TRECWN GREEN ENERGY HUB

Scoping Report

Statkraft UK Limited

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1.0 Introduction

1.1 Background

This document comprises a request for a Scoping Direction from Planning and Environment Decisions Wales (PEDW).

Statkraft UK Ltd (Statkraft) is seeking to develop a Green Energy Hub in which hydrogen is produced through electrolysis of water using wind and solar energy (the 'proposed development'). The proposed development is located on land associated with the former Royal Navy Armament Depot (RNAD) Trecwn, SA62 5YD (The Valley) to the south of Fishguard in Pembrokeshire. The Site location is shown is **Figure 1.1: Site Location.**

The proposed infrastructure would be located within the red line boundary as shown in **Figure 3.1: Proposed Development Locations**, within which are three principal development areas together with associated connecting infrastructure, e.g. underground cables and water pipes:

- the green hydrogen facility would be located within The Valley;
- the solar panels would be located on farmland to the west of The Valley; and
- the wind turbines would be located to the north east of the Valley.

The land occupied by the proposed development as a whole is termed 'the Site'.

The green hydrogen facility comprises all physical infrastructure required for the generation, storage and export of hydrogen.

For the purposes of this scoping request, an initial scoping layout has been developed. It is expected that the layout will continue to evolve through the EIA process. A candidate turbine has yet to be selected, but it is proposed that the proposed development would comprise three turbines with a height to blade tip of up to 149.9m, with a combined generating capacity of around 15MW. The solar panel generating capacity is also expected to be around 15MW.

On the basis of the anticipated generation capacity, Statkraft intends to submit a planning application for the proposed development to PEDW on behalf of Welsh Government as it exceeds the generation capacity threshold for a Development of National Significance (DNS) under the Planning Act (Wales) 2015.

1.2 The Need for EIA

The proposed development falls within Schedule 2 of the Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017 (as amended) (the 'EIA Regulations'), for which EIA is not mandatory. Statkraft has taken the decision that, given the type, scale and location of the proposed development, it will undertake EIA on a voluntary basis.

Statkraft has appointed SLR Consulting Ltd (SLR) to undertake an EIA scoping study and prepare this Scoping Report to accompany a request to PEDW to adopt a Scoping Direction under the EIA Regulations.

The findings of the EIA process will be used to inform the final design of the proposed development and assess its predicated environmental effects. The results will be presented in an Environmental Statement (ES) that will be submitted with the planning application.

1.3 Purpose of the Scoping Report

Undertaking an EIA scoping study is regarded as good practice and is considered to be an important step in EIA as it allows all parties involved in the process to agree on key environmental issues relevant to the proposed development and to agree on the methodology to be used for their assessment.

The specific aims of this Scoping Report are to:

- identify the technical subject areas that may be subject to significant environmental effects as a result of the development proceeding and therefore require further study;
- identify the technical subject areas that are unlikely to be subject to significant environmental effects and can be scoped out from further study;
- provide a basis for a consultation process to agree the scope and content of the ES with PEDW; and
- provide a basis for agreeing methodologies for undertaking required studies, based upon currently available baseline data, site characteristics and best practice in individual technical disciplines.

In arriving as its formal opinion, it is anticipated that PEDW will consult with a number of consultees and incorporate their views within the Scoping Direction.

1.4 Statkraft UK Ltd

Statkraft is a leading company in hydropower internationally and Europe's largest generator of renewable energy. The Group produces hydropower, wind power, solar power and supplies district heating. Statkraft is a global company in energy market operations, with 5,000 employees in 20 countries.

Since 2006, Statkraft has gone from strength to strength in the UK, building experience across wind, solar, hydro, storage, grid stability, EV charging, green hydrogen and a thriving markets business. In Wales, Statkraft operates Alltwallis wind farm in Carmarthenshire, and the Rheidol hydropower scheme near Aberystwyth. Statkraft's Operations Control Centre for the whole of the UK is also based at Rheidol.

Statkraft has invested over £1.3 billion in the UK's renewable energy infrastructure and facilitated over 4 GW of new-build renewable energy generation through Power Purchase Agreements (PPAs).

Across its UK businesses Statkraft employs nearly 450 staff and plays a key role in helping the global business reach its goal of 9 GW of developed wind and solar power by 2025.

Further information on Statkraft can be found on its corporate web site at https://www.statkraft.co.uk/.

1.5 SLR Consulting Ltd

SLR is one of the UK's fastest growing multi-disciplinary environmental consultancies. Within the energy sector, SLR provides a wide range of planning, environmental and technical services relating to the design and development of wind farms and other renewable energy projects.

SLR is a registered Environmental Impact Assessor and Member of the Institute of Environmental Management and Assessment (IEMA). The company has significant experience in the preparation of planning applications and undertaking EIA for a wide variety of projects, including renewable energy, minerals, waste and infrastructure developments. Further information on SLR can be found on its corporate web site at www.slrconsulting.co.uk.

SLR is working with other consultancy partners in preparing this Scoping Report and undertaking the EIA, as follows:

- Land Use Consultants (LUC) – ecology and ornithology;
- Aviatica – aviation and communication services; and
- Land Research Associates (LRA) – agricultural land quality.

The engineering and safety design of the green hydrogen facility is being undertaken on behalf of Statkraft by Arup.

1.6 Report structure

Following this introductory section, the remainder of this report comprises the following sections:

Section 2	provides a description of the Site and its surroundings;
Section 3	provides a description of the proposed development;
Section 4	describes the process of scoping the EIA and the proposed approach to consultation;
Section 5	outlines the planning policy context for the proposed development;
Sections 6 to 16	describe the specialist environmental studies that are proposed to be undertaken to assess the impact of the proposed development on the environment;
Section 17	describes the other environmental topics which do not require dedicated chapters but which will be considered as part of the EIA; and
Section 18	concludes by providing contact details for SLR with whom any matters contained within this report may be discussed in greater detail prior to responding to the scoping exercise.

2.0 Site and Surroundings

2.1 Overview

The prospective application Site comprises the former RNAD facility, known as The Valley, and nearby agricultural land. The proposed boundary within which development would take place is shown on **Figure 3.1: Proposed Development Locations**. The Site is connected to the A40 which runs to the west of the Site by a private road, Admiralty Way.

The Site boundary for the purposes of EIA scoping has been drawn relatively widely to allow for design iteration and further detailed study; it is expected that the 'red line' boundary for the prospective planning application would be reduced from that considered within this Scoping Report.

The location for the proposed development was selected based on the potential of The Valley for strategic employment use, and making use of its exceptional road and rail connections. The expectation is that the hydrogen produced within the Valley would be used to fuel heavy transport such as buses and trains, replacing diesel which most of these vehicles currently use. The intention is that hydrogen fuel would also provide a catalyst for innovative green energy employment uses as part of the Haven Enterprise Zone and the Strategic Employment Site for north Pembrokeshire.

The Valley is one of a number of steep-sided, incised valleys within a gently rolling plateau used predominantly as pasture for grazing of cattle and sheep. A number of farms and small hamlets are located to the north, east, south and west of the Site; the closest of which are the former MoD houses at Trecwn, now in private ownership, including houses along Barham Road and along part of Admiralty Way at Ffos Las. There are also a small number of residential properties close to the entrance to The Valley within the original hamlet of Trecwn, and other properties on rising ground around the Site including a small group of houses in the area north of the solar area known as Bengal.

One operational 4.4MW solar farm, and a number of relatively small (by modern standards) farm-based wind turbines are located within the surrounding area. A community wind turbine, Trebover, is located approximately 3.5km to the north of the Site. This turbine is around 50m to blade tip.

Two main watercourses are found within the Site – the River Aer which drains the northern part of The Valley and runs due north towards Llanychaer, and Nant-y-Bugail, which runs west from Trecwn, parallel to Admiralty Way.

To the north and east of the Site the land rises to the higher land of the Preseli Hills which is principally in use as moorland grazing.

2.2 Access

The Site is connected to the strategic road network by means of a priority junction with the A40 located between the villages of Letterston and Scleddau. The private access road, known as Admiralty Way, extends for approximately 2.8km to the main gates of The Valley.

2.3 Historical Uses

The Valley was developed in the late 1930s by the MoD as an armaments depot, and as such there is no planning history for the Site prior to it being sold to the private sector by the MoD in the 1990s.

The former RNAD is located within a forested valley which was heavily modified to enable the construction of the RNAD in the 1930s. Modifications included the construction of 58 chambers within the steep valley sides for storage of munitions, the spoil (rock) from which was deposited along the valley floor. The chambers vary in size, with storage areas up to 77m long, 10m wide and 9m high.

Many of the former RNAD buildings have been demolished. The main concentration of surviving buildings is in the west of The Valley, east of the main entrance, to the south of the former school and Barham Road.

The RNAD was served by a branch line spur off the Fishguard to Swansea main railway line. The branch line and sidings are still in place and connected to the main line. The rail connection allowed supply of naval mines and munitions via rail throughout the UK, and distribution via deep-sea ports. Facilities were constructed within The Valley for the several thousand workers, including housing, a school, shops, cinemas, and a church, some of which remain to this day.

Other areas of the Site outside The Valley remain in agricultural use, primarily grazing with some hay / silage crops.

2.4 Planning Status and History

The western part of The Valley comprises a Strategic Employment Site (see Section 5 for further details) and also forms part of The Haven Enterprise Zone (see **Figure 2.2: Planning Designations and History**).

Following sale of the RNAD to the private sector, planning permission was granted for the use of the existing buildings and infrastructure for a range of commercial and industrial purposes, as follows:

03/1492/PA Change of use of vacant Armaments Depot to use class B1, B2 & B8 with use of open spaces for recreation purposes – granted 30 April 2004.

This permission has been implemented and certain buildings are occupied with a range of low key employment uses.

Peaking Plant

Planning permission 11/0462/PA was granted in September 2012 for a 20 MWe diesel-fired peaking plant. This permission was not implemented due to lack of electricity grid capacity and has therefore expired. The peaking plant site was located in the southern part of the main buildings complex.

Biomass Facility

Planning permission 14/0300/PA was granted in April 2015 for a 25 MWe biomass facility. This permission was not implemented due to lack of electricity grid capacity and has therefore expired. The biomass facility site was located in the central area of The Valley at the watershed of the two river systems.

2.5 Statutory designations

There are no statutory ecological designations within the Site. Nearby statutory designations are shown on **Figure 2.3: Environmental Designations** and include:

- Afon Cleddau Gorllewinol/Western Cleddau River Site of Special Scientific Interest (SSSI) and Special Area of Conservation (SAC);
- Esgyrn Bottom (SSSI);
- Garn Wood, Kilkiffeth Wood & Dan-deri-Cwm (SSSI);
- North Pembrokeshire Woodlands / Coedydd Gogledd Sir (SAC);
- Corsydd llangloffan (SSSI), National Nature Reserve (NNR);
- Waun Fawr, Puncheston (SSSI);
- Allt Pontfaen – Coed Gelli-fawr (SSSI);
- Preseli (SAC);

- Creigiau Abergwaun (Fishgaurd cliffs) (SSSI);
- West Wales Marine / Gorllewin Cymru Forol (SAC);
- Carn Ingli (SSSI); and
- Comins Tre-rhos (Tre-rhos Common) (SSSI).

There are no landscape designations within the Site. Nearby landscape designations include:

Pembrokeshire Coast National Park, which is characterised in a number of sections. In relation to the Site these sections include:

- the Preseli Hills and coast around Newport (approximately 800m to the east at its closest);
- the coast to the north of Fishguard (over 5 km) and extending west to St David's Peninsula (approximately 17 km); and
- areas around Milford Haven (approximately 17 km to the south).

Landscapes of Outstanding and Special Historic Interest. There are three of these designated landscapes within the local area these being:

- Pen Gaer: Garn Fawr;
- Newport and Caringli; and
- Preseli.

A number of Conservation Areas (CA) are present within the locality and include the following:

- Goodwick CA;
- Fishguard CA;
- Lower Town CA; and
- Newport CA.

There are two listed buildings close to the Site, both of which are Grade II Listed Buildings:

- Barham Memorial School.
- Old School House at Barham Memorial School.

There are a number of Scheduled Monuments and Listed Buildings within the surrounding area.

A number of non-designated historic assets are located within the Site boundary, all of which either date to the Bronze Age (2500-800 BC) or later medieval (AD 1066-1439) periods.

2.6 Forestry and Ancient Woodland

The Valley comprises areas of coniferous plantation established by the MOD in the 1950s, which is now the subject of forestry management by the landowner. Plantation areas are interspersed with longer-established woodland areas, and more recent regeneration. Invasive species such as *Rhododendron* are prevalent in certain areas.

Parts of the forested areas are shown as ancient woodland on the Ancient Woodland Inventory.

3.0 Description of the Development

3.1 Overview

Careful consideration has been given to the provisional layout of the proposed development through technical and environmental feasibility studies, but it should be noted that design evolution will continue as the EIA progresses, taking into account environmental and technical constraints arising from further studies, and feedback obtained during consultation.

Although the layout will be optimised through the EIA and conceptual design process, based on preliminary feasibility work it is likely that the proposed development would consist of the following components:

- 15 MW rated green hydrogen facility, covering an area of up to approximately 2 hectares (ha), and comprising electrolyser, storage and associated infrastructure;
- Approximately 15MW of solar panels, covering an initial search area of approximately 47 ha and comprising inverters and arrays;
- 3 wind turbines up to 149.9m to tip, each with a power rating of up to 4.8MW per turbine and associated crane hardstandings adjacent to each turbine;
- external transformers located on a concrete plinth at the base of the turbine;
- new on-site access tracks with associated watercourse crossings (if required) and widening/improvement works to existing on-site access tracks;
- power cables laid in trenches underground (or overhead where required for environmental mitigation);
- underground pipes to transport water from the existing onsite reservoirs to the green hydrogen facility;
- control building and private electrical network management systems; and
- temporary site construction compounds and associated infrastructure.

3.2 Green Hydrogen Facility

A rigorous site selection exercise for the location of the green hydrogen facility compound has been undertaken, incorporating hydrological, ecological and technical considerations. Two potential broad locations (Option 1 and Option 2) have been selected as most suitable for the green hydrogen facility, both of which lie within the 'brownfield' area of the former RNAD, located on the floor of The Valley and served by existing road infrastructure. The preferred compound locations are shown on **Figure 3.1: Proposed Development Locations.**

The Option 1 location is considered more suitable for accessibility reasons, in particular distribution of hydrogen for transport and industrial use. Option 2 is less conveniently located in relation to nearby businesses and the main site entrance, but has advantages in terms of proximity to water supply, distance from residential properties and minimising flood risk. Further detailed evaluation will be undertaken prior to final site selection and a summary of reasons for selection decisions will be included in the Environmental Statement.

The design of the plant is not yet fixed. However, based on the required generation capacity and operational requirements, **Table 3.1** sets out indicative components of the green hydrogen facility based on current design information, including an indication of the likely dimensions of the various elements of plant and buildings. It should be noted that the compound would also include areas for traffic circulation and parking.

Table 3.1: Indicative green hydrogen facility plant and buildings

Element	Function	Likely Maximum Dimensions (length X width x height (from ground level) in metres)
Site office	General	21.5 x 11.5 x 5.5
MCC Kiosk	Electrical supply	16 x 10 x 4.5
Transformers	Electrical supply	15 x 5 x 4.5
HV Kiosk	Electrical supply	6.4 x 5.4 x 4.5
Nitrogen generation skid unit	Hydrogen production	4 x 2.5 x 2
Nitrogen storage cylinders	Hydrogen production	4 x 1.5 x 2
Water chiller package	Hydrogen production	10 x 8 x 3
Feed water pumps	Hydrogen production	5 x 5 x 2
Water break tank	Hydrogen production	5.7 x 4.4 x 7
Instrument air package	Hydrogen production	4 x 4 x 2
Micro filtration unit	Hydrogen production	5 x 2 x 2
Electrolysers	Hydrogen production	33 x 34 x 5.5 (containerised solution) 33 x 34 x 11 (purpose-built building)
Vents	Hydrogen production	Up to 15m high
Lightning protection finials	Electrical safeguarding	Up to 18m high
Site lighting	Site safety	Up to 12m high
HV kiosk	Hydrogen compression	5.4 x 6.4 x 4.5
Transformers	Hydrogen compression	15 x 5 x 4.5
MCC kiosk	Hydrogen compression	16 x 10 x 4.5
Instrument air skid	Hydrogen compression	4 x 4 x 2
Hydrogen compressor	Hydrogen compression	4.5 x 5 x 5
Heat exchangers	Hydrogen compression	10 x 15 x 4
Hydrogen storage tanks	Hydrogen storage	25 x 4 x 5
Hydrogen offloading bays	Hydrogen offloading	tbc, subject to traffic circulation arrangements

The electrolysis process would use green electricity from the wind and solar elements of the scheme to split water into hydrogen and oxygen for use as a renewable transport fuel. Polymer electrolyte membrane (PEM) technology has been selected due to its ability to operate dynamically with renewable sources of power. A polymer membrane is located between two electrodes to safely separate the hydrogen and oxygen streams, the latter being vented to atmosphere. Hydrogen is cooled, dried and compressed prior to storage. Inputs to the green electrolysis system are renewable electricity and water that would be sourced locally from the Site and treated to the process purity requirements.

Following generation and purification, the hydrogen would be compressed and stored in its gaseous form within purpose-built vessels (storage tanks) designed and constructed according to rigorous safety protocols. The storage capacity and pressure would be designed to ensure security of supply for the end users. Metallic pressure vessels for storage of hydrogen represent a high maturity technology type that is well established and commonly deployed in the UK.

An indicative green hydrogen facility design has been developed for the purposes of scoping. The design is subject to further detailed consideration but an indicative arrangement is shown in **Figure 3.2: Indicative green hydrogen facility layout** for illustrative purposes.

Figure 3.2 – Indicative green hydrogen facility layout

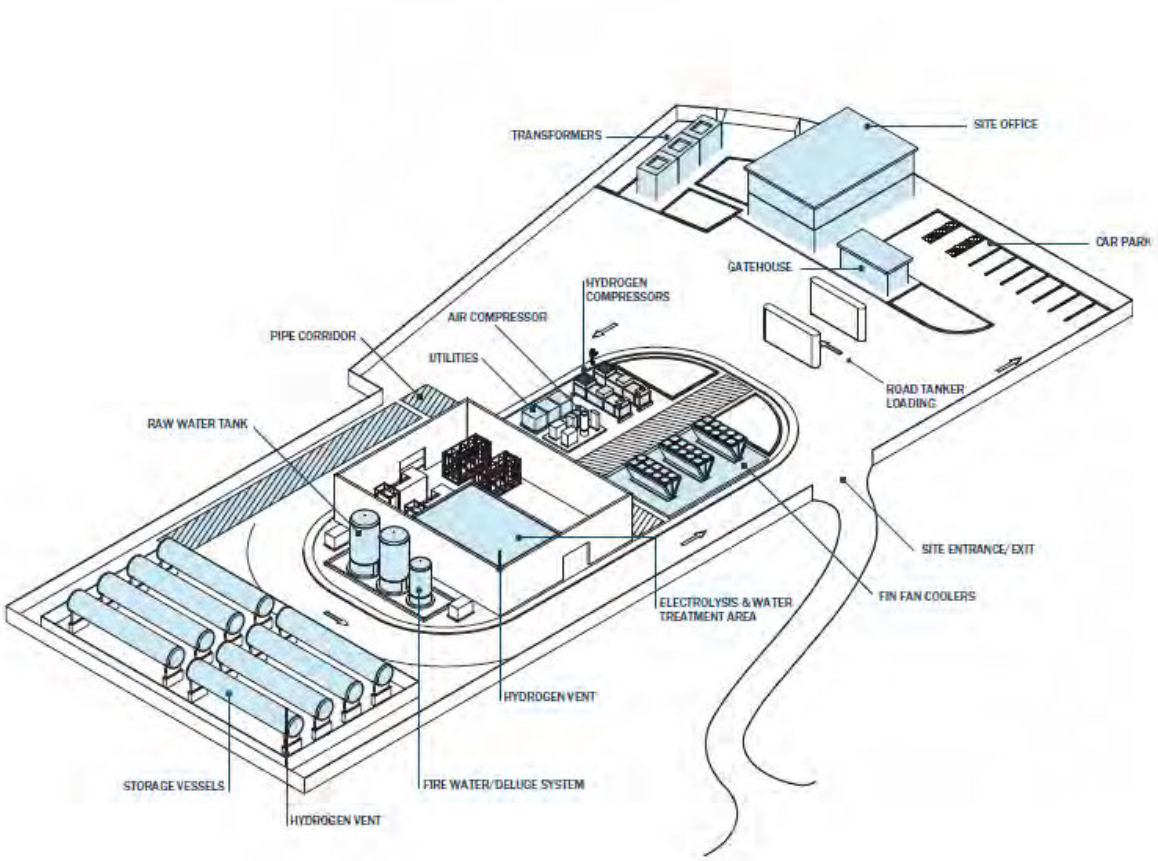


Illustration showing component parts of the hydrogen facility – indicative only

The principal green hydrogen facility process components are described below:

Water supply: water would be taken from an existing water treatment works located within The Valley. The water treatment works currently supplies existing businesses within The Valley and some adjacent residential properties. A proportion of the water would be routed to the green hydrogen production facility for conversion to hydrogen.

Wastewater: a small, dedicated water treatment system with filtration and reverse osmosis would be installed on the Site to remove any salts and impurities and protect the electrolysis system from contamination with other impurities. For indicative purposes only at Scoping stage, the volume of wastewater arising from the process is estimated as up to 2.5m^3/hour (60m^3/day). The wastewater (essentially water concentrated with salts and impurities extracted from the site water) may be tankered offsite, or alternatively discharged to the site sewers for treatment in the standard wastewater treatment system.

Electrolyser: hydrogen would be produced from water via electrolysis using the PEM technology. In addition to hydrogen, the electrolysis process also generates oxygen, heat and a small amount of water. The oxygen would be safely vented to atmosphere, whilst the water would be captured from the hydrogen stream to ensure purity requirements are achieved. Waste heat would be extracted using a closed-loop cooling system to maintain safe operation. The hydrogen would then be compressed prior to storage.

Storage: hydrogen would be stored in purpose-built vessels to buffer the product prior to use. The hydrogen would be stored in its gaseous form and managed according to strict protocol to ensure safety at all times.

Offloading: when required for distribution, the hydrogen would be compressed further and offloaded to road trailers prior to export from Site. Two offloading systems would be installed for resilience and to ensure that the hydrogen users have a consistent source of supply. Hydrogen offloading follows a similar principle to a garage forecourt, whereby a static road trailer connects to the system until full, before disconnecting and driving away. The option exists for rail offloading direct to locomotives, although this does not form part of the current scheme and would be subject to a separate planning application.

Nitrogen: the electrolyser system would occasionally have to be depressurised for safety purposes, in the event of power loss or maintenance. On these occasions small volumes of hydrogen, or hydrogen and nitrogen, would be vented to the atmosphere (nitrogen would be used to flush residual hydrogen from the system for safety purposes, when required). System operation would minimise depressurisation events due to power loss, and maintenance shutdowns are expected to be infrequent (less than 12 times per year). The gas will be released through elevated vents to ensure safe dispersion and would not be considered a concern from an air quality or human health perspective.

Compressed air: a compressed air generation package would be used to support plant operation, such as actuated valve and instrument operation.

Transport movements: hydrogen fuel would be collected from the Site by road tankers as and when required. In order to limit the requirement for storage on Site it is proposed that collections would take place on a regular basis. It is expected that HGV movements are likely to amount to up to 15 per 24 hours.

Safety Reviews

The UK process industry sector is highly regulated with oversight from a range of bodies, including the Health and Safety Executive (HSE) and Natural Resources Wales (NRW). The flammable nature of hydrogen means that the installation and design of facilities that generate, handle and store hydrogen are required to consider all applicable regulation and best practice.

Safety is given the highest priority and the proposed development would be delivered according to the principles of ‘inherent safety by design’. This involves implementing a framework that facilitates identification and quantification of hazards and risks at the earliest possible point, and throughout project delivery. By considering safety at the earliest possible stage, the hierarchy of risk control is adopted, whereby risk control first considers elimination and substitution before any engineering controls are implemented.

This green hydrogen production facility would be designed according to a strict process safety lifecycle linked to the gated design process. This requires that project design progression is contingent on satisfactory completion of safety studies. A summary of some of the key safety studies are described below:

- Hazard identification (HAZID) workshop: this is completed at concept design stage to identify potential hazards and mitigate at an early stage.
- Hazard and operability (HAZOP) workshop: this is a critical milestone in project delivery and is completed at outline design stage and again at completion of detailed design. This is a highly structured and detailed review of the design and is facilitated by an independent qualified individual in accordance with the requirements of BS EN 61882 and IChemE best practice. This looks at credible deviations from the design intent and considers the robustness of safety measures.
- Layers of Protection Analysis (LOPA): where significant hazards are identified at HAZOP, these are progressed to LOPA review, where the independent layers of protection are reviewed in detail to ensure that risk is as low as reasonably practicable. This may lead to the implementation of safety instrumented systems, designed for high reliability and robustness to ensure risk is tolerable.
- Dangerous Substances and Explosive Atmosphere Regulations (DSEAR): these regulations place legal requirements and duties on employers to identify any substances that they use, produce or store that falls under the definition of an explosive substance. Hydrogen falls under these regulations and as such the requirements will be applied throughout design, delivery and operation. This begins at outline design stage through the completion of a DSEAR risk assessment and also includes hazardous area classification to ensure that appropriate equipment specification.

3.3 Wind Turbines

The wind turbine locations have been selected to optimise wind energy capture and avoid environmental and amenity constraints.

A final choice of wind turbine would be made through a competitive tendering exercise post consent and as such these details are yet to be finalised. Further details will be provided in the ES.

For the purposes of the EIA scoping, it has been determined that dimensions of the turbines would not exceed the dimensions shown in **Table 3.2.**

Table 3.2: Indicative Turbines

Element	Maximum Dimensions
Blade Tip Height	Up to 149.9m
Rotor Diameter	Up to 138m
Hub Height	Up to 91.4m

An indicative layout of the turbine locations for scoping purposes is shown on **Figure 3.1: Proposed Development Locations.**

3.4 Solar PV

The location for the proposed solar farm has been selected to optimise aspect (i.e. south facing) and avoid environmental and amenity constraints, including avoiding use of best and most versatile agricultural land.

For the purposes of EIA scoping it is expected that the solar arrays for the proposed development would not exceed the dimensions shown in **Table 3.3.**

Table 3.3: Indicative solar farm

Element	Details
Solar Panel Details TBC	Fixed 'tables' angled at approx. 20° from horizontal
Maximum height	Up to 3m
Area	Up to 47 ha within the current indicative 'search' area
Inverters	String inverters i.e. attached to arrays
Switch gear and transformer unit height	Up to 4m
Fencing	Stockproof fencing approx. 2m high

The indicative search area for the solar is shown on **Figure 3.1: Proposed Development Locations.** The exact development footprint will be confirmed prior to ES stage following further assessment and design.

3.5 Grid Connection

The energy generated by the proposed development would be used entirely onsite to power the electrolyser. There will be times however when the turbines and solar panels are not generating electricity. It is anticipated that the electrolyser would have a connection to the local distribution network to provide security of supply to offtakers. This would also maximise operational safety, increase the operational life of the electrolyser stacks and allow the facility to ramp up hydrogen production rapidly when renewable power becomes available – minimising any power loss. Any power taken from the grid would be matched by generation from a renewable energy asset, via a Power Purchase Agreement (PPA).

The wind and solar elements of the scheme would be connected to the green hydrogen facility directly by underground cables.

3.6 Water Supply

The Valley has a private water supply with sufficient capacity for the proposed development. Water would be provided to the green hydrogen facility compound for use in the electrolysis process from the existing reservoirs by means of piped connections.

3.7 Access

Green hydrogen facility The access for the green hydrogen facility during both construction and operation would use the existing tarmac roads within The Valley which connect with the A40 via Admiralty Way. There is an existing alternative access to the north that would be available for emergency use only, connecting with the B4313 along Cwm Gwaun.

It is possible that certain parts of the internal road network may need to be widened to accommodate construction and / or operational traffic; if this is confirmed, the land required would be included within the red line boundary.

Wind Turbines

A series of studies have been undertaken to establish the most suitable access route for the turbines. Delivery of the components would most likely be from Swansea Docks which has existing facilities and experience of handling large turbine components. From Swansea Docks the turbines would take the following route:

- Baldwins Crescent, under the A483;
- slip road onto the A483;
- A483 to junction with M4;
- M4 to junction with A48;
- A48 to A40; and
- A40 to Site entrance.

The preferred option for turbine delivery to gain access into the Site from the A40 is to use the existing private access road to The Valley.

It is anticipated that an existing logging track which runs from the base of The Valley near the industrial units to the upper valley sides will be upgraded and extended to enable the delivery of the abnormal loads associated with the wind turbines and other construction traffic.

Solar

The current preferred access for construction of the solar arrays is from Admiralty Way, where there is an existing agricultural access just to the west of the residential properties at Ffos Las. An alternative route is available from the minor road to the north which connects the A40 and Llanychaer. Confirmation of the preferred access route will be made following further site investigations.

3.8 Borrow Pits

Although borrow pits are often used in connection with wind farm development as a sustainable solution to minimise construction traffic, it is not considered that The Valley is a suitable location for borrow pit development and so it is not intended to pursue this option.

3.9 Project Lifecycle

The proposed development would be designed with an operational life of 30 years. Following this, providing there has been no approval to extend the life, it is expected that the wind farm, solar panels and green hydrogen facility would then be decommissioned and removed.

4.0 EIA Methodology

4.1 Introduction

This section sets out the general methodology that will be adopted for undertaking the Environmental Impact Assessment and reporting the findings in the ES.

It should be noted that individual disciplines may have their own professional guidance and best practice, and this will be adopted where relevant as set out in the topic-specific sections 6 to 17 of this document.

EIA is a systematic process that must be followed for certain categories of development before they can receive consent. It aims to identify a project's likely significant effects through the scoping process, and then assess those effects, which are then reported in an ES. This ensures that the predicted effects, and the scope of mitigation measures to reduce them where necessary, are properly understood by the public and the determining authority, in this case Welsh Ministers, before it makes its decision.

The EIA process should be systematic, analytical, impartial, consultative and iterative allowing opportunities for environmental concerns to be addressed in the design of a project. Typically, a number of design iterations take place in response to environmental constraints identified during the EIA process prior to the final design being developed.

The EIA will be undertaken in accordance with the EIA Regulations and recognised good practice and guidelines specific to each technical area. It will identify the likely significant environmental effects arising from the proposed development. Consultees are also encouraged to provide confirmation of agreement to the proposed scope in terms of what is included and excluded, the methodology and the receptors identified.

4.2 Content of ES

The results of the EIA process will be reported in an ES. Schedule 4(4) of the EIA Regulations specifies that the ES should describe:

"…factors…likely to be significantly affected by the development: population, human health, biodiversity (for example flora and fauna), land (for example land take), soil (for example organic matter, erosion, compaction, sealing), water (for example hydromorphological changes, quantity and quality), air, climate (for example greenhouse gas emissions, impacts relevant to adaptation), material assets, cultural heritage, including architectural and archaeological aspects, and landscape".

Regulation 4(2) of the EIA Regulations requires the interaction between these factors to be considered. In addition, Regulation 4(4) requires that EIA must:

"…identify, describe and assess in an appropriate manner, in light of each individual case, the direct and indirect significant effects of proposed development on the following —

(a) population and human health;

(b) biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC(1) and Directive 2009/147/EC(2);

I land, soil, water, air and climate;

(d) material assets, cultural heritage and the landscape; aI(e) the interaction between the factors listed in sub-paragraphs (a) to (d).".

Establishing which aspects of the environment are likely to be significantly affected by a particular project is captured in the EIA Scoping process which aims to identify those aspects of the environment and associated issues that need to be considered when assessing the potential effects resulting from a project. This recognises

that there may be some environmental elements for which the project is unlikely to have a significant effect and hence where there is no need for further investigation to be undertaken as part of the EIA.

