.5.5 All cable trenches will be either moleed or not left open overnight to prevent injury to animals. If unavoidable, a means of escape shall be provided such as a slope or plank of wood placed at an angle in the trench.
- 5.5.6 It is recommended that the security fence round the solar farm have a 15cm gap at the base to allow free movement of wildlife through the site.
- 5.5.7 Any lighting, if needed, should follow the latest Bat Conservation Trust guidelines located on their website.

Post Construction:

- 5.5.8 The panels will be at a height of approximately 1m at the lowest end to allow sheep grazing underneath in order to maintain the habitat in a suitable state for amphibians and reptiles, as well as other species such as small mammals which might use the area.
- 5.5.9 A suitable monitoring scheme will be agreed with Neath Port Talbot as necessary.

Biodiversity Enhancements

- 5.5.10 Landscape enhancements within the scheme to provide biodiversity gain consist of a shelter belt of trees along the southern boundary from the pond in the west running along the bottom boundary to the east. This will be around 8-10m wide and consist of native trees, where possible of native provenance. Species recommended include Rowan, Holly and Hawthorn which will provide berries for birds and flowers for pollinators, together with Pedunculate Oak, Ash and Lodgepole Pine, all species which appear in the boundaries and on nearby land. Planting will take place post construction and will be to British Standard *BS5837:2012 Trees in relation to design, demolition and construction – recommendations*, and *BS3998:1989 Treework*.

5.6 Ecosystem Resilience Assessment

- 5.6.1 An ecosystem resilience assessment has been undertaken at the request of the Local Authority. This takes into account the effect the proposed scheme will have on the wider area and the interconnecting habitats and ecosystems within the wider landscape.
- 5.6.2 Within the spatial scope of the proposed scheme, the zone of influence of potential environmental effects is assessed as the area that will be within the construction zone, plus habitats and ecosystems connected to it that may be affected by the construction, operation and decommissioning of the scheme.
- 5.6.3 Table 5.5 below lays out the ecosystems affected, and defines the zone of influence for the Site together with proposed mitigation and any residual impacts.

Table 5.5 Ecosystem resilience assessment

Ecosystem Resilience aspect	Environmental impact/effect	Receptors affected by change	Zone of influence	Proposed mitigation	Residual impact	Enhancement opportunities
Diversity between/ within ecosystems	Land covered by panels/ construction/ decommissioning	Habitats beneath the panels	Within construction / maintenance/ decommissioning area	The most sensitive habitats are outside the scheme. Monitoring scheme to be devised in consultation with local authority.	Land continues to be grazed by sheep under the panels. Amphibians and reptiles continue to use the site. Land reverts to agriculture following decommissioning.	Shelter belt of trees planted to increase biodiversity and provide shelter food and nesting opportunities.
Condition of ecosystems (including structure and functioning)	Construction noise	Wildlife using the site	Within the Site and along the access track	Construction to be undertaken outside of bird nesting season to avoid disturbance. Site mowed to discourage use by amphibian and reptiles.	Noise ceases following completion of construction	n/a
Condition of ecosystems (including structure and functioning)	Vehicle movements	Wildlife using the site	Within the Site and along the access track	An increase of vehicle movements during construction. Post construction occasional maintenance visits will be scheduled. Construction to take place outside bird nesting season. Low risk of direct collision with wildlife on the site, and ecologist to move animals as necessary.	Vehicle movements restricted to maintenance visits and on tracks through site.	n/a

Connections between and within ecosystems	Pollution from construction process	Hydrology within and surrounding the area such as ponds and ditches as well as soil rainwater seepage and runoff. Amphibians using ponds and ditches.	The Site, ditches and ponds directly adjacent to the site, and watercourses these ditches flow into further down the valley.	Sources of pollution include fuel and machinery fluids. All refuelling to take place away from water courses, and 'nappies' to be used. Spill kits on site as a precautionary measure.	Every effort to prevent pollution of water courses will be made.	n/a
Scale of ecosystems	Designated sites – all levels	Dependent on site qualifying features	Dependent on site qualifying features	As assessed in section 5.3 above. The designated sites lie some distance away from the Site and will not be directly affected by the scheme.	n/a	n/a
Diversity between/ within ecosystems Adaptability of ecosystems	Protected species	Bats	The Site and surrounding linear features	The scheme will not affect any potential for bats to follow stream and ditch corridors. No potential roost sites identified.	n/a	n/a

Diversity between/ within ecosystems Adaptability of ecosystems		Birds	The Site and surrounding land and features used for nesting, roosting and feeding	The Site has been mowed and is not suitable for ground nesting birds. Existing scattered trees on the boundaries will not be affected. The most suitable ground nesting bird habitat is not affected by the scheme.	Panels restrict habitat availability for ground nesting birds. Land reverts to agricultural practices following decommissioning providing opportunities for ground nesting birds.	Shelter belt of trees to be planted on southern boundary providing shelter, nesting, roosting and feeding opportunities.
Diversity between/ within ecosystems Adaptability of ecosystems		Reptiles	The Site during construction	The Site will be closely mown and works supervised by a suitably experienced ecologist to catch animals found during construction. Reptiles will recolonize the site post construction.	Panel mounts provide edge habitat and cover for reptiles using the site.	Security fence to have 15cm gap at base to provide free movement of animals around the Site.
Diversity between/ within ecosystems Adaptability of ecosystems		Amphibians	The Site during construction	The Site will be closely mown and works supervised by a suitably experienced ecologist to catch animals found during construction. The ponds will not be affected by the scheme. Amphibians will recolonize the site post construction.	Panel mounts provide edge habitat and cover for amphibians using the site. No ponds will be affected by the proposed scheme.	Security fence to have 15cm gap at base to provide free movement of animals around the Site.

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6. ARCHAEOLOGY AND CULTURAL HERITAGE ASSESSMENT

6.1 Introduction

- 6.1.1 In September 2018 Archaeology Wales (AW) was commissioned by Dulas to carry out an archaeological Desk-Based Assessment of the proposed solar farm development on Mynydd y Gwrhyd adjacent to the existing Awel Aman Tawe (AAT) wind farm at Cwmllynfell, Swansea, SA8 4TA (NGR SN 72720 105380).
- 6.1.2 This assessment has been prepared prior to the submission of a planning application. The purpose of the Desk-Based Assessment, which is detailed in the following report, is to provide the local planning authority, Neath Port Talbot County Borough Council (NPTCBC) with the information they are likely to request in respect of the proposed development, the requirements for which are set out in Planning Policy (revised edition 9, 2016), Section 6.5 and Technical Advice Note (TAN) 24: The Historic Environment (2017). The work is to highlight and assess the impact upon standing and buried remains of potential archaeological interest and to ensure that they are fully investigated and recorded if they are disturbed or revealed as a result of subsequent activities associated with the development.
- 6.1.3 The proposed development is for a solar farm, comprising rows of photovoltaic panels surrounded by security fencing, with associated access track and construction compound, land drains, inverter/transformer building, battery storage equipment and an outdoor education area. The site will use a pre-existing electrical substation associated with the adjacent Awel Aman Tawe wind farm. Including the site compound and ancillary works the site will cover an area of approximately 3.8 hectares. The boundary of the proposed development area is presented in the accompanying figures.

6.2 Site Description

- 6.2.1 The development area occupies an irregular plot of land alongside the Awel Aman Tawe (AAT) wind farm at Mynydd y Gwrhyd, centred on NGR SN 72720 10538.

- 6.2.2 The site occupies southwest facing slopes below the ridgeline of Penlle'rfedwen and is bounded by rough open land to the north and east, with enclosed fields to the west and south. The enclosed fields give way just beyond the southern boundary to an area of rougher ground with tree and shrub cover. The AAT wind farm is located to the north and north-east. With the open land comprising Common Land and Open Access Land. Access is gained by an unnamed road directly north of the development area.
- 6.2.3 The northern end of the site is at approximately 322m AOD, with the land dropping away gently to the southeast. The general area comprises a number of ridges, the main ones being Mynydd Bach and Mynydd Uchaf. The area is elevated, isolated upland moor, bordered by small zones of enclosed land, with Pen-y-waun farm lying to the southwest. The land falls away into the Egel Valley, which then flows south to join the Clydach River.
- 6.2.4 The closest existing settlements, other than scattered farmsteads, are Cwmgors and Gwaun Cae Gurwen, which lie about 2km away to the west. Pontardawe lies *circa* 5km to the south.
- 6.2.5 The geology beneath the proposed development area comprises mainly sandstone of the Rhondda Member, with bands of mudstone, siltstone and sandstone of the Llynfi Member. These form part of the South Wales Middle and Upper Coal Measures Formations. The local environment was previously dominated by swamps, estuaries and deltas. These rocks were formed in marginal coastal plains with lakes and swamps periodically inundated by the sea; or estuaries and deltas, and shallow seas (BGS, 2018).

6.3 Methodology

- 6.3.1 The primary objective of this desk-based assessment is to assess the impact of the development proposals on the historic environment. This will help inform future decision making, design solutions and potential mitigation strategies. The aim is to make full and effective use of existing information in establishing the archaeological significance of the site, to elucidate the presence or absence of archaeological material, its character, distribution, extent, condition and relative significance.

- 6.3.2 The work includes a comprehensive assessment of regional context within which the archaeological evidence rests and aims to highlight any relevant research issues within national and regional research frameworks.
- 6.3.3 This report provides information of sufficient detail to allow informed planning decisions to be made which can safeguard the archaeological resource. Preservation *in situ* has been advocated where at all possible, but where engineering or other factors could result in the loss of archaeological deposits, preservation by record has been recommended.
- 6.3.4 This assessment considers the following:
- a) The nature, extent and degree of survival of archaeological sites, structures, deposits and landscapes within the study area through assessment of various readily available primary sources:
 - Collation and assessment of all relevant information held in the regional HER at GGAT within a 1km radius of the development site;
 - Collation and assessment of all Designated archaeological sites within a 5km radius of the development site;
 - Assessment of all available excavation reports and archives including unpublished and unprocessed material affecting the site and its setting.
 - Assessment of aerial photographic (AP) and satellite imagery evidence;
 - Assessment of archive records held at the County Archive, the National Library of Wales (NLW) and the Royal Commission on Ancient and Historical Monuments in Wales (RCAHMW);
 - Records held by the developer e.g. bore-hole logs, geological/geomorphological information, aerial photographs, maps, plans, ztv data;
 - Map regression analysis using all relevant cartographic sources e.g. all editions of the Ordnance Survey County Series, Tithe and early estate maps (as available);
 - Place-name evidence;
 - Historic documents (e.g. charters, registers, estate papers).

