The Abergelli Power Gas Fired Generating Station Order

6.1 Environmental Statement

Planning Act 2008
The Infrastructure Planning
(Applications: Prescribed Forms and Procedure) Regulations 2009

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Revision	Date	Description
0	May 2018	Submission Version

Environmental Statement

Chapter 1

Introduction

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1. Introduction

1.1 Overview

1.1.1 This document is the Environmental Statement ('ES') for the proposed Abergelli Power Project (hereafter referred to as 'the Project') described below. This ES has been prepared by AECOM on behalf of the Applicant, Abergelli Power Limited (APL).

1.1.2 The Project is situated on open agricultural land located approximately 2 km north of junction 46 of the M4 within the administrative boundary of the City and County of Swansea Council (CCS). Figure 1.1 shows the location of the Project approximately 1 km southeast of Felindre and 1.4 km north of Llangyfelach. The land upon which the Project will be developed, or which is required for construction of the Project, is referred to as the 'Project Site' (see Figure 1.1). The approximate centre of the Project Site lies at grid reference 265284, 201431. The Project Site covers an area of up to approximately 35 ha.

1.2 The Project

1.2.1 The Project is a gas-fired 'peaking' plant which is designed to operate when there is a surge in demand for electricity associated with a particular stress event (e.g. where there is a sudden demand in power required by consumers or a sudden drop in power being generated by plants which are constantly operational such as a sudden outage).

1.2.2 The Project is comprised of the below, and explained in greater detail in Section 3.4.

Table 1-1: Project Components

Project Component	Description	Consenting Route
Power Generation Plant	An Open Cycle Gas Turbine (OCGT) peaking power generating station, fuelled by natural gas and capable of providing a rated electrical output of up to 299 Megawatts (MW). The Power Generation Plant comprises: • Generating Equipment including one Gas Turbine Generator with one exhaust gas flue stack and Balance of Plant (BOP) (together referred to as the 'Generating Equipment') which are located within the 'Generating Equipment Site' (see Section 3.4); • An Access Road (see Figure 3.2)	*Development Consent Order (DCO) through the Planning Act 2008 and EIA carried out under the Infrastructure Planning (Environmental Impact Assessment) Regulations 2009*

Project Component	Description	Consenting Route
	to the Project Site from the B4489 which lies to the west, formed by upgrading an existing access road between the B4489 junction and the Swansea North Substation (the Substation) and constructing a new section of access road from the Substation to the Generating Equipment Site (the Laydown Area, see Section 3.4); • A temporary construction compound for the storage of materials, plant and equipment as well as containing site accommodation and welfare facilities, temporary car parking (see Section 3.4) and temporary fencing (the *Laydown Area*, see Section 3.4). A small area within the Laydown Area will be retained permanently (the *Maintenance Compound*). • *Ecological Mitigation Area* – area for ecological enhancement within the Project Site Boundary; and • Permanent parking and drainage to include: a site foul, oily water and surface water drainage system (see Section 3.4).	
Gas Connection	The Gas Connection will be in the form of a new above ground installation (AGI) and underground gas pipeline connection (the Gas Pipeline). This is to bring natural gas to the Generating Equipment from the National Gas Transmission System. The Gas Pipeline will follow an approximate north-south route corridor, between the National Gas Transmission System south of Rhyd-y-pandy Road and the Generating Equipment Site (see Section 3.5).	*The Gas Connection will be consented through the Town and County Planning Act 1990 (TCPA) and is not part of the DCO Application. Though this Project element is not part of the DCO Application, APL is seeking powers of compulsory acquisition over the land required for the Gas Connection.*

Project Component	Description	Consenting Route
Electrical Connection	This is an underground electrical cable to export power from the Generating Equipment to the National Grid Electricity Transmission System (NETS) (see Section 3.6).	*The Electrical Connection will be consented either through Permitted Development rights or a planning application under the TCPA and is not part of the DCO Application. Though this Project element is not part of the DCO Application, APL is seeking powers of compulsory acquisition over the land required for the Electrical Connection.*

1.2.3 The DCO Application seeks consent for all works required for construction, use, operation and maintenance of the Power Generation Plant (including the Access Road and the Laydown Area, which are integral to the NSIP). The Gas Connection and Electrical Connection are considered to be Associated Development within the meaning of the Planning Act 2008. As the Project is a generating station in Wales below 350 MW, development consent cannot be granted for Associated Development in the DCO[1]. However, the Gas Connection and the Electrical Connection are considered and assessed in this ES to provide full information on the effects of the Project as a whole.

1.3 Abergelli Power Ltd

1.3.1 The Applicant is APL, an energy development company established for the Project and recently acquired by Drax Group PLC (Drax).

1.3.2 Drax is responsible for generating 6% of the UKs electricity, predominantly via Drax power station in Selby. Drax is one of the UK's largest energy producers and is committed to helping to reduce carbon emissions, displacing more coal off the system and providing additional system support to plug the gaps created by intermittent renewables and boost security of supply.