Previous experience of other wind farm, solar and hydrogen development projects, combined with knowledge of the Site and nearby receptors, has identified the topics listed below for consideration in the EIA. A summary of known baseline conditions of relevance, predicted effects, any outline mitigation measures that can be recommended at this stage and the proposed scope for the EIA is provided for each of these topic areas in Sections 6 to 17.

These are:

- Landscape and Visual;
- Ecology;
- Ornithology;
- Water Environment;
- Geology, Soils and Land Quality;
- Cultural Heritage;
- Noise;
- Access, Traffic and Transportation;
- Socio-economics, Tourism and Recreation;
- Air Quality;
- Aviation and Telecommunications;
- Other Issues including Forestry, Climate Change, Shadow Flicker, Major Accidents and Disasters, and Waste.

For each topic that is identified as having potential to give rise to significant effects, a detailed technical assessment will be carried out in accordance with the scope and methodology agreed with relevant consultees. Each technical assessment will be carried out by an appropriately qualified consultant to prevailing technical standards and reported in a dedicated ES chapter.

It is proposed to include a chapter of 'other issues' that are not considered likely to give rise to significant effects and therefore do not require full assessment.

The technical chapters of the ES will each aim to give a detailed assessment of potential impacts, identification of mitigation measures and description of the significance of residual effects (those remaining after the mitigation measures have been implemented).

The results of each technical assessment will be reported in the ES and will be accompanied by technical appendices and illustrative material where appropriate. A Non-Technical Summary will also be produced.

4.3 Type of Effects

The 2017 EIA Regulations (Schedule 4, Paragraph 5) require consideration of a variety of types of effect, namely direct/indirect, secondary, cumulative, transboundary, positive/negative, short/medium/long-term and permanent/temporary. In the ES, effects are considered in terms of how they arise, their nature (i.e. whether they are positive or negative) and their duration.

The assessment of effects upon environmental receptors will cover the period over the construction and operation of the proposed development. These are considered as follows:

- Construction – environmental effects may result from construction activities; these effects are likely to be temporary in duration.
- Operation – environmental effects may result from the proposed development during the operational phase; these effects are likely to be long term or permanent.

4.4 Assessment of Effects

The methodology for predicting nature and magnitude of any potential environmental effects varies according to the technical subject area. This section provides an overview of the general approach that will be adopted.

Baseline Conditions

This section will describe:

- the key receptors that have been identified;
- a brief description of those receptors;
- the sensitivity attributed to each receptor; and
- where further details can be found within the relevant technical appendices.

Sensitivity of Receptors

The sensitivity of receptors will be defined according to the relative sensitivity of existing environmental features on or in the vicinity of the Site, or by the sensitivity of receptors which would potentially be affected by the proposed development, including their capacity to accommodate the kinds of changes the proposed development may bring about.

Criteria for the determination of sensitivity or importance will be established based on prescribed guidance, legislation, statutory designation and/or professional judgement.

Magnitude of Impact

The magnitude of impact (degree of change) relative to environmental baseline conditions will be identified through detailed consideration of the proposed development, taking account of the following factors:

- the degree to which the environment is affected, e.g. whether the quality is enhanced or impaired;
- the scale or degree of change from the baseline situation; and
- whether the effect is temporary or permanent, indirect or direct, short term, medium term or long term.
- In some cases the likelihood of effect occurrence may also be relevant, and where this is a determining feature of the assessment this will be clearly stated.

Significance of Effect

The significance of an effect is derived from an analysis of:

- the sensitivity of receptors to change; and
- the amount and type of change, or magnitude of impact which includes the timing, scale, size, likelihood and duration of the change.

Where relative significance is reported, the assessment will identify the threshold for significant effects.

4.5 Cumulative Effects

For each technical discipline, an assessment will be made of the likely cumulative effects of the proposed development in combination with any other similar developments in proximity to the Site which are reasonably defined and understood; these would comprise projects that:

- are the subject of valid applications[1] or appeals but not yet determined;
- consented; or
- are under construction.

Projects that are already constructed and operational are considered to form part of the baseline conditions.

Cumulative effects can also arise from the combined impact of effects attributable to the proposed development in respect of a particular receptor, such as the combined effect of noise and visual amenity on a residential dwelling.

If PEDW or other stakeholders are aware of any proposals that they consider will need to be assessed in terms of potential cumulative effects, it is requested that are identified as part of the EIA Scoping Direction.

4.6 Assessment of Effects and Mitigation

An assessment of potential environmental effects will be undertaken to identify any predicted significant effects. Where significant adverse environmental effects are predicted in the EIA process, the ES will provide additional measures (bespoke mitigation) to eliminate or reduce the effects to acceptable levels.

Mitigation is considered an integral part of the overall design strategy for the proposed development. Design principles and environmental measures that form an integral part of the project design will be taken into account in the assessment of environmental effects.

A Schedule of Mitigation will be included within the Summary and Conclusions Chapter. The Schedule will summarise the mitigation and enhancement measures proposed in the preceding chapters of the ES to reduce or offset the effects of the proposed development on the environment.

4.7 Residual Effects

Any remaining effects of the proposed development, following implementation of any bespoke mitigation measures, are referred to as 'residual effects'. The EIA will assess each residual effect and identify a significance level. Residual effects may be adverse or beneficial, short, medium or long-term, direct or indirect, permanent or temporary, and reversible or irreversible.

4.8 Decommissioning Effects

Environmental impacts arising from decommissioning works are likely to be of a similar nature, but smaller scale and geographical extent, to construction impacts. For example, it is highly unlikely that piled foundations, if required, would be removed during decommissioning.

In addition, it is not known when decommissioning would take place and therefore the baseline environment at the time of decommissioning cannot be ascertained with any certainty. Furthermore, the proposals for decommissioning and site restoration as well as the future regulatory context are unknown

For these reasons, it is proposed that the assessment of effects resulting from decommissioning activities is scoped out of the EIA.

[1] Projects that have been notified under the DNS Regulations but have not been submitted will not be considered.

4.9 Consultation

Consultation is an important part of the EIA process and will be reported within the ES and supporting documentation, including a Pre-Application Consultation (PAC) Report.

The Applicant is committed to promoting dialogue with statutory and non-statutory consultees and local communities, seeking to engage with all those with an interest in the proposed development to provide transparency during the EIA process.

The Applicant has identified a community consultation area in collaboration with local representatives. This is not a static area and will change in response to feedback throughout the development process.

Methods of engagement will be accessible in English and Welsh, and include:

- household and businesses mailing list of over 5,500 addresses;
- adverts in local newspapers (print and online);
- public exhibitions in a variety of locations;
- webinars;
- face-to-face meetings with stakeholders, local communities and neighbours; and
- dedicated project website.

The Applicant has undertaken pre-Scoping engagement including three public exhibitions attended by over 300 people, and 295 feedback forms were received by post.

5.0 Planning Policy Context

5.1 National policy & guidance

5.1.1 Future Wales – The National Plan 2040

Future Wales – The National Plan 2040 (FWNP) was published in February 2021 and sets out the national development framework for the direction of development in Wales to 2040. It forms part of the statutory development plan meaning it will play a significant role in planning decision making and will form the foundation for regional and local planning in the future.

FWNP sets out a strategy for addressing key national priorities through the planning system, including sustaining and developing a vibrant economy, achieving decarbonisation and climate-resilience, developing strong ecosystems and improving the health and well-being of communities. The Plan links back to the Well-being of Future Generations (Wales) Act 2015 and recognises the obligations brought in as a result of that Act.

Key policies relevant to the proposed development are set out below:

Policy 17 – Renewable and Low Carbon Energy and Associated Infrastructure: "*Welsh Government strongly supports the principle of developing renewable and low carbon energy from all technologies and at all scales to meet our future energy needs.*

In determining planning applications for renewable and low carbon energy development, decision-makers must give significant weight to the need to meet Wales' international commitments and our target to generate 70% of consumed electricity by renewable means by 2030 in order to combat the climate emergency.

In Pre-Assessed Areas for Wind Energy the Welsh Government has already modelled the likely impact on the landscape and has found them to be capable of accommodating development in an acceptable way. There is a presumption in favour of large-scale wind energy development (including repowering) in these areas, subject to the criteria in policy 18.

Applications for large-scale wind and solar will not be permitted in National Parks and Areas of Outstanding Natural Beauty and all proposals should demonstrate that they will not have an unacceptable adverse impact on the environment. Proposals should describe the net benefits the scheme will bring in terms of social, economic, environmental and cultural improvements to local communities."

This policy demonstrates Welsh Government's support in principle for all renewable energy projects and technologies. It places significant weight on meeting Wales' renewable and low carbon targets, which decision makers are obliged to weigh in the 'planning balance' when determining applications.

The proposed development is not located in a Pre-Assessed Areas for Wind Energy.

Policy 18 (see below) makes it clear that being located outside a Pre-Assessed Area does not preclude development of renewable energy projects, including large-scale projects (large-scale being any energy development classed as a Development of National Significance (DNS), and that even outside the Pre-Assessed Areas a "*positive policy framework*" exists.

Policy 18 provides the decision-making framework, setting out criteria that will need to be addressed for any proposals for renewable energy DNS projects.

Policy 18 – Renewable and Low Carbon Energy Developments of National Significance: "*Proposals for renewable and low carbon energy projects (including repowering) qualifying as Developments of National Significance will be permitted subject to policy 17 and the following criteria:*

1. outside of the Pre-Assessed Areas for wind developments and everywhere for all other technologies, the proposal does not have an unacceptable adverse impact on the surrounding landscape (particularly on the setting of National Parks and Areas of Outstanding Natural Beauty);

2. there are no unacceptable adverse visual impacts on nearby communities and individual dwellings;

3. there are no adverse effects on the integrity of Internationally designated sites (including National Site Network sites and Ramsar sites) and the features for which they have been designated (unless there are no alternative solutions, Imperative Reasons of Overriding Public Interest (IROPI) and appropriate compensatory measures have been secured);

4. there are no unacceptable adverse impacts on national statutory designated sites for nature conservation (and the features for which they have been designated), protected habitats and species;

5. the proposal includes biodiversity enhancement measures to provide a net benefit for biodiversity;

6. there are no unacceptable adverse impacts on statutorily protected built heritage assets;

7. there are no unacceptable adverse impacts by way of shadow flicker, noise, reflected light, air quality or electromagnetic disturbance;

8. there are no unacceptable impacts on the operations of defence facilities and operations (including aviation and radar) or the Mid Wales Low Flying Tactical Training Area (TTA-7T);

9. there are no unacceptable adverse impacts on the transport network through the transportation of components or source fuels during its construction and/or ongoing operation;

10. the proposal includes consideration of the materials needed or generated by the development to ensure the sustainable use and management of resources;

11. there are acceptable provisions relating to the decommissioning of the development at the end of its lifetime, including the removal of infrastructure and effective restoration. The cumulative impacts of existing and consented renewable energy schemes should also be considered."

The above matters are considered in this Feasibility Report, and would be addressed in full as part of a future DNS application and Environmental Impact Assessment (EIA).

FWNP makes it clear that Welsh Government wishes to direct social and economic benefit to local communities as a result of hosting large-scale renewable energy schemes. It states: "*Developers should explore how infrastructure improvements associated with a development (including transport infrastructure and communications systems) may be utilised by the host communities to bring additional, non-planning related benefits. Although not a planning consideration, local ownership of projects, in whole or part, can ensure these benefits are accrued over the long-term*". It is recommended that opportunities for bringing forward community benefits as part of the proposed development are explored and are incorporated into the proposals if viable. Such opportunities may include offering land or buildings to local communities, or more strategic opportunities such as working in partnership with local authorities on schemes for use of green hydrogen in vehicles.

FWNP is cognisant of the "*significant challenge*" facing renewable energy projects in connecting to the grid. The proposed development offers a means of resolving this issue in an area of Wales where lack of grid capacity has inhibited development in recent years.

South West Region

FWNP considers strategic development issues for each region in turn. The site is located within the South West Region.

The introduction to the section on South West Region states that "*Decarbonising society and responding to the threats of the climate emergency should be central to all regional planning*". The section headed Regional Growth states "*The Welsh Government wishes to see energy generation, storage and management play a role in supporting the South West economy*".

5.1.2 Planning Policy Wales

Planning Policy Wales (PPW) (Edition 11, February 2021) is the most recent version of PPW which was published in February 2021 to align with FWNP. It sets out the land use planning policies of the Welsh Government. It is supplemented by a series of Technical Advice Notes (TANs), Welsh Government Circulars, and policy clarification letters, which together with PPW provide the national planning policy framework for Wales.

PPW states "*The primary objective of PPW is to ensure that the planning system contributes towards the delivery of sustainable development and improves the social, economic, environmental and cultural well-being of Wales, as required by the Planning (Wales) Act 2015, the Well-being of Future Generations (Wales) Act 2015 and other key legislation and resultant duties such as the Socio-economic Duty. A well functioning planning system is fundamental for sustainable development and achieving sustainable places*".

Section 5.4 Economic Development of Planning Policy Wales (PPW) is directly relevant to the proposed development and states the following.

"5.4.1 For planning purposes the Welsh Government defines economic development as the development of land and buildings for activities that generate sustainable long term prosperity, jobs and incomes. The planning system should ensure that the growth of output and employment in Wales as a whole is not constrained by a shortage of land for economic uses.

5.4.2 Economic land uses include the traditional employment land uses (offices, research and development, industry and warehousing), as well as uses such as retail, tourism, and public services. Economic land uses also include construction, energy, minerals, waste and telecommunications sectors which are also sensitive to planning policy. The Welsh Government seeks to maximise opportunities to strengthen the foundational economy, particularly the food, retail, tourism and care sectors which play such a prominent role throughout Wales; the planning system should be supportive of this aim. Similarly, growth in innovative, emerging technology and high value added sectors such as advanced engineering, renewable and low carbon energy, digital and bio-technology sectors are also strongly supported".

PPW contains significant support for energy generation in particular innovative, emerging technology as part of Welsh Government's approach to decarbonisation, whilst enhancing the economic, social, environmental and cultural well-being of the people and communities of Wales, in order to achieve a better quality of life for current and future generations.

PPW's section on Energy states (paragraphs 5.7.1 and 5.7.2) "*The Welsh Government's highest priority is to reduce demand wherever possible and affordable. Low carbon electricity must become the main source of energy in Wales. Renewable electricity will be used to provide both heating and transport in addition to power. The future energy supply mix will depend on a range of established and emerging low carbon technologies, including biomethane and green hydrogen*

Overall power demand is expected to increase as a result of growing electrification of transport and heat. In order to ensure future demand can be met, significant investment will be needed in energy generation, transmission and distribution infrastructure. The system will need to integrate renewable generation with storage and other flexibility services, in order to minimise the need for new generation and grid system reinforcement".

PPW sets out the benefits of renewable and low carbon energy (paragraph 5.7.7) and why maximising renewable and local carbon generation should be a requirement of the planning system. PPW reasserts the concerns expressed in FWNP regarding grid capacity and connection and states (paragraph 5.7.12):

"*Energy storage has an important part to play in managing the transition to a low carbon economy. The growth in energy generation from renewable sources requires the management of the resultant intermittency in supply, and energy storage can help balance supply and demand. Proposals for new storage facilities should be supported wherever possible*".

As regards decision-making on renewable energy planning applications, paragraph 5.9.1 states:

"*Local authorities should facilitate all forms of renewable and low carbon energy development and should seek cross-department co-operation to achieve this. In doing so, planning authorities should seek to ensure their area's full potential for renewable and low carbon energy generation is maximised and renewable energy targets are achieved. Planning authorities should seek to maximise the potential of renewable energy by linking the development plan with other local authority strategies, including Local Well-being plans and Economic/ Regeneration strategies*".

The above statement is a very robust statement of intent, requiring that renewable and low carbon generation is maximised (rather than optimised, or some lesser requirement. Whilst the proposed development is a DNS project, the role of the local authorities is nevertheless very important and this obligation is a key requirement of their role.

In advising local authorities in their role in determining applications for renewable energy, PPW requires that planning authorities "*should take into account:*

the contribution a proposal will make to meeting identified Welsh, UK and European targets;

the contribution to cutting greenhouse gas emissions; and

the wider environmental, social and economic benefits and opportunities from renewable and low carbon energy development".

It should be noted that the Pembrokeshire Coast National Park Authority is a planning authority and falls within the scope of this requirement.

5.1.3 Technical Advice Notes

There are Technical Advice Notes on a wide range of topics, many of which will be relevant to specific issues connected with the proposed development, such as nature conservation and noise.

5.1.4 Welsh energy policy

Welsh Government has a raft of energy policy, much of which is enshrined at a high level in FWNP and PPW Edition 11, which are both relatively current (published 2021).

Welsh Government is committed to achieving a low carbon economy and it declared a Climate Emergency in April 2019, becoming the first Parliament in the world to confirm this position in May 2019.

The Environment (Wales) Act 2016 requires the Welsh Government to reduce emissions of greenhouse gases in Wales to net zero[2] for the year 2050 with a system of interim emissions targets and carbon budgets. Under

[2] Against a 1990 or 1995 baseline, depending on the gas

Section 39 of the Act Welsh Ministers must prepare and publish a report for each budgetary period setting out their policies and proposals for meeting the carbon budget for that period. Welsh Government published its Second Carbon Budget in October 2021.

Second Carbon Budget–2021 - the pathway to the 2050 net zero target is set through five-yearly carbon budgets and decadal targets. In March 2021, the Senedd passed a suite of regulations to increase Wales' decadal emissions targets from those set in 2018 and to set Carbon Budgets 2 and 3 in line with them. The targets and budgets set in law followed the Climate Change Committee's recommendations:

› Carbon Budget 2 (2021 – 2025): 37% average reduction with a 0% offset limit

› Carbon Budget 3 (2026 – 2030): 58% average reduction[3]

› 2030: 63% reduction. › 2040: 89% reduction

› 2050: at least 100% reduction (net zero).

The report on Carbon Budget 2 makes the strong point that, whilst Carbon Budget 2 has been achieved (primarily through the cessation of coal-fired power generation), the step between Carbon Budget 2 (37% average reduction) and Carbon Budget 3 (58% average reduction) is less certain of achievement and there should be a call to action for every person, community and business in Wales.

5.1.5 Other relevant Welsh policy

The **Well-being of Future Generations (Wales) Act 2015** and the **Environment (Wales) Act 2016** lay the legislative foundations for a cleaner, fairer, stronger Wales, and are at the heart of much of Welsh policy. The seven well-being goals shown in **Figure 5.1** were agreed by the Senedd through the Well-being of Future Generations Act provide a framework for action to meet the needs of the present without compromising the ability of future generations to meet their needs.

Figure 5.1: Welsh Government seven well-being goals

Many of these goals are relevant to renewable energy generation and the proposals for The Valley, and will provide support for the prospective DNS application.

[3] There is no statutory deadline for setting each offset limit. Welsh Government will set the CB3 offset limit no later than 2025

5.2 Local Development Plan

The development plan for Pembrokeshire comprises the *Pembrokeshire Local Development Plan: Planning Pembrokeshire's Future (up to 2021)*, adopted 2013. The replacement local plan commenced in 2017, and consultation responses to the Deposit Draft should have been published in 2020. However, progress has been held up as a result of new guidance published by Natural Resources Wales (NRW) in January 2021 concerning phosphate levels for Riverine Special Areas of Conservation (Riverine SACs) in Wales. As a significant part of Pembrokeshire comprises Riverine SAC catchments, Pembrokeshire local planning authority (the Authority) will not be in a position to know which site allocations can be retained in the draft Plan until further information is received and additional research is undertaken.

The Authority has stated it is likely to wish to make a range of other changes to the Deposit Plan of 2020 in response to consultation feedback and as a result of updated evidence / changes to national policy and context, including those required as a consequence of Covid-19. This is likely to include updates taking account of FWNP and the revised PPW (edition 11) which have been published in the interim period.

As a consequence to the delay to the Deposit Plan and the Authority's intention to make substantial changes, this review focuses on the adopted Local Development Plan.

5.2.1 Adopted Local Development Plan (LDP)

The Council's website advises: "*On 24 September 2020, the Minister for Housing and Local Government, wrote to all Local Authorities and National Park Authorities in Wales regarding end dates for LDPs.*

She advised that:

'Plans adopted prior to 4 January 2016 will remain the LDP for determining planning applications until replaced by a further LDP. For those LDPs adopted after 4 January 2016, the plan will cease to be the LDP on expiry of the period specified in the plan'.

For Pembrokeshire County Council, the current LDP (LDP 1) was adopted on 28/02/2013, which in the context of the Minister's letter means that it will remain in force until LDP 2 (the replacement plan) is adopted.

Therefore, the part of the Plan title saying 'up to 2021' should be disregarded".

The Adopted LDP identifies 4 groups of key issues: Sustainable Communities; A Strong Rural and Urban Economy; Infrastructure, Transport and Accessibility; and Environment. Of these, Environment includes "*meeting national targets for renewable energy*" out of a total of 14 key issues. This is a relatively low key level of interest in the issue which reflects the age of the Plan.

The Strategic Objectives to achieve the Council's vision include "*Building on the County's strategic location for energy and port related development*".

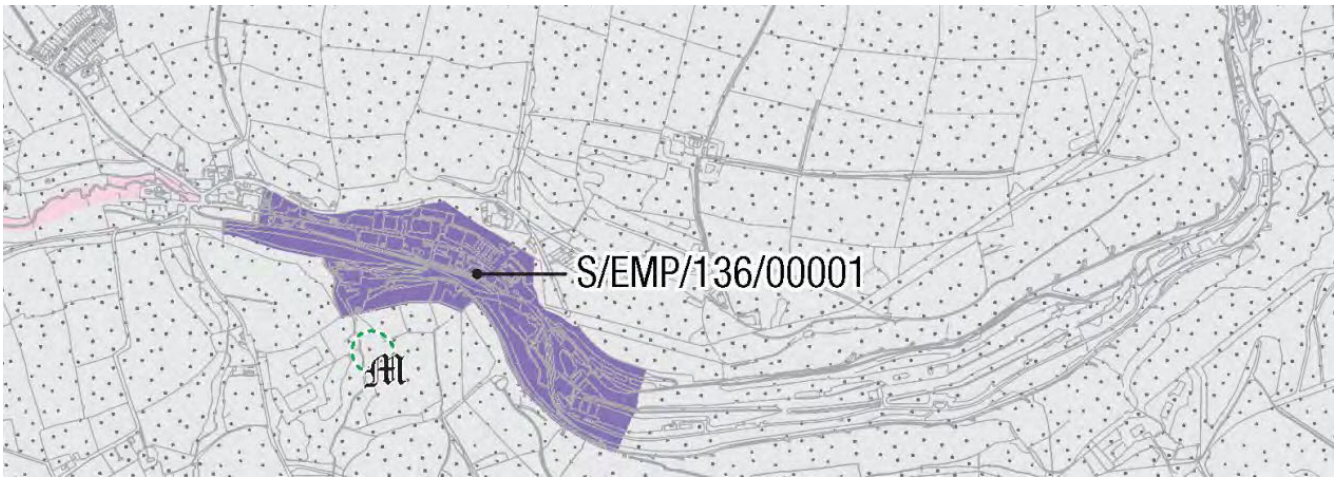
There is policy support for renewable energy development, as follows:

GN.4 Resource efficiency and Renewable and Low-carbon Energy Proposals: "*Development proposals should seek to minimise resource demand, improve resource efficiency and seek power generated from renewable resources, where appropriate. They will be expected to be well designed in terms of energy use. Developments which enable the supply of renewable energy through environmentally acceptable solutions will be supported*". The supporting text is heavily dependent on outdated national policy and targets, including TAN 8 and a UK target of 10% (2010) rising to 15% (2020) of energy from renewable sources by 2020. TAN 8 directed all large scale onshore wind development to defined Strategic Search Areas, and as none of these were in Pembrokeshire the LDP does not consider large scale wind further.

Whilst there is policy support, therefore, for renewable energy in the Adopted Local Plan the policy framework is neither robust nor up to date.

As regards Trecwn, **Policy SP 3: Employment Land Requirements** of the Adopted LDP identifies 21.11ha within The Valley as a Strategic Employment Site. The allocation is shown in the extract in **Figure 5.2**.

Figure 5.2: Strategic Employment Site Allocation, Trecwn Adopted LDP



Whilst the Strategic Employment Site allocation is generally compatible with and supportive of the proposed development, it will be beneficial to demonstrate the employment potential of the green hydrogen scheme, including indirect benefits through use of hydrogen for other employment uses within The Valley.

5.2.2 Draft Deposit Plan (LDP2)

As noted above, preparation of the replacement LDP has stalled and may be subject to significant change going forwards. However, certain aspects of the Deposit Draft LDP2 are worthy of note in identifying the proposed 'direction of travel' for the local planning authority.

The Deposit Draft LDP2 continues the allocation of 21.22 ha at Trecwn as a Strategic Employment Site, as shown on **Figure 5.3**. The draft allocation refers to use classes B1, B2 and B8; this is similar to other 'industrial' and energy sites such as the petro-chemical facilities at Milford Haven.

Figure 5.3 Strategic Employment Site Allocation, Trecwn LDP2

The Draft LDP2 renewable energy polices include a very similar policy to GN.4 of the Adopted LDP. There is an additional policy **GN 5 Renewable Energy – target and allocations**, which identifies a target of 9MW renewable energy for the Plan period, and allocates three sites for solar energy only. This policy is likely to be considered out of step with FWNP and PPW edition 11, and will therefore be updated when the LDP2 is next revised.

6.0 Landscape and Visual

This section considers the scope of work required to assess potential significant effects associated with landscape and visual receptors during the construction and operational phases of the proposed development. The Guidelines for Landscape and Visual Impact Assessment Edition 3 (GLVIA3) states in section 3.11:

"*LVIA scoping should be expected to include several key matters, which should ideally be discussed with landscape professionals in the competent authority as well as with consultation bodies and interest groups. Views from local people may also be sought, for example through contact with parish and/or community councils. Key matters include;*

the extent of the study area to be used for assessment of landscape and visual effects…;

sources of relevant landscape and visual information;

the nature of the possible landscape and visual effects, especially those deemed most likely to occur and be significant;

the main receptors (the word used to mean those parts of the receiving landscape, and the people able to view the proposal, that may be affected by the change) of the potential landscape and

visual effects that need to be addressed in the full assessment, including viewpoints that should be assessed;

the extent and appropriate level of detail for the baseline studies that is reasonably required to assess the landscape and visual effects of the proposed development;

methods to be used in assessing the likely significance of the effects that may be identified;

the requirements with respect to the assessment of likely significant cumulative landscape and visual effects."

6.1 Environmental Baseline and Potential Sources of Impact

The Landscape and Visual Impact Assessment (LVIA) will be prepared by experienced landscape architects in accordance with current guidance. The LVIA will identify and assess the potential effects during the construction, and operational stages that the proposed development may have on the landscape and visual resources of the study area. It will focus on the potentially significant effects; accordingly, any non-significant effects which it is proposed to scope out of the detailed LVIA are identified in this Scoping Report. The LVIA will outline the approach taken to the design of the proposed development as well as mitigation measures that will be implemented to prevent, reduce, or offset potential adverse landscape and visual effects.

Landscape designations and linear routes are identified on **Figure 6.1: Landscape Designations** for the overall study area.

The site area analysis (**Figure 6.2: Site Area Analysis**) illustrates how the overall site is centred on the narrow winding Trecwn valley located on the edge of the Preseli Mountains. This upland area in conjunction with Mynydd Carningli forms a viewshed and screens views to the east (even for the proposed turbines) as illustrated in the two ZTVs (**Figures 6.3a and 6.3b: Zone of Theoretical Visibility Bare Earth (Tip Height) 1:300,000 and 1:50,000 respectively**). These two ZTVs also illustrate the broken views along the coast and across the undulating plain to the west and south.

The baseline landscape is reflected by LANDMAP in detail and grouped into a number of larger landscape character areas by **Figure 6.4: National Landscape Character Areas** and **Figure 6.5: National Marine Character Areas** illustrate the national landscape and marine character areas which provide the wider context for the Pembrokeshire County Council (PCC) and Pembrokeshire Coast National Park Authority (PCNPA) landscape character studies as shown in **Figure 6.6: Pembrokeshire County Council Landscape Character Areas, Figure 6.7: Pembrokeshire Coast National Park Character Areas,** and **Figure 6.8**: **Seascape Character Areas**.

The combined PCC and PCNPA landscape character areas (LCAs) cover all of the terrestrial element of the study area and will form the basic receptors for landscape assessment of the LVIA. The PCNPA seascape character areas (SCA) will be used to inform the assessment baseline for any off-shore landscape effects.

6.1.1 Scope of Study and Study Area

In summary, the proposed development comprises three wind turbines with a blade tip height of 149.9 m, an initial solar search area of approximately 47 ha and up to 3 m in height, and green hydrogen facility of which the tallest element of plant (vents) would be up to 10 m in height with lighting columns in a limited number of locations up to 18m high. The greatest visual effects will be generated by the wind turbine element of the proposed development due to the height of turbines and their movement attracting the eye. The visibility of the solar panel site is likely to be far less extensive due to the restricted height and the greater potential for vegetation screening. The green hydrogen facility would be located within the steep sided Trecwn Valley, and largely contained by a mixture of landform and woodland, and therefore unlikely to be visible outside the immediate valley or upper valley edge.

The extent of the various search and study areas for detailed assessment will be agreed as part of the scoping consultation process. However below are the proposed areas at this stage that are considered suitable and the context for those proposals.

Wind Turbines

Reference to LANDMAP GN46[4] indicates a typical study area of between 20-24 km (23-26 km search area) to be appropriate for the scale of turbine proposed.

The recommended scoping search area for cumulative wind farm assessment is defined as 30-60 km in the PCC document Cumulative Impact of Wind Turbines on Landscape and Visual Amenity Guidance[5] for turbines over 109 m to blade tip, with a detailed study area of 10-15 km.

The PCNPA SPG[6] provides a figure of 40 km for the scoping search area for wind turbines between 146 to 175 m blade tip, with a detailed study area of 20 km.

Considering the above guidance, the scoping search area used for the initial cumulative site assessment is proposed at 40 km and this includes the vast majority of the Pembrokeshire coastal area, west of Carmarthen as shown on **Figure 6.9: Cumulative Assessment.**

No off-shore cumulative wind farms appear close enough to have cumulative interactions with the proposed development. The Celtic Deep Phase 1 and 2 sites (both at concept/early planning stage) are located to the opposite side of St Davids (to the Site) and at a distance of approximately 50 km. Although within the ZTV zone for visibility, the combination of intervening distance, including the undulating landscape of Pembrokeshire would not allow significant visual interaction. The Trivane Demonstrator, off the coast of south Pembrokeshire (concept/early planning stage), would be within the 40 km search area for the proposed development, but not within an area of theoretical visibility (**Figure 6.3a**) and no significant visual interaction would be expected for this site either.

Initial review and professional experience indicate that a detailed study area of 20 km would include all the landscape and visual receptors where significant effects are considered likely, as shown on **Figure 6.1**.

[4] Using LANDMAP in Landscape and Visual Impact Assessments GN46 Natural Resources Wales
[5] Pembrokeshire and Carmarthenshire: Cumulative Impact of Wind Turbines on Landscape and Visual Amenity Guidance (April 2013)
[6] Cumulative Impact of Wind Turbines on Landscape and Visual Amenity, Draft Supplementary planning Guidance: Pembrokeshire Coast National Park Authority and Pembrokeshire County Council (September/October 2021)

Solar Farm

A solar farm search and study area based on LANDMAP GN46 would be 3 km and 2 km respectively (for height structures lower than 25 m). However, consideration of the ZTVs in **Figure 6.10: Zone of Theoretical Visibility Bare Earth: Solar Areas** indicates that a 4-5 km study area may be more appropriate and revised through the assessment process as required.