- b) The significance of any remains in their context both regionally and nationally and in light of the findings of the desk based study.
- c) The history of the site.
- d) The potential impact of any proposed development on the setting of known sites of archaeological importance.
- e) The potential for further archaeological remains to be present, which have not been identified in pre-existing archaeological records.
- f) The potential for further work, with recommendations where appropriate for a suitable investigative and/or mitigation methodology.

6.3.5 In assessing the value of archaeological assets, and the potential impacts upon them by the proposed development, the terms and guidance used in the Design Manual for Roads and Bridges, Volume 11, Section 3 (Highways England 2007) has been utilised. Values are given as:

- Very High (World Heritage Sites and other sites of international importance);
- High (Scheduled Monuments, undesignated assets of schedulable quality, assets of National importance that can contribute significantly to acknowledged national research objectives);
- Medium (Designated or undesignated assets of Regional importance that contribute to regional research objectives);
- Low (assets of local importance, assets compromised by poor preservation or poor survival of contextual associations);
- Negligible (assets with little or no surviving archaeological interest);
- Unknown (the importance of the resource has not been ascertained).

6.3.6 The magnitude of the potential impact on the archaeological assets (which can be either positive or negative), is given as:

- Major (change to most or all key archaeological materials, such that the resource is totally altered; comprehensive changes to setting);

- Moderate (changes to many key archaeological materials, such that the resource is clearly modified; considerable changes to setting that affect the character of the asset);
- Minor (changes to key archaeological materials, such that the asset is slightly altered; slight changes to setting);
- Negligible (very minor changes to archaeological materials, or setting);
- No Change.

6.3.7 This work conforms to the Standard and Guidance for Archaeological Desk-Based Assessment, as produced by the Chartered Institute for Archaeologists (CIfA 2014).

6.4 Archaeological and Historical Background

Previous Archaeological Studies

- 6.4.1 There are three previous archaeological investigations recorded on the regional Historic Environment Record within a search area of 1km around the proposed development site.
- 6.4.2 As part of the assessment of the adjacent wind farm, Dulas produced an Environmental Statement in 2004, based on a desk-based assessment undertaken by Glamorgan-Gwent Archaeological Trust (Pearson & Sherman 2003). This assessment, which incorporated the current proposed development site within its study area, includes a detailed history and development of the area, noting a landscape largely pastoral and industrial activity from the 18th to early 20th century, and an older Bronze Age funerary and ritual landscape. An examination of the historic landscape, using ASIDOHL guidelines, was also undertaken.
- 6.4.3 Prior to the construction work commencing on the adjacent wind farm developed Archaeology Wales Ltd undertook a Topographic and Photographic survey of the access route and development area (Poucher 2013). This provided a detailed record of the historic access route and adjacent archaeological features, but it did not extend across the current proposed development area.

6.4.4 During development works associated with the wind farm development an archaeological watching brief was maintained on ground-breaking activity (Poucher 2017). This watching brief covered the access track, turbine base and substation excavations that include elements of the northern part of the current proposed development area. This recorded a sequence of three main layers of dark peaty topsoil deposits overlying a mixed natural subsoil of mottled orange and grey clay to yellow-brown sandy-clay. The only features noted were deposits relating to the current field drainage ditch along the northern edge of the site, and a buried, but presumed modern, field drainage ditch running parallel. The watching brief did however note new stone alignments on the open ground to the north, potentially associated with Bronze Age activity and/or post-medieval boundary markers.

The Historic Landscape (Figure 6-1)

- 6.4.5 The proposed development site does not lie within a registered Historic Landscape, neither does any registered landscape lie within 5km of the site. The closest registered Historic Landscape is the Black Mountain & Mynydd Myddfai Landscape of Outstanding Historic Interest – HLW (D) 1 (Cadw et al 1998), the boundary of which lies approximately 7km to the north of the proposed development area.
- 6.4.6 The proposed development site does not lie within any Conservation Areas, nor do any lie within the 5km study area.
- 6.4.7 The site does not lie within any registered Historic Parks & Gardens, nor do any lie within 5km of the proposed development site.
- 6.4.8 The site lies within the Landmap Historic Landscape of Clydach Cwm Du (NPTHL041). Landmap areas are not designated landscapes, but contain objective and subjective information designed to enable landscape quality to be taken into account in decision making. The Clydach Cwm Du historic landscape covers an area of over 36km², comprising a large rural area of regular and irregular fields, with woodland elements. The overall value of this area is assessed as ‘High’, representing a well-preserved extensive upland valley fieldscape of medieval or post-medieval origin with evidence of prehistoric funerary and ritual activity, medieval and post-medieval upland settlement and 19th to early 20th century industrial activity with associated settlement.

- 6.4.9 The site also borders, along its northern edge, the Landmap Historic Landscape of Mynydd Uchaf (Mynydd y Garth) (NPTHL029). This landscape, covering an area of just under 8km², comprises six discrete area of upland moorland. The overall value is assessed as 'Outstanding', as an extensive prehistoric landscape associated with funerary, ritual or field clearance activity, represented by numerous, broadly distributed cairns. Late 19th to early 20th century industrial extractive activity has disrupted this coherence to a certain extent.

Scheduled Ancient Monuments (Figure 6-1)

- 6.4.10 Scheduled Ancient Monuments are sites considered to be of national importance and have statutory protection under the Ancient Monuments and Archaeological Areas Act 1979. No Scheduled Ancient Monuments lie within the boundary of the proposed development area.
- 6.4.11 There are eight Scheduled Ancient Monument within the 5km search area. The closest site is the prehistoric Mynydd y Garth Cairn (GM612), which lies on the summit of Mynydd y Garth 3.2km to the south. On the summit of Bancbryn, between 3.4km to 3.8km to the west of the proposed development site, lies a series of similar prehistoric cairns (CM333, CM334 & CM335). Just beyond these sites lies a post-medieval farmstead (CM332).
- 6.4.12 Within the Swansea Valley to the southeast a variety of post-medieval canal features including an aqueduct (GM396), lock and dry dock (GM397) and a colliery quay (GM453).

Listed Buildings (Figure 6-1)

- 6.4.13 No listed buildings lie within the boundary of the proposed development area.
- 6.4.14 There are 28 Listed Buildings within the 5km search area around the proposed development area. Of these three are Grade II* listed (LBs 23088, 25953 & 80809). The remaining buildings are all Grade II listed.
- 6.4.15 The closest listed building to the site is the Grade II* listed Capel y Tabernacl (LB 23088) and the associated, Grade II listed, walls, railings and gates (LB 23090) in Cwmgors, just over 2.1km to the west. The Grade II listed war memorial (LB 26820) lies

2.8km to the northwest in Gwaun Cae Gurwen. The remaining Listed Buildings all lie in excess of 3km from the proposed development site.

Known Archaeological Remains and Historical Development (Figure 6-2)

- 6.4.16 There are 43 sites listed on the HER within 1km of the proposed development site, none of which lie within the proposed development area. The full catalogue provided by Glamorgan-Gwent Archaeological Trust for sites recorded within 1km is included as Appendix 6-1.
- 6.4.17 There are also 6 sites listed on the National Monuments Record (NMR) maintained by the Royal Commission of Ancient and Historical Monuments Wales (RCAHMW) within the same search area. None of these sites lie within the proposed development area. Four of these NMR sites are duplicated on the HER records, one refers to Fforch Egel farmstead to the southeast (NPRN 18649), the other to coal workings to the east (NPRN 418114).
- 6.4.18 No records of artefacts and coins are recorded within the Portable Antiquities Scheme database (www.finds.org.uk) within the 1km search area.
- 6.4.19 The recorded archaeological sites are briefly described below, according to period, where they are incorporated into a summary of the historical development of the area.

Prehistoric: Palaeolithic (c.450,000 – 10,000 BC), Mesolithic (c.10,000 – 4400 BC), Neolithic (4400 BC – 2300 BC), Bronze Age (2300 BC – 700 BC) & Iron Age (700 BC – AD 43)

- 6.4.20 By the Mesolithic period upland areas such as this would have been exploited on a seasonal basis by groups of hunter-gatherers moving through the landscape. Such upland landscapes may also have provided clearer corridors within the predominant woodland through which these groups could move and communicate more freely. Such groups however would have left little trace of their passing and no such archaeological evidence has been recorded in the study area, or indeed the wider landscape.

- 6.4.21 During the Neolithic period the population became more settled, lands became cultivated and woodlands were cleared to facilitate this. Upland soils were often thinner and easier to cultivate, therefore settlements and activity are recorded in such upland locations, however there is no current evidence of Neolithic activity within the study area or wider landscape.
- 6.4.22 By the Bronze Age however there appears to be a marked increase in the presence of human activity in these upland locations. This activity is often evidenced by the occurrence of funerary and ritual monuments, particularly evident within the study area and across many of the surrounding upland landscapes. Many of these monuments comprise burial mounds or cairns, often apparently sited for dramatic effect on ridge crests or prominently visible from well-travelled paths. Some also may have been used as boundary markers. Six such cairns are recorded in the study area (PRNs 474w, 475w, 476w, 477w, 478w & 1476w). As a result of recent archaeological work in the area (Poucher 2017) the locations of some these cairns has been modified slightly, and one further possible cairn and a circular stone arrangement were also noted, but these cairns are all located on or close to the top of the ridge to the west of the proposed development area. Despite largely being denuded, many of these sites are still clearly visible either from similar monuments on high ground, or silhouetted against the skyline when viewed from lower slopes. Despite the proliferations of these monuments no associated Bronze Age activity has been identified in the surrounding area, it is unclear where, if any, associated settlements would have been located.
- 6.4.23 On the basis of known archaeological evidence, such activity does not appear to continue into the subsequent Iron Age. It is thought that cultivated soils in upland landscapes rapidly degrade, becoming pasture, then ultimately podzolic soils and bog. Evidence from across Britain would suggest a worsening climate from around the later Bronze Age (Rackham 1986, Atherden 1976), making these upland areas less fertile, hospitable and suitable for human activity. There is currently no evidence of Iron Age archaeological remains within the study area or wider landscape.