1.3.3 Drax acquired APL from Watt Power Limited (Watt Power) in 2016. Stag Energy Development Company Ltd (Stag Energy) previously provided management services to Watt Power in relation to APL. Stag Energy continues to provide resources to APL through a management services agreement. Stag Energy was founded in 2002 and the company draws on a depth of experience within a team that has created and delivered over 10,000 MW of power generation and related infrastructure projects across the globe, of which 2,500 MW has been delivered in the UK.

1.3.4 Drax currently has three other power generation projects which have either already been granted consent under or are being brought forward through the PA 2008

[1] The Secretary of State concluded in the Hirwaun Generating Station Order 2015 that a gas connection and an electrical connection were not integral to or part of the actual generating station. As such the DCO will not seek development consent for the Gas Connection or the Electrical Connection, but is likely to seek powers of compulsory acquisition over land required for the Gas Connection and the Electrical Connection (which is the approach taken by the Secretary of State in making the Hirwaun order).

process. They are: Progress Power Ltd at Eye Airfield in Suffolk (www.progresspower.co.uk): Hirwaun Power Ltd at Hirwaun in South Wales (www.hirwaunpower.co.uk): and Millbrook Power Ltd in the 'Marston Vale' in Bedfordshire (www.millbrookpower.co.uk). The first two listed projects were granted Development Consent in July 2015.

1.3.5 APL is committed to the development of assets to support the UK Government's drive to a low carbon economy. APL recognises the need to balance commercial issues with the environmental benefits and concerns relating to energy projects and believes this balance can be responsibly delivered. The Project would be designed and developed to high quality, safety and environmental standards.

1.3.6 Further information on the companies referred to above is provided at www.abergellipower.co.uk or www.drax.com.

1.4 Purpose of this Environmental Statement

1.4.1 The Power Generation Plant constitutes a Nationally Significant Infrastructure Project (NSIP) pursuant to the Planning Act 2008 (as amended) (PA 2008) and therefore requires development consent under the PA 2008.

1.4.2 This ES assesses the Project as a whole which includes the Power Generation Plant (to be consented under the DCO), the Gas Connection (to be applied for under a separate Town & Country Planning Act (TCPA) application), and the Electrical Connection (to be constructed under Permitted Development).

1.4.3 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2009 (the 'EIA Regulations') require an EIA to be carried out in respect of any development listed in Schedule 1 to the EIA Regulations ('Schedule 1 development'). The Project is a Schedule 1 development as it is a thermal generating station with a heat output[2] of 300 MW or more as listed in Schedule 1, paragraph 2(1) of the EIA Regulations.

1.4.4 The Project falls under the EIA Regulations and not the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (EIA Regulations 2017). This is because a scoping opinion was requested from the Secretary of State under the EIA Regulations before the commencement of the EIA Regulations 2017. This means that, in accordance with the transitional arrangements at Regulation 37 of the EIA Regulations 2017, the EIA Regulations 2009 will continue to apply to the Project.

1.4.5 Accordingly, this ES has been prepared to present the environmental information collected to date and provides an assessment of the likely significant environmental effects of the Project.

1.4.6 This document is the first "ES" which has been prepared for the Project, following two Preliminary Environmental Impact Reports (PEIR). The first PEIR was published and consulted upon in 2014 (the "2014 PEIR") together with supporting information and a Non-Technical Summary ("2014 PEIR NTS"). This information

[2] Thermal output is commonly defined as the amount of 'useable heat' which is produced as part of the process of the combustion of fuel. Only a part of this useable heat can be converted to electrical energy, which is why this is a larger value than electrical output.

accompanied APL's initial phase of statutory consultation ("Phase 1 Statutory Consultation") with both the local community and prescribed consultees.

1.4.7 The second PEIR was published in January 2018 (the "2018 PEIR") together with supporting information and a Non-Technical Summary ("2018 PEIR NTS"). This information accompanied APL's second phase of statutory consultation ("Phase 2 Statutory Consultation") with both the local community and prescribed consultees. This ES reflects (and provides information regarding) updates on Project parameters and design evolution, as well as the refined EIA processes.

1.4.8 The feedback received relating to the 2014 PEIR and 2018 PEIR helped to inform and refine the EIA process (including this ES) as well as the design and development of the Project.

1.4.9 The approach to assessment undertaken in this ES is described further in **Chapter 4: Approach to Environmental Impact Assessment**.

1.5 Application for Development Consent

1.5.1 An onshore electricity generating station is considered to be a NSIP under the PA 2008 if it is in England or Wales and its generating capacity (rated electrical output) is more than 50 MW. As the Project is in Wales and will have a rated electrical output over 50 MW, it is classified as a NSIP under Section 14(1) (a) and Section 15(2) of the PA 2008.

1.5.2 Under Section 31 of the PA 2008, a DCO is required for development that is or forms part of a NSIP and therefore it is necessary that an application for a DCO is submitted to the Secretary of State (SoS).

1.5.3 A DCO for a NSIP may be granted only if an application is made under Section 37 of the PA 2008 to the SoS. Section 37 of the PA 2008 (and associated legislation) also governs the content of an application for a DCO, including requirements for certain accompanying documents.