Green Hydrogen Facility

A green hydrogen facility search and study area based on LANDMAP GN46 would also be 3 km and 2 km respectively (for height structures lower than 25 m). Topographical analysis indicates that these distances of search and study areas would be suitable for the Valley floor and enclosed valley position chosen for this element.

6.1.2 Baseline Conditions including Field Studies

The establishment of baseline conditions relating to the landscape and visual resource will involve a combination of desk study, preparation and review of ZTV maps and visualisations as well as field work. A baseline description of the existing LCAs and SCA, landscape designations and visual amenity receptors within the proposed 40km radius study area, that are anticipated to incur significant effects, will be assembled in the Baseline Assessment.

National Character Areas

The National Character Areas (NCA) are shown on **Figure 6.4.** The Site is located on the northern side of Pembrokeshire within the 'Preseli Hills' NCA46) and 'Taf and Cleddau Vales' (NCA44) NCAs. The 'West and North Pembrokeshire Coast' (NCA43) is present along the coast line to the north.

The coastal waters (shown on **Figure 6.5**) are divided into the National Marine Character Areas (MCAs, also known as SCAs) of 'Cardigan Bay (MCA 16) and Outer Cardigan Bay (MCA 17) to the north. The 'West Pembrokeshire Coastal Waters and Islands' (MCA 18) covers the coastal water to the west with 'West Pembrokeshire Islands, Bars and Inshore Waters' (MCA 19) beyond. It is not anticipated that other areas would have more than a very limited level of visibility if any, and thus are of little importance to the LVIA assessment process.

It is proposed that consideration would be given to the identified NCA and MCAs in the baseline as they are often useful in providing the context for the more local character areas. It is not intended to assess landscape and visual effects on these national areas as the scale of the proposed development is not considered large enough to have significant effects on these large areas.

Local Character Areas

Local landscape/Seascape character areas are defined by the PCC and PCNPA studies, with their location and extent relative to the Site illustrated on **Figures 6.6, 6.7 and 6.8**.

The PCC and PCNPA terrestrial studies abut with no overlap, and can therefore be regarded as one data set, for assessment purposes. However, the PCNPA LCA and PCNPA SCA studies overlap along the coastline covering slightly different areas. It is therefore proposed to assess the effects on the LCA areas as the definitive character assessment on land, and only use the SCA areas for the offshore assessment element. This is to simplify the assessment and avoid confusion and any double counting of effects.

The area of the Site is largely included within PCC LCA of 'Trecwn' (PLCA27) but also extends into 'Mynydd Cilciffeth' (PLCA4) and the 'Scleddau Lowlands' (PLCA5) as identified in the PCC study and described below.

PCC -Trecwn (PLCA27)

The main characteristics of this area include the woodland and rock lined valley which is linked into the surrounding valleys by major glacial meltwater channels. The narrow twisting valley was formerly used as a Royal Navy Armaments depot due to its defensive capabilities. The valley floor is still characterised by large industrial sheds and a railway that links to underground tunnels.

The key qualities identified are as follows:

"The area contains some contrasting features in the woodland and rock lined valley with former MoD industrial buildings and the railway that lie within but still retains a strong sense of place and tranquillity resultant from the enclosed atmosphere. Residential development is limited but provides movement and activity along the valley bottom and at the north of the area. The tranquillity here is occasionally broken by industrial traffic which otherwise contains woodland sounds. Views along the valley floor are limited, and from outside the area, wooded slopes obscure views of the development within."

The area would be particularly sensitive to the loss of woodland cover in terms of character, which may also have secondary effects on drainage and the glacial channels.

Although industrial sheds are present the area has development has acquired a degree of tranquillity and new development within the valley may adversely affect this.

Guidelines for future change include a desire to replace the coniferous plantations with native broadleaf species, preserve the historic value of the former MoD use and ensure any new use is sensitively integrated into the existing landscape.

PCC - Mynydd Cilciffeth (PLCA4)

This area includes the upland landscape to the east and south of the Trecwn Valley on the edge of the Preseli Hills.

The key qualities identified are as follows;

"Extensive panoramic views out of the area provide a strong sense of place and reach across wooded valleys to the west, coast to the north and Preseli mountains to the east. The moorland and exposed rock at the summit of Mynydd Cilciffeth adds to the attractive qualities of this area where a sense of exposure and peacefulness is reinforced by natural soundscape. The upland areas retain a sense of exposure and wildness whilst the lower slopes form part of the wider managed landscape managed for agriculture and forestry, where isolated farmsteads and cottages, post and wire rather than stone and hedgebank enclosure do not yet override the sense of history. Traditional house types, small farmyards and close-knit buildings and the absence of modern telecommunication and renewables in the landscape help reinforce a sense of history".

This is an area detracted from by coniferous woodland and declining landscape management. The panoramic views are sensitive to the development on the skyline and vertical structures with extensive views out towards the coast.

PCC - Scleddau Lowlands (PLCA5)

This area includes the landscape to the south of Fishguard and also encloses the western part of the Trecwn Valley and lower ground to the south near to Mynydd Cilciffeth.

The key qualities identified are as follows;

"Attractive views in and out of the area towards the Preseli Hills to the east provide a sense of place whilst the rolling farmland punctuated with villages and sporadic houses as well agricultural farmsteads provide a sense of long history of agricultural management and settlement in a rich and verdant landscape. Locally, the A40 sweeps through the landscape with local visual and noise intrusion. The road does however have important modern cultural associations and provides access to Ireland via the Ferry port at Fishguard."

Change within the area includes;

"Wind turbines within the area are mostly of a sympathetic scale punctuate the landscape but do not dominate. Large scale solar park development has taken place within the area."

This likely refers to the usually single small-scale turbines linked to farmsteads across Pembrokeshire (these are not all shown on the cumulative map).

Increases in light pollution around villages and light spill into the open rural landscape are seen as issues.

PCNPA - Pen Caer/Strumble Head

LCA 21 – Pen Caer/Strumble Head is over 5km from the Site and it is noted that *"Hill tops provide panoramic views of the Preseli Hills to the east, and along the coast, which add to the local distinctiveness."*

The special qualities of the landscape include the following:

"An extensive are of wild, open moorland and farmland with attractive views to rocky coastal cliffs and the Preseli Hills";

"There are many notable historical and archaeological sites which result in this LCA being of national importance with outstanding values in both historical and cultural landscape Aspects"; and

"The historical importance of this landscape has been formally recognised by its inclusion in the Pen Caer: Garn Fawr and Strumble Head Registered Landscape of Special Historic Interest in Wales".

The ridgelines identified on **Figure 6.2** include areas to the south of Pen Caer/Strumble. These allow for open views inland to the Preseli Hills but also screen large areas to the north from the potential turbines.

PCNPA - Trefin

The PCNP character area LCA 20 - Trefin extends further away along the coast from the Site and the character study identifies;

"*The cliff tops offer extensive views north and south along the coast. The hinterland is a gently undulating agricultural landscape of medium-sized fields with a close visual relationship with the adjacent coast*."

The main attraction remains the coast with coastal views more orientated along the coast and not towards the Preseli Hills. The distance of the proposed development is over 5 km at the closest from the Trefin LCA and further from the cliff tops and increasing within this LCA. The potential turbines would be seen beyond the agricultural hinterland when and thus the main components of the landscape views inland would be preserved. The solar PV sites on the more elevated eastern part of the site would be theoretically visible around the base of the turbines but likely to be difficult to perceive.

PCNPA - Mynydd Carningli

LCA 22 – Mynydd Carningli is located approximately 1.3 km to the east of the proposed development at its closest. The character details identify the special qualities include the following:

"There is a pervading sense of remoteness and wildness, resulting from the strong sense of exposure on the open moorland and heathland, together with the close proximity of the sea. The relative inaccessibility imparts a sense of tranquillity";

"There are strong historical links with the upland of the Mynydd Carningli and Mynydd Preseli range of hills and the quality and extent of historical and archaeological features here is of recognised national significance within Wales and of outstanding value, as evidenced by the demarcation of the Newport and Carningli Registered Landscape of Special Historical Interest in Wales"; and

"The single dominant archaeological feature is that of the spectacular Iron Age fort at the summit of Mynydd Carningli. From this radiate outwards prehistoric field systems, settlement evidence and ritual sites (such as standing stones); the abundant evidence for prehistoric human activity from the Neolithic to the Iron Age can be traced across the high ground".

The ZTV indicates visibility of the proposed wind turbines across a large area of the LCA. The open nature of the LCA and views out to the west across the development site would make the area sensitive to potential wind turbine development.

PCNPA - Cwm Gwaun/Afon Nyfer

The area (LCA 26) is formed by a narrow, enclosed valley which winds its way between Mynydd Carningli and Mynydd Preseli. The special qualities include the following characteristics:

"There is a pervading sense of shelter resulting in these valleys from a combination of landform, woodland and the dense mature hedgerow network bounding most of the fields";

"There is a strong sense of enclosure and intimacy imparted by the above characteristics, resulting in a patchwork of small fields punctuated by woodland blocks, giving the landscape a rich texture. This contrasts strongly with the open moorland of the nearby Preseli Hills, with attractive broad views";

"These factors contribute positively to the feeling of the valleys as being a landscape which is substantially unspoilt by recent built development or changes in agricultural management".

The ZTV indicates no theoretical visibility for the proposed development elements from the valley floor and the wealth of woodland and tree cover is likely to expand this level of screening to the lower parts of the valley sides.

PCNPA - Mynydd Preseli

LCA 27 – Mynydd Preseli is located to the south of Cwm Gwaun and its special qualities include the following:

"It is visible from large parts of the National Park and from extensive parts of the surrounding county of Pembrokeshire, providing a familiar and readily discernible reference point in conditions of moderate to clear visibility";

"There is a pervading sense of remoteness and wildness, especially on the summits and the upper slopes of these hills, and a strong sense of exposure, resulting from the proximity of the sea and the lack of cover and shelter on the open high ground";

"Distinctive rock formations at the summits provide visual punctuation points as the eye is drawn up the slopes and along the smooth ridges forming the horizon";

"This is a landscape of recognised national historical and cultural significance within Wales. There are close historical and archaeological links with the adjacent Mynydd Carningli and many common attributes, especially the prehistoric ritual landscape".

The ZTV indicates limited visibility within this LCA area largely limited to north facing slopes and highpoints.

The main views out to the coast are in the direction of Dinas Island, some views are present towards the ridgeline on the south of Strumble Head.

LANDMAP

LANDMAP is a Welsh GIS-based landscape resource managed by NRW where landscape characteristics, qualities and influences are recorded and evaluated into a nationally consistent data set.

"LANDMAP describes and evaluates the physical, ecological, visual, cultural and historic aspects of the landscapes of Wales, and provides the basis of a consistent, quality assured national approach to landscape assessment."

In terms of study areas, LANDMAP guidance GN46 provides a guide to the starting point for discussion with regulators and stakeholders.

"*At the outset of the LVIA, it may not be clear exactly how large the study area needs to be. For some types of development such as wind farms, visual effects may spread across a very large area. In such cases, it can be helpful to use the already mapped and evaluated information in LANDMAP, as well as other sources such as landscape designations, existing landscape sensitivity assessments, inter-visibility maps or long-distance key views in an early desk search stage to help to identify the extent of study area needed for the detailed LVIA. This search can be particularly useful in cases with large numbers of more distant visible landscapes to provide an evidenced basis for their inclusion or exclusion*."

The LANDMAP areas to be considered in the baseline and assessed in the LVIA will include the following as identified by methodology contained in LANDMAP guidance[7].

LANDMAP Landscape Habitat Aspect

The Pembrokeshire Landscape Habitat Aspect Areas within the proposed Site area include the following, with the development components directly affecting that aspect area identified in brackets:

- LH315 – South of Fishguard (wind and solar PV);
- LH660 – Mynydd Craig-lwyd (green hydrogen facility);
- LH693 – Surrounding Letterston (adjacent to Site boundary only);
- LH825 – Wern Lwyd (green hydrogen facility);
- LH555 – Mynydd Cilciffeth (adjacent to Site boundary only); and
- LH832 – Surrounding Puncheston (adjacent to Site boundary only).

The Landscape Habitat Aspect Areas with a high or outstanding value, for overall evaluation or connectivity/cohesion, are noted in bold text in the bullet list above and considered in detail below. Other levels of evaluation include moderate and low and only considered where the development is located within these aspect areas.

Wern Lwyd

The landscape of this area has a high value for broadleaved woodland and scrub habitats, while containing large areas of coniferous woodland and industrial buildings. A large part of the valley is defined as part of the Ancient Woodland Inventory, either as ancient woodland, restored ancient woodland or ancient woodland covered by existing plantation woodland. Options for the proposed green hydrogen facility and other elements of the proposed development located adjacent to an area of ancient semi-natural woodland would need to avoid root protection zones and construction damage, and effects on the ancient woodland would need to be carefully considered and addressed in the detailed design stage. The proposed wind turbines are located 100-150 m from the western edge of some of these ancient woodland areas, potential issues may include turbulence due to woodland presence and potential removal of woodland areas. Consideration would be given to all areas on the Ancient Woodland Inventory and/or identified as ancient woodland.

The western section of Wern Lwyd contains the Afon Cleddau Gorllewinol/Western Cleddau River Site of Special Scientific Interest (SSSI) and the Afonydd Cleddau / Cleddau Rivers Special Area of Conservation (SAC). The river habitat is an important site for lampreys, bullheads and otters.

Mynydd Cilciffeth

This area is important for its mosaic grassland and heath habitats and is located on the upper valley side to the east of the green hydrogen facility compound. However, it lies outside the site boundary with wooded slopes between it and the proposed development. No direct effects on the landscape habitats of this area would occur.

LANDMAP Cultural Landscape Aspect

The Pembrokeshire Cultural Landscape Aspect Areas within the Site area include the following, with the development component(s) potentially directly affecting that aspect area identified in brackets:

- CL009 – Railway System (green hydrogen facility);

[7] Natural Resources Wales, web based resource available at https://naturalresources.wales/guidance-and-advice/business-sectors/planning-and-development/evidence-to-inform-development-planning/using-landmap-in-landscape-and-visual-impact-assessments-gn46/?lang=en (15 September 2021)

- CL857 – Lowlands (North) (wind and solar PV); and
- CL997 – Principal Roads (adjacent to Site boundary only).

None of these aspect areas are identified as High or Outstanding, each being Moderate instead.

Railway System

The railway system stretches from Fishguard in the north to Haverfordwest in the south and is important due to its association with Isambard Kingdom Brunel who was the engineer for the Carmarthen to Fishguard to Haverfordwest section of this line. It includes a branch line which winds its way to Trecwn and into the Valley where the green hydrogen facility would be located.

The value of this branch line is identified in the Pembrokeshire LCA Area 27: Trecwn which describes the railway as follows;

"*… the railway is considered to form part of the wider Victorian railway network albeit that the branch was likely built to serve the MoD depot. Currently disused, the branch line is capable of re-instatement … The former MoD buildings and railway line have historic significance and should not be removed without consideration to their historic and tourism potential.*"

Lowlands (North)

This LANDMAP area contains most of the landscape around the Site (excluding the railway system above). Its summary description states: "*Diverse rural/agricultural use in the main and some scattered settlement … The lowland part of Pembrokeshire, characterised by rich farmland and small wooded areas, more bilingual in character than the lowland area to the south*."

No specific elements are identified but the proposed wind and solar PV elements of the proposed development would be located within this aspect area and potential sensitivity would need to be assessed through the area's landscape character.

Principal Roads

In the vicinity of the Site this refers to the A40 Fishguard to Haverfordwest road which passes beneath a bridge used for the branch railway line to Trecwn to the north of Letterston. No direct effects on this aspect area are likely to affect its value, with two potential solar PV areas the closest part of the main development to the A40.

The aspect area has a strong cultural value as a major transportation corridor and *"Proposals for improving the A40 are included in the Joint Unitary Development Plan for Pembrokeshire 2000 - 2016 prepared by Pembrokeshire County Council and the Pembrokeshire Coast National Park Authority."*

LANDMAP Geological Landscape Aspect

The Pembrokeshire (PMBRK) Geological Landscape Aspect Areas within the Site area include the following, with the development component(s) potentially directly affecting that aspect area identified in brackets:

- GL066 – Bengal (wind and solar PV);
- GL067 – Pentre-Newydd – Esgyrn Bottom (green hydrogen facility);
- GL071 – Mynydd Cilciffeth (adjacent to Site boundary only);
- GL081 – Skybir Mountain (adjacent to Site boundary only)
- GL083 – Heathfield (contains rail/road connection within red line but none of three main components); and
- GL110 – Upper Western Claddau – Esgyrn Bottom (solar PV and green hydrogen facility).

The Geological Landscape Aspect Areas with a high or outstanding value for overall evaluation or rarity/uniqueness are noted in bold text in the bullet list above. Upper Western Claddau – Esgyrn Bottom and connecting Cwm Gwaun Aspect Areas of GL044, GL45 and GL046. Reflecting the value of the glacial meltwater channels identified above.

Geological Landscapes Special Relationships

The Pentre-Newydd – Esgyrn Bottom and Upper Western Claddau – Esgyrn Bottom areas form part of an important complex of glacial meltwater channels which connect to the Cwm Gwaun Aspect Areas GL044, GL045 and GL046 described as follows:

"*Deeply incised, very steep sided valley linking the eastern limits of the Western Cleddau system to the Cwm Gwaun glacial meltwater channel [Quaternary: Pleistocene]. Flow of streams present now towards Cwm Gwaun rather than the former. Includes adjacent incised sides of Trecwn and the Esgyrn Bottom area. Base of main section in the Pentre-Newydd area narrow but broadens to S and SW. Bedrock dominated by Ordovician slates*."

With the recommendation that:

"*Ensure that no significant geological or geomorphological features are lost or damaged (e.g. due to development/ forestry, etc), including through carrying out a survey to identify candidate RIGS for protection through develop plan policies and constraint mapping*."

No other special relationships with adjacent Geological Landscape Aspect Areas are present.

LANDMAP Historic Landscapes

The Site comprises a number of Historic Landscape Aspect Areas as follows;

- HL46060 - Mathry – Hayscastle (wind and solar PV);
- HL46098 - Morvil (adjacent to Site boundary only);
- HL46101 – Mynydd Cilciffeth (adjacent to Site boundary only);
- HL46112 – Little Newcastle (adjacent to Site boundary only);
- HL46114 – Fagwyr-fran Forestry (includes forestry within application site but none of main components); and
- HL46115 – Trecwn (green hydrogen facility , wind and solar PV).

The majority of the area under consideration contains Historic Landscape Aspect Areas of either 'high' or 'outstanding' overall evaluation. The 'outstanding' areas with potential visibility (as defined by the blade tip ZTV) are separated from the Site and concentrated in a number of particular areas as follows:

- To the west approximately 17km from the Site: HL46086 – Porthgain – Aber Eiddy, HL42279 – Treleddyd – Tretio – Caerfarchell, HL42267 – Penmaen Dewi and HL42275 – Tyddewi (St Davids);
- To the south approximately 9km from the Site: HL46208 – Walton East, HL46204 – Wiston Llawhaden, HL43878 – Haverfordwest, HL43907 – Picton and Slebech and HL43906 – Canaston and Minwear Woods;
- To the south approximately 6km from the Site: HL46067 – Carningli, HL42266 – Mynydd Preseli, HL42264 Eglwyswrw, HL42247 – Gland Cross and HL42217 – Pengelli Forest; and
- To the north approximately 10km from the Site: HL46063 – Garn Fawr.

Other 'outstanding' areas are located near to Cardigan and on the south coast of Pembrokeshire both at distance of over 20km. At this distance the landscape effects perceived through visual connections/views would not be predicted as significant.

Through the main bulk of the area under consideration the Historic Landscape is defined as having a 'high' overall evaluation with the interior lowland landscape largely comprising HL46060 – Mathry – Hayscastle Aspect Area.

Trecwn

The Aspect Area contains the various elements of the MOD establishment at Trecwn, including the aforementioned branch railway. The most significant archaeological elements are identified as iron age hillforts, post-medieval structures and other sites. These include an Iron Age settlement and Scheduled Monument on Fagwr-Fran Moor, near the eastern site boundary and adjacent to one of the solar PV sites. Other scheduled monuments are found across the higher ground to the south of the Site and some to the northwest. Of note are Waun-Castell Camp near to the southern site boundary and Caer Penbicas to the north of the site boundary.

Various listed buildings are present comprising the Church of St David (Grade II), to the far northeast of the Site; the Old School House and Barham Memorial School (both Grade II and located within Trecwn).

Marthy – Haycastle

This is an extensive LANDMAP Aspect Area covering a large part of the study area to the west and south of the site, occupying an incised plateau. Historic Landscape Question 41 states:

"*This area has been assigned an overall value of high based on the quality of the archaeological resource, particularly in terms of evidence for prehistoric ritual/funerary activity*".

Little Newcastle

This is an elevated area to the south of the Site and has High overall evaluation due to the following aspects:

"*The high overall value assigned to this area reflects the diverse, multi-period scope of the archaeological record, with evidence of Neolithic chambered tombs, Iron Age hillforts, early medieval ecclesiastical sites, nucleated medieval settlement…*"

Morvil

This area includes the high ground to the south of Cwm Gwaun.

"*The overall value of high assigned to this area reflects the coherence of the fieldscape and settlement pattern, with little evidence of modern intrusion, and the diverse, multi-period scope of the archaeological record, distinguished by several deserted settlements*"

Mynydd Cilciffeth

This area is a small hill immediately east of the Site.

"*This area has been assigned an overall value of high, chiefly based on the survival of evidence for prehistoric ritual/funerary activity on Mynydd Cilciffeth and an extensive, well-preserved series of multi-period settlement/agricultural features…*"

Intervisibility between sites within this area and other similar sites in adjacent areas may be an important consideration in detailed design layout.

Fagwyr-fran Forestry

This is an area of modern forestry plantation which detracts from the overall coherence of the landscape.

Visual and Sensory

The Site comprises the following Visual and Sensory Aspect Areas;

- VS041 – Letterston (wind and solar PV);
- VS043 – Trecwn (green hydrogen facility); and
- VS044 – New Inn (adjacent to Site boundary only)

The 'overall' evaluation for Letterston is 'moderate', but High for Trecwn and New Inn.

Letterston

The Letterston area includes the incised plateau of settled lowland farming to the west, with only a marginal area of the Site within this aspect area.

"*The value of ''moderate'' given for all criteria of scenic quality, integrity, character and rarity accounts for the overall value of ''moderate'' which considers the rolling agricultural landscape with scattered settlements that is common throughout…*"

Recently added data to LANDMAP includes a Dark Skies assessment[8] classified into eight colour bands of brightness values, which identifies a moderate level of night time light pollution.

New Inn

This area includes a large area of upland grazing land through the Preseli Hills with infrequent human access and exposed/remote character.

As well as High overall evaluation this area has a high evaluation for scenic quality with an attractive, exposed and remote landscape with positive views into and out of the area with views to the Preseli Hills. The evaluation of landscape character is also high and defined by upland vegetation and visual links to the Preseli Hills.

The Dark Skies assessment, has identified very low light pollution and very dark skies, making the area susceptible to light pollution.

Trecwn

The LANDMAP description of the landscape of this area is as follows:

"*The upland valley Aspect Area of Trecwn is dominated by dense swathes of woodland including coniferous plantations within a wider less structured broadleaf woodland setting... The valley floor is characterised by large industrial sheds and a railway associated with the former MoD arms plant which detract from the original village buildings... Exposed rock outcrops in the steep upper valley sides adds an upland character to the area...*"

The LANDMAP Dark Skies assessment also identifies slight and localised light pollution is present within this area, due to a limited number of densely grouped developments leading to significant localised light pollution. Outside these areas dark skies are present.

The Pembrokeshire landscape character assessment (PLCA27) identifies key characteristics as;

"*The area contains some contrasting features in the woodland and rock lined valley with former MoD industrial buildings and the railway that lie within but still retains a strong sense of place and tranquillity resultant from the enclosed atmosphere. Residential development is limited but provides movement and activity along the valley bottom and at the north of the area. The tranquillity here is occasionally broken by industrial traffic which otherwise contains woodland sounds. Views along the valley floor are limited, and from outside the area, wooded slopes obscure views of the development within*."

Other Areas of Note

To the east of the proposed Site the ridge line of the Preseli Hills is formed by 'Mynydd Carningli' and 'Mynydd Preseli Tops' visual and sensory aspect areas both of which have an outstanding overall evaluation as well as for scenic quality and landscape character.

The two areas form the distinctive form of the Preseli Hills.

Mynydd Carningli is described as:

[8] https://luc.maps.arcgis.com/apps/opsdashboard/index.html#/1cd6ba8a1d7d4a62aff635cfcbaf4aec

"*… has a distinctive outline, a landmark from many parts of Pembrokeshire and the sea. It feels wild and open with very fine views in all directions. The contrast of exposed large-scale open land with the small fields of the lower slopes adjacent adds to its beauty.*"

Whereas Mynydd Preseli Tops is described as follows;

"*Mynydd Preseli is a relatively small, yet highly distinctive Aspect Area characterised by open and exposed moorland interspersed with rocky summits reaching 468mAOD & scree slopes. The dominant landcover is rough grass with some bracken. The hilltops form a strong skyline which dominates northern Pembrokeshire and are visible from great distances, especially from the south. The upland nature of the area lends it to extensive views across adjacent areas of rolling farmland & valleys to the coast. The exposed upland has a strong sense of place. The Aspect Area is a distinctive visual element of the north Pembrokeshire landscape adding a tourist attraction feature to the area*."

These two areas also have limited levels of light pollution and dark skies, making them susceptible to lighting within the landscape.

LANDMAP Study Summary

The LANDMAP assessment provides detailed information of the landscape of the Site and adjacent areas. This identifies elements of value and potential susceptibilities to change that result from the proposed development.

More recent additions to LANDMAP provide information on dark skies and the levels of existing light pollution. Careful design of the development may have the potential to reduce some of the existing light pollution at the Site or at least avoid additional light pollution within Trecwn Valley. The potential need for aviation lighting on the wind turbines needs to be very carefully considered.

The potential exists for the improvement of the existing landscape through converting conifers plantations to native broadleaf woodland thus providing biodiversity net gains, recreating field patterns, and potentially off-setting adverse landscape aspects of the final development.

6.1.3 Zones of Theoretical Visibility

Wind Turbines

A preliminary blade tip zone of theoretical visibility (ZTV) has been prepared for the indicative three turbine layout with a blade tip height of 149.9 m and as shown in **Figures 6.3a and 6.3b. Figure 6.3a** illustrates the ZTV across the larger 40km search area providing the context. **Figure 6.3b** illustrates the same ZTV but concentrating on the detailed 20 km study area.

As previously outlined the visibility would be constrained by landform, in particular the Preseli Hills which would predominantly prevent views towards the Site from the east and south east.

The sea cliffs and hills around the coastline of Pembrokeshire would screen most areas of the sea adjacent to the coastline, potentially avoiding views from beaches and recreational users in small boats, canoes etc. More distant views from the open sea would be possible to the north and west for larger ocean-going craft and ferries.

Inland visibility would be intermittent but widespread due an incised plateau landform, with steep sided valleys breaking up the pattern of theoretical visibility. This undulating landform extends to the coastline where higher hills provide screening for the coastal landscape, such as at Stumble Head (approximately 9 km to north of Site).

The ZTV is based on a bare earth model and does not include the screening effects of buildings or vegetation. For areas of higher ground (Preseli Hills) and along the coastal edges, vegetation and built structures are generally limited, and the ZTV is likely to be close to a true reflection of visibility. However, across most of the inland areas, roadside vegetation, woodland and built-up areas such as Fishguard and various villages would restrict the extent of visibility shown by the ZTV.

Solar Farm

Figures 6.10 is a ZTV for the solar farm area.

The larger (northern) area of the solar farm is located on a slight ridge, sloping down to the southeast. This locally elevated position creates a wider area of theoretical visibility. However, hedgerow vegetation along the north side of the public road would limit views to the north, although the hedge bank (with limited vegetation) would allow views of the solar panels from the public road and a small number of properties along this road. Visibility to the south extends along the rising edge of more elevated landscape connected to Ysgubor Mountain with potential views looking down onto the solar farm.

Visibility for the smaller (southern) area is much more restricted by landforms due to its much lower elevation near the valley floor. Views from Ysgubor Mountain (referenced as Skybir Mountain in LANDMAP data) and other elevated ground would follow a similar but much more restricted pattern of visibility.

Green Hydrogen Facility

At this stage no ZTVs of the green hydrogen facility have been undertaken, although the level of woodland and landform screening is predicted to give rise to limited visibility for both locational options. A detailed investigation of the visibility for the green hydrogen facility will be undertaken as part of the iterative Landscape and Visual Impact Assessment process. Should a need for visual screening be identified mitigation measures will be considered.

6.1.4 Landscape Designations

No international, national or regional landscape designations occur within the Site boundary.

The Pembrokeshire Coast National Park (PCNP) comprises the key landscape designation in the study area and reflects the national value placed on such areas for natural beauty and outdoor recreation.

The PCNP generally follows the coast around Pembrokeshire but is broken into a number of sections. In relation to the Site these sections include:

- the Preseli Hills and coast around Newport (approximately 800m to the east at its closest);
- the coast to the north of Fishguard (over 5 km) and extending west to St David's Peninsula (approximately 17 km); and
- areas around Milford Haven (approximately 17 km to the south).

No direct physical landscape effects would occur to the National Park, as the proposed development is outside the Park boundary. However, visual effects would occur which would create potential aesthetic and perceptual changes and resultant effects on landscape character.

Due to proximity and open views these effects would be greatest on the Preseli section of the PCNP and may adversely affect views from the Preseli Hills to the coast. Effects from the PCNP to the north of Fishguard and on the retreating coastline to the west would be less due to the increased distance and character of the coast compared to the Preseli Hills.

The qualifying elements of the designated landscapes which are within the ZTV and anticipated to incur potentially significant effects will be identified and the LVIA will assess the effects of the proposed development against their key qualities. This will have regard to likely actual visibility taking account of local landform and vegetation, with the designated areas considered likely to incur effects included in the assessment.

A number of designated landscape and 'landscape related' designations are located within the study area and shown on various figures contained with the main report, as outline below.

Landscape related designations include mainly heritage and ecology designations that can contribute value to the landscape by their presence; examples would be nature reserves and conservation areas. They also have the

potential to be areas more sensitive to visual effects as they could be associated with higher concentrations of visual receptors (people). Direct effects on these designations will be dealt with under the relevant technical discipline, considering for example the loss of habitat in a nature reserve or effects on the setting of buildings within a conservation area. However, these designations will be considered from a landscape and visual perspective in this analysis.

Landscape and landscape related designations considered particularly important within the study area for this feasibility study are as follows;

- Landscapes of Outstanding and Special Historic Interest;
- Conservation Areas;
- Registered Parks and Gardens;
- Ancient Woodlands; and
- Sites of Special Scientific Interest.

Other designations have been identified but not considered for the purposes of this report as effects on them would be identified elsewhere.

Landscapes of Outstanding and Special Historic Interest

There are three of these designated landscapes within the local area these being:

- Pen Gaer: Garn Fawr;
- Newport and Carningli; and
- Preseli.

The sensitive aspects outlined in the PCNP landscape character areas identified above are likely to be reflected in concerns for effects on these areas.

Conservation Areas

A number of Conservation Areas (CA) are present within the locality and include the following:

- Goodwick CA;
- Fishguard CA;
- Lower Town CA; and
- Newport CA.

No views are indicated by the blade tip ZTV (**Figure 6.3a**) for Newport CA or Lower Town CA.

Some visibility is predicted for Fishguard CA, although this is likely to be reduced by buildings and limited views out from the centre of the town.

There is the potential for relatively open views from the Goodwick CA as this part of the settlement slopes south east presenting opportunities for views across the bay and the settlement of Fishguard towards the Site. Predicted views would include the upper sections of the wind turbines seen above Fishguard in conjunction with existing tall flood lights located at the harbour/ferry terminal.