Roman (AD 43 – c. AD 410)

- 6.4.24 As with the Iron Age, there is currently no recorded evidence of activity during the Roman, or Romano-British period within the study area. Within the wider landscape it

is likely a Roman road would have linked the Roman forts at Llandeilo to the west and Coelbren to the east, passing through the landscape around Brynamman and Cwmllynfell to the north, but there is no indication this affected any activity closer to the proposed development area.

Early Medieval (c. AD 410 – AD 1086) & Medieval (1086 – 1536)

- 6.4.25 The early centuries after the end of Roman administration in Wales are thinly documented. During this period the early kingdoms of Wales were emerging, alongside migrations or invasions from abroad. As kingdoms became established during the later early medieval period this area is likely to have been something of a border land between the lands of Glywysing to the east and Dyfed to the west, and subsequently Morgannwg, later Glamorgan to the east, and Deheubarth to the west. There is however currently no evidence of early medieval archaeological remains within the study area of wider landscape.
- 6.4.26 During the medieval period this area became part of the Lordship of Gower. The establishment of Anglo-Norman control over Gower appears to have been a relatively gradual following their first incursions in the late 11th century. Having established a castle and borough in Swansea by around 1100 Anglo-Norman knights fees were being established in the surrounding areas and across southern Gower in the early 12th century. The northern part of Gower, being largely upland and deep valleys, is likely to have been less well-populated and more remote. This area became part of the ecclesiastical parish of Llangiwig, with the proposed development site lying on the edge of the manor of Cae Gurwen, held as half a knight's fee. The southern boundary of this manor has been depicted (Rees 1932) as running along the ridge top close to the proposed development site, from the point where Nant y Gaseg feeds into the Cwm Gors valley to the southwest (just north of Mynydd y Garth) across the ridge line to Pen-rhiw-fawr to the east and into the Twrch valley near Cwm-twrch Uchaf. This would appear to correspond to a series of boundary stones (PRNs 3391w – 3399w, 3409w & 3434w) that have been identified along the ridge top, some of which are inscribed with the letters 'C G' or 'CnG'. Although these boundary stones appear to be post-medieval in date, they may well be marking the limit of the medieval manor. Rees also indicates that farmsteads had been established within the valleys during the medieval period,

marking 'Bryn-du' to the north, and 'Maerdy' to the northwest, and these uplands areas may have been used for grazing by this time.

Post-Medieval (1536 – 1899) & Modern (1900 – present day)

- 6.4.27 Farming in upland areas continued and expanded into the post-medieval period, with populations peaking during the 19th century. Many of the farmsteads, cottages and trackways that are still visible in the landscape would have been established during this period. By the early 19th century, as visible on the early Ordnance Survey drawings (Budgen 1811), the farmsteads of Tyn-y-coecae (PRN 3353w), Bryn-Melyn (PRN 3405w) and Pen-y-waun (PRN 3352w) had been established, as had Blaen-nant-hir (PRN 3349w) and an unnamed sites nearby (PRN 3350w). Other farmsteads, such as Penwaun-uchaf (PRN 3406w) and Pen-how (PRN3351w) are known to have existed by the mid-19th century, but may have earlier origins, but being too small to mark on earlier maps. These farmsteads were largely located on valley slopes below the summit of the ridges, close to springs or the heads of streams, and close to the boundary of enclosed farmland and open upland. The open upland is still likely to have been as grazing land during this period, and was probably long established common land.
- 6.4.28 From the 17th century onwards the local upland areas were increasingly exploited for coal and stone. Along the ridgeline to the west a number of relatively small-scale quarries (PRNs 3365w, 3439w, 3446w & 3435w) have been recorded, although the latter (PRN 3435w) may actually be associated with coal mining activity. To the northeast of the proposed development site lies more substantial coal mine adits (PRNs 5189w & 5191w), with substantial colliery activity also recorded to the east (NPRN 418114 & PRN 3368w). Similarly more extensive quarry activity is also recorded in these areas (PRNs 5192w & 5194w). These recorded remains are likely to be 18th and 19th century in date, but some were in use until the mid-20th century.
- 6.4.29 When the quarries and coal mines finally closed in the mid-20th century, many of the farmsteads on these upland fringes were also abandoned and the site became once more a relatively remote landscape.

6.5 Map Regression (Figures 6-3 & 6-4)

Ordnance Survey original surveyor's drawings, Llandovery, 1811, 1:31680

- 6.5.1 The earliest cartographic source available which depicts the proposed development area is the Thomas Budgen map of Llandovery dated 1811. This map lacks fine detail for the proposed development area, but it shows enclosed fields in the site area and to the south-west in the lower lying land of the valley, with the higher surrounding ridges being open. The stream that forms the eastern boundary of the site, part of the River Egel system, is shown. Several small farmsteads are shown in the area, including Penywaun to the south-west of the development area, and Brynmelyn to the east.
- 6.5.2 5.1.2 No sites of specific archaeological interest are shown within the proposed development area.

Tithe map, Plan of the Parish of Llanguicke in the County of Glamorgan, 1842 (Figure 6-3)

- 6.5.3 The tithe map of 1842 depicts the field boundaries and buildings in the area of the site in more detail than the 1811 map. The development area covers the area of field nos. 746, 747, and 748. Field no. 747 is a large irregular shaped field that covers the majority of the site, with the smaller field no. 748 on its eastern edge, and no. 746, described as a cottage ('cot') and garden is situated in the northern corner. A rectangular building, the cottage, is shown on the north-west boundary of no. 746. No land use information is available for nos. 747 and 748. All three fields were owned by Samuel Williams, who owned several others fields to the south and south-west including no. 750, which is Penywaun Homestead. The occupier of field nos. 747 and 748 is listed as Thomas Williams, who occupied Penywaun farmstead. The cottage and garden, no. 746, was occupied by William Jenkins. The only feature of specific archaeological interest identified on the site is the cottage, which likely survives as the ruins of Penwaun-Uchaf (PRN03406w) to the northeast of the proposed development area.

- 6.5.4 The irregular shape of the fields in the development area suggest they may have been well-established by the time of the tithe map. The same can be said for most of the fields in the wider area to the east and south. A small cluster of fields to the south-west have straight boundaries indicative of later post-medieval enclosure. The development area is located on the edge of Penllaerfedwen Common, which occupied the higher ground to the north and west. The common land also loops round following the ridge to the south.

Ordnance Survey County Series 1st Edition, Glamorganshire, 1878, 1:2500 (Figure 6-4)

- 6.5.5 The field boundaries depicted on the 1878 Ordnance Survey map have a similar layout to those shown on the tithe map. A small field (no. 835) has been enclosed on the eastern edge of the large field, and to its north, between it and the garden of Pen-y-waun-uchaf, is a new building with a small area surrounding it (no. 834), presumably a garden. A narrow strip of land along the stream on the south-east border of the development area has been enclosed and is marked as rough pasture.
- 6.5.6 The greater detail of the Ordnance Survey map shows a number of tracks and roads connecting the farmsteads in the area. The main track shown, running north-east – south-west to the north of the development area, along the edge of Penllaerfedwen Common, is the same route as the modern access track to the site. On the 1878 map this track continues north-east to coal drifts and the Bryn-melyn Quarry, and to the south-west to join a north – south running road, what is today the A474. Several other smaller tracks cross the Common north-west – south-east from this main track. One track runs east – west across the development area to a new farmstead called Pen-y-coedcae, 100m east from the edge of the development area. Coal levels and surface quarries are marked around Pen-y-coedcae. Although there is some evidence of coal extraction and quarrying the surrounding landscape remains predominantly rural agricultural fieldscapes with isolated farmsteads, and common land on the upland areas.

- 6.5.7 One further feature of archaeological interest is shown to the north of the proposed development area, and that is the building, probably a farmhouse, shown in field no. 834.

Ordnance Survey County Series 2nd Edition, Glamorganshire, 1898, 1:2500

- 6.5.8 There is little change shown within the development area, with the field boundaries remaining the same as on the 1878 map. However, the building noted in field no. 834 (now no. 842) is no longer shown. A new building has been constructed directly to the south-west of the original building at Penwaun-uchaf.
- 6.5.9 In the area surrounding the site the field boundaries, tracks and foot paths remain largely the same. However, there is a notable increase in the number of old coal levels and old coal drifts depicted, particularly on the common to the east of the site. A small pit, labelled as an old coal level, is depicted immediately to the north of the site boundary near Penwaun-uchaf farmstead. To the north of the site, at Bryn-melyn Quarry, a tramway is depicted, which runs north from the quarry to join the Gwaun-Cae-Gurwen Railway.

Ordnance Survey County Series 3rd Edition, Glamorganshire, 1918, 1:2500

- 6.5.10 Only two minor changes are visible in the site area. Two new buildings are depicted at Penwaun-uchaf, on the very north-east boundary of the development area. South along the eastern site boundary a small rectangular field has been enclosed within the already established field no. 841.
- 6.5.11 There is no discernible change in the surrounding landscape.

Ordnance Survey County Series Carmarthenshire, 1953, 1:10,560

- 6.5.12 Although at a lesser scale than the maps previously looked at, this is the only map to depict the site in the mid 20th century. There is little discernible change in the site or the surrounding area, although Bryn-melyn Quarry is now marked as disused.

Ordnance Survey plan 1962, 1:2500

- 6.5.13 There is no discernible change to the site itself or the surrounding area, other than the largest field and the smaller one to the west both now being marked as rough pasture.

Ordnance Survey plan 1989-1991, 1:10000

- 6.5.14 The field boundaries in the development area remain the same as on the previous map. In the northern corner of the site at Penwaun-uchaf farmstead only one building is now shown, and looks by its location to be the original building depicted on the 1878 map.
- 6.5.15 Immediately to the south-east of the site a large area is now marked as a disused pit with tip to the north. About 300m to the south of the development area, in an area previously shown as agricultural fields, is now a conifer forest, an extension of Blaen-egel Wood to the south.