1.5.4 These requirements are specified, in particular, in the Infrastructure Planning (Applications: Prescribed Forms and Procedures) Regulations 2014 (as amended) (the "APFP Regulations"). The APFP Regulations require that an application for a DCO, where applicable, must be accompanied by an ES and any associated scoping or screening opinions or directions. A screening opinion was not sought for the Project, however a Scoping Opinion, dated 1st August 2014, (Appendix 4.2) has been sought from the SoS. A notice of the intention to submit an application for Development Consent (Regulation 6 Notification), including an Environmental Statement, was submitted to PINS on 8th October 2014.

1.5.5 Further information on the companies referred to above is provided at www.abergellipower.co.uk or www.drax.com.

1.6 Structure of the ES

1.6.1 This ES has been prepared to provide information about the Project, the regulatory framework under which it has been prepared and the results of the preliminary

environmental assessment work. It is comprised of four parts: three Volumes, as described below, and a separate Non-Technical Summary (NTS) which provides a summary of the findings in the ES in non-technical language.

1.6.2 Volume 1 is the main written text and reports the findings of the ES in full. There are 16 chapters in Volume 1 of this ES, which are set out as follows:

- **Chapter 1: Introduction** – provides an overview of the Project, a description of APL, the purpose of this ES and its structure, and an introduction to the consenting regime;
- **Chapter 2: Regulatory and Policy Background** – provides a summary of the policy and guidance which governs the EIA process;
- **Chapter 3: Project and Site Description** – a description of the Project Site and surroundings, as well as the constituent parts of the Project, indicative schedule of construction activities and embedded mitigation;
- **Chapter 4: Approach to Environmental Impact Assessment** – a description of the methodology used in undertaking the EIA on the Project;
- **Chapter 5: Alternatives Considered** – a description of the site selection process as well as the access, technology and connection (gas and electrical) options considered by APL;
- Technical chapters - each chapter includes description of the baseline conditions identified relevant to each topic, the methodology used in the assessment, an assessment of the likely significant environmental effects and cumulative effects, a description of any additional mitigation proposed and identification of any likely significant residual effects
- **Chapter 6: Air Quality**;
- **Chapter 7: Noise & Vibration;**
- **Chapter 8: Ecology;**
- **Chapter 9: Water Quality and Resources;**
- **Chapter 10: Geology, Ground Conditions and Hydrogeology;**
- **Chapter 11: Landscape and Visual Effects;**
- **Chapter 12: Traffic, Transport and Access;**
- **Chapter 13: Historic Environment**; and
- **Chapter 14: Socio-Economics;**
- **Chapter 15: Other Effects** – a brief description of other potential significant effects which fall outside of the specialist topic chapters or are considered within a number of different topic chapters (Electromagnetic Fields (EMF), public health, waste, major incidents, health and safety, climate change and aviation);
- **Chapter 16: Summary of Residual Effects** – a summary of the residual effects identified in each of the specialist topic chapters. A mitigation register is also appended (Appendix 3.1, Appendix A) to identify how the mitigation will be delivered and who will be responsible for its delivery.
- **Chapter 17: Cumulative Impacts**; and

1.6.3 Volume 2 of the ES includes all of the Figures and Photomontages. Volume 3 of the ES includes all of the Appendices referred to in each of the chapters.

1.7 Availability of the ES

1.7.1 Copies of the ES and this ES NTS are available on the project website http://www.abergellipower.co.uk

1.7.2 The Documents can be obtained by writing to Abergelli Power Limited, 49 York Place, Edinburgh, EH1 3JD. A reasonable copying charge may apply up to a maximum of £250 for the full suite of Documents and £10 for an electronic copy on CD. Copies of individual Documents are also available on request.

1.7.3 Documents can be viewed at Swansea Central Library, Clydach Library, Gorseinon Library, Morriston Library, and Pondtarddulais Library. The technical appendices to the ES will only be available electronically at the libraries.

Table 1-2: Document Deposit Locations

	Swansea Central Library	Clydach Library	Gorseinon Library	Morriston Library	Pontarddulais Library
Monday	Closed	9.30-17.30	9.00-18.00	9.00-18.00	9.00- 13.00 and 14.00 - 17.00
Tuesday	8.30-20.00	9.30-17.30	9.00-18.00	9.00-18.00	9.00- 13.00 and 14.00 - 17.00
Wednesday	8.30-20.00	9.30-17.30	9.00-18.00	9.00-18.00	9.00- 13.00 and 14.00 - 17.00
Thursday	8.30-20.00	9.30-17.30	9.00-18.00	9.00-18.00	9.00- 13.00 and 14.00 - 17.00
Friday	8.30-20.00	9.30-18.30	9.00-19.00	9.00-18.00	9.00- 13.00 and 14.00 - 18.00
Saturday	10.00- 16.00	9.30-16.30	9.00-17.00	9.00-17.00	9.00- 13.00
Sunday	10.00-16.00	CLOSED	CLOSED	CLOSED	CLOSED

Chapter 2

Regulatory and Policy Background

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2. Regulatory and Policy Background

2.1 Introduction

2.1.1 This chapter summarises the main regulatory and policy framework that is relevant to the Project at international, national and local levels.

2.1.2 A summary of the European Union (EU) Directives, National Policy Statements (NPS) as well as national and local policy considered relevant to the Project is set out below. A detailed description of the planning policy background and its relevance to the Project is provided in the Planning Statement (Document Reference 10.1.0) which is produced as a separate document as part of the application for development consent.