Registered Parks and Gardens

A large number of this designation area located within the local area including 45 in total as identified on **Figure 6.1**. The closest of these to the Site include the following:

- Afon Gaun is in the Fishguard Lower Town area and no views are anticipated due to the valley landform and vegetation screening;
- the Fishguard Bay Hotel overlooks the harbour area towards Fishguard and the Preseli Hills and therefore views may be possible within the context of the harbour and town development;
- Manorowen is a late-17th-century walled garden with a gazebo that has a panoramic view across Fishguard Bay which lies to the north east. The Site is located to the south east and views are predicted to be screened by woodland vegetation; and
- Scolton Manor Gardens and Kitchen Gardens is over 10km distant, and no views are indicated on **Figure 6.3a**.

The majority of the 45 identified parks and gardens are located outside the 20 km buffer and distance is likely to play a key mitigating factor for any that are identified as having theoretical visibility.

Ancient Woodland

There are areas of Ancient Woodland located within the Trecwn Valley and these areas are given a high level of protection from disturbance and/or loss due to developments.

Sites of Special Scientific Interest

Llangloffan Fen is a Site of Special Scientific Interest (SSSI), a National Nature Reserve (NNR) and part of the Cleddau Rivers Special Area of Conservation (SAC). It includes the Western Cleddau River which is of special interest for otter, bullhead, river lamprey and brook lamprey. The Nant-y-Bugail water course, which passes through the Trecwn Valley is a tributary of the Cleddau river.

All elements of the proposed development would need to minimise direct and indirect effects on water courses.

6.1.5 Viewpoints

A total of ten viewpoints have been used to inform early investigation and design work and these are recorded below in **Table 6-1**.

At this stage it is accepted that the viewpoint study area coverage is limited to the south and west of the study area towards St David's and Haverfordwest. In addition, the northern coast would benefit from additional viewpoints at Dinas Head and along the coast to the northwest.

In addition, viewpoints closer to the Site will be included, to assess the more local effects of the solar farm and green hydrogen facility components, as well as the wind turbines. Such viewpoints may include the settlement of Trecwn, Barham Road/Hill Road, Wesley Place, Ffos-Las, and other local roads, isolated properties and public rights of way on the adjacent hillsides.

The location of these additional viewpoints will be identified through consultation and further site work and included in the EIA stage of the project development.

Table 6-1
Viewpoint details

VP No.	Location	Easting	Northing	Elevation (m AOD)	Distance*/ Direction	Key receptors
1	Garn Fawr, Mynydd Dinas	200828	236853	303	3.9 km north east	PCNP, Open Access Land
2	Cerrig Lladron	206549	232056	468	7.6 km east	PCNP, Open Access Land, OS Viewpoint

VP No.	Location	Easting	Northing	Elevation (m AOD)	Distance*/ Direction	Key receptors
3	Fagwyr-fran, Standing Stone	200719	231615	234	2.2 km south east	NCR 47, PRoW, Residents, Heritage site
4	Mynydd Castlebythe	202804	229646	346	5.1 km south east	PCNP, Open Access Land, Heritage sites
5	Letterston Treletert	194423	229857	128	5.4 km south west	Settlement, A40, Residents, PRoW
6	Llangloffan Cross	190512	232921	108	6.2 km west	Local Roads, Scattered properties/ settlements
7	Pen Pwllmelyn, Fishguard	195539	235771	137	3.7 km north west	Edge of settlement, residents, local road
8	Garn Fawr, Trefasser	189589	238860	213	10 km north west	PCNP, ProW, Open Access Land, Heritage Sites
9	Garnwnda, Burial Chamber & Standing Stone	193244	239049	149	7.5 km north west	PCNP, PRoW, Heritage sites, Residents
10	A487, Tynewydd	197284	237418	60	4 km north	PCNP, A487, PRoW, Residents

* Distance from nearest turbine

6.1.6 Potential Sources of Impact

The proposed development would have a direct impact on the landscape fabric or physical elements of the landscape on the Site due to the removal or alteration to the vegetation and land cover to accommodate the various components of the proposed development. These effects would be different for the three components of the proposed development, i.e. the wind turbines, solar farm and green hydrogen facility .

The main source of landscape and visual impacts from the proposed development would be the appearance of the turbines from the surrounding landscape resource and in views obtained by people in the surrounding area. The effect of other elements of the proposed development such as the access track and substation, which may be visible from the surrounding area, will also be assessed.

The following identifies potential effects of the proposed development which will be assessed in detail in the ES:

- the design of the proposed development in relation to the landform of the Site and surrounding area;
- effects of the proposed development on the key characteristics of landscape character types located within the study area;
- effects upon the special qualities of the national, regional and local landscape designations within the study area;
- effects on views and visual amenity of residents of the nearby settlements of Fishguard, Goodwick and Haverfordwest will be considered, together with smaller settlements within 10 km of the proposed development and more dispersed properties within 5 km;

- effects on views from public roads such as the A40, A487 B4313 including sequential and cumulative effects;
- effects upon linear recreational routes such as the Pembrokeshire/Wales Coast Path and National Cycle Routes including sequential and cumulative effects
- views seen by recreational receptors including beaches, country parks and summits within the study area; and
- the design of ancillary elements including electrical connections/equipment, external transformers, invertors, access roads/tracks, crane hard-standings and borrow pits if utilised.

Wind Turbines

The towers and turbine blades will be the greatest source of impact for the wind turbines, in conjunction with the movement of the blades, largely due to their size and potential prominence in views. The movement of blades tends to attract attention or distract viewers from what they may be concentrating on. The current proposed layout comprises a simple form of three turbines.

External transformers can also create impact as they make the sculptural form of the wind turbine more cluttered, although the choice of a muted green/brown transformer colour can strengthen their link to adjacent rural land and disassociate them from the turbines.

Secondary effects can be caused by access road/tracks, particularly were regrading of landforms is required and also where they cross existing field patterns and water courses or introduce linear features that are not characteristic to the local area.

Construction pads for cranes and storage and borrow pits for the supply of stone can also add to the effects caused.

Links between the turbines and green hydrogen facility would be by underground cable and thus with minimal effects.

Solar Farm

An access point would be required either from Admiralty way or from the public road network. The solar area would require security fencing to protect the Site and storage containers for parts and equipment.

The rows of panels used introduce a regular and constructed feature with reflective surfaces often seen as an undulating form following the ground surface.

Green Hydrogen Facility

The appearance of the green hydrogen facility has not been finalised yet but it would have an industrial appearance. There is likely to be a site office, various transformers, kiosks, water tanks and pumps and other ancillary structures similar in appearance to shipping containers. However, due to its location and scale its appearance would have a minimal visual effect due to its location beyond the existing various buildings at a more remote and screened position.

6.2 Method of Assessment and Reporting

The same method of reporting and assessment will be undertaken for each of the three main components of the proposed development. The effect of each component on each receptor will be established providing the receptor is in the study area for that component. Thus, nearby receptors may assess the effects for all three components individually and the combined effect of all three components together. However, outside the study area for the green hydrogen facility, this component will not be considered, and outside the study area for the solar farms, only the wind turbines will be considered.

Once the baseline landscape and visual context has been established and following completion of the design optimisation process, the detailed LVIA will be undertaken.

The assessment will be carried out in accordance with the agreed methodology to identify the susceptibility and overall sensitivity of the landscape and visual receptors in the study area, as well as the magnitude of change, including cumulative change and related effects on these receptors caused by the proposed development.

An assessment of the potential effects on both landscape character and visual amenity arising from the proposed development at each of the agreed viewpoints will be carried out. This assessment will involve the production of computer-generated wirelines and photomontages to predict the views of the proposed turbines from each of the agreed viewpoints. The existing and predicted views from each of these viewpoints will be analysed to identify the magnitude of change and the residual effects on landscape character and visual amenity based on field work as well as desk-based assessment.

The findings of the LVIA will draw on the viewpoint assessment as well as desk study and field work to identify potentially significant effects on landscape character, landscape designations and visual amenity receptors in the study area.

The LVIA input to the ES will include the following:

- LVIA Chapter;
- Technical Appendix 6.1: LVIA Methodology;
- Technical Appendix 6.2: Viewpoint Assessment;
- Technical Appendix 6.3: Residential Visual Amenity Survey; and
- Figures: to include ZTVs, LCT and landscape designations plans, visualisations and cumulative drawings.

6.3 Consultation

It is suggested that a consultation meeting will be held with PCC, PCNPA and NRW in order to identify and agree the key matters to be addressed in the LVIA and the proposed approach to design development and mitigation will be explained. Agreement will also be sought on the proposed methodology, study area and proposed list of viewpoint locations issued with this Scoping Report, including those to be scoped out of the detailed assessment.

Further consultations will be carried out to agree the scope of the cumulative assessment and identify wind farms that are relevant to the identification of significant cumulative effects from the proposed development, as well as the final selection of representative viewpoints and related visualisation requirements. Where relevant points or issues are raised through public consultation this would inform the scope of the LVIA.

In summary, consultee agreement is sought for the following areas of the landscape and visual impact assessment, as set out above:

- methodology to be used for the LVIA, including visualisation standards;
- extent of study area(s) for the Landscape and Visual Impact Assessment;
- agreement on the number and locations of the proposed final viewpoints;
- scope of the cumulative Landscape and Visual Impact Assessment and associated study area; and
- any additional matters arising.

6.4 Matters Scoped Out

Wind Turbines

No night-time assessment work will be undertaken in respect of the wind turbines. As the proposed turbines would not reach or exceed 150m to tip height, visible aviation lights would not be required. It is expected that infrared lights may be required, however these would not be visible without the use of specific equipment.

It is proposed to scope out any receptors, designations and landscape character areas that are not included within the areas of visibility, as identified by ZTV study of the final turbine locations and dimensions. A precautionary approach would be adopted in this regard if receptors are directly adjacent to areas of visibility and/or access and approaches to and from the receptor may include visibility.

Solar Farm

All receptors outside the study area for the solar farm would be scoped out.

No night-time assessment work would be undertaken as site lighting would be limited to motion activated security lighting only.

Green Hydrogen Facility

A ZTV study would be carried out for the final design of the green hydrogen facility and receptors within the area of visibility assessed. A precautionary approach would be adopted for any receptors adjacent to areas of visibility. However, the location and context of this element of the development suggests effects would be contained and very limited.

It is not currently clear if a night-time assessment would be beneficial given the location of this element and its enclosure by landform and vegetation.

6.5 References and Standard Guidance

General guidance utilised in the study includes the following documents, with additional local guidance identified through the assessment:

The Guidelines for Landscape and Visual Impact Assessment, Third Edition (GLVIA3)[9];

Assessing Landscape Value Outside National Designations[10]

Visual Representation of Development Proposals[11]

LANDMAP Methodology Overview [12]

Using LANDMAP in Landscape and Visual Impact Assessments GN46[13];

Designing Wind Farms in Wales;[14] and

Siting and Designing Wind Farms in the Landscape[15].

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[9] Landscape institute and Institute of Environmental Management and Assessment, Guidelines for Landscape and Visual Impact Assessment Third Edition (2013).

[10] Landscape Institute Technical Guidance Note (February 2021)

[11] Landscape Institute, Visual Representation of Development Proposals Technical Guidance Note (17th Sept 2019)

[12] Natural Resources Wales, LANDMAP Methodology Overview June 2017

[13] Natural Resources Wales, web based resource available at https://naturalresources.wales/guidance-and-advice/business-sectors/planning-and-development/evidence-to-inform-development-planning/using-landmap-in-landscape-and-visual-impact-assessments-gn46/?lang=en (15 September 2021)

[14] Design Commission for Wales, Designing Wind Farms in Wales (October 2012)

[15] Scottish Natural Heritage, Siting and Designing Wind Farms in the Landscape Version 3a (August 2017)

7.0 Ornithology

7.1 Environmental Baseline and Potential Sources of Impact

7.1.1 Scope of Study and Study Area

Wind Turbines

The Ornithological Impact Assessment (OcIA) of the proposed development's wind turbine component will seek to identify and assess potentially significant effects on sensitive ornithological features. Note that other ecological issues are discussed separately in Section 8.

In order that ornithological features are fully understood, a series of desk and field surveys will be undertaken. The Scope of Study and Study Area are summarised below, with further methodological detail provided in section 7.1.2.

Desk Study – a search for all statutory and non-statutory biodiversity sites[16] within 5km of the Site will be undertaken. The Desk Study will also seek to identify existing records of protected or notable avian features within 5km of the Site.

Field Surveys

- **Breeding Bird Surveys** – breeding bird surveys will be undertaken within the footprint of the wind turbines and their associated infrastructure, and a buffer of up to 500m where access permits.
- **Flight Activity Surveys** – flight activity surveys will be conducted within the airspace of turbines, plus a 500m buffer. Flight activity surveys will focus on those species known to be most vulnerable to collision with rotating blades, or those species whose flight movements could be displaced by the presence of turbines.
- **Raptor Surveys** – Searches for scare breeding raptors will be undertaken within set survey buffers around the site, extending up to 2km.

Solar Farm

Breeding bird surveys of the footprint associated with the solar farm and its infrastructure will be undertaken.

Green Hydrogen Facility

Owing to the absence of suitable habitat within the proposed footprint of the green hydrogen facility compound options, no targeted ornithological surveys will be undertaken at these locations.

The findings of these studies will determine the full scope of the OcIA for each component of the proposed development, however it is anticipated that the assessment will focus on:

- effects on designated sites during construction and operation;
- loss of habitat for breeding birds during construction and operation; and
- collision risks associated with turbine operation.

[16] Including all European Sites (SPAs and Ramsar sites), Sites of Special Scientific interest (SSSIs) with ornithological interest, National and Local Nature Reserves and Local Nature Conservation Sites (or similar) identified in the Pembrokeshire LDP.

7.1.2 Baseline Conditions including Field Studies

Wind Turbines

Ornithological field surveys associated with the proposed development are ongoing, having commenced in 2021. The proposed development's wind turbine component is located in rough grazing pasture, to the south of which lies the more densely wooded Valley. In order that the ornithological sensitivities of this part of the Site are fully understood, the following surveys are currently underway:

- Breeding bird survey[17] of infrastructure footprint and a 500m buffer where access permits. All territories will be mapped, via three separate visits in April, May and June.
- Flight Activity Surveys[18] of turbine airspace and a 500m buffer. Vantage Point locations will be adopted based on site and desk-based visibility assessments (ZTVs). Data will be collected in both 2021 and 2022, with at least 36 hours of watches completed in the breeding season (April to August) and 36 hours of watches completed in the non-breeding season (September to March). In compliance with best practice, data will be collected within a series of height bands appropriate to the proposed development.
- Raptor Surveys[18] of turbine airspace and buffers of up to 2km. Surveys were undertaken between March and August in both 2021 and 2022.

Where appropriate, further detailed surveys for species will be undertaken and in consultation with project stakeholders.

Solar Farm

This part of the Site comprises intensively managed agricultural land, used primarily for cattle grazing and hay/silage production. Breeding bird surveys, following the method described above, will be collected within the solar farm area, and a buffer of up to 500m.

Green Hydrogen Facility

Both options comprise brownfield land, with Option 1 part of the active employment area. No specific ornithological surveys are proposed for the locations of the green hydrogen facility component of the proposed development.

7.1.3 Potential Sources of Impact

Wind Turbines

Based on emerging design detail, the OcIA will establish all potential pathways to significant effects on sensitive ecological features. At this stage, it is considered impacts may arise from:

Construction

- removal of natural or semi-natural habitat to facilitate construction; and
- the presence of plant, equipment and construction professionals.

These sources of impact could lead to effects including loss of habitat for breeding birds, and disturbance to breeding birds, potentially leading to failed breeding attempts or direct mortality.

Operation

Wind turbines

- turbine operation; and

[17] Based on methods described by the British Trust for Ornithology, Breeding Bird Survey (BBS).
[18] NatureScot (2017). Recommended Bird Survey Methods to Inform Impact Assessment of Onshore Wind Farms (Version 2)

- maintenance and management.

These sources of impact could lead to effects including disturbance of mortality of ornithological features, particularly as a consequence of collision.

Solar Farm

Potential sources of construction impact associated with the solar farm component of the proposed development are similar to those described above. During operation, however, potential impacts are likely to be limited to disturbance of ornithological features due to ongoing maintenance and management.

Green Hydrogen Facility

In the absence of suitable breeding habitat, impacts on ornithological features as a consequence of the construction and operation of the green hydrogen facility are unlikely to be significant.

7.2 Method of Assessment and Reporting

The OcIA will be prepared in compliance with current best practice[19]. The best practice method seeks, via baseline data, to identify all relevant sensitive ornithological features. Sensitive ornithological features are subsequently assigned an 'ecological importance' value, based on a geographic scale, as informed by legislation and national/local biodiversity policy.

Impact pathways and associated effects are then identified for each sensitive ornithological feature, and their significance considered, using a prescribed range of assessment parameters. In determining significance, designed-in best construction practice is considered.

Where effects are considered significant within the context of the EIA Regulations, further mitigation and/or compensation is developed and residual significance re-assessed.

The OcIA will be supported by a suite of Technical Appendices, each in turn supported by a series of maps, figures and site photography. Technical Appendices will include:

- Desk Study – to include legislative and policy review;
- Bird Survey Report – to include all methods deployed during baseline data collection; and
- Collision Risk Model (wind turbine component only)– based on the Band Collision Risk Model approach[20].

7.3 Consultation

Upon completion of all field surveys, NRW will be invited to provide comment on the appropriateness of the survey data. Agreement on appropriate assessment parameters, mitigation measures and, where necessary, compensatory measures will be sought.

Note that NRW was approached in summer 2022, with a view to discussing the appropriateness of a second year of ornithological baseline data collection. No response has been received to date. In the absence of NRW's input, a second year of data collection has commenced. **NRW's response to this request, as part of their scoping response, would be welcome.**

[19] CIEEM (2019). Guidelines for Ecological Impact Assessment in the UK and Ireland – Terrestrial, Freshwater and Coastal (version 1.1 updated September 2019).

[20] Scottish Natural Heritage (2000). Windfarms and Birds: Calculating a Theoretical Collision Risk Assuming No Avoiding Action.

7.4 Matters Scoped Out

Wind Turbines

In the absence of structural or functional connectivity to statutory and non-statutory designated sites, it is considered appropriate that effects on designated sites are excluded from assessment.

Where data suggests the agricultural land in which turbines and infrastructure will be located is not of value to breeding birds, habitat loss will be scoped out of assessment.

Solar Farm

Exclusions detailed above also apply to the solar farm component of the assessment.

Green Hydrogen Facility

Ornithological effects associated with the green hydrogen facility are unlikely to be significant, due to the absence of suitable habitat. It is proposed that ornithological effects associated with the green hydrogen facility are scoped out of assessment.

7.5 References and Standard Guidance

This chapter has been prepared in cognisance of current legislative and policy drivers, and best ornithological survey and assessment practice.

The Habitat and Species Regulations 2017 (as amended)

The Wildlife and Countryside Act 1981 (as amended)

Natural Environment and Rural Communities Act 2006

The Environment (Wales) Act 2016

Welsh Species and Habitats of Principle Importance (as established by the above Act)

Planning Policy Wales – Technical Advice Note 5: Nature Conservation and Planning

RSPB Birds of Conservation Concern (Red and Amber lists)

NatureScot (2017). Recommended Bird Survey Methods to Inform Impact Assessment of Onshore Wind Farms (Version 2)

Scottish Natural Heritage (2000). Windfarms and Birds: Calculating a Theoretical Collision Risk Assuming No Avoiding Action.

Welsh Nature Recovery Plan (2015)

The Pembrokeshire Local Biodiversity Action Plan

CIEEM (2019). Guidelines for Ecological Impact Assessment in the UK and Ireland – Terrestrial, Freshwater and Coastal (version 1.1 updated September 2019)

8.0 Ecology

8.1 Environmental Baseline and Potential Sources of Impact

8.1.1 Scope of Study and Study Area

Wind Turbines

The Ecological Impact Assessment (EcIA) of the proposed development's wind turbine component will seek to identify and assess potentially significant effects on sensitive ecological features. Note that ornithological issues are discussed separately in Section 7.

In order that ecological features are fully understood, a series of desk and field surveys will be undertaken. The Scope of Study and Study Area are summarised below, with further methodological detail provided in section 8.1.2. A preliminary overview of designated sites is provided in **Figure 8.1: Ecological Designations**.

Desk Study – a search for all statutory and non-statutory biodiversity sites[21] within 5km of the Site will be undertaken. The Desk Study will also seek to identify existing records of protected or notable species within 5km of the Site.

Field Surveys

- **Habitats and Vegetation** – habitat and vegetation surveys will be undertaken at the location of all infrastructure and a buffer of up to 250m.
- **Protected Species** – protected species surveys will be undertaken at the location of all infrastructure and a series of buffer areas, as defined by species specific best practice (described in Section 8.1.2).

Solar Farm

The approach described above will also apply to the proposed development's solar farm component.

Green Hydrogen Facility

The approach described above will also apply to both options for the proposed development's green hydrogen facility and associated infrastructure.

The findings of these studies will determine the full scope of the EcIA for each component of the proposed development, however it is anticipated that the assessment will focus on:

- effects on designated sites during construction and operation;
- effects on habitats of conservation importance[22] during construction; and
- effects on protected and notable species[23] during construction and operation.

8.1.2 Baseline Conditions including Field Studies

Wind Turbines

Ecological field surveys associated with the proposed development are ongoing, having commenced in 2021. The proposed development's wind turbine component is located in a rough grazing pasture, to the south of

[21] Including all European Sites (SACs), Sites of Special Scientific interest (SSSIs), National and Local Nature Reserves, Local Nature Conservation Sites (or similar) identified in the Pembrokeshire LDP and Ancient Woodland.
[22] Defined as Habitat and Species Regulations 2017 (as amended) Annex 1 Habitats, Welsh Habitats of Principle Importance, Habitats referenced in local Biodiversity Action Plans and habitats associated with peat depositions.
[23] Defined as Species offered protection via the Habitat and Species Regulations 2017 (as amended), The Wildlife and Countryside Act 1981 (as amended), Welsh Species of Principle Importance and species referenced in local Biodiversity Action Plans.

which lies the more densely wooded Valley. In order that the ecological sensitivities of this part of the Site are fully understood, the following surveys are currently underway:

- Phase 1 Habitat Survey[24] of all infrastructure and a 250m buffer;
- National Vegetation Classification (NVC) Survey[25] of all habitats of conservation importance and a 250m buffer;
- Protected Species walkover survey[26] through which suitable habitat for, and direct evidence of, protected species is recorded at an appropriate time of year. Species searched for include those identified in the desk study, and those considered appropriate in the professional judgement of project ecologists. A precautionary approach will be taken, and a wide range of species will be considered during the walkover survey, at this stage, species considered potentially present in the wind turbine area are limited to:
  - Bats (Potential Bat Roost Assessment[27] will inform the need for any detailed surveys)
  - Badger
  - Pine marten.
- in compliance with best practice initially published in 2019[28], static bat detectors (SM4 or SM4 mini) have been deployed at each proposed turbine location for a minimum of 10 nights in each spring, summer and autumn. Data collected during each season will be analysed, along with prevalent weather conditions, in compliance with best practice[28].

Where appropriate, further detailed surveys for species will be undertaken and in consultation with project stakeholders.

Solar Farm

This part of the Site comprises intensively managed agricultural land, used primarily for cattle grazing and hay/silage production. The methods described above will also be applied to the solar farm component of the proposed development, with the exception of bat survey methods designed only for wind turbine assessment.

Green Hydrogen Facility

The methods described above will also be applied to both options for the green hydrogen facility component of the project, again with the exception of bat survey methods designed only for wind turbine assessment.

While this part of the site comprises brownfield land and is part of the active employment area, the densely vegetated nature of The Valley, and its proximity to running water, means the following further surveys will be completed:

- otter and water vole survey[26] of all watercourses within 200m of the Site;
- bat roost/activity surveys[27] of any buildings proposed for demolition that demonstrate moderate or high bat roost potential; and
- bat activity transect surveys[27] with The Valley each month between April and October.

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[24] JNCC (1991). Phase 1 Habitat Survey - A Handbook for Environmental Audit. JNCC, Peterborough
[25] Rodwell, J.S (2006). NVC Users' Handbook. JNCC, Peterborough (and associated technical volumes)
[26] All of which are compliant with methods described in (CIEEM 2021) Good Practice Guidance for Habitats and Species. Version 3.
[27] Bat Conservation Trust (2016). Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd Edition). BCT, London
[28] NatureScot (2021). Bats and Onshore Wind Turbines – Survey, Assessment and Mitigation

8.1.3 Potential Sources of Impact

Wind Turbines

Based on emerging design detail, the EcIA will establish all potential pathways to significant effects on sensitive ecological features. At this stage, it is considered impacts may arise from:

Construction

- removal of natural or semi-natural habitat to facilitate construction, including turbine infrastructure and associated access tracks; and
- the presence of plant, equipment and construction professionals.

These sources of impact could lead to effects including loss of habitats of conservation concern, loss of habitat for protected species and more direct impacts on protected species, such as disturbance or mortality.

Operation

- turbine operation; and
- maintenance and management.

These sources of impact could lead to effects including disturbance of mortality of protected species, primarily bats as a consequence of barotrauma.

Solar Farm

Potential sources of construction impact associated with the solar farm component of the proposed development are similar to those described above. During operation, however, potential impacts are likely to be limited to disturbance or mortality of protected species due to ongoing maintenance and management.

Green Hydrogen Facility

Potential sources of impact associated with the green hydrogen facility component of the proposed development are similar to those described above. During operation, however, potential impacts are likely to be limited to disturbance or mortality of protected species due to ongoing maintenance and management, particularly where additional lighting is considered necessary as part of the design process.

8.2 Method of Assessment and Reporting

The EcIA will be prepared in compliance with current best practice[29]. The best practice method seeks, via baseline data, to identify all relevant sensitive ecological features. Sensitive ecological features are subsequently assigned an 'ecological importance' value, based on a geographic scale, as informed by legislation and national/local biodiversity policy.

Impact pathways and associated effects are then identified for each sensitive ecological feature, and their significance considered, using a prescribed range of assessment parameters. In determining significance, designed-in best construction practice is considered.

Where effects are considered significant within the context of the EIA Regulations, further mitigation and/or compensation will be developed and residual significance re-assessed.

The EcIA will be supported by a suite of Technical Appendices, each in turn supported by a series of maps, figures and site photography. Technical Appendices will include:

[29] CIEEM (2019*).* Guidelines for Ecological Impact Assessment in the UK and Ireland – Terrestrial, Freshwater and Coastal (version 1.1 updated September 2019).

- Desk Study – to include legislative and policy review;
- Habitat and Vegetation Survey;
- Protected Species Survey; and
- stand-alone Bat Survey and Assessment for the proposed development's wind turbine component.

8.3 Consultation

Upon completion of all field surveys, NRW will be invited to provide comment on the appropriateness of the survey data. Agreement on appropriate assessment parameters, mitigation measures and, where necessary, compensatory measures will be sought. **NRW's comments in response to this Scoping Report would also be welcome.**

8.4 Matters Scoped Out

Wind Turbines

In the absence of structural or functional connectivity to statutory and non-statutory designated sites, it is considered appropriate that effects on designated sites are excluded from assessment.

Effects on all common and widespread habitats, particularly those associated with the agricultural landscape, will be excluded from assessment.

Where protected species survey data demonstrates the likely absence of a species, or limited activity, it is considered that potential effects will not be significant and these will be scoped out of assessment.

Solar Farm

Exclusions detailed above also apply to the solar farm component of the assessment. In addition, given the limited nature of maintenance and management, it is considered appropriate that all operational effects are scoped out.

Green Hydrogen Facility

The Valley, in which both options for the green hydrogen facility and its associated infrastructure would be located, has potential to be of greater ecological importance that the agricultural landscape to the north. At this stage, it is considered appropriate to scope out effects on common and widespread habitats; however all other potential effects will be considered, during both construction and operation.

8.5 References and Standard Guidance

This chapter has been prepared in cognisance of current legislative and policy drivers, and best ecological survey and assessment practice.

The Habitat and Species Regulations 2017 (as amended)

The Wildlife and Countryside Act 1981 (as amended)

The Protection of Badgers Act 1992

Natural Environment and Rural Communities Act 2006

The Environment (Wales) Act 2016

Welsh Species and Habitats of Principle Importance (as established by the above Act)

Planning Policy Wales – Technical Advice Note 5: Nature Conservation and Planning

Welsh Nature Recovery Plan (2015)

The Pembrokeshire Local Biodiversity Action Plan

JNCC (1991). Phase 1 Habitat Survey - A Handbook for Environmental Audit. JNCC, Peterborough

Rodwell, J.S (2006). NVC Users' Handbook. JNCC, Peterborough (and associated technical volumes)

CIEEM (2021) Good Practice Guidance for Habitats and Species. Version 3

Bat Conservation Trust (2016). Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd Edition). BCT, London

NatureScot (2021). Bats and Onshore Wind Turbines – Survey, Assessment and Mitigation

CIEEM (2019). Guidelines for Ecological Impact Assessment in the UK and Ireland – Terrestrial, Freshwater and Coastal (version 1.1 updated September 2019).

9.0 Water Environment

9.1 Environmental Baseline and Potential Sources of Impact

9.1.1 Scope of Study and Study Area

A water environment chapter will be developed to assess the potential impact of the proposed development elements on the local and regional hydrology and hydrogeology.

The ES chapter will be supported by a standalone Flood Consequences Assessment (FCA) and Drainage Statement for the green hydrogen facility and solar farm development.

The study area is determined based on the sensitivity of the receptors and the potential pathways, however a standard search radius of 2km from the Site will be used as a suitable search radius for identifying sensitive receptors which will be refined as considered appropriate.

The proposed development is located within the catchment of a steeply incised valley (The Valley) which initially runs east-west prior to dog-legging in a northerly direction. This valley includes two main watercourses: the Nant-y-Bugail flows in a westerly direction within the east-west trending part of The Valley and the river Aer flows in a northerly direction within the northern trending part of The Valley. The study area will at a minimum extend to the eastern, western and northern extents of The Valley, as discussed in further detail below.

Wind turbines

The three wind turbines are located on raised ground above The Valley towards the eastern end of The Valley, where it doglegs north. A search radius of 2km from these wind turbines will be completed.

Solar farm

The solar farm will be located towards the western end of The Valley, primarily within the catchment of the Nant-y-Bugail. The panels will be located on the northern slope of The Valley, extending across the top of the valley ridge with a small area potentially falling within the catchment of the Cwm Witch watercourse to the north. The study area will extend a minimum of 2km from the solar farm but also include the Nant-y-Bugail, Cwm Witch and the Afon Cleddau into which both watercourses flow.

Green Hydrogen Facility

The green hydrogen facility would be located within the base of the east-west trending section of The Valley, adjacent to the Nant-y-Bugail. The study area will include the Nant-y-Bugail and its tributaries as well as well as the down-stream Afon Cleddau.

9.1.2 Baseline Conditions including Field Studies

The baseline setting will be assessed through a site walkover to review the hydrological setting and through a desk study based on but not limited to the following:

- British Geological Survey (BGS) mapping and reports include superficial and bedrock geology, aquifer classifications and hydrogeological mapping;
- Natural Resources Wales (NRW) mapping including Source Protection Zones (SPZs), aquifer classifications and landfill locations;
- NRW Flood map for planning;
- Natural England mapping (MAGIC) of ecological designated sites;

- an information request will be submitted to NRW and local council to obtain available data on groundwater levels, groundwater quality, surface water levels, flood risk, locations of landfills and locations of any licensed or private abstractions;
- details from site investigations previously undertaken to provide details of geology, groundwater levels, Infiltration rates etc, where available;
- details of flood risk from a hydraulic model of the Nant-y-Bugail currently in development; and
- any other previously completed reports available.

An initial assessment of the baseline conditions of the Site is outlined below.