6.6 Aerial Photographs and Lidar (Figure 6-5)

Aerial Photos

- 6.6.1 A search for aerial photographs of the area produced images taken between the mid 1940s and the present day. The earliest photos, taken by the RAF in the mid-1940s, shows the entire development area as one of enclosed, but rough uncultivated boggy ground. The boundaries include the northern, western and southern boundaries of the proposed development area, with the rough ground continuing to the boundary defined by the watercourse marked on current map sources to the east. There is an internal enclosure on the east corner, and a small area of cultivated land adjacent to Penwaun-uchaf, both outside the proposed development area. Both Penwaun-uchaf and Penwaun farmsteads appear to be in use at this time, but no distinctive feature of archaeological interest is noted within the proposed development area.
- 6.6.2 Subsequent aerial photos show little further of interest within the proposed development area, other than some attempts at drainage and cultivation along the western edge of the site during the 1960s. More recent aerial photos and satellite imagery of the 21st century indicates that further drainage has gone in to this area,

occasional scrub clearance has taken place, and the ground has been used as pasture, but it is not clear when this more extensive drainage was inserted. Despite the drainage and clearance, no particular features of archaeological interest have been noted within the proposed development area.

- 6.6.3 Lidar data at 1m DTM is available for the site area (Figure 6-5). This data illustrates the topography of the site, sloping down to the south/southeast, with a slight ridge running northeast – southwest across the centre of the site. Some possible drainage activity is shown in the southeast half of the site, but no features of specific archaeological interest.

6.7 Site Visit (Photos 1 – 16, Appendix 6-2)

- 6.7.1 A site visit was undertaken on the 16th August 2018. Conditions were dry, sunny with some cloud cover, with good visibility.
- 6.7.2 The site is an area sloping down to the south/southeast, covered in upland grasses and rush with areas of boggy ground, currently grazed by sheep and horses. The northern boundary is defined by the recent wind turbine development, comprising a turbine and substation building and gravel track between the two. The western boundary is defined by post-and-wire fencing on top of an earth bank with adjacent drainage ditch, the bank presumably upcast material from the ditch. Post-and-wire fencing alongside drainage ditches define the remaining boundaries, including an internal boundary running northeast – southwest across the site. To the southeast of this boundary the lower ground becomes boggy and difficult to navigate. The nature of the ground cover makes the identification of potential subtle archaeological features difficult, however the topography and ground cover would suggest an area generally unsuitable for settlement activity, or prehistoric ritual and funerary activity. No specific features of archaeological interest were noted within the proposed development area.
- 6.7.3 Surrounding the site two abandoned farmstead complexes were noted. To the northeast stands Penwaun-uchaf (PRN 3406w), the roofless remains of a 19th century stone-built farmhouse and outbuildings. A similar distance from the proposed development site, but lying to the southwest, are the remains of Pen-y-waun (PRN 3352w). This too comprises the roofless ruins of the main farmhouse and some

surrounding outbuildings, of a similar size and apparent date to Penwaun-uchaf. On the opposing valley side to the east lie the clearly visible remains of Penlle'r Fedwen Quarry (PRN 5192w) and Penwaun-uchaf coal workings (NPRN 418114), established in the 19th century but since reworked.

- 6.7.4 From the site there are extensive views southward down the Egel valley with the ridgeline of Cefn Gwrhyd to the southeast. Middle distant views also take in the ridgeline of Mynydd Uchaf with Mynydd y Garth extending beyond to the southwest. Views to the west and north are less extensive as ground continues to rise, with views to the east not extending beyond the area of the Penwaun-uchaf coal workings on the opposite side of the valley head.

6.8 Impact Assessment

Assessment of Archaeological Potential and Importance

- 6.8.1 This general area is noted for two main periods of potential archaeological activity. There is a relatively high number of Bronze Age ritual and funerary monuments within the study area. Known sites however are concentrated on ridge top areas to the west with the topography of the proposed development area likely reducing the potential for such sites, and no further evidence of any associated activity has come to light in previous archaeological investigations or the current site visit within the proposed development area. Despite this, there remains a general potential for Bronze Age archaeological remains in the area, and should such evidence exist it could potentially be of at least Medium (Regional) archaeological importance.
- 6.8.2 The second period of potential archaeological activity relates to post-medieval agricultural settlement and activity, alongside quarrying and coal-mining activity. Such remains are however likely well-recorded on map sources and aerial photographs, and no such remains, other than relatively recent field boundaries and drainage, has come to light within the proposed development area. Should such evidence exist within the proposed development area it is likely to be of Low (Local) archaeological importance.
- 6.8.3 No specific sites of archaeological interest have been identified within the bounds of the proposed development area. The nearest specific features of interest comprise the

remains of the post-medieval farmsteads of Pen-y-waun (PRN 3352w) 95m to the southwest, and Penwaun-uchaf (PRN 3406w) 100m to the northeast, and post-medieval boundary stone (PRN 3395w) 55m to the north. These features are considered to be of Low (Local) archaeological value.

Previous Impacts

- 6.8.4 The site is likely to have been undeveloped agricultural land for some time, mainly used for pasture, with some attempts at land drainage evident. The northern edge off the site incorporates an existing wind turbine, substation and trackway access, groundwork associated with this activity was observed by an archaeologist during a previous phase of works (Poucher 2017). Generally across the site there is a good potential for any below-ground archaeological remains to survive well.

Potential Impacts of the Proposed Development

- 6.8.5 The proposed development is for a solar farm, comprising rows of photovoltaic panels surrounded by security fencing, with associated access track and construction compound, land drains, inverter/transformer building, battery storage equipment and an outdoor education area. The photovoltaic panels themselves are typically piled in to the ground, individually having a limited impact on sub-surface deposits due to the small land-take of the piles, however cumulatively they may be considered to have a larger impact. Associated works, such as the establishment of the access track, foundations for the battery equipment and education area and excavation for cable trenches and land drains, all have the potential to expose, damage or destroy archaeological remains.
- 6.8.6 The proposed development also has the potential to generate indirect (visual) effects on archaeological sites, such as altering the visual setting or tranquillity of the sites and landscapes.
- 6.8.7 The site compound, site entrance and substation will use or occupy areas of previous development, that have been excavated under archaeological observation (Poucher 2017), and therefore will not impact further on potential archaeological remains.

Historic Landscapes

- 6.8.8 The site lies within the Landmap Historic Landscape of Clydach Cwm Du (NPTHL041). Within the Landmap categorisation system this area is assessed as of 'High' value, given this is an undesignated landscape, and higher categories exists, this would be considered to be of 'Medium' value in terms of the assessment criteria. The main characteristics of this area include the rural aspect, irregular fieldscapes, some woodland, some disused mines and opencast workings, and some urban growth around Gwaun Cae Gurwen. The proposed development comprises 0.1% of the historic landscape. Although visually different, grazing will still be possible within the proposed development area, historic field boundaries will be maintained, and no other characteristic elements of the landscape will be removed. Therefore the proposed development is considered to have a Minor impact on this historic landscape.
- 6.8.9 The site lies adjacent to Landmap Historic Landscape of Mynydd Uchaf (Mynydd y Garth) (NPTHL029). This landscape is assessed as of 'outstanding' value, which would be considered to be of 'High' value in terms of the assessment criteria. The main characteristic of this area is unenclosed upland moor with well-defined and visually coherent boundaries, and notable areas of Bronze Age funerary and ritual activity. The proposed development will have no direct impact on this landscape, neither will it affect its visual distinctiveness, although the development will be visible in views of the landscape from high ground to the east. No currently known areas of Bronze Age funerary and ritual activity will be affected. Therefore the proposed development is considered to have a Negligible impact on this historic landscape.
- 6.8.10 No registered Historic Landscape (Cadw et al 1998), Conservation Area or Historic Park & Garden will be directly or indirectly affected by the proposed development.

Scheduled Ancient Monuments

- 6.8.11 No Scheduled Ancient Monument (SAM) will be directly affected by the proposed development.
- 6.8.12 There are eight Scheduled Ancient Monuments within 5km of the proposed development site.

- 6.8.13 GM396, GM397 and GM453 all lie within the Swansea Valley to the east, there are no visual or other links to the proposed development site.
- 6.8.14 CM332, CM333, CM334 and CM335 all occupy high ground on and around Bancbryn to the west. However, the land continues to rise to the west of the proposed development area, therefore there will be no visual link to these sites. These sites include a post-medieval farmstead but largely comprise Bronze Age monuments, there is currently no known associated archaeological remains that will be affected within the proposed development area. Bronze Age monuments occupy high ground to the west of the proposed development area, but links, visual or otherwise, between these monuments and the aforementioned Scheduled Monuments will not be affected.
- 6.8.15 The remaining site is also a Bronze Age monument GM612, on Mynydd y Garth to the south. This is part of a cluster of monuments on southerly facing slopes. Mynydd y Garth is visible from the proposed development area, but these monuments are not. Therefore no SAMs will be indirectly affected by the proposed development.

Listed Buildings

- 6.8.16 No listed buildings will be directly affected by the proposed development.
- 6.8.17 There are 28 listed buildings within a 5km search surrounding the proposed development. These listed buildings are primarily located within the various valleys that cut through the upland landscape, but no listed building is visible from the proposed development area, and no other indirect associations could be established with any listed building within the search area. Therefore no listed buildings will be indirectly impacted by the proposed development.

Non-designated Archaeological Sites

- 6.8.18 No specific sites of archaeological interest have been identified within the bounds of the proposed development area, although some general archaeological potential has been identified, and features of archaeological interest lie in close proximity to the site. The general archaeological potential includes possible Bronze Age activity in the area, and post-medieval agricultural and industrial activity. No above ground evidence of such activity has been identified, any potential below-ground remains associated with this activity may be directly impacted upon by the proposed development, but as

it is not known if any such remains exist, the scale of the impact is also unknown. However, given the lack of visible above ground remains or tangible evidence of features within the proposed development site this impact is considered to be Minor.

- 6.8.19 To the southwest of the proposed development site lies Pen-y-waun (PRN 3352w), and to the northeast lies Penwaun-uchaf (PRN 3406w), both ruinous post-medieval farmsteads. To the north lies a series of post-medieval boundary stones, the nearest being PRN 3395w. However, as all these sites lie outside the proposed development area they should not be directly impacted upon. The altered visual nature of the proposed development area, from enclosed rough pasture to solar farm, will alter the agricultural setting of both farmsteads, although enclosed fields will be maintained and associated historic boundaries will remain unaltered. This is considered to be a Minor indirect impact on the two farmsteads (PRNs 3352w & 3406w).