2.2 European Union

2.2.1 The UK voted to leave the EU on the 23rd June 2016. The formal process of triggering Article 50 of the Lisbon Treaty, to commence negotiations for exiting the EU, was undertaken on 29th March 2017. However, the exit process is anticipated to involve lengthy and complex negotiations, taking up to two years. Until the UK formally leaves the EU and/or discards or alters EU legislation, it is considered that the following EU Directives are still relevant to the Project:

- Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment ("the Environmental Impact Assessment Directive" (EIA)) (Ref. 2.1) and Directive 2014/52/EU (Ref. 2.2);
- Directive 2010/75/EU of 24 November 2010 on industrial emissions (integrated pollution prevention and control) ("the Industrial Emissions Directive" (IED)) (Ref. 2.3);
- Directive 1992/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora ("the Habitats Directive") (Ref. 2.4);
- Directive 2009/147/EC of 30 November 2009 on the conservation of wild birds ("the Birds Directive") (Ref. 2.5);
- Directive 2008/50/EC of 21 May 2008 on ambient air quality and cleaner air for Europe ("the Ambient Air Quality Directive") (Ref. 2.6); and
- Industrial Emissions Directive 2010/75/EU – Best Available Techniques (BAT) reference document (BREF) for large combustion plants (July 2017) (Ref 2.7).

a) Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (the EIA Directive)

2.2.2 The EIA Directive (Ref 2.1) ensures that plans, programmes and projects likely to have significant effects on the environment are made subject to an environmental assessment, prior to their approval or authorisation. The Directive sets the thresholds for projects that require an EIA and also outlines the impacts on the environment to be assessed in the EIA process. This Directive was implemented in respect of Nationally Significant Infrastructure Projects ("NSIPs") in the UK by the Infrastructure Planning (Environmental Impact Assessment) Regulations 2009 (as amended) (the "EIA Regulations").

2.2.3 It is noted here that the EIA Directive was amended in May 2014 (EU Directive 2014/52/EU) (Ref 2.2) and the amendments have been implemented in Member States as of 16 May 2017. For NSIPs, such as the Project, this will be through the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (which came into force on 16th May 2017).

2.2.4 However, Regulation 37(2)(a) of the 2017 Regulations states that, where a scoping opinion has already been requested, or an application or an ES submitted, before the commencement of the new EIA regulations, the previous EIA regulations and regime will continue to apply. Therefore, as a Scoping Report was submitted for the Project in June 2014, the Environmental Statement has been undertaken in line with the previous (2011) EIA Directive and associated EIA Regulations.

b) Directive 2010/75/EU of 24 November 2010 on industrial emissions (integrated pollution prevention and control) (the Industrial Emissions Directive (IED));

2.2.5 In December 2010 the EU adopted a proposal for a Directive on industrial emissions (IED) (Ref. 2.3). The IED recasts seven existing directives related to industrial emissions, in particular Directive 2008/1/EC of 15th January 2008 concerning integrated pollution prevention and control (IPPC) ("the IPPC Directive"), and Directive 2001/80/EC of 23rd October 2001 on the limitation of emissions of certain pollutants into the air from large combustion plants ("the Large Combustion Plant Directive (LCPD)"), into a single legislative instrument to improve the permitting, compliance and enforcement regimes adopted by Member States. However, the general principles of the IPPC Directive and the LCPD Directive are retained and will remain relevant to the Project. The IED has been implemented in England and Wales by the Environmental Permitting (England and Wales) Regulations 2016.

c) Directive 1992/43/EEC of 21 May 1992 on the Conservation of natural habitats and of wild fauna and flora (the Habitats Directive);

2.2.6 The aim of the Habitats Directive (Ref 2.4) is to contribute towards ensuring bio-diversity through the conservation of natural habitats and of wild fauna and flora. Measures taken pursuant to this Directive by the Member States are designed to maintain or restore, at favourable conservation status, natural habitats and species of wild fauna and flora of community interest whilst also taking into account economic, social and cultural requirements, and regional and local characteristics.

2.2.7 The Conservation of Habitats and Species Regulations 2010 (the "Habitats Regulations") implement the Habitats Directive in England and Wales. The Habitats Regulations contain five Parts and four Schedules, and provide for:

- The designation and protection of "European Sites;"
- The protection of "European protected species;" and
- The adaptation of planning and other controls for the protection of European Sites.

d) Directive 2009/147/EC of 30 November 2009 on the conservation of wild birds (the Birds Directive);

2.2.8 The aim of the Birds Directive (Ref 2.5) is to protect, manage and control all species of naturally occurring wild birds in the Member States. Member States are required to take the requisite measures to maintain the population of the species at a level which corresponds to ecological, scientific and cultural requirements, while taking account of economic and recreational requirements, or to adapt the population of these species to that level. The Birds Directive is implemented in England and Wales through the Wildlife & Countryside Act 1981 (as amended) and the Habitats Regulations.

e) Directive 2008/50/EC of 21 May 2008 on ambient air quality and cleaner air for Europe (the Ambient Air Quality Directive);