Site Setting and Topography

All three proposed elements of the development are located within the catchment of The Valley within which the Nant-y-Bugail flows in a westerly direction and the River Aer flows in a northerly direction out of The Valley. The valley floor falls from c. 105mAOD at the divide between the Nant-y-Bugail and River Aer to c.70mAOD at its western end.

The proposals include:

- three wind turbines at the eastern end of The Valley to be located towards the catchment divide between the Nant-y-Bugail and River Aer, these are located on the northern side of the valley at between 195 – 210m AOD, c.100m above the valley floor.
- a solar farm located at the western end of the Site on the northern slope of the valley. The more westerly part of the solar area (is located between 25m and 50m above the valley floor whilst the more easterly area is between 5m and 40m above the valley floor.
- a green hydrogen facility compound located in the valley floor at an elevation of c.87mAOD.

Hydrology

The three elements of the proposed development are primarily located within the catchment of the steep sided Trecwn Valley which forms a dog-leg, running broadly east-west along the Nant-y-Bugail and north-south along the River Aer. The catchment divide between the two watercourse is along the north-south portion of The Valley with the River Aer flowing in a northerly direction to the Afon Gwaun and the Nant-y-Bugail flowing westerly.

Both watercourses are fed by a series of minor tributaries and springs which rise along the valley sides. The locations of these watercourses are shown on **Figure 9.1: Hydrological Features.**

The green hydrogen facility and the majority of the solar PV development are located within the catchment of the Nant-y-Bugail whilst the wind turbines are located close to the catchment divide, with turbines 1 and 2 falling within the catchment of the River Aer and turbine 3 within the catchment of the Nant-y-Bugail, these are located on relatively flat ground above The Valley but fall within the catchments of these watercourses.

A small portion of the solar farm development may extend into the catchment of the Cwm Witch to the north. This stream rises from a series of springs and flows in a westerly direction to its ultimate confluence with the Afon Cleddau.

Flood Risk

Areas at risk of flooding in Wales are currently shown by the NRW Development Advice Maps (DAM)[30] however a revised TAN15 is due to be implemented in June 2023 which will be supported by the new *'flood map for*

[30] Natural Resources Wales / Flood Map for Planning / Development Advice Map

planning' mapping[31]. This TAN15 guidance and accompanying mapping will significantly redefine the policy response to flood risk. Whilst the revised mapping currently has no official status for planning purposes until June 2023, NRW advises that it *'may also use the Flood Map for Planning data as the 'best available information' on flood risk to inform our planning advice*' and it therefore will be a material consideration when considering the flood risk to the proposed development.

It is understood that the proposed application will be submitted after June 2023 and therefore references in this scoping document to TAN15 are to the draft version of the TAN15 update published in December 2021[32].

The flood mapping areas are shown on **Figure 9.2**: **Fluvial Flood Risk Map** and **Figure 9.3: Surface Water Flood Risk Map.**

Figure 2 of TAN15 defines a number Flood Zones that are reproduced **in Table 9-1**.

Table 9-1: Definition of Flood Map for Planning flood zones

Zone	Flooding from rivers	Flooding from the sea	Flooding from surface water and small watercourses
1	Less than 1 in 1000 (0.1%) (plus climate change) chance of flooding in a given year.		
2	Less than 1 in 100 (1%) but greater than 1 in 1000 (0.1%) chance of flooding in a given year, including climate change.	Less than 1 in 200 (0.5%) but greater than 1 in 1000 (0.1%) chance of flooding in a given year, including climate change.	Less than 1 in 100 (1%) but greater than 1 in 1000 (0.1%) chance of flooding in a given year, including climate change.
3	A greater than 1 in 100 (1%) chance of flooding in a given year, including climate change.	A greater than 1 in 200 (0.5%) chance of flooding in a given year, including climate change.	A greater than 1 in 100 (1%) chance of flooding in a given year, including climate change.
TAN 15 Defended Zones	Areas where flood risk management infrastructure provides a minimum standard of protection against flooding from rivers of 1:100 (plus climate change and freeboard).	Areas where flood risk management infrastructure provides a minimum standard of protection against flooding from the sea of 1:200 (plus climate change and freeboard).	Not applicable

With reference to TAN 15 '*Figure 3 – Development Vulnerability Categories'*, it has been assumed that the proposed development would fall within the definition of '*renewable energy generation facilities*' which are considered to be a '*less vulnerable'* form of development.

[31] Flood Map for Planning (naturalresources.wales)
[32] https://gov.wales/technical-advice-note-tan-15-development-flooding-and-coastal-erosion

Solar PV

The proposed solar PV development is located entirely within Flood Zone A / Flood Zone 1 (low risk) and is therefore considered appropriate development. There are also no watercourses within the vicinity of the proposed solar farm.

Wind Turbines

All three proposed turbine locations are shown to be located entirely within Flood Zone 1 (low risk). There are no watercourses within the vicinity of turbines locations 1 or 2. There is a minor drain located to the south-east of turbine location 3 but this is not located within 10m of the proposed location.

All three turbines are located on high ground above the valley of the Nant-y-Bugail / River Aer and are considered to be at low risk from all sources of flooding.

Green Hydrogen Facility

The proposed location of the green hydrogen facility is within the floor of The Valley within an area shown by the *flood map for planning* to lie largely within Flood Zone 2; however, parts of the Site and the access to the Site are shown to lie within Flood Zone 3.

It is however noted that the hydrology of The Valley is complex with extensive historical canalisation and culverting of the watercourse which is unlikely to have been reflected in the flood mapping.

A hydraulic model will therefore be developed for the Nant-y-Bugail to better define the flood risk and flood zoning within the vicinity of the green hydrogen facility and the access to it. The outcomes from the model will inform the FCA that will be prepared to support the proposed application.

Section 10 of TAN15 requires that for development to be permitted in Flood Zones 2, the determining authority must be satisfied that:

> *1. It will assist, or be part of, a strategy supported by the Development Plan to regenerate an existing settlement or achieve key economic or environmental objectives; AND*
>
> *2. Its location meets the definition of previously developed land; AND*
>
> *3. The potential consequences of a flooding event for the particular type of development have been considered, and found to be acceptable in accordance with the criteria contained in section 11.*

And in Flood Zone 3 that:

> *Less vulnerable development will only be justified if:*
>
> *1. There are exceptional circumstances that require its location in Zone 3, such as the interests of national security, energy security, public health or to mitigate the impacts of climate change; AND*
>
> *2. Its location meets the definition of previously developed land; AND*
>
> *3. The potential consequences of a flooding event for the particular type of development have been considered, and found to be acceptable in accordance with the criteria contained in section 11.*

Section 11 of TAN provides advice on ensuring the acceptability of flood consequences and would be expressly addressed by the FCA which will seek to demonstrate, on the basis of detailed hydraulic modelling, that the development would be justified in the flood zone.

Hydrogeology

A review of BGS mapping indicates that the base of to be determined by detailed hydraulic modelling, within which the proposed green hydrogen facility would be located; is underlain by superficial Head deposits – clay, silt, sand and gravel. These deposits are only recorded in the base of The Valley and the mapping indicates that

there are no superficial deposits along the valley sides, including the proposed locations for the wind turbines and solar farm.

Bedrock deposits beneath all elements of the development comprise '*Abermaw Shale*' formation with igneous intrusions.

The aquifer designation maps indicate that the superficial deposits (where present) are classified as *secondary (undifferentiated)* whilst the bedrock is classified as a *Secondary B*.

Given the nature of the underlying geology it is considered that groundwater is unlikely to constitute a significant receptor, although it is noted that there is the potential for the bedrock to support private water supplies and/or to support some baseflow to watercourses. Additional information will be obtained on the locations of any groundwater abstractions.

Water Dependent Ecological Sites

The Nant-y-Bugail watercourse from Trecwn to its confluence with the Afon Cleddau is classified as part of the Western Cleddau River Site of Special Scientific Interest (SSSI) and Special Area of Conservation (SAC) which is primarily designated for important populations of otter, bullhead, river lamprey and brook lamprey as well as its range of river habitats.

This is located just down-stream of the proposed green hydrogen facility locations and directly adjacent to the proposed solar PV development.

9.1.3 Potential Sources of Impact

The EIA will include assessments on all potential receptors including:

- groundwater within the Abermaw Shale and Head deposits (where present);
- Nant-y-Bugail and its tributaries: surface water levels, flows and quality;
- River Aer and its tributaries: surface water levels, flows and quality;
- Western Cleddau River SSSI and SAC;
- flood risk to the development itself from the Nant-y-Bugail, tributaries and surface water run-off; and
- impact of the development on flood risk down-stream flood risk.

The EIA will include an assessment of impacts during the construction phases of the Site and the long-term impact of the different elements of the Site including:

- impact of construction on groundwater and surface water quality through spillages and generation of waste material;
- impact of the active running of the solar farm, wind turbines and green hydrogen facility on groundwater and surface water quality through spillages of oils or other chemicals stored on site;
- impact of the development, both during construction and active phases on the ecological status of the Nant-y-Bugail and the Western Cleddau;
- assessment of water usage requirements to demonstrate available water supply;
- details of how effluent from the green hydrogen facility will be managed, including details of any need for treatment prior to discharge;
- impact of the developments on flood risk down-stream due to either increased run-off or displacement of flood water; and

- a standalone FCA will be included as an appendix to the ES to assess flood risk to each of the elements during both construction and long-term use of the Site. The FCA will be supported by a Drainage Statement completed in accordance of the advice contained at Chapter 8 of TAN15 to demonstrate the feasibility of the proposed sustainable drainage measures (SuDS) that will be provided to manage the volume, rate and quality of surface water runoff over all phases of development. In accordance with good practice, a pre-application advice will be sought from Pembrokeshire SuDS Approval Body (SAB).

9.2 Method of Assessment and Reporting

A qualitative risk assessment methodology will be used to assess the significance of the potential effects. Two factors will be considered: the sensitivity of the receiving environment and the potential magnitude should that potential impact occur.

This approach provides a mechanism for identifying the areas where mitigation measures are required, and for identifying mitigation measures appropriate to the risk presented by the proposed development. This approach also allows effort to be focused on reducing risk where the greatest benefit may result.

The sensitivity of the receiving environment (i.e., the baseline quality of the receiving environment as well as its ability to absorb the effect without perceptible change) and the magnitude of impacts will each be considered through a set of pre-defined criteria.

The sensitivity of the receiving environment together with the magnitude of the effect defines the significance of the effect, which will be categorised into level of significance.

The ES chapter will be supported by a FCA, Drainage Statement and hydraulic modelling of the Nant-y-Bugail.

Hydraulic Modelling

A hydraulic model of the Nant-y-Bugail will be developed to inform the FCA and in particular to better define the extent of flood zones 2 and 3. It will also be used to assess and design any mitigation measures that may be required to ensure that the development does not increase the risk of flooding elsewhere.

Flood Consequences Assessment

A standalone FCA will be developed as an appendix to the ES. This will be developed in accordance with current best practice and TAN15 guidance.

The FCA will assess the potential risk of flooding from all sources including tidal, fluvial, surface water, groundwater, reservoirs and artificial drainage systems. Initially a scoping assessment will be undertaken on all three developments and where risk of flooding is identified a further, more detailed assessment will be completed. Based on the initial review of the Site setting it is likely that this will primarily focus on the risk to the green hydrogen facility .

Drainage Statement

A drainage statement will be prepared for the green hydrogen facility and solar PV elements of the development. This will be completed in accordance with appropriate guidance from SAB and will include a description of the existing drainage and explain how surface water will be managed in a sustainable manner in keeping with guidance outlined in the SuDS manual and also include details of future maintenance requirements.

It is considered that a drainage statement will only be required for the green hydrogen facility and solar PV as the wind turbines will have minimal footprints and will not materially impact surface water run-off.

9.3 Consultation

Prior to commencement of the design of any SuDS features consultation will be undertaken with Pembrokeshire County Council as the SAB to ensure that the SuDS outlined within the surface water drainage statement are developed in accordance with best practice.

9.4 Matters Scoped Out

The proposed wind turbines will have minimal impermeable areas which will be less than the 100m^2 minimum development size for needing sustainable drainage systems approval and will not materially alter current surface water run-off. Surface water drainage design for this element of the development has therefore been scoped out of the assessment.

9.5 References and Standard Guidance

The Water Environment chapter will be developed in accordance with appropriate legislation, policy and guidance, as follows:

Legislation

The key piece of legislation that protects the UK's water environment is the Water Framework Directive (2000/60/EC), transposed into UK law by '*The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017*'. These regulations protect all elements of the water cycle and seek to enhance the quality of groundwaters, surface waters, estuaries, and coastal waters.

Other key national legislation and policy relevant to the proposed development include:

- Environment Act 1995;
- Natural Resources Wales (NRW) statutory obligations over the management and control of pollution into water;
- The Sustainable Drainage Regulations, 2018; and
- Flood and Water Management Act, 2010.

Guidance

Relevant UK guidance on good practice for construction projects is detailed in the following documents:

Control of Water Pollution from Construction Sites - Guide to Good Practice, CIRIA 2002.

Environmental Good Practice on Site C741, CIRIA 2015;

The SuDS Manual (Report C753). CIRIA, 2015;

CIRIA Report C624, Development and flood risk – guidance for the construction industry (October 2004);

BS8533:2017, Assessing and managing flood risk in development – Code of Practice (December 2017);

Sustainable Drainage (SuDS) Statutory Guidance, 2019

Pembrokeshire County Council Sustainable Drainage Approval Body (SAB) guidance, Sustainable Drainage Approving Body (SAB) - Pembrokeshire County Council; and

Guidance for Pollution Prevention (GPP) and the Pollution Prevention Guidelines (PPGs).

Planning Policy Wales (2021)

The chapter will take due regard for policy in relation to flood risk and climate change as outlined within Planning Policy Wales as outlined in Technical Advice Note 15 (TAN15) Development, flooding and coastal erosion (December 2021)

10.0 Geology, Soils and Land Quality

10.1 Environmental Baseline and Potential Sources of Impact

10.1.1 Scope of Study and Study Area

This section identifies the Geological, Soil and Land Quality issues of relevance to the proposed development of the proposed development. It describes the potential effects from the construction, operation and maintenance, of the proposed development on Geology, Soils and Land Quality and sets out the proposed scope of the EIA. The proposed methods for the EIA are also presented. The effects on agricultural land are considered separately in Chapter 14: Socio-economics, Tourism, Recreation and Land Use.

Study Area

The impact assessment will identify and consider potential sources and receptors within 500m of the proposed Site infrastructure as set out on **Figure 3.1**, which includes the proposed locations for the wind turbines, solar PV and green hydrogen facility .

The impact assessment will also consider potential cumulative, or in-combination effects associated with other developments within 2km of the proposed development.

10.1.2 Baseline Conditions including Field Studies

Baseline data to inform scoping for Geology, Soils and Land Quality has been taken from publicly available information and opensource data from a range of sources, along with the available environmental reports relating to the Site. The data review includes:

Aerial Photography

Lle Geo-Portal Website, Welsh Government and Natural Resources Wales (NRW):

- Historic and active landfill sites.
- Permitted industrial and commercial facilities.
- Groundwater Source Protection Zones (SPZ).

British Geological Survey (BGS) GeoIndex mapping:

- Geology – artificial ground, mining, superficial deposits, bedrock.
- Borehole data.
- Aquifer designation and groundwater vulnerability.
- Minerals resource map.
- Aggregates safeguarding map.
- Historical mining areas.

The Coal Authority Website

Ordnance Survey Historical Mapping

Department for Environment, Food and Rural Affairs (DEFRA) MAGIC website:

- Current mapping.
- Statutory and non-statutory environmental designations.

Cranfield Soil and Agrifood Institute Soilscapes map viewer:

- Soil type and character.

Zetica Website:

- Unexploded Bomb (UXB) risk mapping

Previous environmental reports relating to the Site:

- TerraConsult Limited (2014): Phase 1 Site Investigation Report – proposed Trecwn Biomass to Energy Facility at the former Royal Naval Armaments Depot, Trecwn, Pembrokeshire (Ref: 1789/02); for Renewable Developments (Wales) Limited.
- TerraConsult Limited (2014): Water Framework Directive Assessment Report – proposed Trecwn Biomass to Energy Facility at the former Royal Naval Armaments Depot, Trecwn, Pembrokeshire (Ref: 1789/02); for Renewable Developments (Wales) Limited.
- Axis P.E.D. Limited (2014): Environmental Statement – proposed Trecwn Biomass to Energy Facility at the former Royal Naval Armaments Depot, Trecwn, Pembrokeshire (Ref: 1376-01); for Renewable Developments (Wales) Limited.

Baseline mapping is provided in **Figure 10.1: Bedrock Geology**, **Figure 10.2: Superficial Geology** and **Figure 10.3: Areas of Potentially Contaminated Land.**

The key findings from the review of the baseline data are summarised in the following sections:

Geology & Environmental Setting

- the Site is generally surrounded by agricultural land and woodland;
- the Nant-y-Bugail and the River Aer run through the centre of the Site at the base of the valley;
- Nant-y-Bugail within the site boundary forms part of the Western Cleddau River SAC and SSSI for aquatic life;
- the Site is mapped as underlain by superficial Head, Alluvium and Glaciofluvial Deposits over bedrock geology that primarily comprises shale and mudstone with igneous intrusions. The superficial deposits are designated by the EA as secondary (undifferentiated) aquifers and the bedrock designated as a secondary B aquifer. The Site is not located within a groundwater source protection zone (SPZ);
- BGS records indicate that there are deposits of Made Ground (shale gravel) at the base of the valley in the central part of the Site, associated with the excavation of ammunition storage caverns for the Royal Navy Armaments Depot (RNAD);
- the Soilscapes map viewer indicates that the Site is primarily covered by freely draining acid loamy low fertility soils over rock, with localised areas of loamy and clayey moderately fertile floodplain soils with naturally high groundwater immediately adjacent to Nant-y-Bugail in the western part of the Site;
- there are no geological SSSI or Regionally Important Geological and Geomorphological Sites (RIGS) located within 500m of the proposed infrastructure, although there is a RIGS located approximately 500m north of the site boundary at Cronllwyn Quarry for Ordovician stratigraphy; and
- the Site is in a Radon Affected Area, as between 5% and 10% of properties are above the Action Level. Basic radon protective measures are necessary for buildings to be constructed as part of the proposed development.

Mineral Safeguarding Areas

Potentially significant areas of safeguarded mineral and aggregate deposits identified within the study area include the following:

- Category 1 - Dolerite intrusions with potential for high specification aggregate; and

- Category 2 - Slate.

Mining Areas

- the Site is not located within a coal mining reporting area;
- there are historical quarries located along the sides of The Valley, although none of the proposed infrastructure is located on the site of a former quarry; and
- there were excavation and extraction activities associated with the creation of the munition storage caverns, and it is understood that this material was used to form the Made Ground within The Valley.

Commercial and Industrial Activities

- The Valley comprises a decommissioned RNAD which includes some existing commercial properties and a network of railway lines;
- the Site was historically farmland until 1937 when the construction of the RNAD commenced. This ordnance storage and maintenance facility was operational until 1990. Since then, the RNAD has been decommissioned and a number of the buildings and infrastructure have been demolished;
- potential sources of historical contamination at the Site associated with the former RNAD include various industrial facilities associated with munitions maintenance and storage, engine sheds and railway sidings, and general maintenance /waste management facilities;
- localised areas of potential contamination could include heavy metals, polycyclic aromatic hydrocarbons (PAHs), oils/lubricants, petroleum hydrocarbons, solvents, explosive residues, PCBs and asbestos; and
- Previous rounds of surface water sampling undertaken at the Site by TerraConsult in 2014 indicated that that there was no widespread problem with surface water or groundwater contamination associated with the potential sources of historical contamination at the RNAD.

Waste Disposal and Recycling Facilities

- the only recorded landfill within 2km of the Site is located outside of the Site boundary, and none of the proposed infrastructure is located within 500m of this waste disposal facility; and
- there are no other waste disposal or recycling facilities located within 500m of the Site.

Unexploded Ordnance

- the Zetica Bomb Risk Map shows a low risk for unexploded ordnance at the Site;
- the site manager confirmed that there are no records of the Site being bombed during WWII;
- all known munitions were removed from the RNAD by the MOD prior to decommissioning; and
- there were no live fire areas on the RNAD.

10.1.3 Potential Sources of Impact

Geology and Soils

The proposed development could encroach on potentially significant areas of safeguarded mineral and aggregate deposits beneath the Site.

Land Quality

Historical sources of potential contamination associated with the Site within the former RNAD include:

- industrial facilities associated with munitions maintenance and storage;
- engine sheds and railway sidings; and

- general maintenance and waste management facilities.

Potential historical contaminants could include heavy metals, polycyclic aromatic hydrocarbons (PAHs), oils/lubricants, petroleum hydrocarbons, solvents, explosive residues, PCBs and asbestos.

There could also be limited sources of potential contamination associated with the proposed green hydrogen facility compound which will be confirmed once the design has been finalised, although these risks are likely to be mitigated by the use of modern environmental management systems and appropriate containment measures (e.g. bunded tanks, drainage protection measures, emergency spill response).

10.2 Method of Assessment and Reporting

Planning Policy Wales

National Planning Policy in Wales is set out in The Welsh Government (2021) Planning Policy Wales Edition 11 (PPW) (Ref 11.17).

The PPW states that:

> *"Opportunities offered by the planning system to address land contamination should be maximised as part of its preference for the use of PDL. Whenever development or re-development potential exists the planning system will be the preferred means of addressing potential land contamination."*

The Natural Environment: Soils

PPW states that the planning system should protect valued soils and prevent the adverse effects of unacceptable levels of pollution. This is because soil is an essential finite resource that provides important 'ecosystem services'. As part of the Government's 'Safeguarding our Soils' strategy, DEFRA published a code of practice on the sustainable use of soils on construction sites which was intended to be helpful in development design and setting planning conditions[33]. After discussing legislation relevant at the time, the code covers:

- pre-construction planning including soil resource surveys;
- soil management during construction; and
- landscape, habitat or garden creation.

Land Affected by Contamination

The PPW has a core aim to encourage the effective use of land by reusing land that has been previously developed (brownfield land), provided that it is not of high environmental value.

PPW directs those involved in development to ensure sites are suitable for use and not be capable of being determined as contaminated land under Part 2A - which means that the category of land, post remediation (if required), should be considered.

The Contaminated Land Regime

Specific legislation and guidance on the assessment of contaminated land in Wales is principally provided under:

Part 2A of the EPA 1990, as inserted by Section 57 of the Environment Act 1995;

- The Contaminated Land (Wales) Regulations 2006 (No.2989 W.278) make provision, in relation to Wales, for the identification and remediation of contaminated land under Part 2A of the Environmental Protection Act 1990;

[33] Construction Code of practice for the Sustainable Use of Soils on Construction Sites, Defra, 2009

- The Building Regulations (Wales) 2010: Part C1 - Site Preparation and Resistance to Contaminants which provides guidance for the protection of new buildings and structures from potentially contaminated land; and
- The Environment (Wales) Act 2016 is legislation introduced by the National Assembly for Wales that established necessary legislation to enable a more sustainable and coordinated approach to the planning and management of the natural resources of Wales.

Overall, the regime advocates a precautionary approach to dealing with contaminated land, and there is clear direction to avoid the "excessive cost burdens" of "wastefully expensive remediation".

The normal procedure for assessing land dictates that potential contaminant Sources, Pathways and Receptors should be considered within the context of potential contaminant linkages (PCLs) and that an evaluation of the risks associated with each linkage should drive decisions regarding the status of the land as contaminated, unaffected by contamination or requiring further investigation.

Under Part 2A of the EPA, the starting point should be that land is not 'contaminated land' unless there is reason to consider otherwise. Only land where unacceptable risks are clearly identified, after a risk assessment has been undertaken in accordance with the Statutory Guidance, should be considered as meeting the Part 2A definition of contaminated land.

Under Part 2A, risks should be considered only in relation to the current use of the land. "Current use" means:

- the use which is being made of the land currently;
- reasonably likely future uses of the land that would not require a new or amended grant of planning permission;
- any temporary use to which the land is put, or is likely to be put, from time to time within the bounds of current planning permission; and
- likely informal use of the land, for example children playing on the land, whether authorised by the owners or occupiers, or not.

Sites subject to Detailed Inspection under Part 2A by Local Authorities should be classified as Categories 1 to 4. For clarity:

- Category 1: describes land which is clearly problematic;
- Categories 2 and 3: cover the less straightforward land where detailed consideration is needed before deciding whether it is Category 2 (contaminated land requiring remedial action) or Category 3 (not contaminated land) - wider socio-economic factors come into play if health risks assessment fails to produce a decision; and
- Category 4: describes land that is clearly not contaminated land.

The Category 4 test is particularly important in this instance as it defines when land is clearly not 'contaminated land' in the legal sense. It introduces the idea that it would be exceptional for land exhibiting normal background levels of contamination or contaminant levels below published assessment criteria to be considered as 'contaminated land'.

Construction Design and Management Regulations

The Construction Design and Management Regulations 2015 (CDM 2015) are also relevant as they govern the way construction projects are planned to ensure overall health, safety and welfare of all parties.

Proposed Approach to the Environmental Impact Assessment

The following guidance documents have been referenced when devising the assessment methodology:

- a key item is the Environment Agency's (EA) Land contamination risk management (LCRM) guidance, which is also applicable in Wales, and indicates that a Conceptual Site Model (CSM) should identify those contamination sources, pathways and receptors which are "likely" to represent an "unacceptable" risk either to human health or the surrounding environment.
- Contaminated Land Statutory Guidance 2012 (ref: WG19243) was issued by the Welsh Government and is intended to explain how Local Authorities should implement the regime as detailed by EPA 1990, including how they should go about deciding whether land is contaminated land in the legal sense of the term.
- Construction Industry Research and Information Association (CIRIA) C552 (Contaminated Land Risk Assessment. A guide to good practice) examines the risk assessment of contaminated land and explains the key elements of risk assessment practices and procedures.

Methodology

Soil and Geology

The Development Impact Assessment will discuss the potential impacts of the proposed development on soils and near surface geological deposits via physical-movement and pollution. The assessment will consider impacts during construction and operation of the development.

Appropriate mitigation measures will be identified where predicted impacts during construction and operation are significant. Generally speaking, it will not be possible to quantify these effects, and so qualitative assessments will be carried out based on available knowledge and professional judgement.

The approach for agricultural land assessment is covered in Chapter 14.

Land Quality

A phased investigative approach would be undertaken to assess Land Quality in accordance with LCRM guidelines, starting with a desk-study to identify potential pollutant linkages as part of a Source-Pathway-Receptor based Conceptual Site Model.

This will include comprehensive collation and evaluation of all available historic information regarding the site and detailed conceptualisation based on client data and existing desk study information. Information sources will include those outlined in Section 10.1.2.

The output from the above review will be a detailed report on the potential environmental (ground contamination) issues identified that may require consideration. It will include a conceptual site model identifying potential pollutant linkages and a qualitative risk assessment.

Overall, this "precautionary" approach is designed to give confidence to the local authority that the development site, in the words of the National Planning Policy Framework February 2019 Clause 178a, is:

> *"suitable for its new use taking account of ground conditions and land instability, including from natural hazards or former activities such as mining, pollution arising from previous uses and any proposals for mitigation including land remediation or impacts on the natural environment arising from that remediation";*

Unexploded Ordnance

It should be noted that for the purposes of the assessment, although the potential risks are likely to be low, unexploded ordnance (UXO) will be assessed alongside other geohazards such as ground-based contaminants and hazardous gases. In effect, UXO will be treated as a "Source" of hazard in a risk-based approach. This is judged appropriate as, whilst there is no legislation specifically dealing with UXO, health and safety legislation such as the CDM Regulations and Health and Safety at Work Act effectively place obligations to ensure appropriate assessment and mitigation measures, if required.

10.3 Consultation

We will seek to obtain environmental data and preliminary views of the proposed development from relevant consultees, including:

- Natural Resources Wales;
- Pembrokeshire County Council; and
- the Ministry of Defence.

10.4 Matters Scoped Out

This scoping report has identified that the proposed development could encroach on potentially significant areas of safeguarded mineral and aggregate deposits beneath the Site, and the potential impact to geology will be assessed further as part of the ES.

The potential risks to the proposed development from contaminated land and UXO are considered to be relatively low, and any residual risks will be addressed by compliance with standard planning conditions, CDM and building regulations, engineered mitigation and containment measures, and environmental best practice during the construction phase.

Land Quality issues will therefore be scoped of the EIA, and this is discussed in more detail in Section 10.4.1 below.

10.4.1 Land Quality

Wind Turbines and Solar

The potential impacts associated with land quality during the operational phase of the proposed development are likely to be low. The infrastructure for the solar PV and wind turbines is to be located on previously undeveloped land without any identified sources of potentially contamination. As such, land quality matters are proposed to be scoped out of the EIA.

Green Hydrogen Facility

The green hydrogen facility would be of relatively low sensitivity with respect to human health during the operational phase, and any potential impacts impact from contaminated land are likely to be addressed by engineered control measures (e.g. the presence of hardstanding and gas protection measures). Potentially significant issues relating to human health during the construction phase are likely to be addressed with standard environmental mitigation measures (e.g. PPE, dust suppression measures, etc). The installation on concrete hardstanding and the removal of any localised areas of Made Ground containing potentially unacceptable concentrations of concern during the construction phase in accordance with PPW and building regulations guidance would also mitigate the potential impacts to controlled waters.

Given the above, the site and development proposals are unlikely to raise any significant effects with regard to Land Quality, and any potential localised issues around the green hydrogen facility would be addressed by standard planning conditions and building regulations. As such, these matters are to be scoped out of the EIA.

10.5 References and Standard Guidance

The key reference and standard guidance documents that will be used as part of this assessment are listed below:

Part IIA of the Environment Protection Act, 1990;

The Building Regulations (Wales) (Amendment) Regulations 2010;

The Contaminated Land (Wales) (Amendment) Regulations 2012;

Contaminated Land Statutory Guidance, April 2012, DEFRA;

Planning Policy Wales, Edition 11, February 2021, Welsh Government;

British Geological Survey (2012) Aggregates safeguarding map of South West Wales (Ref: OR/12/024)

British Geological Survey (BGS) 'GeoIndex'. [Accessed: September 2022] Available: [http://mapapps.bgs.ac.uk/geologyofbritain/home.html]

British Geological Survey (2010) Mineral Resource map of South West Wales (Ref: OR/10/025)

BS5930:2015: Code of practice for site investigations;

BS10175: 2011 +A1:2013: Investigation of Potentially Contaminated Sites - Code of Practice;

Environment Agency (2020) Land contamination risk management (LCRM) Guidance;

Environment Agency (2001) Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention (Ref: NC/99/73);

Environment Agency (2002) Piling into Contaminated Sites;

Environment Agency (2006) Piling in Layered Ground: Risks to Groundwater and Archaeology (SC020074SR);

Environment Agency (2013) Groundwater Protection: Policy and Practice Version 1.1;

Environment Agency (2010) Evidence, Verification of Remediation of Land Contamination; and

Environment Agency (2010) Report GPLC1 Guiding Principles for Land Contamination.

11.0 Cultural Heritage

11.1 Environmental Baseline and Potential Sources of Impact

11.1.1 Scope of Study and Study Area

The proposals would not result in any direct impacts upon designated historic assets.

A 1km study area would be sufficient to enable proportionate consideration of direct impacts upon any non-designated and/or potential buried archaeological remains.

A 3km study area would be sufficient to enable proportionate consideration of indirect impacts upon the significance of surrounding historic assets (i.e., as a result of change to setting). Consideration of indirect impacts would be assisted by the use of a ZTV (Zone of Theoretical Visibility).

Historic assets that are not considered susceptible to indirect impact as a result of the proposals will be scoped out. Only those historic assets considered potentially susceptible to indirect impact would be subject to EIA.

11.1.2 Baseline Conditions including Field Studies

Archaeology

There are no designated archaeological remains, e.g. Scheduled Monuments, located within the Site.