6.9 Conclusions

Impacts on Designated Assets

- 6.9.1 No registered Historic Landscape, Conservation Areas or Historic Park & Garden will be directly or indirectly affected by the proposed development.
- 6.9.2 No Scheduled Ancient Monument or Listed Building will be directly or indirectly affected by the proposed development.

Impacts on Non-designated Assets

- 6.9.3 The site lies within the Landmap Historic Landscape of Clydach Cwm Du (NPThL041). Landmap areas are not designated landscapes, but contain objective and subjective information designed to enable landscape quality to be taken into account in decision making. Clydach Cwm Du (NPThL041) is considered to be of Medium value in terms of the assessment criteria. The proposed development is considered to have a Minor impact on this landscape, as it visually alters the development area, but largely maintains the characteristic features of the landscape and represents only 0.1% of the landscape area.

- 6.9.4 The site lies adjacent to Landmap Historic Landscape of Mynydd Uchaf (Mynydd y Garth) (NPTHL029), considered to be of High value. The proposed development is considered to have a Negligible impact on this landscape, as it does not alter the landscape characteristics, and is visible only in views of the landscape from high ground to the east.
- 6.9.5 No specific features of archaeological interest have been identified within the proposed development boundary.
- 6.9.6 Research suggests there is a general potential for Bronze Age activity and post-medieval agricultural and industrial activity in the area. Any potential Bronze Age activity is considered to be of at least Medium archaeological value, post-medieval activity is considered to be of Low archaeological value. Given the lack of definitive remains or surface traces of any such archaeology, the impact is considered to be Minor.
- 6.9.7 Two sites of archaeological interest have been identified in close proximity, comprising post-medieval farmstead remains of Pen-y-waun (PRN 3352w) and Penwaun-uchaf (PRN 3406w), both considered to be of Low value. The altered visual nature of the proposed development area is considered to have a Minor indirect impact on these farmsteads.

Table 6-1: Sites of archaeological interest affected by the proposed development

Reference	Site Name	Site Type	Value	Magnitude of Impact
NPTHL041	Clydach Cwm Du	Landmap Historic Landscape Character Area	Medium	Minor
NPTHL029	Mynydd Uchaf	Landmap Historic Landscape Character Area	High	Negligible
PRN 3352w	Pen-y-waun	Post-medieval	Low	Minor

		farmstead ruins		
PRN 3406w	Penwaun-uchaf	Post-medieval farmstead ruins	Low	Minor
-	-	General archaeological potential (Bronze Age activity)	Medium	Minor
-	-	General archaeological potential (Post-medieval agricultural/industrial activity)	Low	Minor

6.10 Mitigation

- 6.10.1 The impact of the proposed development on the historic landscape character areas is difficult to mitigate against, as is the indirect impact upon the two post-medieval farmsteads (PRNs 3352w & 3406w). Maintaining the visible remains of the farmsteads, and historic boundaries, both of which should happen within the current proposed development, will ensure impacts are kept to a minimum.
- 6.10.2 A general archaeological potential for Bronze Age activity, along with post-medieval agricultural and industrial activity has been highlighted in this area. It may be appropriate therefore that an archaeological watching brief is maintained on ground-breaking activity associated with the development in order to mitigate against the impact of these potential archaeological remains.

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7. HYDROLOGY AND HYDROGEOLOGY

7.1 Introduction

- 7.1.1 This chapter describes the geology, hydrology and hydrogeology baseline and environmental assessment for the proposed Mynydd Y Gwrhyd solar farm (the 'Site'). This chapter was developed by Wallingford HydroSolutions Ltd (WHS) along with the supporting Drainage Strategy produced for the Site, which can be viewed at Appendix 7.1.

7.2 Assessment Methodology and Data Sources

- 7.2.1 The Site's vulnerability to development has been initially assessed by reviewing the baseline hydrological and hydrogeological environment. Following this, the potential impacts of the proposed solar farm during construction and operation have been identified relative to the baseline conditions. Proposed mitigation measures and good practice guidance for both construction and operation have been recommended in order to minimise the impacts of the proposed site on the hydrological and hydrogeological environment. The residual risks have then been identified and assessed post mitigation.
- 7.2.2 For the geology and hydrology section of this report the main data source utilised was the British Geological Society (BGS) online mapping service⁴. This was used to establish the existing (baseline) geological and hydrogeological characteristics at the proposed Site.
- 7.2.3 The existing drainage of the Site was assessed using a range of data sources, including LiDAR data and Natural Resource Wales online flood mapping⁵.

⁴ <http://mapapps.bgs.ac.uk/geologyofbritain/home.html> Accessed on: 18/09/2018

⁵ <https://naturalresources.wales/evidence-and-data/maps/long-term-flood-risk/?lang=en>. Accessed on: 18/09/2018

7.3 Baseline

Geology, Hydrogeology and Soils

Bedrock Geology

- 7.3.1 The BGS online mapping service was utilised to view the spatial coverage of bedrock geology at the site. The BGS 1:50,000 bedrock map indicates that the site is underlain by sandstone of the Rhondda Member which is a form of sedimentary bedrock formed in the Carboniferous Period. The bedrock lithology is described as green-grey, lithic arenites with thin mudstone/siltstone and seatearth interbeds. The bedrock reaches a maximum thickness of 320m.

Superficial Geology and Soils

- 7.3.2 The baseline soil conditions have been assessed using Soilsclapes online mapping service⁶. The soil association has been identified as Podzols and described as "very acid loamy upland soils with a wet peaty surface". There are no recorded superficial deposits within the area.

Hydrogeology

- 7.3.3 The hydrogeology of the site was assessed using the BGS borehole scan data. A review of a borehole completed in March 2011, located at NGR: 271730, 209100, approximately 1.75km to the south west of the Site, indicated that groundwater was at a depth of 8m. This indicates that groundwater is relatively deep throughout most of the year at the Site.
- 7.3.4 Groundwater vulnerability is largely controlled by the thickness and permeability of the subsoil (i.e. thin, permeable soil means that groundwater can become more easily contaminated without mitigation). The subsoil at the borehole site begins at a depth of 1.4m with a thickness of 23m, therefore similar depths are expected below the solar farm. Due to the thickness of the subsoil the vulnerability class at the Site is considered "moderate", therefore appropriate mitigation (see section 7.5) will ensure the protection of groundwater in the area.

⁶ Cranfield Soil and Agrifood Institute Soilsclapes online mapping: Accessed via: <http://www.landis.org.uk/soilsclapes/>

Surface Hydrology and Site Drainage

- 7.3.5 The surface hydrology and site drainage has been reviewed using a Digital Terrain Model (DTM) from LiDAR data downloaded from the Lle Geo-Portal website. The DTM indicates that the Site exhibits a topographic fall to the south of the site, with overland flows draining in this direction. The north of the Site is the highest, peaking at approximately 317m AOD and falling to 292m AOD in the south of the Site. There are a number of small drainage ditches/ springs surrounding the site boundary which drain in a southerly direction and forming the beginning of the River Egel.
- 7.3.6 The fluvial flood risk has been reviewed using the NRW online flood maps. No historic flood events have been recorded at or near the Site. The pluvial and fluvial flood maps show that there is no fluvial flood risk to the Site and pluvial flood risk is confined to the drainage ditches to the east and west of the site boundary. The pluvial and fluvial flood mapping is available in Appendix 7.1.

Water Quality

- 7.3.7 The water quality for the nearest watercourses that the Site drains into has been assessed using the Water Framework Directive (WFD) status records. Due to the lack of availability of data for smaller watercourses, the most appropriate record selected was for the surrounding catchment selected via the NRW online mapping service for Cycle 2 Rivers and waterbodies⁷. The status of the River Egel, which is approximately 160m downstream of the Site and is joined by the tributary of the Upper Clydach to form the Tawe, has been classed as good. Therefore, appropriate mitigation is required to ensure that the water quality of the surrounding watercourses to the Site is not affected. The chemical status of groundwater within the area is poor.

7.4 Potential Impacts

- 7.4.1 To assess the potential impacts of the solar farm, the proposed infrastructure was reviewed referencing the site plan (Figure 1-2). Access to the Site is via the track to an existing wind turbine to the north of the site boundary, which is expected to be

⁷ <https://nrw.maps.arcgis.com/apps/webappviewer/index.html?id=2176397a06d64731af8b21fd69a143f6>. Accessed on 18/09/2018.

extended into the site boundary during construction. During the construction phase it is expected that a temporary compound will be constructed, however, as this will be a non-permanent structure the impacts are assumed to be negligible. The following infrastructure is proposed:

- Solar panels and tables
- Inverter/transformer substations
- Battery storage plant
- Energy storage infrastructure

Potential Impacts on Soil

- 7.4.2 There is a risk of soil compaction mainly during the construction phase due to the footprint of both staff and vehicles. Where soil becomes compacted the soakaway potential of the soil decreases correlating to more surface water being transported as runoff, therefore potentially increasing the flashiness of the catchment during high rainfall events.
- 7.4.3 The design of the solar panels has the potential to alter the hydrological regime of the existing fields. The impacts on soil however are considered low due to the small footprint of the frames in direct contact with the soil.
- 7.4.4 Excavation of topsoil from laying of the access track, compound and transformers within the Site can have a direct impact on the exposed subsoil or rock due to increased risk of erosion. This is a particular risk during high rainfall events, and can lead to sedimentation of runoff, in turn having an effect on the water quality of the receiving watercourses.
- 7.4.5 Excavations during the instillation of sub-ground level cables could potentially result in the erosion of the subsoil and sedimentation of rainwater runoff. However, given the shallow depth of excavations associated with solar farm construction, this risk is considered to be low.

Potential Impacts of Water Quality

- 7.4.6 There is a low risk of chemical spillages/leaks from any cabling associated with the substation. In the event of such an event, chemicals may soak through the subsoil and into the groundwater.
- 7.4.7 There is also the risk of contamination from fuel spillages from construction vehicles. However, this risk is considered low, providing that refuelling of vehicles occurs off site.
- 7.4.8 The risk of sedimentation during construction is considered above in paragraph 7.4.4.