2.2.9 The Ambient Air Quality Directive (Ref. 2.6) sets out measures aimed at avoiding, preventing or reducing harmful effects on human health and the environment, by seeking to combat emissions of pollutants at source and identifying and implementing the most effective emission reduction measures at local and national level. In Wales, the Ambient Air Quality Directive is implemented by the Air Quality Standards (Wales) Regulations 2010.

f) Industrial Emissions Directive 2010/75/EU – Best Available Techniques (BAT) reference document (BREF) for large combustion plants (July 2017)

2.2.10 The BREF for the Large Combustion Plants sector covers combustion of fuels in installations with a total rated thermal input of 50 MW or more. It sets out a series of best available techniques which should be applied to large combustion plants in order to drive greater efficiency, cost savings and lower emissions. Given the nature of the Project (to operate intermittently as a peaking plant) many of the techniques highlighted in the BREF do not apply to the Project. Nevertheless, it has been referenced where appropriate.

2.3 Nationally Significant Infrastructure Projects and Planning Act 2008

2.3.1 The generation capacity of the Power Generation Plant will exceed 50 MWe and will therefore be classified as a NSIP under Section 15 of the Planning Act 2008 (“PA 2008”) (Ref. 2.8). Accordingly, Development Consent will be required in accordance with Section 31 of the PA 2008.

2.3.2 Development Consent for a NSIP may only be granted by a Development Consent Order (“DCO”) through an application under Section 37 of the PA 2008 to the Secretary of State (“SoS”).

2.3.3 If the DCO Application for the Power Generation Plant is accepted by the SoS, it will be examined for a period of up to six months, starting the day after the date of the Preliminary Meeting for the Project. The examination is a predominantly written process led either by a single appointed person or a panel, who will, within three months of the end of the examination, submit a report with their recommendation on the Application to the relevant SoS. The SoS will then have three months from

the receipt of the PINS' report to make a decision on the DCO Application pursuant to the regime established by the PA 2008. The relevant SoS for the Project is the Secretary of State for Business, Energy & Industrial Strategy (BEIS).

2.3.4 Section 104 of the PA 2008 requires the SoS to a make a decision on an application in accordance with relevant NPSs. The relevant NPSs to the Project are discussed in section 2.6 below.

2.4 Wales Act 2017

2.4.1 As part of a wider devolution of powers, the Wales Act 2017 ("WA 2017") (Ref. 2.9) will transfer decision-making powers to the Welsh Government in relation to electricity generating stations up to a capacity of 350MW.

2.4.2 The effect of the WA 2017 will be to devolve the SoS's power under the PA 2008 to grant development consent for all electricity generating stations in Wales insofar as such projects (not including wind powered generating stations) do not exceed a capacity of 350MW, to the Welsh Ministers. The Wales Act 2017 (Commencement No. 4) Regulations 2017 (Ref 2.10) confirmed that the transfer of decision making powers will take effect from 1st April 2019 for new applications made after that date. Applications which have already been accepted by the SoS into examination at that point will continue through the process and be determined by the SoS.

2.4.3 Accordingly, the consenting regime for the Power Generation Plant remains the PA 2008.

2.5 Environment (Wales) Act 2016

2.5.1 The Environment (Wales) Act 2016 (Ref. 2.11) provides legislation to plan and manage Wales' natural resources. The Act aims to position Wales as a low carbon economy ready to adapt to climate change impacts and to deliver significant economic, social and environmental benefits for Wales.

2.5.2 The key parts of the Act relevant to the Project are:

- Part 1: Sustainable management of natural resources – seeks to manage Wales' natural resources in a proactive, sustainable and coordinated manner.
- Part 2: Climate change – provides Welsh Ministers with powers to enforce statutory emission reduction targets, including an 80% reduction in emissions by 2020.
- Part 4: Collection and disposal of waste – seeks to improve waste management processes through increased business waste recycling, better food waste treatment and increased energy recovery.

2.6 Infrastructure Planning (Environmental Impact Assessment) Regulations 2009 and Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

2.6.1 The EIA Regulations (Ref 2.12) require an EIA to be carried out in respect of development that is classed as EIA development. All development in Schedule 1 to

the EIA Regulations (*"Schedule 1 development"*) requires EIA. Development in Schedule 2 to the EIA Regulations ("*Schedule 2 development"*) requires EIA if it is likely to have significant effects on the environment.

2.6.2 The Project has been identified as a Schedule 1 development and therefore the Applicant intends to carry out an EIA for the Project in accordance with the EIA Regulations.

2.6.3 Regulation 5(2)(a) of the Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 (the "APFP Regulations") (Ref. 2.13) requires that any ES required pursuant to the EIA Regulations, together with any scoping or screening opinions or directions, must accompany the application for development consent.

2.6.4 This document presents the environmental information and an assessment, of the likely significant environmental effects of the Project.

2.7 The Well-being of Future Generations (Wales) Act 2015

2.7.1 The Well-being of Future Generations (Wales) Act 2015 (Ref 2.14) seeks to improve the social, economic, environmental and cultural well-being of Wales by undertaking actions in accordance with the *"sustainable development principle"* (section 5) to achieve the well-being goals (section 4).