Numerous non-designated archaeological remains are recorded within the Site. These date to either the Bronze Age (2,500-800 BC), medieval (AD 1066-1539) or post-medieval (AD 1540-1900) periods. The Bronze Age remains relate to funerary/ceremonial activity and include barrows and a standing stone. The medieval remains largely relate to settlement, including Llanstinan Grange. The post-medieval remains largely relate to former cottages/houses or former industrial sites, e.g., quarries and a mill.

As well as being potentially susceptible to impact in and of themselves, the presence of these assets indicates that there is the potential for further archaeological remains dating to these periods within the Site.

As the Site has remained largely undeveloped, other than by the MoD, no previous archaeological investigations are known to have taken place.

Built Historic Assets

There are three designated historic assets within the immediate vicinity of the Site, all comprising Grade II Listed buildings: Barham Memorial School and Old School House (List nos. 15876 & 15877), and Church of St David (List no. 87809).

Within the 3km study area, there are 42 other Listed buildings, including two Grade II* Listed Buildings:

- Church of St. Justinian, c.1km north of the Site (List no. 20818); and
- Cwrt, c.650m north of the Site (List no. 13067).

There are 31 Scheduled monuments within 3km of the Site.

No Conservation Areas have been identified within 3km of the Site.

The Registered Historic Landscape of Newport and Carningli is located c.4km to the north-east.

Designated and non-designated assets are shown on **Figure 11.1: Designated Heritage Assets** and **Figure 11.2.1 and 11.2.2: Non-Designated Heritage Assets** respectively.

11.1.3 Potential Sources of Impact

Cultural Heritage encompasses all aspects of the historic environment, including buried archaeological remains, archaeological earthworks, historic buildings and other above-ground structural remains, and areas of historic landscape.

There is the potential for the proposed development to directly impact any surviving historic assets within the Site via the truncation of underlying archaeological remains. Truncation may result from construction activities, including demolition, excavation, 'grubbing out' or piling. Desiccation and/or saturation of buried archaeological remains might also result from the potential changes to the water table, with the new moisture levels and chemical environments having the potential to affect any such remains.

Indirect impacts upon the significance of historic assets may arise from changes to their setting. This includes cumulative change that might result from the introduction of other consented schemes within the Site environs.

Wind Turbines

Three wind turbines are proposed within the north-east of the Site. Groundworks associated with the construction of the wind turbines and associated infrastructure would have the potential to cause direct impacts to any below-ground remains.

The wind turbines (each of which would be up to 149.9m tall) are the aspect of the proposal with the greatest potential to result in indirect impact upon the significance of historic assets located within the surrounding area. Consideration has been given to their potential visibility, up to a distance of 3km, for purposes of scoping.

Solar Farm

The solar arrays would be located within the western part of the Site. Groundworks associated with the construction of the arrays and associated infrastructure would have the potential to cause direct impacts to any buried archaeological remains.

The limited height of the solar arrays makes them less likely to result in indirect impact upon the significance of any surrounding historic assets. However, consideration has been given to their potential visibility, up to a distance of 3km, for the purposes of scoping.

Green Hydrogen Facility

The green hydrogen facility would be within The Valley bottom within the centre of the Site. Groundworks associated with the construction of the green hydrogen facility and associated infrastructure would have the potential to result in direct impact upon any buried archaeological remains, albeit the area already contains modern made ground deposits, which would either overlie any such remains or have replaced them. Its comparatively minor scale and low-lying position means that the potential for the green hydrogen facility to result in any indirect impacts upon the significance of surrounding historic assets is minimal.

11.2 Method of Assessment and Reporting

The ES chapter will set out the relevant applicable statute, policy and guidance context, summarise the historic baseline, define the significance of any susceptible historic assets and provide the results of a detailed impact assessment with relation to the latest version of the masterplan. The chapter will provide a determination of the level of impact upon the significance of identified susceptible historic assets and will provide a justified statement of the significance of any identified effects, in accordance with the EIA Regulations. Any necessary mitigation measures will be proposed, and any anticipated residual effects identified. A proportionate level of cumulative impact assessment will also be included.

The Cultural Heritage ES chapter would be informed by the baseline assessment and will include that assessment as a Technical Appendix.

11.3 Consultation

Consultation will be held with the following consultees to discuss and agree the scope for the assessment of cultural heritage impacts within the ES chapter:

- Cadw;
- Dyfed Archaeological Trust (DAT); and
- the Historic Building Conservation Officer to Pembrokeshire County Council.

Based upon the research and assessment undertaken to date, however, the anticipated assessment scope is proposed below.

11.4 Matters Scoped In

Direct Impacts

The assets set out in **Table 11.1** are non-designated assets located within the Site. The presence of these assets is indicative of the potential for further archaeological remains dating to these periods to survive buried within the Site. Although such remains would not be anticipated to be of such significance that they would preclude development within the Site, they are considered to be sufficiently significant to warrant further consideration, as does the potential for any associated unrecorded remains.

Again, while it is not anticipated that the presence of such remains would preclude development within the Site, it is probable that a programme of archaeological survey would be required, initially to include a Site walkover and possibly a geophysical survey. The scope, methodology and timing of any such fieldwork would need to be agreed in liaison with the relevant archaeological advisor.

Table 11.1: Recorded non-designated historic assets within Site boundary

HER Number	Name	Period
DAT2600	Gilfach Farm – possible Bronze Age round barrow site	Bronze Age
DAT5035	Crug Mawr – possible Bronze Age round barrow site	Bronze Age
DAT10461	Graig-lwyd – possible Bronze Age standing stone site	Bronze Age
DAT2596	Ffynnon Fair Holy Well	Medieval
DAT7964	West Beacon; East Beacon	Medieval
DAT8676	Parc Hendre – possible former house, now demolished	Medieval
DAT12529	Llanstinan Grange	Medieval
DAT5034	Trecwn Mill – demolished former mill	Post-medieval
DAT6510	Ffynnon-goy-Isaf –deserted/ruined cottage	Post-medieval
DAT6514	Crug-Las – deserted/ruined cottage	Post-medieval
DAT6517	Carn-deifog Isaf – deserted/ruined cottage	Post-medieval

HER Number	Name	Period
DAT6513 DAT6518 DAT20425	Cwm-Ceiliog – deserted/ruined cottage	Post-medieval
DAT7247	Mansion – admiralty demolished in 20th century	Post-medieval
DAT17606	Sand pit – disused	Post-medieval
DAT17611	Fishpond	Post-medieval
DAT17613	Quarry – disused	Post-medieval
DAT17598	Quarry – disused	Post-medieval
DAT8473	Llanstinan House – ruined 18th century complex	Post-medieval
DAT24678	Allt Yr Yn – deserted/destroyed by development of the Trecwn Arms store	Post-medieval
DAT20426	Pentre Newydd – deserted ruined cottage	Post-medieval
DAT21469	New Bridge – rubbing stone	Post-medieval
DAT24672	Crug Mawr – deserted/destroyed by development of the Trecwn Arms store	Post-medieval

Indirect Impacts

Historical assets identified as potentially susceptible to indirect impact as a result of change to setting are set out in **Table 11.2**.

Table 11.2: Historical assets scoped into assessment

Ref No.	Type	Name	Distance from Site & Direction	ZTV (0 = No visibility, 3 = high visibility)	Rationale
13067	Grade II* Listed Building	Court / Cwrt	830m north	3	Potential views towards the Site and therefore change in setting to Grade II* Listed building

Ref No.	Type	Name	Distance from Site & Direction	ZTV (0 = No visibility, 3 = high visibility)	Rationale
15876 & 15877	Grade II Listed Buildings	Old School House Barham & Barham Memorial School	Immediately north of Site boundary	0	Whilst not within ZTV and within heavily wooded area, included within assessment due to proximity to green hydrogen facility (c.300m) which may have potential to affect setting
PE138	Scheduled Monument	Castell Pant-y-Philip	740m north	3	Potential views towards Site, which may contribute to significance due to historical topographical advantage
PE139	Scheduled Monument	Caer Penbicas	65m north	3	Anticipated open views across Site. Such views may contribute to significance due to historical topographic advantage
PE293	Scheduled Monument	Mynydd Cilciffeth Round Barrows	780m south-east	3	Anticipated open views across Site. Such views may contribute to significance
PE417	Scheduled Monument	Iron Age/Romano-British settlement, Fagwr-Fran Moor	10m south-east	3	Anticipated views across Site. Such views may contribute to significance due to historical topographic advantage

11.5 Matters Scoped Out

Indirect Impacts

On the basis of the work undertaken to date, professional judgement, and experience of other comparable projects, all other historic assets have been scoped out of any further assessment of indirect impacts at this stage. This is due to the lack of anticipated effect upon the significance of these assets.

It is also considered that any assets that fall outside the ZTV can be scoped out of the EIA in relation to cultural heritage. It is important to consider that the ZTV accounts for topographical formation, but not built form, vegetative screening and other physical forms which do not comprise the natural topographical formation (it is a 'bare earth' ZTV). Therefore, although an asset may be located within the ZTV, features such as buildings, woodland, hedgerows may prevent the asset being intervisible with the Site.

11.6 References and Standard Guidance

11.6.1 Sources

Historic Environment Record (HER) Data from the Dyfed Archaeological Trust (DAT) and data maintained by Cadw within their records of designated historic assets will be consulted, as will a range of other relevant data sources, including:

- satellite and, if proportionate, aerial photography;
- LiDAR DTM and DSM data;
- historic mapping;
- geotechnical data;
- the Research Framework for the Archaeology of Wales;
- previously published investigations, excavation reports and grey literature; and
- information gathered during a site visit.

11.6.2 Statute, Guidance and Policy

Applicable statute would comprise Section 66(i) of the Planning (Listed Buildings and Conservation Areas) Act (1990), which provides that:

'In considering whether to grant planning permission for development which affects a listed building or its setting, the local planning authority or, as the case may be, the Secretary of State shall have special regard to the desirability of preserving the building or its setting or any features of special architectural or historic interest which it possesses'.

The relevant legislative policies comprise Planning Policy Wales 11 (PPW11) (2021), which provides the national planning policy framework for the consideration of the historic environment, with particular reference to section 6.1.9, which states that:

'Any decisions made through the planning system must fully consider the impact on the historic environment and on the significance and heritage values of individual historic assets and their contribution to the character of the place. '

PPW (2021) is supplemented by guidance contained in *Technical Advice Note 24: The Historic Environment.* Other guidance documents to be observed comprise the *Standard and Guidance for Historic Environment Desk-Based Assessment* (CIfA 2014), and *Setting of Historic Assets in Wales, Guidance Note 3* (CADW 2017).

12.0 Noise

12.1 Environmental Baseline and Potential Sources of Impact

12.1.1 Scope of Study and Study Area

The noise assessment will focus on the potential for adverse noise and vibration impacts and effects at the nearest noise (and vibration) sensitive receptors (NVSRs) from the following aspects of the proposed development:

- construction noise and vibration from the wind turbines, solar farm and green hydrogen facility ; and
- operational noise from the wind turbines and green hydrogen facility .

Noise and vibration sensitive receptors are defined to be residential or designated ecological receptors (typically SSSIs or SPAs) that could be adversely affected by incident noise from the development.

The study area for the noise assessment will comprise differing elements for the different aspects of the proposed development, as follows:

- construction noise and vibration assessments and green hydrogen facility operational noise assessment – the study area will comprise NVSRs within 1 km of the proposed infrstructure. It should be noted that for a significant number of these receptors there will be receptors closer to the proposed development, which will have the potential for greater noise and vibration impacts and effects and so will not need to be considered directly in the assessment.
- wind turbine operational noise assessment – the study area will comprise the area within which noise levels from the proposed turbines may exceed 35 dB L_{A90} at wind speeds up to 10 ms^{-1}, based on the potential area for turbine installation.

12.1.2 Baseline Conditions including Field Studies

Baseline sound levels for the construction noise and vibration assessments will be assumed to be within the Category A noise thresholds levels of the ABC method contained within Annex E.3.2 of British Standard 5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Part 1: Noise*.

This will ensure that the noise limits are robust for a project set in a rural location. Baseline vibration levels will be assumed to be negligible.

Baseline sound levels for the wind turbine operational assessment will be recorded at locations representative of a number of the closest NVSRs to the proposed turbine locations, in accordance with the Institute of Acoustics' *A Good Practice Guidance to the Application of ESTU-R-97 for the Assessment and Rating of Wind Turbine Noise*.

Baseline sound levels for the green hydrogen facility operational noise assessment will be recorded at locations representative of the nearest NVSRs to the proposed location of the green hydrogen facility, in order to undertake an assessment of the operational noise in accordance with British Standard 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound*.

12.1.3 Potential Sources of Impact

Noise sensitive receptors are shown on **Figure 12.1: Noise Receptors.**

During the construction phase of the project, it is considered that the potential sources of impact will be the mobile plant, drilling and piling operations necessary to undertake the construction. All of these operations have the potential to cause impact with excessive noise at sensitive receptors. In addition, any drilling and piling has the potential to cause impact at sensitive receptors from vibration.

During the operational phase of the project, it is considered that the potential sources of noise are the hubs of the wind turbines and the operations of the green hydrogen facility . As these both have the potential for resulting in excessive noise at sensitive receptors, they have the potential for impact.

12.2 Method of Assessment and Reporting

The assessments will be undertaken with reference to the overarching National Policy Statements EN-1 *Overarching National Policy Statement for Energy* and EN-3 *National Policy Statement for Renewable Energy Infrastructure*, along with Planning Policy Wales including the supplementary Technical Advice Note 11, *Noise*.

Although Pembrokeshire County Council does not have a specific policy in its Adopted Local Plan, it does state that "*Development will be permitted where… It would not result in a significant detrimental impact on local amenity in terms of … noise or vibration levels*". Pembrokeshire's Supplementary Planning Guidance *Renewable Energy* states that a planning application for a renewable energy development should be accompanied by "*an assessment of any noise implications of a proposal*" and that "*Renewable energy proposals should conform to the relevant British Standards (i.e. BS 4142, BS 5228, and BS 8233) along with other good practice measures (such as restricted working hours during construction) in order to minimise the noise impact of any scheme*", as well as identifying ETSU-R-97 for windfarm projects.

On this basis, the following methods of assessment are proposed.

Construction Assessments

The noise levels associated with construction will be predicted at the identified NVSRs implementing the proprietary noise modelling software Cadna/A®, which incorporates the calculation methodology outlined in BS 5228:2009+A1:2014.

The predicted noise levels will then be assessed in accordance with BS 5228:2009+A1:2014 *Part 1 – Noise* for residential receptors and AQTAG09 *Guidance on the effects of industrial noise on wildlife* for relevant ecological receptors.

The vibration levels associated with each construction phase will be predicted at the identified NVSRs and assessed in accordance with BS 5228:2009+A1:2014 *Part 2 – Vibration*.

The significance of effects will be determined with reference to the Guidelines for Environmental Noise Impact Assessment 2014, as published by the Institute of Environmental Management and Assessment (IEMA). The results of the modelling and prediction work will be assessed in accordance with the relevant criteria to identify the significance of construction noise and vibration impacts. Where appropriate, specific mitigation measures will be detailed to prevent, reduce, or offset any significant adverse effects, and the likely residual effects after these measures have been employed.

Solar Operational Assessment

It is considered that the operation of the solar farm will not have any significant sources of noise and will therefore not be a potential source of impact. Solar operational noise will therefore be scoped out of the assessment.

Wind Turbine Operational Assessment

The noise levels of the operational OWF will be predicted in accordance with the guidance provided in ETSU-R-97 and the Institute of Acoustics' Good Practice Guide. Assessments of the predicted noise levels will be undertaken under ETSU-R-97 in line with the Institute of Acoustics' Good Practice Guide with reference to the baseline sound levels measured at the NVSRs. Additionally, it is suggested that the specific sound level of the source be assessed against the limits stated in the World Health Organisation (WHO) *Environmental Noise Guidelines for the European Region – Guideline Values for Community Noise in Specific Environments*. Consultation with the Pembrokeshire County Council EHO will be required in order to agree a methodology for the assessment.

Green Hydrogen Facility Operational Assessment

The noise levels associated with the operation of the green hydrogen facility will be predicted at the identified NSRs implementing the proprietary noise modelling software Cadna/A®, which incorporates the calculation methodology; in this instance the calculation algorithms contained in ISO 9613-2:1996-2 would be utilised.

The predicted noise levels would be assessed at the nearest residential NVSRs in conjunction with BS 4142:2014+A1:2019 and AQTAG09 *Guidance on the effects of industrial noise on wildlife* for relevant ecological receptors.

The significance of effects will be determined with reference to the IEMA Guidelines. Predicted noise levels will be assessed in accordance with the relevant criteria to identify the significance of operational impacts. Where appropriate, specific mitigation measures will be detailed and the likely residual effects after these measures have been employed.

12.3 Consultation

It is intended to consult as early as practicable with the Environmental Health department of Pembrokeshire County Council regarding the locations for baseline sound surveys to best inform the operational noise assessments for the wind turbines and green hydrogen facility . Consultation will also include discussions to agree the assessment methodologies set out above.

12.4 Matters Scoped Out

It is proposed to scope out sound outside the audible range (i.e. infrasound and ultrasound).

It is considered that operational noise from the solar farm would be negligible, as minimal infrastructure is required for these operations.

Based on SLR's previous experience, operational vibration has been scoped out from the wind turbines, solar farm, and green hydrogen facility as either they are not considered to be significant sources of vibration and/or are considered separated spatially to the degree that operational vibration will be negligible.

12.5 References and Standard Guidance

National Policy Statement EN-1 *Overarching National Policy Statement for Energy*

National Policy Statement EN-3 *National Policy Statement for Renewable Energy Infrastructure*

Planning Policy Wales

Technical Advice Note (Wales) 11 *Noise*

British Standard 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound*

British Standard 5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Part 1: Noise*

British Standard 5228-2:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration*

World Health Organisation

Guidelines for Environmental Noise Impact Assessment

Calculation of Road Traffic Noise

ETSU-R-97 *The Assessment and Rating of Noise from Wind Farms*

Institute of Acoustics' *A Good Practice Guidance to the Application of ESTU-R-97 for the Assessment and Rating of Wind Turbine Noise*

AQTAG09 *Guidance on the effects of industrial noise on wildlife.*

13.0 Access, Traffic and Transport

This section considers the scope of work required to assess the potential significant effects associated with access, traffic and transport during the construction and operational phases of the proposed development.

13.1 Environmental Baseline and Potential Sources of Impact

The study area for assessment will include each access road into the site from the A40, the A40 between the two access points, the A40 north towards Fishguard and south towards Haverfordwest. Traffic data will be obtained so that existing traffic flows and vehicle classification for the key roads are identified, informing the baseline situation. Injury accident data for the roads within the study area will be obtained to ensure that road safety issues are identified. An automatic traffic count (ATC) will be placed on the A40 between the two access options.

It is anticipated that deliveries to Site during the construction phase will travel along the A40 from both directions. All abnormal indivisible loads (AILs) are expected to travel along the M4 to the A48 and on to the A40. The proposed route for AILs will not be assessed within this section of the ES and an abnormal load route assessment (ALRA) will be prepared separately, to be submitted as a Technical Appendix, with the findings from the ALRA considered within this section of the ES.

13.1.1 Scope of Study and Study Area

The assessment is required to evaluate the effects of the proposed development and to determine the scale of the impacts on the identified sensitive receptors. From a desktop study of the Site access and the proposed delivery route, the main receptors, sensitive to increased traffic levels, are anticipated to be located along the A40 where there are a small number of communities which include Ford, Wolfscastle, Letterston and Scleddau. In addition, residential properties (Ffos Las) along Admiralty Way and the more northern access route from the A40 will be included, as well as the village of Trecwn.

These communities include residential properties and non-residential properties such as public houses, businesses (café, shops) and churches. There are also several individually placed dwellings, away from the villages, as well as farms along the delivery route.

It is anticipated that the largest items to be delivered to Site would be the wind turbine components (WTC), along with any substation elements. As such, the ALRA will focus on these elements, while the ES will consider the impacts associated with the transport of all other construction materials, structures and plant required during construction for each element of the proposed development.

Wind Turbines

The port of entry for AILs has been identified as Swansea Docks, which has existing facilities and experience of handling large turbine components. From the Docks the route would be via the A483, the M4, the A48 and the A40. AILs would join the M4 from the A483, and continue along the M4 to the A48. At Johnstown the route would continue west along the A40 towards Haverfordwest before turning north to the Site access.

Access for the construction of the solar array is anticipated to be provided from Admiralty Way, with use of an existing agricultural gateway located to the west of the residential properties at Ffos Las. Should this access location be considered unsuitable, an alternative has been identified from the minor road to the north which connects to the A40 and Llanychaer.

The assessment will focus on the delivery of construction materials, with a ALRA included as a Technical Appendix to the ES. The full extent of the study area will be confirmed within the ES Traffic and Transport chapter.

13.1.2 Baseline Conditions including Field Studies

The Access, Traffic and Transport chapter of the ES will include a detailed evaluation of the baseline conditions and will focus on assessing the potential impacts to arise during the construction phase and for each element of the proposed development.

This will include an abridged construction works programme, details of vehicle types and sizes to be used during the construction phase, and an estimate of the number of trips anticipated to be generated by HGVs, LGVs and light vehicles. Mitigation measures to alleviate the known local traffic issues arising from the construction traffic will be identified, with the aim of reducing the effect of the vehicle movements identified.

Desk Study

The following data collection and analysis will be undertaken:

- a review of available nearby development application documents;
- a review of the ALRA;
- analysis of traffic count data and accident data;
- Identification of likely sensitive receptors within the study area;
- assessment of traffic impacts of previous and committed local developments to understand identified effects;
- compilation of data on the number of construction vehicles and staff numbers related to each phase of the construction likely to be present on the local road network during the construction phase; and
- a review of height and weight restrictions along the proposed construction transport routes.

Field Surveys

A high-level review of the key abnormal load route has been completed from Swansea Docks to the Site access locations. A more detailed review and site visit will include a visual inspection of the route to identify any likely constraints or issues. In addition, each Site access location will be considered as part of the site visit.

It is common practice for traffic surveys to be commissioned in order to provide a baseline situation for traffic flows, movements and speeds. An Automatic Traffic Counter (ATC) on the A40 between the two access locations will be commissioned to collect data for 24 hours a day across a seven-day continuous period. The traffic data collected will provide classified and directional traffic flow data. An additional ATC may be required to provide existing traffic flow data for Admiralty Way, particularly if this access route is likely to be the preferred option during much of the construction; however, this requirement will be confirmed through consultation with the highway authority.

Speeds will also be recorded in order to determine the 85th percentile speeds and will be used to determine whether the access junction has sufficient visibility splays. Should a traffic count be unable/ unacceptable for commissioning, Pembrokeshire County Council (PCC) and the Welsh Government will be further consulted for existing traffic data along the delivery route.

13.1.3 Potential Sources of Impact

The potential sources of impact have been divided into three development phases: construction, operation and decommissioning. As set out in section 4.8, decommissioning effects are similar to but lesser than construction and will be scoped out. In summary, the main potential sources of impact are likely to relate to the impact of construction and operational traffic on the residential areas along the network route.

Construction Phase

The construction phase is likely to create the greatest environmental impacts. This is due to the number of Heavy Goods Vehicles (HGVs) and Light Goods Vehicles (LGVs) required to transport the materials onsite; as such there would be traffic impacts associated with the communities and roads along the delivery routes of each element (wind turbines, solar farm and the green hydrogen facility).

Operational Phase

Once the Site is operational, the development would have traffic/ transport related impacts caused by deliveries, staff movements and maintenance vehicles travelling to the site. The possible traffic generation associated with the operation of each element (wind turbines, solar farm and the green hydrogen facility) will be described within the ES.

The operational traffic generated by the green hydrogen facility will be included in an assessment of the operational impacts, with the daily traffic generation predicted and vehicles allocated to the roads within the study area.

13.2 Method of Assessment and Reporting

The assessment will first calculate the traffic generation associated with the construction phase. This will include an abridged construction works programme, details of vehicle types and sizes to be used during the construction phase, and an estimate of the number of trips anticipated to be generated by HGVs, LGVs and light vehicles. Specifically, the assessment will include the following:

- a review of the construction programme to confirm the key traffic generating activities;
- compilation of data on the number of daily vehicle trips to be present on the roads within the study area, and identification of the likely maximum or worst case scenario;
- a review of the ALRA and an assessment of the possible impacts associated with the transport of abnormal loads;
- a comparison between likely traffic flows on potentially affected roads against the baseline situation for a future year scenario with and without the proposed development, reported as percentage increases; and
- identification of the impacts.

Mitigation measures to alleviate the known local traffic issues arising from the construction traffic will be identified, with the aim of reducing the effect of the vehicle movements identified

The Institute of Environmental Management and Assessment (IEMA) guidance (1993) will form the basis for which the effects of traffic during the construction phase will be assessed. Based on the IEMA guidance, the factors identified as being the most discernible potential environmental effects likely to arise from changes in traffic movements have been set out below and will be considered in the assessment as potential effects which may arise from changes in traffic flows from the proposed development.

- **noise and vibration** – the potential effect caused by additional traffic on sensitive receptors, which in this case would relate to residential areas along the A40;
- **driver severance and delay** – the potential delays to existing drivers and their potential severance from other areas;
- **community severance and delay** – the potential severance to communities and the delays to movements between communities;

- **vulnerable road users and road safety** – the potential effect on vulnerable users of the road (i.e. pedestrians and cyclists);
- **hazardous and dangerous loads** – the potential effect on road users and local residents caused by the movement of abnormal loads; and
- **dust and dirt** – the potential effect on dust, dirt and other detritus being brought onto the road.

The IEMA guidelines provide two thresholds when considering predicted increase in traffic, whereby a full assessment is required:

- where the total traffic would increase by 30% or more (10% in sensitive areas); and/ or
- where the HGV traffic would increase by 30% or more (10% in sensitive areas).

The potential sensitivity of the receptors to changes in traffic levels will be determined by considering the study area and presence of receptors in relation to each potential impact. The receptors will be assessed individually to determine its sensitivity and the assessment criteria is set out in **Table 13.1**.

Table 13.1 Receptor Sensitivity

Impact	Low Sensitivity	Medium Sensitivity	High Sensitivity
Noise and Vibration	No sensitive receptors	Presence of sensitive receptors near to the road	Presence of sensitive receptors adjacent to the road
Driver Severance and Delay	Road network not affected	Road network not experiencing congestion at peak times	Road network experiencing congestion at peak times
Community Severance and Delay	No presence of existing communities severed by road	Presence of existing communities with a moderate level of existing severance (subjective assessment)	Presence of existing communities with low existing severance (subjective assessment)
Vulnerable Road Users and Road Safety	High sensitivity receptor		
Hazardous and Dangerous Loads	No hazardous or dangerous loads on the road network	Some hazardous or dangerous loads on the road network	Abnormal and oversized loads to use road network
Dust and Dirt	Limited presence of sensitive receptors (subjective assessment)	Low to medium presence of sensitive receptors (subjective assessment)	High presence of sensitive receptors (subjective assessment)

The magnitude of impact or change will be considered according to the criteria defined in Table 13.2.

Table 13.22 Magnitude Criteria

Impact	Negligible	Minor	Moderate	Major
Noise and Vibration	<25% increase in traffic	>25% increase in traffic Quantitative assessment based on predicted increase in traffic against measured baseline		
Driver Severance and Delay	<10% increase in traffic	>10% increase in traffic Quantitative assessment of road capacity based on existing traffic flows and predicted future traffic levels		

Impact	Negligible	Minor	Moderate	Major
Community Severance and Delay	<10% increase in traffic	<30% increase in traffic	<60% increase in traffic	>60% increase in traffic
Vulnerable Road Users	<10% increase in traffic	>10% increase in traffic Quantitative assessment of existing provision and future traffic levels		
Road Safety	<10% increase in traffic	>10% increase in traffic Quantitative assessment of existing accident records and predicted increases in traffic		
Hazardous and Dangerous Loads	0% increase in traffic	<30% increase in traffic	<60% increase in traffic	>60% increase in traffic
Dust and Dirt	<10% increase in traffic	<30% increase in traffic	<60% increase in traffic	>60% increase in traffic

Cumulative Impacts

The cumulative impacts from any other local permitted developments will be a key consideration for the assessment, particularly in relation to the control of construction traffic in the local area. The cumulative assessment will focus on the construction phase as this would be the most likely period to create significant effects should construction phases overlap or occur sequentially amongst permitted developments.

The traffic assessment and draft traffic management plans will be reviewed for the other developments identified to be of direct relevance and on a similar construction timeline to the proposed development. The proposed construction timescales for these developments will be carefully considered with operational sites removed from the cumulative assessment. The assessment will focus on consented developments and applications at application / appeal stage within close proximity to the site. Such sites will be identified and discussed with PCC.

13.3 Consultation

The scope of the study and assessment for the proposed development in relation to access, traffic and transport will seek to identify potential issues which may result from the construction of the development. Consultation with stakeholders will be completed through the scoping process.

The proposed development will continue to be discussed with the following prescribed bodies and key stakeholders/ organisations:

- PCC - Consultation to discuss the potential impacts of the proposed development on the local road network and cumulative traffic effects;
- Welsh Government as the strategic road authority; and
- Swansea Docks.

13.4 Matters Scoped Out

AILs would be considered in more detail within a separately submitted ALRA; the findings and recommendations from the report will be discussed within this section of the ES with any impacts identified and assessed as required.

Wind Turbines and Solar Farm

It is anticipated that any traffic associated with the operation and maintenance of the wind turbines and solar farm will be significantly lower than generated for the construction phase. As such, the assessment of the operation stage for the wind turbines and solar farm are to be scoped out.

13.5 References and Standard Guidance

References and Standard Guidance

The access, traffic and transport assessment will be carried out in accordance with the following policy and guidance documents:

Institute of Highways and Transportation (IHT) publication 'Guidelines for Traffic Impact Assessment';

'Guidelines for the Environmental Assessment of Road Traffic' (1993) for the IEMA;

DfT 'Design Manual for Roads and Bridges' (DMRB);

Planning Policy Wales, Technical Advice Note (TAN) 18: Transport;

Welsh Office Circular 11/99 Environmental Impact Assessment; and

The Town and Country Planning (Environmental Impact Assessment) Regulations 1999 (S.I. 1999/293) as amended by S.I. 2000/2867.

14.0 Socio-Economics, Tourism, Recreation and Land Use

14.1 Environmental Baseline and Potential Sources of Impact

An assessment will be undertaken of the socio-economic effects of the proposed development, including impacts of the construction and operation of the proposed development on the local economy, local businesses (including farms) and employment, impacts on tourism and recreation, and impacts on land use. With regard to land use, particular regard will be had to impacts on agricultural land.

14.1.1 Scope of Study and Study Area

A two-tiered study area is proposed for the assessment, defined as follows:

Wider Study Area (WSA)

The WSA is intended to encompass the area within which significant effects on employment and the local economy, including the tourism economy, could occur. The WSA is required for certain receptor groups because the majority of the business and labour market effects that could occur would be experienced by population and business centres located across a wide area. The WSA area will primarily be set at the area of the Pembrokeshire County Council administrative area, but effects are also considered within the rest of Wales and the UK where relevant.

Local Area of Influence (LAI)

The LAI forms the focus for assessment of both direct and indirect effects on those receptors that are likely to experience effects at a more local level, particularly recreation and tourism assets. The LAI for such projects is generally defined by the Site together with an area extending to 5km from the Site boundary. A 5km LAI would encompass a number of settlements along the A40 and include Fishguard, taking account of the potential disruption to routes and venues used by tourists.

14.1.2 Baseline Conditions

Socio-Economics

According to ONS population estimates (2021a), the population of Pembrokeshire in 2020 was approximately 126,800. Of this population, the number of those who are considered to be of 'working age' (16-64) is 72,200, which is approximately 56.9%. This is 4.3% less than Wales as a whole (61.2%) and 5.5% less than the average for Great Britain (62.4%). It is evident that Pembrokeshire has an older population than average, with 27.0% over the age of 64, compared with 21.6% in Wales and 19.1% in Great Britain (ONS, 2022a).