Potential Impacts on Surface Hydrology and Drainage

- 7.4.9 With the development comes a potential increase in impermeable area i.e. manmade surfaces. However, the only impermeable area proposed would be the concrete plinth of the substation control building. Impermeable area decreases the amount of infiltration that can take place, resulting in increased rates of surface water runoff. This means that rainwater can reach rivers quicker, carrying a larger volume, subsequently increasing flood risk.
- 7.4.10 The solar panels will not prevent rainwater from reaching the existing fields as it will spill off the panels into the ground, therefore the risk of significantly increased runoff rates is considered low. This is considered in detail within Appendix 7.1.

7.5 Mitigation Measures

Mitigation Measures for Soils

- 7.5.1 It is recommended that the excavations for the access track will be replaced with gravel material as soon as possible following their construction to reduce the risk of erosion/sedimentation. Granular material should be used as opposed to tarmac to allow a level of infiltration to better represent current soil conditions and infiltration levels with lower impact on rainfall runoff. Any construction should be ceased during intense rainfall events and immediately after such events to reduce the risk of erosion and sedimentation into the drainage network.

- 7.5.2 If sedimentation is expected to occur during construction or high rainfall events, mitigation to prevent additional sediment entering the watercourses is required to prevent worsening of the water body status. To prevent sediment from entering any watercourses after draining from the site sediment traps, the proposed swales would capture any remaining sediment runoff as detailed in Appendix 7.1.
- 7.5.3 Underground cable laying should be designed and installed to ensure a low risk of pollution from this activity. Excavations required for cable installation should be undertaken in a manner as to minimise the time which subsoil layers are exposed. Additionally, excavations and cable laying should cease during heavy rainfall and, ideally, be planned during periods predicted to be dry.
- 7.5.4 Active on-site monitoring should also be prioritised throughout construction to ensure the soil remains in good condition and to identify if the soil is becoming compacted. Should significant compaction be detected, vehicle rerouting to reduce this impact should be put in place. The quality of the access track to the Site should be monitored. Where gravel becomes compacted sedimentation may occur, therefore the access track should be updated regularly to reduce crushed stone on site. This on-site monitoring should informally continue at a lower frequency into operation.

Mitigation Measures for Water Quality

- 7.5.5 All fuel, lubricants and chemicals should be stored within bund containment areas, with the capacity to store at least 10% more volume than the maximum storage volume required. Furthermore, any filling points should be within the bunded area or have secondary containment provided. Any pipework should be located above ground to protect from accidental damage.
- 7.5.6 Refuelling, cleaning and routine maintenance of vehicles should be carried out off-site. Drip trays or absorbent mats should be placed under standing plant to prevent any spills reaching the watercourses. Spill kits and other necessary equipment should be provided on site to contain and clean up any spills of fuel, lubricants or other chemicals.

- 7.5.7 All solid and liquid waste materials should be properly disposed of in controlled landfill sites away from the site. Welfare facilities should be provided onsite and any effluent contained within a sealed unit which would be appropriately disposed of offsite.
- 7.5.8 As previously discussed silt traps should be utilised where required to prevent sediment leaving the construction area.

Mitigation Measures for Drainage

- 7.5.9 Despite the implications of the proposed panels on surface water runoff being accounted for within the design of the panels, a conservative approach has been adopted by incorporating a swale into the proposed layout as a method of managing surface water runoff. The Site has been treated as one drainage zone with a swale proposed along the south eastern and western boundary to intercept and store rainwater in the 100 year plus climate change rainfall event. More details on the mitigation measures for drainage, including an outline design, can be found in the drainage strategy, available as Appendix 7.1.

7.6 Residual Impacts

- 7.6.1 Residual impacts have been assessed by reviewing the proposed mitigation measures against the potential impacts outlined above.
- 7.6.2 It is considered that the majority of potential impacts can be managed appropriately through good practice construction methods and sustainable design. However, some residual risks remain, and have been outlined in Table 7-1.

Table 7-1: Residual Risks and proposed mitigation

Risk	Proposed Mitigation	Residual Risk
Sedimentation of runoff	Silt traps and maintenance of the access track	Low
Change in overland flow paths resulting in downstream flooding	Sustainable design of panels with adequate spacing and drainage design	Low
Pollution/contamination of groundwater and surface runoff	Vehicle refuelling offsite/minimising time subsoil exposed	Low

Soil Compaction	Active on-site monitoring and vehicle re-routing if required	Low
Overall		Low

8. TRAFFIC AND TRANSPORT

8.1 Introduction

- 8.1.1 An evaluation of traffic and transport requirements of the solar farm proposal has been conducted and has been applied in the formulation of this Transport Management Plan (TMP). It is anticipated that adherence to this TMP, or any amendment of it approved in writing by the local authority, may form a condition on any planning consent received for the proposed development.
- 8.1.2 It is anticipated that this TMP would be a live document and will require review by the Principal Contractor prior to commencement of works on site, if the scheme is approved.
- 8.1.3 Pre-application consultation with Neath Port Talbot County Borough Council led to a response (Ref.: Q2018/0131) explaining that, amongst other things, policy RE1 in the Local Development Plan requires that *“the development will not compromise highway safety”*. The reply also confirms that the following items should be addressed:
- Delivery vehicle type(s).
 - Scoping route for deliveries
 - Calculation of the number of delivery vehicles during the course of the construction period
 - Statement regarding the operational vehicle movements, and;
 - Details of staff car parking area, compound area and site office during the course of construction

8.2 Scope

- 8.2.1 The principal matters that the CTMP covers are outlined below:
- Roles and Responsibilities;
 - Indicative delivery programme and vehicle numbers;
 - Site Access;

- Routes to site; and
- Management Measures.

Roles and Responsibilities

8.2.2 The key parties involved in construction of the solar farm are set out in Table 8-1.

Table 8-1: Project Roles and Contacts

Position	Contact Name	Company	Number	Address
<i>Project Team</i>				
Client	Dan McCallum	Awel Aman Tawe	(01639) 830870	Awel Aman Tawe, 76-78 Heol Gwilym, Cwmllynfell, Abertawe/Swansea SA9 2GN
Principal Contractor	To be confirmed			
Construction Manager	To be confirmed			
Other contractor(s)	To be confirmed			
<i>Third Parties</i>				
Highways Authority (Neath Port Talbot County Council)	Transport and Roads Department		(01639) 686868 General enquiries	Neath Port Talbot CBC, Civic Centre, Port Talbot, SA13 1PJ

- 8.2.3 The applicant will be responsible for appointing a competent Principal Contractor to undertake the works on site and managing them, including in accordance with the TMP.
- 8.2.4 The Principal Contractor is responsible for managing activity on site safely and accordance with the TMP and relevant regulatory and statutory provisions. The TMP is a working document and it is the responsibility of the Principal Contractor to review it prior to commencement on site.
- 8.2.5 The Principal Contractor will ensure that all Subcontractors and personnel receive a site induction, which will address relevant matters within this TMP.

8.3 Indicative Delivery Programme and Vehicle Numbers

Vehicle Movements

- 8.3.1 Vehicle movements related to construction of the Development are made up of standard HGV deliveries of plant, parts (including photovoltaic panels, mounting frames and inverters) and materials, as well as light vehicles primarily for transport of construction personnel. A small number of vehicle movements are associated with removal of waste, welfare facilities and other temporary infrastructure at the end the construction period. No Abnormal Indivisible Loads (AILs) or other non-standard deliveries are expected. In total approximately 109 deliveries by HGV (218 HGV vehicle movements) will be required, as detailed in Table 8-2 below.
- 8.3.2 A maximum of 20 construction workers are forecast to be on site during peak construction activity, with the average across the full construction period being significantly lower. The construction workers will arrive in shared transport wherever possible, to minimise the volume of resulting light vehicle movements. Adequate parking for all light vehicles will be provided within the construction compound. No on-street parking will be required.

Delivery Programme

- 8.3.3 An indicative construction timetable is also presented in Table 8-2. This timetable indicates when HGVs movements may occur, based on distribution of the total

expected number of vehicles over the expected period of each construction activity. It should be noted that this may be affected by weather conditions and availability of plant and materials. The calendar weeks highlighted blue show when each task is expected to be carried out and the numbers show the approximate number of HGV deliveries which are expected to arrive on site in any given week.

Table 8-2: HGV Vehicle Movements and Assumed Installation Timetable

			Indicative Distribution of Movements over Construction Period									
Task	Description of Activities	Total Movements	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10
Ecological Protection	Erection of internal fencing to protect trees, hedges and field margins.	6	6									
Construction site setup	Erection of security fencing, establishment of construction compound, site offices and welfare facilities	30	10	10	10							
Access tracks	Preparation of construction related and permanent access tracks	66	30	30	6							
Mounting Structure	Delivery and installation of supporting structures for PV arrays	28			7	7	7	7				

			Indicative Distribution of Movements over Construction Period									
Task	Description of Activities	Total Movements	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10
PV Array	Delivery and installation of PV panels	30					10	10	10			
Grid connection works	Cabling, grid connection, sand fill for cable trenches.	10			4	2	2	2				
Inverters and transformers	Delivery of inverters and transformers (including cranes for install)	16					6	5	5			
CCTV and other security measures	Delivery of CCTV and associated equipment	2								2		
Commissioning and testing	Ensuring all site systems work effectively (no HGV deliveries)	0										

Indicative Distribution of Movements over Construction Period												
Task	Description of Activities	Total Movements	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10
Site closure and reinstatement	Removal of all temporary structures and reinstatement of the compound area and site	30									10	20
Total movements		218	46	40	27	9	25	24	15	2	10	20
Approximate average movements per day (assuming 5 day week)		4	9	8	5	2	5	5	3	<1	2	4

8.4 Site Access

Existing Site Access

- 8.4.1 Access to the proposed solar farm site is via the A474 turning east on to a small unclassified carriageway approximately 2km South of Cwmgors (at SN703086). Vehicles shall proceed along this road for 2km to the point where vehicles will turn North (at SN717095) to make use of the existing track which gives access to the existing wind farm adjacent to the proposed Solar Farm site.
- 8.4.2 The route was previously used for access to enable the construction of the wind farm and is also regularly used for large agricultural plant as is therefore deemed suitable for use by HGVs.