2.7.2 The "sustainable development principle" requires a public body to "*act in a manner which seeks to ensure that the needs of the present are met without compromising the ability of future generations to meet their own needs*" (section 5 (1)), thereby taking into account (section 5 (2)):

- Balancing short term needs with safeguarding long term needs;
- Taking an integrated approach considering well-being objectives;
- Involving other persons with an interest and reflecting the diversity of the population;
- Acting in collaboration with other persons to meet well-being objectives; and
- Deploying resources to prevent or reduce problems which contribute to well-being objectives.

2.7.3 The well-being goals, comprise the following (Table 1):

- *"A prosperous Wales;"*
- *"A resilient Wales;"*
- *"A healthier Wales;"*
- *"A more equal Wales;"*
- *"A Wales of cohesive communities;"*
- *"A Wales of vibrant culture and thriving Welsh language;"* and
- *"A globally responsible Wales."*

2.7.4 The Wellbeing of Future Generations (Wales) Act is not binding on the Examining Authority (ExA) or SoS. However, it sets out sustainable development principles

and well-being goals which are applicable to public bodies involved in the planning system in Wales. It is therefore relevant to the examination of the DCO Application.

2.8 National Policy Statements

2.8.1 The Department for Energy and Climate Change (DECC) published 6 NPS for Energy in 2011. The NPS which are relevant to the consideration of the DCO application for the Power Generating Plant are:

- *Overarching National Policy Statement for Energy (EN-1) (Ref. 2.15);*
- *National Policy Statement for Fossil Fuel Electricity Generating Infrastructure (EN-2) (Ref. 2.16);*
- *National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4) (Ref. 2.17); and*
- *National Policy Statement for Electricity Networks Infrastructure (EN-5) (Ref. 2.18).*

2.8.2 Section 104 of the PA 2008 provides that in making decisions on applications for development consent, the SoS must have regard (amongst certain other documents and matters) to any relevant NPS to which the application relates and must decide applications in accordance with such relevant NPS(s) unless the adverse impacts of the proposal would outweigh its benefits (or in certain other limited circumstances defined in s104, subsections (4) to (8) of the PA 2008).

2.8.3 NPS EN-1 is a relevant NPS for any energy NSIP, along with the relevant technology specific NPS. For the DCO Application this includes NPS EN-2 National Policy Statement for Fossil Fuel Electricity Generating Infrastructure. NPS EN-4 National Policy Statement for Gas Supply Infrastructure does not directly relate to the Power Generation Plant, since development consent is not sought in the DCO for the Gas Connection, however regard has been had to the NPS and the relevant parts are discussed below. NPS EN-5 does not directly relate to the Power Generation Plant, since development consent is not sought in the DCO for the Electrical Connection, and the design of the Electrical Connection is predominantly underground, however regard has been had to the NPS and the relevant parts are discussed below.

a) Overarching National Policy Statement for Energy (NPS EN-1)

2.8.4 NPS EN-1 (Ref. 2.15) sets out the Government's overall policy towards the delivery of major energy infrastructure.

2.8.5 Paragraph 1.1.1 of NPS EN-1 states that *"…this NPS, when combined with the relevant technology-specific energy NPS, provides the primary basis for decisions…"*. The relevant technology-specific energy NPS for this Application is NPS EN-2. NPS EN-4 and NPS EN-5 do not directly apply as development consent is not sought for the Electricity Connection and Gas Connection, but regard has been had to relevant content in the NPS and they are discussed below. In addition, Paragraph 4.1.5 of NPS EN-1 states that Development Plan Documents or other documents in the Local Development Framework may be both important

and relevant considerations to SoS decision-making. Local planning policy for City & County of Swansea (CCS) relevant to this Application is also set out below.

2.8.6 Paragraph 3.1.3 of NPS EN-1 states that all development consent applications for energy infrastructure should be assessed "*on the basis that the Government has demonstrated that there is a need for those types of infrastructure and that the scale and urgency of that need is as described for each of them in this Part*." Accordingly, the SoS "*should give substantial weight to the contribution which projects would make towards satisfying this need when considering applications for development consent under the Planning Act 2008*" (paragraph 3.1.4).

2.8.7 Section 3.3 of NPS EN-1 sets out the key reasons why the Government believes there is an *"urgent need"* for new electricity NSIPs (paragraph 3.3.1), including:

- *"Meeting energy security and carbon reduction objectives;"*
- *"The need to replace closing electricity generating capacity;"*
- *"The need for more electricity capacity to support an increased supply from renewables;"* and
- *"Future increases in electricity demand."*

2.8.8 Furthermore, paragraph 3.7.3 of NPS EN-1 stresses that new electricity network infrastructure projects add to the *"reliability of the national energy supply*" and provide *"crucial national benefits"* which are shared by all users of the system.

2.8.9 Whilst alternatives to the need for new large scale electricity infrastructure have been considered – including: reducing demand; more intelligent use of electricity; and interconnection of electricity systems – the Government believes that these measures will not be sufficient to meet energy and climate change objectives on their own (paragraph 3.3.25 of NPS EN-1).