Despite an ageing population, Pembrokeshire has a higher than average economic activity rate of 78.4% (59,100 economically active residents), compared to Wales as a whole (76.5%), however, both are lower than the average for Great Britain (78.6%) (ONS, 2022b). This high economic activity rate is not reflected in the average earnings in Pembrokeshire, which could be partially attributed to a lower than average level of full-time employment.

In terms of what people do in Pembrokeshire, there twice as many people as a percentage of the resident population involved in 'Accommodation and Food Service Activities' (ONS, 2021b) compared to Wales and Great Britain, indicating the prevalence of the tourism sector in Pembrokeshire. Fewer people work in 'Manufacturing' than nationally.

Tourism and Recreation

The tourism industry in Pembrokeshire is estimated to be contributing £206.5million to the economy each year according to the latest Economic Impact of Tourism report in 2019 (Pembrokeshire County Council, 2021).

The same study found that, in 2020, approximately 3,923,000 visitors came to the area, which equates to over 30 times the resident population, with approximately 84.2% of these being day trips and 15.8% of the visitors staying overnight. It is estimated that tourism supports 6,655 Full Time Equivalent (FTE) jobs and a total of 9,037 actual jobs equating to 15.5% of all employment, with further employment indirectly supported through supply chain and transportation industries.

In terms of visitor attractions, Pembrokeshire has a wealth of coastal and upland scenery, beaches, and walking and cycling routes.

Within the LAI, notable visitor and recreational attractions include:

- The Pembrokeshire Coast National Park including the coast and Preseli Hills;
- The Wales Coast Path;
- The Celtic Trail Cycle Route;
- Cwm Gwaun; and
- Fishguard, its harbour and its fort.

Land Use

The three elements of the proposed development would occupy markedly different land use types:

- Green hydrogen facility – the green hydrogen facility compound would be located with The Valley, within a brownfield site allocated for employment use;
- Solar PV – the solar arrays would be located on farmland in the west of the Site currently used for grazing of cattle and sheep, and silage crops; and
- Wind turbines – the turbines would be located on more elevated farmland in the north east of the Site currently used for sheep grazing.

Initial desk studies indicated land proposed for use as for solar arrays on the Predictive Agricultural Land Classification map (Welsh Government, 2019) as potentially Grade 3a, which falls within the definition of 'best and most versatile' (BMV) agricultural land. Following site investigation undertaken by specialist agricultural land surveyors Land Research Associates Ltd to test the mapping and an iterative process of site design, it was confirmed that much of the land identified within the Llanstinan Home Farm as Grade 3a is actually Grade 3b. It is proposed that, as far as possible, no BMV land would be affected by the proposed development.

In recognition of the importance of protecting BMV land in Welsh Government policy, this Scoping Request is accompanied (at **Appendix 3**) by a technical report undertaken on behalf of the applicant by Land Research Associates Ltd which provides a detailed analysis of agricultural land quality in relation to the proposed solar development area. The methodology used for the study has been shared with the Welsh Government's Land Quality Advice Service who have confirmed that methodology used was acceptable.

14.1.3 Potential Sources of Impact

During construction there are likely to be beneficial effects on the regional and Welsh economy arising from employment opportunities for construction businesses in the region, and increased spend on local services and accommodation for workers. The assessment would identify the potential level of expenditure and the opportunities for the supply chain within the WSA.

Construction activities may also have a temporary adverse impact on certain local receptors including tourism visitors and users of recreational routes affected by construction activities. Effects on local accommodation businesses could be adverse (for example if there is any disruption caused by construction traffic) or beneficial (if used by construction workers).

Socio-economic effects during operation of the proposed development include direct employment associated with management, operation and maintenance of the proposed development, albeit at relatively low staffing numbers. The proposed development is expected to be a catalyst for further employment uses with The Valley, and the potential for indirect employment effects will be assessed.

The most visible aspect of the proposed development is likely to be the wind turbines, and the potential effects of the presence of the turbines on the tourism economy will be assessed. A number of studies have examined whether there is a link between the development of wind farms and changes in patterns of tourism spend and behaviour, and generally the conclusion is that there is little effect. The assessment will draw upon the findings of these studies when examining whether the operational development may have an adverse effect on the local visitor economy. The presence of the proposed development may also affect individual tourism and recreational receptors through visual and other impacts; these will be assessed taking account of the findings of other assessments such as landscape and visual, whilst aiming to avoid 'double counting' of effects.

14.2 Method of Assessment and Reporting

There is no industry standard guidance for this assessment. The proposed method for the assessment, based on experience from similar projects, is detailed below and will take into consideration any matters raised in this scoping exercise. The assessment will:

- consider the social and economic policy context at the local, regional and national level;
- review socio-economic, tourism, recreation and land use baseline conditions within the relevant study areas;
- assess the likely scale, scope, permanence and significance of identified effects, taking account of any embedded environmental or social measures proposed within the application;
- recommend mitigation measures, where appropriate; and
- assess cumulative effects of the scheme with other proposed schemes.

Relevant Policy and Guidance

The proposed development would occupy some agricultural land (specifically the solar PV and wind turbines) and, for the green hydrogen facility , areas of previously developed brownfield land.

PPW states that local planning authorities should take into account the benefits of BMV land when considering whether significant development of agricultural land is necessary. BMV agricultural land is defined as Grades 1, 2 and 3a by policy guidance and some 7% of land in Wales falls within this classification.

PPW states that *"planning applications and local development plans should include survey evidence when they cover grade 1, 2 or 3a land"*.

Baseline Data Collection

The assessment will use desk-based information sources to assess the likely effects, supplemented by consultation with relevant stakeholders where necessary, and professional judgement based on previous experience. A proposed schedule of data sources to be used is contained in a reference list in Section 14.5.

As noted above, site-specific studies will be used to verify desk based studies where appropriate, specifically with regard to agricultural land quality.

Assessment Methodology

Receptor sensitivity will be based on importance or scale and the ability of the baseline to absorb or be influenced by the identified effects. For example, a receptor (such as the local construction supply chain or a right of way) is considered less sensitive if there are alternatives with capacity within the relevant study area. In assigning receptor sensitivity, consideration has been given to the following:

- the capacity of the receptor to absorb or tolerate change;
- importance of the receptor e.g. local, regional, national, international;
- the availability of comparable alternatives;
- the ease at which the resource could be replaced; and
- the level of usage and nature of users (e.g. sensitive groups such as people with disabilities).

In order to aid clear and robust identification of significant effects, specific and targeted criteria for defining the magnitude of impacts have been developed for this assessment based on experience on other similar projects. The following four levels of magnitude will be adopted using professional judgement: high; medium; low and negligible. These reflect the level of change relative to baseline conditions and /or whether the change would affect a large proportion of the existing baseline conditions or would result in a major change to existing patterns of use. These impacts can be beneficial, adverse or neutral.

The level of effect of an impact on socio-economic tourism, recreation and land use receptors will initially be assessed by combining the magnitude of the impact and the sensitivity of the receptor. Where an effect is classified as major, this is considered to represent a 'significant effect' in terms of the EIA Regulations. Where an effect is classified as moderate, this may be considered to represent a 'significant effect' but would be subject to professional judgement and interpretation, particularly where the sensitivity or impact magnitude levels are not clear or are borderline between categories or the impact is intermittent.

It should be noted that significant effects need not be unacceptable or irreversible.

A statement of residual effects, following consideration of any project-specific mitigation measures, will be provided.

Mitigation

The assessment will take account of any environmental principles that are incorporated into the design of the proposed development. These could include good practice measures with regard to traffic management, control of noise and dust, signage and provisions for maintaining access for walkers, details of which would be set out in a Construction and Environmental Management Plan (CEMP) and/or Construction Traffic Management Plan (CTMP).

Any additional mitigation measures that would reduce the level of any significant effects would be considered prior to assessing residual effects.

Cumulative Assessment

In relation to economic effects, cumulative effects depend on the extent to which the supply chain and labour market within the WSA have the capacity to meet demand for construction services from a number of similar projects. An assessment would be made as to whether it is considered likely that the cumulative effect indicates a loss of benefit as a result of cumulative projects, or an enhancement of opportunity which would help to develop expertise and capacity in the market. The cumulative effects assessment will be able to make a quantitative judgement on potential loss of benefit due to cumulative projects. Enhancement of opportunity will be identified only in qualitative terms.

Other cumulative effects may arise if the construction and/or operation of a number of similar developments, in type and or scale, were to affect receptors in the LAI.

14.3 Consultation

The assessment will use desk-based information sources to assess the likely effects, supplemented by consultation with stakeholders if relevant. If further information is required to inform the baseline it will be sought from various sources, including:

- Pembrokeshire County Council;
- Pembrokeshire Coast National Park Authority;
- Local Community Councils ;
- British Horse Society;
- Welsh Cycling;
- Sport Wales;
- Ramblers Cymru;
- Sustrans;
- Visit Pembrokeshire; and
- Visit Wales.

Any consultation would have three key objectives:

- to verify published information;
- to identify potential effects; and
- to help assess significance of potential impacts.

14.4 Matters Scoped Out

Based on past experience of relevant renewable energy developments of this scale, it is not expected that there would be a large influx of workers' families to the area during the construction phase and those who would be working in the area would be there temporarily, for only a few months; consequently it is not expected that there would be a significant effect on the demand for permanent housing, health or educational services.

Regarding permanent employees for the operation of the proposed energy hub, these numbers are expected to be low and, as such, the additional demand for permanent housing, health or educational services is expected to be low.

Recreational activities outside the Site are scoped out unless they are promoted regionally/nationally and are therefore likely to draw in visitors from outside the area.

14.5 References and Standard Guidance

Future Wales – The National Plan 2040

Planning Policy Wales

The Well-being of Future Generations (Wales) Act 2015

A More Equal Wales: The Socio-economic Duty - guidance and resources for public bodies

Pembrokeshire Local Development Plan

Pembrokeshire Coast National Park Local Development Plan

Office for National Statistics (including NOMIS)

Visit Pembrokeshire publications

Visit Wales Publications.

Office of National Statistics

Data Map Wales, *Predictive Agricultural Land Classification.*

Land Research Associates Ltd (July, 2022), *Agricultural Quality of Land at Trecwn*.

Welsh Government, 2019. *Predictive Agricultural Land Classification (ALC) Map 2*, available at: DataMapWales (gov.wales)

Wales Coastal Path (2022), *Interactive Coast Path Map*

Sustrans (2022), *Map of the National Cycle Network.*

15.0 Air Quality

15.1 Environmental Baseline and Potential Sources of Impact

15.1.1 Scope of Study and Study Area

The air quality assessment will focus on potential impacts and effects as result of the following aspects associated with the proposed development:

- construction phase dust and fine particulate matter emissions; and
- construction phase vehicle exhaust emissions.

The study area for the construction phase dust assessment will comprise receptor locations within 350 m of the Site boundary and 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the Site entrance(s).

The study area for the construction phase vehicle exhaust emissions assessment will be determined based upon detailed traffic information provided by the appointed transport team for the proposed development. The traffic data will be compared to screening criteria contained within national air quality Institute of Air Quality Management (IAQM) guidance.

15.1.2 Baseline Conditions including Field Studies

Baseline air quality conditions, across the assessed study area, will be determined using the latest publicly available air quality data, published by the Department for Environment, Food and Rural Affairs (Defra) and Pembrokeshire County Council (PCC). Specifically, resources such as Defra's background air quality mapping database, Defra's Automatic Urban and Rural Network and PCC's Local Air Quality Management monitoring network will be utilised to determine baseline conditions (where appropriate).

15.1.3 Potential Sources of Impact

It is considered that the potential sources of impact, from an air quality perspective, associated with the proposed development comprise emissions of dust, fine particulate matter and nitrogen dioxide during the construction phase. These emissions are considered to be associated with all required construction and earthworks activities, alongside movements of construction vehicles along the local road network. The potential impacts include nuisance due to dust soiling and health and ecological effects due to increased pollutant concentrations.

15.2 Method of Assessment and Reporting

The construction phase dust assessment will comprise a qualitative desk-based assessment undertaken in accordance with IAQM guidance. The assessment will consider the potential impacts of dust and fine particulate matter at sensitive receptor locations (e.g. existing residential properties and designated ecological receptors during activities (e.g. earthworks) associated with the construction phase of the development. Potential mitigation measures will be outlined, where required.

The construction phase vehicle exhaust emissions assessment will be undertaken in accordance with IAQM guidance. Initially, detailed traffic data for the proposed development (to be provided by the appointed transport team) will be compared to air quality screening criteria with consideration given to the proximity of surrounding Air Quality Management Areas, sensitive designated conservation sites and sensitive human receptor locations (e.g. residential dwellings). Where trip-generation for the proposed development falls below the aforementioned screening criteria, a qualitative screening assessment will be undertaken. In the event that trip-generation for the proposed development exceeds the screening criteria, a quantitative modelling assessment

will be undertaken using the atmospheric dispersion software ADMS-Roads in accordance with guidance published by Defra and the IAQM. Potential mitigation measures will be outlined, where required.

The results of the aforementioned assessments will be detailed within an ES Chapter.

15.3 Consultation

Consultation will be undertaken with the Public Protection Division of PCC to discuss and agree the air quality assessment methodology.

15.4 Matters Scoped Out

The following aspects have been scoped out of the air quality assessment for the proposed development:

- operational phase vehicle exhaust emissions; and
- operational phase onsite pollution emissions.

It is considered that an assessment of operational phase vehicle exhaust emissions can be scoped out of the air quality assessment due to the likely limited additional traffic movements arising from the operation of the proposed development. On this basis, it is considered that operational phase vehicle exhaust emissions, generated by the proposed development, are unlikely to have a significant effect on local air quality.

The proposed technology involves the separation of water into its composite parts of oxygen and hydrogen, through a process called electrolysis as described in Section 3. Neither of the resultant products from this process (oxygen and hydrogen) are air pollutants and they would not be used onsite as a source of fuel. In addition, the green hydrogen facility would be powered by renewable energy again with no direct onsite emissions.

The electrolyser system would occasionally have to be depressurised for safety purposes, in the event of power loss or maintenance. On these occasions small volumes of hydrogen, or hydrogen and nitrogen, would be vented to the atmosphere. System operation would minimise depressurisation events due to power loss, and maintenance shutdowns are expected to be infrequent (less than 12 times per year). The gas would be released through elevated vents to ensure safe dispersion and would not be considered a concern from an air quality or human health perspective.

It is therefore considered that an assessment of operational phase onsite pollutant emissions can be scoped out of the air quality assessment.

15.5 References and Standard Guidance

The Air Quality Strategy (AQS) for England, Scotland, Wales and Northern Ireland[34]

Defra: Local Air Quality Management Technical Guidance (LAQM.TG(22))[35]

Environmental Protection UK (EPUK) and IAQM: Land-Use Planning and Development Control: Planning for Air Quality[36];

IAQM: Guidance on the Assessment Dust from Demolition and Construction[37]

[34] The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, Defra (July 2007).

[35] Local Air Quality Management Technical Guidance 22, Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland. August 2022

[36] EPUK and IAQM, Land-Use Planning and Development Control: Planning for Air Quality, v1.2 2017.

[37] IAQM, Guidance on the Assessment Dust from Demolition and Construction, v1.1 2016.

IAQM: Guidance on the Assessment of Air Quality Impacts on Designated Nature Conservation Sites[38]

[38] Institute of Air Quality Management, A guide to the assessment of air quality impacts on designated nature conservation sites (2020).

16.0 Aviation and Telecommunications

16.1 Environmental Baseline and Potential Sources of Impact

16.1.1 Scope of Study and Study Area

Wind Turbines

Wind turbines have the potential to affect the performance of radars used for air traffic control, air defence and meteorological forecasting. They can also present an obstacle hazard to aircraft flying at low altitude and may affect the specified minimum altitudes for aircraft flying instrument approach procedures at airports.

The study area for aviation will consist of radii of different dimensions from the Site boundary for specified types of aviation infrastructure, derived from those set out in CAA guidance CAP 764, as follows:

- 150 km for air traffic control and air defence primary surveillance radars;
- 60 km for instrument flight procedures;
- 30 km for licensed and certificated aerodromes;
- 20 km for secondary surveillance radars and Meteorological Office radars;
- 10 km for unlicensed aerodromes and launching sites; military low flying areas; aeronautical radio navigation aids; and aeronautical radio transmitters/receivers.

Tall structures such as buildings and wind turbines can adversely affect the performance of fixed telecommunications links, if positioned close enough to those links. The study area for fixed telecommunications will consist of a radius of 1.5 km from the Site boundary.

Wind turbines have the potential to affect the quality of terrestrial television reception if the turbines are located between domestic properties and the television transmitters from which they receive their TV signals. The study area for television transmitter facilities will consist of a radius of 20 km from the Site boundary.

Solar Farm

Solar photovoltaic panels located close to aerodromes have the potential to cause glint and glare which may affect pilots of aircraft on final approach and air traffic controllers.

A study area of 5 km radius from the solar farm will be used to identify potential aviation receptors.

Green Hydrogen Facility

The plant and equipment associated with hydrogen electrolysers have no known effects on aviation or telecommunications and are not considered further in this section of the report.

16.1.2 Baseline Conditions including Field Studies

Aviation

The Site is located some 4 km south of Fishguard. The airspace over the Site is Class G (uncontrolled) from ground level up to Flight Level 145 (approximately 14,500ft above sea level). Above that level is the Class A controlled airspace of the Strumble Control Area (CTA), under the control of the NATS Swanwick Centre.

The uncontrolled airspace over the Site is in occasional use by light aircraft and military aircraft. The controlled airspace over the Site, at and above FL145, is in regular and frequent use by commercial and other en route air traffic, notably between the UK/Europe and Ireland and between the UK/Europe and North America. All of these aircraft are under the control of NATS En Route 'London Control' from their air traffic control centre at Swanwick in Hampshire.

Primary surveillance radars with the potential to detect turbines on the Site are as follows:

- NATS En Route Burrington (130 km southeast of the Site); and
- QinetiQ Aberporth (31 km northeast of the Site).

The Site is well beyond the 20km radius consultation zone from the nearest Meteorological Office radar (Crug-y-Gorllwyn, 30km east of the Site).

The Site is in an area classified by the Ministry of Defence (MoD) as a "low priority military low flying area less likely to raise concerns". Low flying is not anticipated to be a concern and no MoD objection is expected.

Haverfordwest is a Code 2 licensed aerodrome under the terms of CAP 168: Licensing of Aerodromes. It is located 14km south of the Site. It is available for Visual Flight Rules (VFR) traffic only, having no Instrument Flight Procedures (IFPs) and no radar.

There are no unlicensed airfields or other aviation landing sites within 15km of the Site.

The NATS En Route Strumble Doppler VHF Omni-Range (DVOR) – a radio navigation beacon for use by en route air traffic – is located 8km northwest of the proposed wind turbines.

Fixed telecommunications

Ofcom data show only one fixed telecommunications link within 1.5 km of the Site boundary. The locations of any scanning telemetry or television re-broadcast links will be determined through consultation with the appropriate bodies.

Television reception

The main terrestrial television transmitter for the Trecwn area is at Preseli, 18 km east of the site. In addition there are local transmitters at Trefin (14 km west of the Site), Fishguard (7 km north west of the Site) and Haverfordwest (7.5 km south west of the Site).

16.1.3 Potential Sources of Impact

Potential sources of impact are noted in section 16.1.1. above.

16.2 Method of Assessment and Reporting

Wind Turbines

Impacts on air traffic control primary surveillance radars will be assessed by software modelling of the radar line of sight to the turbines. In the event of radar line of sight being found to exist, an operational impact assessment will be conducted, taking into account the structure and classification of the airspace; the types and volumes of air traffic using the airspace; the types of air traffic service provided in the airspace concerned; the capabilities of the radar; and the availability of operational and technical mitigations.

Physical obstacle hazards to aircraft will be assessed by reviewing the horizontal and vertical distances of the turbines from the Haverfordwest obstacle limitation surfaces in accordance with CAP 168.

Potential effects on the Strumble DVOR will be assessed by applying the recommended separation criteria published by NATS En Route and the International Civil Aviation Organisation (ICAO).

The fixed microwave link identified by Ofcom is not close enough to the proposed turbines to cause adverse effects. It is therefore proposed to scope out assessment of fixed microwave links. Effects on other fixed links will be assessed through consultation with the appropriate bodies.

The potential for adverse effects on television reception will be assessed by identifying the main and local terrestrial TV transmitters serving the area; mapping the areas around the proposed development where TV

reception may be affected; and identifying any domestic properties in those areas using guidance published by the BBC.

Solar Farm

Since there are no airfields or landing sites and no air traffic control towers within 5 km of the Site it is proposed to scope out assessment of the effects of the solar farm on aviation.

Green Hydrogen Facility

Since there are no airfields or landing sites and no air traffic control towers within 5 km of the Site it is proposed to scope out assessment of the effects of the green hydrogen facility on aviation.

The electrolyser and its associated infrastructure does not have the potential to affect aviation, radar or telecommunication infrastructure.

16.3 Consultation

It is proposed to consult Haverfordwest Aerodrome, NATS En Route and the MoD on the aviation effects of the development.

The Joint Radio Company, Atkins and Arqiva will be consulted on effects on scanning telemetry and television re-broadcast links.

16.4 Matters Scoped Out

Wind Turbines

Effects on Meteorological Office radars will be scoped out.

The fixed microwave link identified by Ofcom is not close enough to the proposed turbines to cause adverse effects. It is therefore proposed to scope out assessment of fixed microwave links.

Solar Farm

It is proposed to scope out all effects of the solar farm on aviation and telecommunications.

Hydrogen Electrolyser

It is proposed to scope out all effects of the green hydrogen facility on aviation and telecommunications.

16.5 References and Standard Guidance

The Air Navigation Order 2016 (as amended in September 2021 and February 2022)

The Town and Country Planning (Safeguarded Aerodromes, Technical Sites and Military Explosives Storage Areas) Direction 2002

CAA, Policy and Guidance on Wind Turbines (CAP 764)

CAA Air Traffic Services Safety Requirements (CAP 670)

CAA, Licensing of Aerodromes (CAP 168)

CAA, Safeguarding of Aerodromes (CAP 738)

International Civil Aviation Organisation (ICAO), Annex 14 to the Chicago Convention, Vol.1, Eighth Edition (2018)

ICAO EUR Doc 015: European Guidance Material on Managing Building Restricted Areas (2015)

17.0 Other Issues

A single chapter will be prepared to draw together the implications of the proposed development on other facets of the environment that do not require full assessment as part of the EIA process, or to signpost readers to where they are dealt with within other technical chapters of the ES. It is anticipated that this chapter would include discussion of the following issues:

- Shadow Flicker;
- Climate and Carbon Balance;
- Population and Human Health;
- Major Accidents and Disasters; and
- Waste.

17.1 Shadow Flicker

Shadow flicker occurs when a certain combination of conditions prevail at a certain location, time of day and year. It firstly requires the sun to be at a certain level in the sky. The sun then shines onto a window of a residential dwelling from behind the wind turbine rotor. As the wind turbine blades rotate this causes the shadow of the turbine blades to flick on and off. This may have a negative effect on residents in affected properties. If shadow flicker cannot be avoided through design, technical mitigation solutions are available, such as shutting down turbines when certain conditions prevail.

In the UK, significant shadow flicker is only likely to occur within a distance of ten times the rotor diameter of a wind turbine from a residential dwelling and within 130 degrees either side of north[39].

The rotor diameter of the proposed turbines would be up to 138 m; so the potential area in which shadow flicker could occur would be up to 1,380 m from the proposed turbine locations. Once the final turbine layout and parameters are fixed, the locations of residential properties in proximity to the Site will be verified and if any are situated within ten rotor diameters from the proposed turbine positions, a shadow flicker model will be run to predict potential levels of effect. Shadow flicker is considered as an environmental constraint during the design process.

The location of all residential dwellings in proximity to the Site will be verified during the EIA process to capture any recent changes in use or planning applications.

Based on the design of the proposed development undertaken to date, and the number of residential properties found in the surrounding area, it is likely that a full shadow flicker assessment will be required for the EIA, covering residential properties within 10 rotor diameters of turbines, within 130 degrees either side of north.

17.2 Climate and Carbon Balance

The EIA Regulations (Regulation 5) require EIA to take account of the impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change.

[39] Parsons Brinckerhoff Consultants on behalf of DECC (2010) Update of UK Shadow Flicker Evidence Base. Available at: http://www.decc.gov.uk/en/content/cms/meeting_energy/renewable_ener/ored_news/ored_news/uk_shad_flick/uk_shad_flick.aspx (Accessed on 28/03/2017)

The purpose of the proposed development is to produce low carbon green energy that would contribute to reduction of emissions of greenhouse gases. Chapter 17 will identify the potential effect on carbon emissions and climate change due to the operation of the proposed development.

Consideration of climate change will also be inherent within the assessment of effects associated with other disciplines including the Water Environment. The ES will take account of the vulnerability and contribution of, the proposed development to climate change in relevant technical chapters.

17.3 Population and Human Health

The need to assess the effects of a development on population and human health was brought into the EIA Regulations in 2017 as a specific requirement, and is a fundamental objective of EIA. The approach proposed for this project is that consideration of population and human health will be inherent within the assessment of effects associated with other disciplines including Transport, Noise and Socio-Economics.

As such, whilst the ES will not contain a specific chapter on population and human health, this topic will be considered throughout all ES Chapters and as part of the wider EIA. This approach is considered entirely consistent with the EIA Regulations and proportionate for the type of development proposed.

Where no significant effects are likely these are scoped out of the assessment.

17.4 Major Accidents and Hazards

The EIA Regulations require consideration to be given to the vulnerability of the proposed development to major accidents or disasters that are relevant to that development.

Major accidents or disasters may warrant a full assessment where they represent a risk to the proposed development, either from the proposed location or the project itself. A high risk is considered to be where there is reasonable likelihood of the accident or disaster occurring, or where the effect of the accident or disaster would lead to the requirement for mitigation which is beyond the usual scope of construction or operational activities.

It should be noted that the ES will take account of proposed mitigation, including good practice management measures and regulatory controls including Control of Major Accident Hazards (COMAH) Regulations in assessing potential effects. It is therefore proposed that to address risk of major accidents and disasters Chapter 17 will include a section setting out in detail the proposed mitigation, including good practice management measures and regulatory controls, that would be employed in connection with the proposed development.

It should also be noted that both an Environmental Permit, regulated by NRW, and a Hazardous Consents Licence, regulated by Pembrokeshire County Council, will be required to operate the green hydrogen facility .

17.5 Waste

Statkraft is committed to sustainably managing resources. With regard to the proposed development, construction management would take place in accordance with a Construction Environmental Management Plan (CEMP) which would ensure that contractors are aware of the potential environmental impacts of the construction activities, and that management measures are in place to mitigate these potential impacts. This will include management of construction waste in accordance with the waste hierarchy and sustainable waste management practices.

It is intended that the ES will describe the likely volumes and type of construction waste that may be generated and identify whether this will be required to the be taken offsite. Matters relating to the generation and movement of waste will be considered within all relevant technical chapters.

The operation of the proposed development is not expected to give rise to significant volumes of waste, and operational effects are therefore scoped out.

18.0 Summary and Conclusion

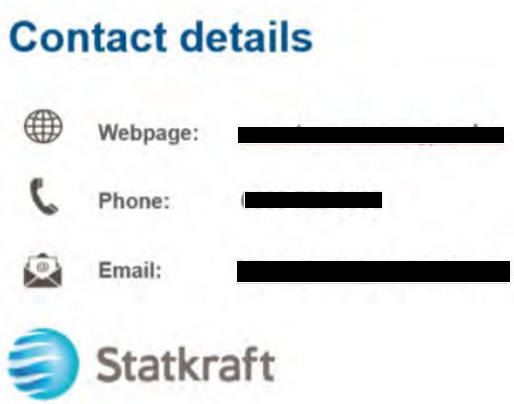
This EIA Scoping Report outlines the proposed technical and environmental assessments that will be included within the ES for the proposed development. The proposed scope and methodologies for each assessment have been provided and the guidance to be followed set out. Should any further information be required in order that a full EIA Scoping Direction can be provided we would be happy to provide further information and/or discuss any further requirements.

Contact Details

Anne Dugdale
SLR Consulting
Ground Floor Helmont House
Churchill Way
Cardiff,
CF10 2HE

Tel: [redacted]
Email: [redacted]

Further information with regard to the project can be found on the project website, details below:



APPENDIX 1: GLOSSARY OF TERMS

Abbreviation	Full term
DNS	Development of National Significance
EIA	Environmental Impact Assessment
ES	Environmental Statement
Ha	Hectares
HDV	Heavy Duty Vehicles
HGV	Heavy Goods Vehicles
HRA	Habitats Regulations Assessment
LNR	Local Nature Reserve
LSA	Local Study Area
LVIA	Landscape and Visual Impact Assessment
LPA	Local Planning Authority
MW	Megawatts
MWe	Megawatts electrical
NCN	National Cycle Network
NOx	Oxides of Nitrogen
NRW	Natural Resources Wales
ONS	Office of National Statistics
PCC	Pembrokeshire County Council
PCNPA	Pembrokeshire Coast National Park Authority
SAC	Special Area of Conservation

Abbreviation	Full term
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
ZTV	Zone of Theoretical Visibility

APPENDIX 2

Historic Assets Scoped Out of Further Assessment

Ref No.	Type	Name	Distance from Site & Direction	ZTV (0 = No visibility, 3 = high visibility)	Rationale
12256	Grade II* Listed Building	Plas Glyn-y-Mel	2.9km north	0	Asset not within ZTV and no anticipated visibility due to distance/topography
20818	Grade II* Listed Building	Church of St Justinian	1.1km north	0	Asset within a low-lying dip, surrounded by woodland. Asset not within ZTV, no potential intervisibility
87809	Grade II Listed Building	Church of St David	0m - On the northeast boundary of the Site	2	The asset's setting is very densely vegetated, no anticipated visibility with rest of Site. None of the built developments will affect the immediate settings of the Church
26806	Grade II Listed Building	Y Garn	200m east	3	Asset's significance derives from evidential and historic value. Asset surrounded by vegetation and views towards site limited
12003	Grade II Listed Building	Pontfaen House	Collectively, these assets have been scoped out. As Grade II Listed Buildings, their significance is of local importance, and the wider landscape is unlikely to substantially contribute to their significance, which largely derives from their evidential value in the physical preservation of the character and materials of their construction, the immediate environment which contributes to the assets contextual historical function and fabric, and other built assets, both designated and non-designated, that share a contemporary relationship, i.e. historical roads, towns or rural buildings. None of the significant views from these assets comprise views towards/into the Site. Their encompassing setting does not extend to land within the Site, and therefore the developments within the Site would not cause any affects to the assets significance. In all cases, the ability to appreciate, experience and understand the assets would remain preserved		
12004	Grade II Listed Building	Outbuildings at Pontfaen			
12961	Grade II Listed Building	Priskilly Forest			
12962	Grade II Listed Building	Former Coach-House, Priskilly Forest			
13049	Grade II Listed Building	Llanstinian Bridge			
13055	Grade II Listed Building	Silo Tower at Llangwarren Farm			
13068	Grade II Listed Building	Coach-house at Cwrt			
13069	Grade II Listed Building	Farmyard building, Cwrt			

Ref No.	Type	Name	Distance from Site & Direction	ZTV (0 = No visibility, 3 = high visibility)	Rationale
15194	Grade II Listed Building	Capel Sion			
15195	Grade II Listed Building	Jordanston Hall			
15197	Grade II Listed Building	St Cawrda Church			
15198	Grade II Listed Building	Llangwarren Bridge			
22761	Grade II Listed Building	Saron Baptist Chapel			
24977	Grade II Listed Building	Pont Llangwarren			
25867	Grade II Listed Building	Ty Newydd			
25868	Grade II Listed Building	White Hart			
26717	Grade II Listed Building	Ciliauwen			
26718	Grade II Listed Building	Range at Ciliauwen			
26719	Grade II Listed Building	Outbuilding at Ciliauwen			
26720	Grade II Listed Building	Ciliauwen Lodge			
26721	Grade II Listed Building	Gatepiers at Ciliauwen Lodge			
26804	Grade II Listed Building	Boundary Stone			
26805	Grade II Listed Building	Pont Llanychaer			Collectively, these assets have been scoped out. As Grade II Listed Buildings, their significance is of local importance, and the wider landscape is unlikely to substantially contribute to their significance, which largely derives from their evidential value in the physical preservation of the character and materials of their construction, the immediate environment which contributes to the assets contextual historical function and fabric, and other built assets, both designated and non-designated, that share a contemporary relationship, i.e. historical roads, towns or rural buildings. None of the significant views from these assets comprise views towards/into the Site. Their encompassing setting does not extend to land within the Site, and therefore the developments within the Site would not cause any affects to the assets significance. In all cases, the ability to appreciate, experience and understand the assets would remain preserved.