Construction Site Access

- 8.4.3 No works are envisaged to enable access to the site. Existing site entrance arrangements off the A474 are suitable for the access of articulated loads.
- 8.4.4 A temporary construction compound shall be provided adjacent to the site to allow for staff parking and to enable delivery vehicles to unload away from the public carriageway. The location of the temporary compound can be seen on Figure 1-2.
- 8.4.5 The presence of the temporary construction compound adjacent to the site would allow for effective management of traffic entering and exiting the site so that timings can be arranged dependent upon traffic movements on the main A474.

Highway Access Route

Available Routes to Site

- 8.4.6 The most likely route for delivery vehicles would be from the M4 exiting at junction 45 to the north of Swansea. The route would then utilise the A4067 heading north passing through Pontardawe before joining the A474 turning off on the route described above (see section 8.4.1) approximately 2km south of Cwmgors.
- 8.4.7 The size and condition of these roads are deemed suitable for the type of vehicles that are anticipated and the route avoids any town centres and residential areas.

Proposed Vehicle Routing

- 8.4.8 It is proposed that all HGV deliveries follow the same route so that local road users know which route will be being utilised throughout the construction period. The proposed route is indicated on Figure 8-1.

8.5 Management Measures

General Management Measures

- 8.5.1 No specific requests were made by Neath Port Talbot County Borough Council, but certain items were listed as needing addressing. Following similar proposed constructions in other county and borough councils the developer would like to propose the following measures to minimise disruption to local residents.
- 8.5.2 HGV deliveries will be scheduled to arrive outside peak hours (assumed to be 07:00-09:00 and 16:00-18:00), Monday to Friday.
- 8.5.3 All vehicles arriving at site during the construction period will enter the construction compound. At this location, either:
- deliveries will be unloaded for storage and later transport to the solar farm site; or
 - drivers will be provided with a site induction and then directed to proceed directly to solar farm site.

Management of the unnamed, minor road

- 8.5.4 Whilst this road is currently used by vehicles in association with existing agricultural activities, the solar farm will result in an increase in the intensity of vehicle movements on the lane for the duration of construction. As a result, the following management measures will be implemented:

Survey

- 8.5.5 The route to site will be subject to a visual survey pre- and post-construction. Both surveys will incorporate making a photographic record. Any defects found in the post

construction survey, which are attributable to vehicle movements associated with the Development, will be rectified at the cost of the Applicant.

Management and Scheduling of Deliveries

- 8.5.6 The Principal Contractor will ensure that HGV movements are suitably timed or controlled to avoid conflict between vehicles approaching and departing the site on the road. When a delivery arriving at site is expected, departing vehicles may be held at the construction compound, to avoid local residents passing more than one HGV on their journey in the local area.

Local Residents

- 8.5.7 Prior to construction commencing, the Client, or their appointed Principal Contractor, will contact local residents, and those along the proposed route whose properties are accessed using the minor roads on the proposed access route to:

- Inform them of the expected construction programme and vehicle movements;
- Provide a contact name and phone number to which any concerns may be addressed; and
- Ask for their cooperation in ensuring on-street parking on the proposed route does not obstruct access and allows sufficient space for passing.

- 8.5.8 It is not considered that any formal parking restrictions along the proposed route are required.

Wheel Washing

- 8.5.9 At the entrance to the construction compound, a wheel washing facility will be provided and vehicles departing onto unnamed road will be cleaned as required to avoid the transport of soil or mud on to the public road.

Management of Public Rights of Way

- 8.5.10 There are no public rights of way within or in close proximity to the development site, the access route or the grid connection. Therefore no management of public rights of way is required.

8.6 Summary and Conclusions

- 8.6.1 This outline Traffic Management Plan (TMP) has been prepared to accompany a planning application for a solar farm on Mynydd y Gwryd. It is anticipated that average daily movements for HGVs are expected to be approximately 10 during the peak week of construction. This will be reduced significantly following the initial few weeks of the construction phase.
- 8.6.2 The site will not require an upgrade to the existing field entrance to allow HGV access. HGV delivery will be restricted to a specific route to avoid damage to the roads, pavements and for road safety.
- 8.6.3 Subject to the implementation of the management measures outlined in this chapter, it is considered that access to the site for construction traffic can be achieved without any significant effects to other road users or highway safety.

9. GLINT AND GLARE

9.1 Introduction

- 9.1.1 Glint and glare are phenomenon caused by many reflective materials, whereby light from the sun is reflected off such materials with a potential to cause hazard, nuisance or unwanted visual impact. Although the terms 'glint' and 'glare' are commonly used together, various sources use different definitions. For the purposes of this assessment, glint is defined as the direct reflection of the sun from the solar panels. Glare is defined as the continuous source of brightness, which is not the direct reflection of the sun, but the reflection of a bright sky. The level of potential glare from solar PV panels is similar to that of water and much less than that of materials such as concrete and vegetation. Glint and Glare are also commonly referred to as 'solar reflection'.
- 9.1.2 For a receptor, such as a property or road, to experience glint or glare, it would need to have visibility of the solar farm. In addition to this, the receptor would need to be located to the east or west of the panels as glint or glare would occur when the sun is low in the sky (towards sunset or sunrise) and would reflect light at an angle off the panels rather than shining directly down onto panels. Once the sun reaches a certain elevation in the sky, the incident angle of the sun will reflect off the solar panels at an opposing angle that will not impact on any ground based receptors. As a result of this, for ground based receptors, glint and glare from solar farms will generally only occur in the mornings and the evenings. Receptors to the north or south of the panels would not be affected.

9.2 Summary of Findings

- 9.2.1 Solar panels, by their nature, are designed to absorb as much sunlight as possible, thus converting the sun's energy to electricity. As a result, the amount of light reflected off these installations is far less than one might expect.
- 9.2.2 As demonstrated with the Figure 4-1 Zone of Theoretical Visibility the solar scheme is not widely visible and does not encompass any receptor group that would be a concern if the scheme were built. In addition to this, the solar farm will be further screened by existing vegetation. No roads or properties with visibility of the solar farm are located to the east

or west of the proposed development, and accordingly no glint or glare will be experienced by receptors of any kind.

10. NOISE EVALUATION

10.1 Potential Noise Emissions

- 10.1.1 This noise evaluation has been prepared in order to determine, based upon the characteristics of the elements of the proposed scheme that may give rise to noise emissions and nearby residential receptors, whether a full noise assessment would be required to support a planning application or whether a desk-based evaluation supported by standard mitigation measures would be appropriate.
- 10.1.2 The elements of the proposed development with the potential to give rise to incidents of noise to receptors are considered to be:
- Construction noise
 - Operational noise through on-site elements including noise arisings from:
 - Inverter / transformer stations
 - On-site substation
- 10.1.3 The proposed scheme does not comprise moving parts with the potential for associated noise emissions and it is not an industrial process that would give rise to continuous noise streams. The proposed scheme has not been deemed EIA development and as such the potential for adverse significant effects is highly unlikely; this reinforces the suitability of undertaking desk-based noise modelling for the purposes of determining whether further evidence is required for determination.

10.2 Solar Farm Design and Embedded Mitigation

- 10.2.1 The proposed solar farm is designed to purposely locate any noise emitting infrastructure as far from residential properties as practicable. The inverter units and on-site substation are sensitively placed in locations central to the solar farm so that noise emissions associated with operational components would arise within the confines of the development itself.
- 10.2.2 The design process of centralising the noise emitting infrastructure serves to mitigate any potential noise effects to local residents. The solar arrays around the inverters and

substation will further serve to dampen any noise emissions as they form physical structures that absorb noise.

- 10.2.3 The centralised inverter will be housed within a containerised unit, which will absorb noise emissions at source and thereby rapidly reduce audibility within a short distance of each structure.
- 10.2.4 The adoption of these parameters into the design of the solar farm have substantially reduced noise from emitting sources and thereby confirm the sufficiency of desk-top modelling in giving certainty that effects to residential amenity will not arise.
- 10.2.5 It should also be noted that, for the construction phase, the layout of the tracks for the scheme has been designed to minimise the necessity for vehicles using reversing alarms, thereby mitigating noise emissions from construction vehicles.

10.3 Study Area and Baseline Receptors

- 10.3.1 Noise emissions from solar farm infrastructure dissipate very rapidly from source and are associated solely with a 'humming' sound that emits from a substation or central inverter. Typically there will be no audibility of noise emitting features at no greater than 125m from source.
- 10.3.2 The following plan demonstrates the relative location of the solar farm site to the nearest residential properties:

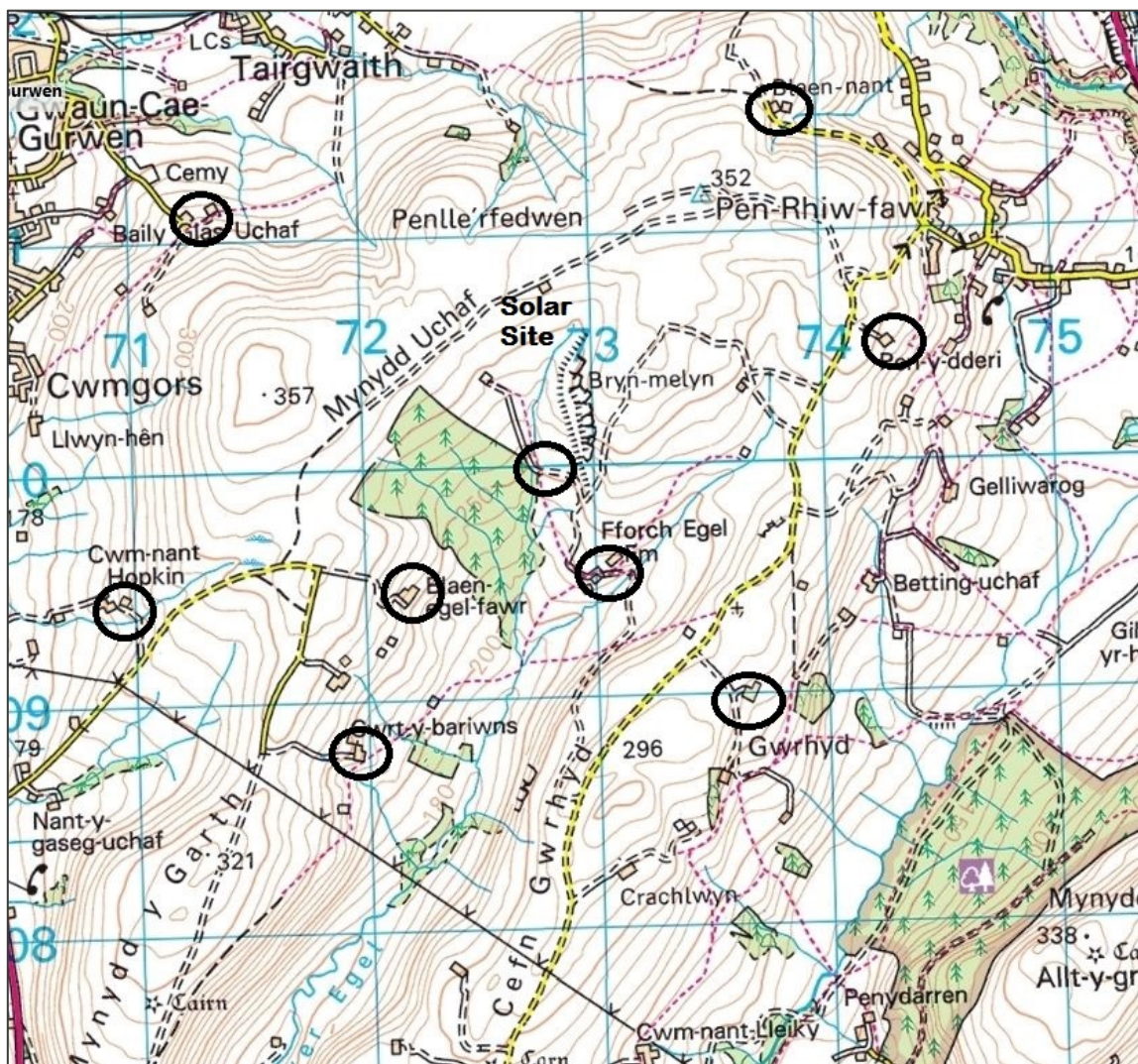


Plate 5: Noise Sensitive Properties

- 10.3.3 The nearest existing principal residential receptor, Fforch Egel Farm, is located over 950 m from the site boundary. It is reasonable to assume therefore that, over this distance, there will be no harmful effects to residential amenity during the operational phase of the development.
- 10.3.4 A property is planned for construction at Pen y Waun, which would be the closest residence to the development site, 220m south of the solar arrays but over 400m from the nearest noise emitting inverter/transformer. As explained below, noise levels would rapidly reduce from the source and would not be a issue for this property.

10.4 Construction Noise

- 10.4.1 Potential noise effects would need to be controlled in accordance with relevant British Standards Codes of practices including: BS 5228-1: 1997 *"Noise Control on Construction and Open Sites - Part 1"*; BS 5228:2009 and A1:2014 *"Code of practice for noise and vibration control on construction and open sites"*; and BS 8233:2014 *"Guidance on Sound Reduction and Noise Insulation for Buildings"*. Conditions that may be attached to a planning permission would be required to conform to such Standard requirements.
- 10.4.2 Due to its very nature, construction activity is a temporary activity and any effects will therefore be short-lived, likely to be over 12 weeks. Typically, sources of construction noise include site vehicles and some intrusive works during piling and in the groundworks for the foundations for the substation and inverters; such activities will be controlled through agreement with the Planning Authority on a Construction Environmental Management Plan, which will set out how construction activities will comply with requirements to protect the amenity of local residents.
- 10.4.3 Construction works will be carried out during the day-time period and plant will be required to be 'throttled down' or turned off when not in productive use. Operators of all mobile equipment will receive a briefing at the commencement of the project to ensure appropriate use of machinery in order to limit noise levels.
- 10.4.4 Construction will take place over a period of 12 weeks during which the principal activities will be those as set out in the Description of Development, Section 3 of this Environmental Report.
- 10.4.5 Over the 12 week period, hours of operation will be limited to:
- Monday to Friday, 8 am to 5pm
 - Saturday, 8 am to 1 pm
- 10.4.6 During construction, the Applicant will be responsible for appointing a Principal Contractor, who will be responsible for managing activity on-site in accordance with regulatory and statutory provisions, including any conditions imposed by the Planning Authority. The Principal Contractor will, in turn, ensure that all Subcontractors and

personnel receive a site induction and adhere to any requirements specifying the control of noise throughout the construction period.

10.4.7 Accordingly, the Principal Contractor will ensure that construction noise is limited to acceptable levels, using one or more of the following approaches if necessary:

- Limiting working time;
- Use of low noise plant and machinery; and
- Installation of noise barriers during periods of work.

10.4.8 In addition, the following noise management measures for the construction phase are proposed:

- Confirmation of the following procedures for ensuring compliance with statutory or other identified noise control limits;
- Procedures for minimising the noise from construction related traffic on the existing road network;
- Procedures for ensuring that all works are carried out according to the principle of 'Best Practicable Means' as defined in the Control of Pollution Act 1974;
- General induction training for site operatives and specific training for staff having responsibility for particular aspects of controlling noise from the site;
- Programme for noise monitoring / auditing; and
- Means of liaison with the Planning Authority and the community.

10.4.9 Furthermore, general measures to demonstrate Best Practicable Means for controlling noise will include the following as appropriate:

10.4.10 Each item of plant shall comply with the noise limits quoted in the relevant European Commission Directive 2000/14/EC/United transposed into UK Kingdom Statutory Instrument (SI) 2001/1701.

10.4.11 Careful selection of plant will be undertaken to ensure that noise emissions are minimised.

- 10.4.12 Construction methods will be reviewed and careful programming undertaken to optimise when activities generating higher levels of noise are carried out.
- 10.4.13 Plant and equipment liable to create noise whilst in operation will, as far as reasonably practicable, be located away from sensitive receptors. The use of barriers to absorb and/or deflect noise away from noise sensitive areas will be employed where required and reasonably practicable.
- 10.4.14 All plant, equipment and noise control measures applied to plant and equipment shall be maintained in good and efficient working order and operated such that noise emissions are minimised as far as reasonably practicable. As far as reasonably practicable, any plant, equipment or items fitted with noise control equipment found to be defective will not be operated until repaired.
- 10.4.15 Where reasonably practicable, fixed items of construction plant should be electrically powered in preference to diesel or petrol driven.
- 10.4.16 Vehicles and mechanical plant employed for any activity associated with the construction works will, where reasonably practicable, be fitted with effective exhaust silencers and shall be maintained in good working order and operated in a manner such that noise emissions are controlled and limited as far as reasonably practicable.
- 10.4.17 Machines in intermittent use should be shut down or throttled down to a minimum during periods between works. Static noise emitting equipment operating continuously will be housed within suitable acoustic enclosure, where appropriate.
- 10.4.18 A programme of community liaison will be undertaken, in order to ensure all potentially sensitive premises are notified of forthcoming works.

10.5 Operational Noise

- 10.5.1 The following paragraphs address the potential operational noise performance parameters for the proposed Mynydd y Gwryd solar farm. It should be noted that there will be no moving parts to the scheme and the solar panels operate without any noise emissions.

- 10.5.2 Inverter/transformer units are fitted with cooling fans that generate a small amount of noise when the solar farm is operational. As solar farms only operate during daylight hours, there will be no operational noise generated in the evening, night and early morning (when ambient noise levels are typically lowest).
- 10.5.3 During the operational phase of the development, noise emissions from solar farm plant will not exceed 45 dB LAeq,T, when standing within the perimeter of the scheme and close (i.e. within 15m) of the inverters, which is equivalent to the World Health Organisation (WHO) 'Guidelines for Community Noise' guideline noise level value for "sleep disturbance, window open" during night-time periods.
- 10.5.4 The character of noise often associated with the operation of inverters/transformers at a solar farm is typically described as a buzzing sound (i.e. potentially tonal at a particular frequency). The very low levels of noise associated with inverters at the solar farm should not however be a matter causing public concern as any audibility tails off entirely within 125 metres of the inverter and transformer units, because essentially the cabinets in which they are housed effectively trap the majority of audible noise. The inverters and transformers have been purposefully located to avoid any unwarranted noise incidences.
- 10.5.5 The on-site substation, at which the generated power will be stepped up to the voltage of the distribution network, will be constructed and operated in accordance with WPD specifications and will effectively contain the noise emissions within the building. Noise levels at a distance of 1m from the building will be no greater than 25dB (A), and such levels will attenuate rapidly with greater distance from the building.
- 10.5.6 The noise associated with the operation of the solar farm, specifically in relation to the inverters and on-site substation, will either be inaudible or would not exceed 20 decibels dBL_{Aeq}, noise levels which are considered to be very low, as defined within BS4142. Accordingly the Applicant is confident that no audibility of the solar farm scheme will arise to local residences during operation, particularly in light of the separation distances from such receptors.

10.6 Noise Evaluation Conclusions

- 10.6.1 The siting and design process for the proposed solar site has largely mitigated the potential for noise emissions from electrical infrastructure, principally the inverter units and the on-site substation. The selected locations are such that, in accordance with the noise characteristics of these components, sufficient distance from noise sensitive properties has been accommodated in the site design.
- 10.6.2 Construction noise will be for a limited period of up to 12 weeks and will be strictly controlled to standard working hours. The Principal Contractor for the installation will have responsibility for ensuring that on-site activities do not breach amenity conditions for nearby residents.
- 10.6.3 Operational noise will be limited to daytime only, which is the period of generation for the solar farm. Night-time noise from the scheme will not arise.
- 10.6.4 Operational noise levels from the day-time operation of the scheme will either be inaudible or would not exceed 20 decibels dB LAeq, noise levels which are considered to be very low, as defined within BS4142, and such levels would also not exceed the World Health Organisation (WHO) 'Guidelines for Community Noise'.
- 10.6.5 On this basis of the findings of this preliminary noise evaluation, it is concluded that the development would be constructed and operated within statutory noise limits and that no adverse effects to residential amenity would arise. No further assessment of noise propagation is therefore advised.