2.8.10 Paragraph 3.6.1 of NPS EN-1 recognises the *"vital role"* that fossil fuel power stations play in providing electricity supplies, and states that *"they will continue to play an important role in our energy mix as the UK makes the transition to a low carbon economy."*

2.8.11 Section 4 of NPS EN-1 sets out the general assessment principles by which applications relating to energy infrastructure are to be decided.

2.8.12 Paragraph 4.1.2 of NPS EN-1 states that, given the level and urgency of need for energy infrastructure, the SoS *"should start with a presumption in favour of granting consent to applications for energy NSIPs."*

2.8.13 Paragraph 4.1.3 of NPS EN-1 explains that the SoS will weigh up a proposal's contribution to meeting the need for energy infrastructure, job creation and other long term and wider benefits, against the potential adverse impacts of the proposal in question including, *"any long-term and cumulative adverse impacts, as well as any measures to avoid, reduce or compensate for any adverse impacts."*

2.8.14 Paragraph 4.1.4 of NPS EN-1 continues and explains that the SoS should take into account *"environmental, social and economic benefits and adverse impacts, at*

national, regional and local levels" whether identified in the NPSs or elsewhere, including in local impact reports.

2.8.15 In addition, Paragraph 4.1.5 of NPS EN-1 states that other matters that the SoS may consider both *"important and relevant to its decision-making"* could include Development Plan Documents or other documents in the Local Development Framework and explains that *"in the event of a conflict between these or any other documents and an NPS, the NPS prevails."* The documents included within the Local Development Framework for CCS are referenced below at section 2.9.

2.8.16 Paragraph 4.1.7 of NPS EN-1 confirms that the SoS will have regard to the guidance in Circular 11/95, as revised, on *"The Use of Conditions in Planning Permissions"* in agreeing or suggesting requirements in a DCO. Although that Circular has in part been superseded by advice contained within NPPG (published in March 2014), the Applicant notes that the general advice remains essentially similar.

2.8.17 Paragraph 4.1.8 states that "The [SoS] may take into account any development consent obligations that an applicant agrees with local authorities."

2.8.18 Paragraph 4.1.9 of NPS EN-1 states that viability issues are unlikely to be of relevance to decision making providing that the technical feasibility of the proposal has been properly assessed, but limited exceptions exist and are set out in NPS EN-1 and others.

2.8.19 Paragraph 4.2.1 of NPS EN-1 advises that, "*All proposals for projects that are subject to the European Environmental Impact Assessment Directive must be accompanied by an ES describing the aspects of the environment likely to be significantly affected by the project.*" The Environmental Statement (ES) should include an assessment of the likely significant effects of the proposed project on the environment, including direct, indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects at all stages of the project. Paragraph 4.2.3 of NPS EN-1 adds that "*the ES should cover the environmental, social and economic effects arising from pre-construction, construction, operation and decommissioning of the project*." When considering cumulative effects, Paragraph 4.2.5 of NPS EN-1 advises that the ES should provide information on how the effects of the proposal combine and interact with the effects of other development, including projects for which consent is sought or granted, as well as those already in existence.

2.8.20 Paragraph 4.3.1 of NPS EN-1 advises applicants to consult with the Countryside Council for Wales (CCW) (now Natural Resources Wales (NRW)), in respect of Habitats and Species Regulations, and to subsequently undertake an Appropriate Assessment if required.

2.8.21 Paragraph 4.4.1 of NPS EN-1 notes that "*the relevance or otherwise to the decision-making process of the existence (or alleged existence) of alternatives to the proposed development is in the first instance a matter of law, detailed guidance on which falls outside the scope of this NPS. From a policy perspective NPS EN-1*

does not contain any general requirement to consider alternatives or to establish whether the proposed project represents the best option." However, paragraph 4.4.2 of NPS EN-1 states that applicants are obliged to include, as a matter of fact, information about the main alternatives that have been considered within the ES, including the main reasons for the applicant's choice, taking into account the environmental, social and economic effects.

2.8.22 Paragraph 4.5.1 of NPS EN-1 states that good design for energy infrastructure "*should produce sustainable infrastructure sensitive to place, efficient in the use of natural resources and energy used in their construction and operation, matched by an appearance that demonstrates good aesthetic as far as possible*." However, paragraph 4.5.1 also acknowledges that "*the nature of much energy infrastructure development will often limit the extent to which it can contribute to the enhancement of the quality of the area.*"

2.8.23 Paragraph 4.5.3 of NPS EN-1 seeks that proposals are "*sustainable and, having regard to regulatory and other constraints, are as attractive, durable and adaptable (including taking account of natural hazards such as flooding) as they can be*." Further, Paragraph 4.5.3 states that "*Whilst the applicant may not have any or very limited choice in the physical appearance of some energy infrastructure, there may be opportunities for the applicant to demonstrate good design in terms of siting relative to existing landscape character, landform and vegetation*."

2.8.24 Paragraph 4.5.4 of NPS EN-1 seeks that applicants "*demonstrate in their application documents how the design process was conducted and how the proposed design evolved. Where a number of different designs were considered, applicants should set out the reasons why the favoured choice has been selected.*" Further, paragraph 4.5.4 of NPS EN-1 notes that "*in considering applications the [SoS] should take into account the ultimate purpose of the infrastructure and bear in mind the operational, safety and security requirements which the design has to satisfy*."