Ref No.	Type	Name	Distance from Site & Direction	ZTV (0 = No visibility, 3 = high visibility)	Rationale
26807	Grade II Listed Building	Mill building, Cwrt	Collectively, these assets have been scoped out. As Grade II Listed Buildings, their significance is of local importance, and the wider landscape is unlikely to substantially contribute to their significance, which largely derives from their evidential value in the physical preservation of the character and materials of their construction, the immediate environment which contributes to the assets contextual historical function and fabric, and other built assets, both designated and non-designated, that share a contemporary relationship, i.e. historical roads, towns or rural buildings. None of the significant views from these assets comprise views towards/into the Site. Their encompassing setting does not extend to land within the Site, and therefore the developments within the Site would not cause any affects to the assets significance. In all cases, the ability to appreciate, experience and understand the assets would remain preserved		
26808	Grade II Listed Building	Cowhouse and stables, Cwrt			
26809	Grade II Listed Building	Church of St Brynach			
26810	Grade II Listed Building	The Old Vicarage			
26811	Grade II Listed Building	Picton Mill Bridge			
26812	Grade II Listed Building	Cilciffeth			
26813	Grade II Listed Building	Vaulted undercroft at Cilciffeth			
26814	Grade II Listed Building	Tredafydd Uchaf			
26815	Grade II Listed Building	Cwm Llan			
26816	Grade II Listed Building	Llethr			
26817	Grade II Listed Building	Bont Cilrhedyn			
87708	Grade II Listed Building	Dyffryn Arms Public House			
87809	Grade II Listed Building	Church of St David			
PE062	Scheduled Monument	Pen-Dre Round Barrow	1.5km south	2	Significance derived largely from evidential value and limited anticipated visibility towards Site
PE081	Scheduled Monument	Castell Hendre-Wen	2.8km northeast	3	The large intervening distance would be anticipated to negate any impact to setting

Ref No.	Type	Name	Distance from Site & Direction	ZTV (0 = No visibility, 3 = high visibility)	Rationale
PE082	Scheduled Monument	Round Barrow, Jordanson Hill	2.2km northwest	3	Significance derived largely from evidential value and limited anticipated visibility towards Site due to intervening distance
PE126, PE505 & PE506	Scheduled Monuments	Parc-y-Meirw Standing Stones, Trellwyn Fawr Standing Stone and Trellwyn Fach Standing Stone	1.2km - 1.7km northeast	3	Assets' significance from setting derived from small hills which they are located upon and their group value. Changes in very distanced views towards Site not anticipated to affect significance of assets.
PE140	Scheduled Monument	Waun-Cantell Camp	60m south	3	Setting of the asset comprises the wooded area in which it is located, no anticipated views towards Site. Asset's significance derives from evidential value.
PE141	Scheduled Monument	Castell Cwm-Wyntyll	1.2km south	3	Asset positioned within the central lowland of small valley, no anticipated views towards the site which contribute to significance. Asset's significance derived from evidential value
PE145	Scheduled Monument	Inscribed Stone, Llangwarran Farm	1km west	2	Significance derived largely from evidential value and limited anticipated distanced visibility towards Site
PE200 & PE485	Scheduled Monuments	Ty-Meini Standing Stone & Inscribed Stone, Penwaun	2.7km & 2.9km north	2	No anticipated visbilty due to intervening distances, built form and vegetation, Assets derive significance from evidential and group value
PE226	Scheduled Monument	Two Pillar-Crosses	3km east	0	Asset not within ZTV, no anticipated intervisibility with Site
PE227	Scheduled Monument	Five Pillar-Crosses	2km east	0	Asset not within ZTV, no anticipated visibility with Site
PE228 & PE229	Scheduled Monuments	Two Pillar-Crosses & Holy Well	1.2km north	3	Assets' setting comprises the church yard and church in which they are located. The site makes no contribution to the assets' significance.
PE230	Scheduled Monument	Pillar Cross in Churchyard	Within the Site Boundary	3	Asset's setting is the Church yard. The areas of development do not contribute to the asset's significance through setting.
PE231	Scheduled Monument	Bucket Camp	500m south	1	No anticipated visibility towards Site. Asset's significance derived from evidential value
PE232	Scheduled Monument	Castell Mael	2.8km south	0	Asset not within ZTV, no anticipated intervisibility with Site
PE237	Scheduled Monument	Wern Camp	3km southeast	1	No intervisibility anticipated due to topography and distance. Asset's significance derived from evidential value
PE299	Scheduled Monument	Summerton Camp	1.7km south	1	No intervisibility anticipated due to topography and distance

Ref No.	Type	Name	Distance from Site & Direction	ZTV (0 = No visibility, 3 = high visibility)	Rationale
PE340	Scheduled Monument	Fagwr-Fran Standing Stone	1.1km southeast	3	Material visibility of the Site not anticipated, with changes to any potential distanced views of the Site not anticipated to affect significance. Asset largely derives significance from evidential value.
PE341	Scheduled Monument	Marsh Round Barrow	1.6km southeast	2	Asset's significance derives from its evidential value and distanced views of the Site are not considered to contribute to the asset's significance
PE349	Scheduled Monument	Cronllwyn Earthwork	0.67km north	2	Topography and vegetation suggests no material views towards Site would be anticipated. Asset largely derives significance from evidential value
PE407	Scheduled Monument	Iron Age Enclosure Kilkiffeth Wood	2.4km east	0	Asset not within ZTV, no anticipated visibility of Site. Asset's significance derived from evidential value
PE513 & PE514	Scheduled Monuments	Carreg Quoitan Standing Stone & Parc Maen Llwyd Standing Stone	2.4km & 2.6km southeast	2	Material views of Site not anticipated due to intervening distance. Assets' significance derives from evidential and group value
PE550	Scheduled Monument	Defended Enclosure, Pentre	2km southeast	2	Material views of Site not anticipated due to intervening distance and topography

APPENDIX 3: AGRICULTURAL LAND QUALITY REPORT

AGRICULTURAL QUALITY OF LAND AT TRECWN HAVERFORDWEST

Report 1999/1

14th July, 2022

Land Research ASSOCIATES
www.lra.co.uk

AGRICULTURAL QUALITY

OF LAND AT TRECWN, HAVERFORDWEST

L Thomas, MSc, MISoilSci

Report 1999/1
Land Research Associates Ltd
Lockington Hall,
Lockington,
Derby
DE74 2RH
www.lra.co.uk

14th July, 2022

SUMMARY

An agricultural land quality survey has been undertaken of 49.4 ha of land at Trecwn, Haverfordwest, in June 2022.

The land has shallow silty clay loams over slate, with an area of groundwater-affected land in the south-west. Agricultural land quality is limited by a combination of wetness, adverse climate, shallow soil depth, topsoil stone content and slope gradient to a mixture of subgrades 3a and 3b.

1.0 Introduction

1.1 This report provides information on the agricultural quality of 49.4 ha of land at Trecwn, Haverfordwest. The report is based on a survey of the land in June 2022.

SITE ENVIRONMENT

1.2 The survey area comprises one large block at Llanstinan Home Farm and a smaller block in the south-west. The main site is bordered to the north by north by a single track road, to the south by woodland, and to the east and west by adjoining agricultural land. The smaller block is bordered to the north by woodland, to the south and east by adjoining woodland, and to the west by the A40.

1.3 The main site comprises a hill summit in the west, sloping land down to the woodland. The main site varies in elevation from 120 m to 75 m, with an average elevation of approximately 100 m AOD. The block in the south-west is level at a lower average elevation of 70 m AOD.

1.4 At the time of survey all of the land was under grass, either silage meadow or grazed by beef cattle.

PUBLISHED INFORMATION

1.5 1:50,000 scale BGS information records the geology of most of the land to be Penmaen Dewi Shale Formation mudstone. The two easternmost fields are recorded to be underlain by Ogof Hen Formation muddy sandstone with superficial deposits of Head.

1.6 The National Soil Map (published at 1:250,000 scale) records land at the main site as within the Manod Association, typically comprising well drained fine loamy or fine silty soils over rock. Land in the south-western block is recorded to be within the Conway Association, typically deep stoneless fine silty and clayey soils variably affected by groundwater[1].

1.7 The Welsh Predictive Agricultural Land Classification map[2] shows the land to be predominantly subgrade 3a, with an area of subgrade 3b in the centre and grade 4 in the south-west.

[1]Rudeforth, C. C., et al., 1984. *Soils and their use in Wales.* Soil survey of England and Wales, Bulletin No. 11, Harpenden.

[2] Welsh Government, 2019. Predictive Agricultural Land Classification (ALC) Map 2, available at: <Predictive Agricultural Land Classification (ALC) Map 2 | DataMapWales (gov.wales)>

2.0 Soils

2.1 A soils and agricultural quality survey was carried out in June 2022 in accordance with MAFF (1988) Agricultural Land Classification guidelines[3]. It was based on observations at intersects of a 100 m grid, giving a density of one observation per hectare. During the survey, soils were examined by hand augerings to a maximum depth of 0.7 m. A log of the sampling points and a map (Map 1) showing their location is in an appendix to this report.

2.2 Soils were found to vary in depth and drainage, as described below.

SHALLOW SILTY LOAMS

2.3 These soils dominate across the main site. They typically comprise medium silty clay loam topsoil, over a thin permeable loamy subsoil that overlies slate at variable depth (20 – 71 cm). The topsoils are slightly to moderately stony. The land is assessed to be freely-draining (Soil Wetness Class I).

2.4 An example shallow profile is described from a pit excavation at observation point 20 (see Map 1).

0-20 cm	Dark brown (10YR 3/3) medium silty clay loam with 15% slate stones >20 mm; well developed fine subangular blocky structure; friable; many fine fibrous roots; 2-5% pores; smooth clear boundary to:
20 cm+	Hard slate; impenetrable to roots.

2.5 An example profile with thin subsoil is described from a pit excavation at observation point 21 (see Map 1).

0-20 cm	Dark brown (10YR 3/3) medium silty clay loam with 15% slate stones >20 mm; well developed fine subangular blocky structure; friable; many fine fibrous roots; 2-5% pores; smooth clear boundary to:
20-41 cm	Yellowish brown (10YR 6/6) medium silty clay loam with <2% fine faint reddish yellow (7.5YR 6/8) mottles; 25% slate stones >20 mm; moderately developed fine subangular blocky structure; friable; common fine fibrous roots; 2% macropores; medium packing density; wavy clear boundary to:
41 cm+	Hard slate; impenetrable to roots.

IMPERFECTLY DRAINING SILTY LOAMS

2.6 These soils occur in the south-western block on lower, groundwater-affected land. They comprise medium silty clay loam topsoil over permeable subsoil of the same texture. Despite their permeability, the subsoils are *gleyed* to shallow depth, indicating seasonal waterlogging and judged to be imperfectly-draining (Soil Wetness Class III).

[3]MAFF, (1988).*Agricultural Land Classification for England and Wales: Guidelines and Criteria for Grading the Quality of Agricultural Land*.

2.7 An example shallow profile is described from a pit excavation at observation point 47 (see Map 1).

0-25 cm	Very dark greyish brown (10YR 3/2) medium silty clay loam; stoneless; well developed medium to fine sub-angular blocky structure; friable; abundant fine fibrous roots; 2-5% pores; smooth clear boundary to:
25-60 cm	Grey (10YR 7/1) medium silty clay loam with 20% distinct fine and medium yellowish brown (10YR 5/8) mottles; stoneless; moderately developed coarse sub-angular blocky structure; friable; medium packing density; porous; many fine fibrous roots; smooth clear boundary to:
60 cm+	Hard slate; impenetrable to roots.

3.0 Agricultural land quality

3.1. To assist in assessing land quality, the Ministry of Agriculture, Fisheries and Food (MAFF) developed a method for classifying agricultural land by grade according to the extent to which physical or chemical characteristics impose long-term limitations on agricultural use for food production. The MAFF ALC system classifies land into five grades numbered 1 to 5, with grade 3 divided into two subgrades (3a and 3b). The system was devised and introduced in the 1960s and revised in 1988.

3.2. The agricultural climate is an important factor in assessing the agricultural quality of land and has been calculated using the Climatological Data for Agricultural Land Classification[4]. The relevant site data for an average elevation of 100 m is given below.

• Average annual rainfall:	1237 mm
• January-June accumulated temperature >0°C	1446 day°
• Field capacity period (when the soils are fully replete with water)	249 days mid Sept-mid May
• Summer moisture deficits for:	wheat: 69 mm potatoes: 52 mm

3.3. The survey described in the previous section was used in conjunction with the agro-climatic data above to classify the site using the revised guidelines for ALC issued in 1988 by MAFF[5]. The moist climate at this elevation limits land quality to a maximum of subgrade 3a at elevations above 110 m, and to grade 2 at lower elevations (in the south of the site).

SURVEY RESULTS

3.4. The agricultural quality of the land is variably determined by wetness, adverse climate, soil depth, topsoil stone content and slope gradient. Other factors have been assessed but do not affect the land grade. Land of grades 3 and 4 has been identified.

Subgrade 3a

3.5. In parts of the site where the soils are deeper over bedrock, land is limited to this subgrade (at best) by adverse climate. The persistent wetness and humidity of the local climate is likely to lead to crop disease, adversely affecting yield and quality.

[4]Meteorological Office, (1989).*Climatological Data for Agricultural Land Classification*.
[5]MAFF, (1988).*Agricultural Land Classification for England and Wales: Guidelines and Criteria for Grading the Quality of Agricultural Land*.

3.6. Wetness is also a limiting factor on the deeper soils within the site. The moderately clay content of the topsoils under the moist local climate means land will not be accessible with machinery in winter and early spring. Although access to the land is possible in late spring and autumn most years.

3.7. Also included are areas with moderately shallow soils over hard slate (30-45 cm on average). The restricted depth to hard bedrock makes cultivation of roots crops difficult and limited rooting depth has adverse effects on crop growth.

Subgrade 3b

3.8. This subgrade includes most of the land within the site where the silty loams are of shallow depth over bedrock (between 20 and 30 cm). The shallow depth of the soils over hard rock limits the depth and range of cultivation possible, restricts rooting depth and nutrient capacity of the soils. Some of the land within this subgrade is also limited by topsoil stone content. High topsoil stone content can impair precision cultivation, damage rooting crops and reduces the nutrient holding capacity of the soil.

3.9. Some small areas have slope gradients between 7 and 10 degrees. This is likely to make the use of some cultivation machinery difficult and increases erosion risk under cultivation.

3.10. This subgrade also comprises land in the south-west which is imperfectly draining (Soil Wetness Class III). The combination of moderately high topsoil clay content and impeded drainage under the wet local climate severely restricts land access. Land use is mainly restricted to grass, of which yields could be moderate to high but limitations in access can make utilisation of the crop difficult.

Other land (non-agricultural)

3.11. This comprises tracks and a timber yard.

Grade areas

3.12. The land grade is shown on Map 2 and the area occupied is shown below.

Table 1: Areas occupied by the different land grades

Grade/subgrade	*Area (ha)*	*% of the land*
Subgrade 3a	12.0	24
Subgrade 3b	35.8	72
Other land	1.6	4
Total	49.4	100

APPENDIX

DETAILS OF OBSERVATIONS

MAPS

Land at Trecwn: Soils and ALC survey – Details of observations at each sampling point

Obs	Topsoil			Upper subsoil			Lower subsoil			Slope	Wetness	Agricultural quality	
No	Depth (cm)	Texture	Stones >20 mm (%)	Depth (cm)	Texture	Mottling	Depth (cm)	Texture	Mottling	(°)	Class	Grade	Main limitation
1	0-25	MZCL	<5	25+	Slate					1	I	3b	De
2	0-25	MZCL	<5	25-71	MZCL shaley	x	71+	Stopped on slate		3	I	3a	C/W
3	0-26	MZCL	<5	20+	Slate					3	I	3b	De
4	0-24	MZCL	<5	24-30	MZCL	x	30+	Slate		1	I	3b/3a	De
5	0-30	MZCL	5-10	30-61	MZCL	x	61+	Slate		2	I	3a	C/W
6	0-25	MZCL	5-10	25-38	MZCL	x	38+	Slate		2	I	3a	De/C/W
7	0-20	MZCL	5-10	20+	Slate					0	I	3b	De
8	0-25	MZCL	5-10	25-36	MZCL	x	36+	Slate		1	I	3a	De/C/W
9	0-25	MZCL	<5	25-55+	M/HZCL	x	55+	Slate		1	I	3a	C/W
10	0-28	MZCL	5-10	28-41	MZCL	xx	41-50 50+	MCL shaley Slate	xx(x)	1	I	3a/3b	W
11	0-25	MZCL	5-10	25+	Slate					1	I	3b	De
12	0-26	MZCL	5-10	26-41	MZCL	x	41+	Slate		2	I	3a	C/De/W
13	0-20	MZCL	5-10	20-40	MZCL	x	40+	Slate		3	I	3a	C/De/W
14	0-20	MZCL	5-10	20+	Slate					0	I	3b	De
15	0-20	MZCL	15-20	20+	Slate					3	I	3b	De/St
16	0-25	MZCL	<5	25-42	MCZL	xx	42+	Slate		3	I	3a	C/De/W
17	0-26	MZCL	<5	26-03+	MZCL shaley	x	30+	Slate		2	I	3b	De
18	0-20	MZCL	10-15	20+	Slate					1	I	3b	De
19	0-20	MZCL	10-15	20+	Slate					3	I	3b	De
20	0-20	MZCL	10-15	20+	Slate					4	I	3b	De
21	0-20	MZCL	10-15	20-43	MZCL	x	43+	Slate		3	I	3a	St/W
22	0-20	MZCL	15-20	20+	Slate					6	I	3b	De/St
23	0-20	MZCL	15-20	20+	Slate					4	I	3b	De/St
24	0-25	MZCL	5-10	25-51	MZCL	xx	51+	Slate		3	I	3a	C/W
25	0-20	MZCL	15-20	20+	Slate					0	I	3b	De/St
26	Track												
27	Track												
28	0-28	MZCL	10-15	28-46	MZCL	x	40+	Slate		8	I	3b	Sl
29	0-20	MZCL	5-10	20+	Slate					8	I	3b	Sl
30	0-20	MZCL	5-10	20-34	MZCL	x	34+	Slate		8	I	3b	Sl
31	0-25	MZCL	5-10	25-40	MZCL	o	40-51 51+	MZCL Slate	x	5	I	3a	W

Obs	Topsoil			Upper subsoil			Lower subsoil			Slope	Wetness	Agricultural quality	
No	Depth (cm)	Texture	Stones >20 mm (%)	Depth (cm)	Texture	Mottling	Depth (cm)	Texture	Mottling	(°)	Class	Grade	Main limitation
32	0-22	MZCL	5-10	22-40	MZCL	x	40+	Slate		6	I	3a	De/W
33	0-20	MZCL	5-10	20-35+	MZCL	x	35+	Slate		5	I	3a	C/W
34	0-20	MZCL	5-10	20+	Slate					5	I	3b	De
35	0-25	MZCL	5-10	25+	Slate					6	I	3b	De
36	0-20	MZCL	5-10	20+	Slate					9	I	3b	De/Sl
37	0-21	MZCL	15-20	21+	Slate					7	I	3b	De
38	0-20	MZCL	5-10	20+	Slate					6	I	3b	De
39	0-28	MZCL	5-10	28-50	MZCL	x	50-60 60+	MZCL Slate	x	8	I	3b	Sl
40	0-20	MZCL	5-10	20-42	MZCL	x	42+	Slate		6	I	3a	De/W
41	0-28	MZCL	5-10	28-56	MZCL	xx	56+	Slate		7	I	3a	W
42	0-15	MZCL	5-10	15+	Slate					10	I	4	De
43	0-25	MZCL	5-10	25-54	MZCL sl st	xxx	54+	Slate		5	III	3b	W
44	0-20	MZCL	15-20	20+	Slate					8	I	3b	De/Sl
45	0-22	MZCL	5-10	22-40	MZCL	xxx	40+	Slate		2	III	3b	W
46	0-20	MZCL	5-10	20-40	MZCL	xxx	40+	Slate		3	III	3b	W
47	0-21	MZCL	5-10	21-43	MZCL	xxx	43+	Slate		1	III	3b	W
48	Hedgerow												
49	0-20	MZCL	5-10	20-42	MZCL	xxx	42+	Slate		1	III	3b	W

Soil log key

Gley indicators[1]

o	unmottled
x	1-2% ochreous mottles and brownish matrix (or a few to common root mottles (topsoils))[3]
xx	>2% ochreous mottles and brownish matrix and/or dull structure faces (slightly gleyed horizon)
xxx	>2% ochreous mottles and greyish or pale matrix (gleyed horizon) or reddish matrix and >2% greyish, brownish or ochreous mottles and pale ped faces mottles or f-m concentrations (gleyed horizon)
xxxx	dominantly blueish matrix, often with some ochreous mottles (gleyed horizon)

Texture[2]

C - clay
ZC - silty clay
SC - sandy clay
CL - clay loam (H-heavy, M-medium)
ZCL - silty clay loam (H-heavy, M-medium)
SZL - sandy silt loam (F-fine, M-medium,C-coarse)
LS - loamy sand (F-fine, M-medium, C-coarse)
SL - sandy loam (F-fine, M-medium, C-coarse)
S - sand (F-fine, M-medium, C-coarse)
SCL - sandy clay loam

P - peat (H-humified, SF-semi-fibrous, F-fibrous)

LP - loamy peat; PL - peaty loam

Limitations:

W - wetness/workability
D - droughtiness
De - depth
F - flooding
St – stoniness
Sl – slope
T – topography/microrelief
C - Climate

Suffixes & prefixes:

o - organic

(vsl, sl, m, v, x)st – (very slightly, slightly, moderately, very, extremely) stony[6]

(vsl, sl, m, v, x)
(very slightly, slightly,
moderately, very, extremely) calcareous[7]

Slowly permeable layers[4]

a depth underlined (e.g. 50) indicates
the top of a slowly permeable layer

A wavy underline (e.g. 50 indicates
the top of a layer borderline to slowly permeable

Wetness Class[5]

I (freely drained) to VI (very poorly drained)

Other abbreviations

fmn - ferri-manganiferous concentrations
dist - disturbed soil layer;
R – bedrock (CH – chalk, SST – sandstone
LST – limestone, MST – Mudstone)
r-reddish, gn – greenish

[1]Gley indicators in accordance with Hodgson, J.M., 1997. Soil Survey Field Handbook (third edition). Soil survey technical monograph No. 5

[2]Texture in accordance with particle size classes in Hodgson (1997)

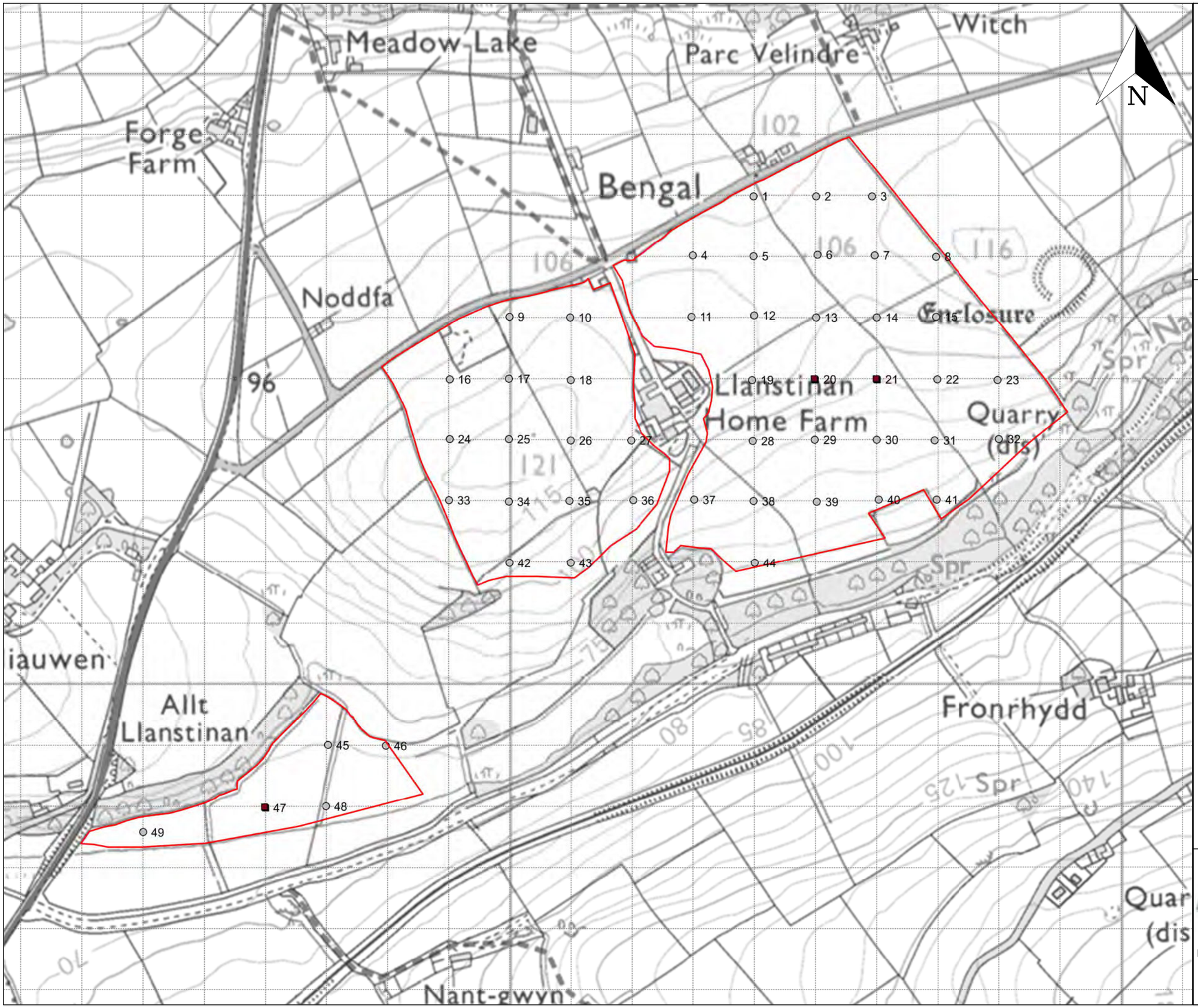
[3] Occasionally recorded in the texture box

[4]Permeability is estimated for auger borings and must be confirmed by full pit observations in accordance with the definitions in: Revised Guidelines for grading the quality of Agricultural Land (Maff 1988)

[5]Soil Wetness Classes are defined in Hodgson (1997)

[6]stoniness classes as defined in Hodgson (1997)

[7]calcareous classes as defined in Hodgson (1997)



KEY

- Auger observation
- Soil/land grade description pit
- Survey area

Site:

Land at Trecwyn, Haverfordwest

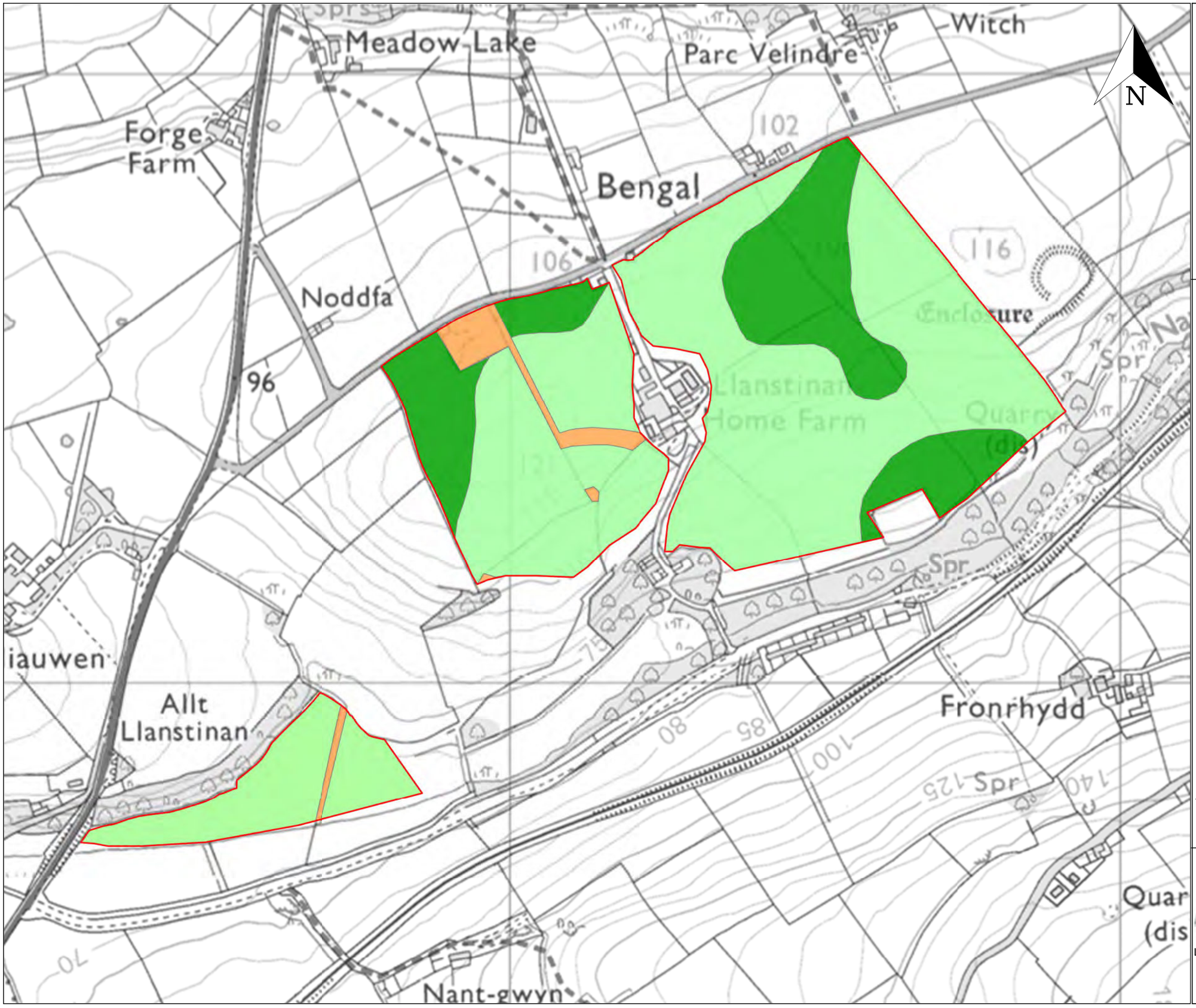
Map title:

Map 1
Survey observations

Land Research Associates
Lockington Hall
Lockington
Derby DE74 2RH

Scale: 1:6,000

Date: 14/07/2022



KEY

- Subgrade 3a
- Subgrade 3b
- Survey area

Site:

Land at Trecwyn, Haverfordwest

Map title:

Map 2
Agricultural Land Classification

Land Research Associates
Lockington Hall
Lockington
Derby DE74 2RH

Scale: 1:6,000

Date: 14/07/2022