2.8.25 Paragraph 4.5.5 of NPS EN-1 states that *"applicants are encouraged"* to use design review services.

2.8.26 Paragraph 4.6.6 of NPS EN-1 states that, "*Under guidelines issued by DECC (then DTI) in 2006, any application to develop a thermal generating station under Section 36 of the Electricity Act 1989 must either include CHP [Combined Heat and Power] or contain evidence that the possibilities for CHP have been fully explored to inform the IPC's consideration of the application*." Further, paragraph 4.6.7 of NPS EN-1 advises that the opportunities for CHP should be considered from the outset of the site selection process.

2.8.27 Section 4.7 of NPS EN-1 explains the considerations to be given to Carbon Capture and Storage and Carbon Capture and explains that all applications for new combustion plant which are of a generating capacity at or over 300MW and of a type covered by the EU's Large Combustion Plant Directive (LCPD) should demonstrate that the plant is *"Carbon Capture Ready"* (CCR).

2.8.28 Section 4.8 of EN-1 sets out considerations that applicants and the ExA/SoS should take into account to help ensure that new energy infrastructure is resilient to climate change. Paragraph 4.8.5 of NPS EN-1 advises that applicants *"must consider the impacts of climate change when planning the location, design, build, operation and, where appropriate, decommissioning of new energy infrastructure."*

2.8.29 Paragraph 4.9.1 of NPS EN-1 advises applicants to consult the National Grid and to ensure that there is the necessary infrastructure and capacity within an existing or planned transmission or distribution network to accommodate the electricity generated.

2.8.30 Paragraph 4.10.1 of NPS EN-1 advises that *"Issues relating to discharges or emissions from a proposed project which affect air quality, water quality, land quality and the marine environment, or which include noise and vibration may be subject to separate regulation under the pollution control framework or other consenting and licensing regimes*."

2.8.31 Paragraph 4.11.1 of NPS EN-1 advises applicants to consult with the Health and Safety Executive (HSE) on *"matters relating to safety"* which are *"relevant to the construction, operation and decommissioning of energy infrastructure"*.

2.8.32 Paragraph 4.12.1 of NPS EN-1 explains that all establishments wishing to hold stock of hazardous substances above a threshold will require Hazardous Substances consent, and thus should consult the HSE at the pre-application stage.

2.8.33 Section 4.13 of NPS EN-1 advises that energy production has the "*potential to impact on health and wellbeing*" (paragraph 4.13.1), through "*increased traffic, air or water pollution, dust, odour, hazardous waste and substances, noise, exposure to radiation and increases in pests*" (paragraph 4.13.3). Accordingly, the ES should assess these effects and identify any *"measures to avoid, reduce or compensate for these impacts as appropriate*" (paragraph 4.13.2).

2.8.34 Paragraph 4.14.2 of NPS EN-1 stresses the importance of considering possible sources of nuisance and how they may be mitigated or limited at the pre-application stage under section 79(1) of the Environmental Protection Act 1990.

2.8.35 Paragraph 4.15.2 of NPS EN-1 outlines that "*Government policy is to ensure that, where possible, proportionate protective security measures are designed into new infrastructure projects at an early stage in the project development*."

2.8.36 Part 5 of NPS EN-1 explains the potential impacts of energy infrastructure, in terms of: "*air quality and emissions"; "biodiversity and ecological conservation"; "civil and military aviation and defence interests"; "coastal change"; "dust, odour, artificial light, smoke, steam and insect infestation"; "flood risk"; "historic environment"; "landscape and visual"; "land use including open space, green infrastructure and Green Belt"; "noise and vibration"; "socio-economic"; "traffic and transport"; "waste management";* and *"water quality and resources".*

2.8.37 Paragraph 5.2.1 of NPS EN-1 advises that the construction, operation and decommissioning of infrastructure development "*can involve emissions to air which could lead to adverse impacts on health, on protected species and habitats, or on the wider countryside*." Paragraph 5.2.7 of NPS EN-1 provides that the applicant should undertake an assessment as part of the ES, describing:

- "*Any significant air emissions, their mitigation and any residual effects distinguishing between the project stages and taking account of any significant emissions from any road traffic generated by the project;*
- *The predicted absolute emission levels of the proposed project, after mitigation methods have been applied;*
- *Existing air quality levels and the relative change in air quality from existing levels;* and
- *Any potential eutrophication impacts*."

2.8.38 With regard to biodiversity and geological conservation for EIA development, paragraph 5.3.3 of NPS EN-1 advises that the ES "*clearly sets out any effects on internationally, nationally and locally designated sites of ecological or geological conservation importance, on protected species and on habitats and other species identified as being of principal importance for the conservation of biodiversity*." Appropriate mitigation measures should be "*an integral part of the proposed development*" and should demonstrate that: activities are confined to the minimum areas required during construction; best practice is followed during construction and operation; habitats are restored after construction works where practicable; and opportunities are taken to enhance or create new habitats (paragraph 5.3.18).

2.8.39 Paragraph 5.4.1 of NPS EN-1 advises that civil and military aviation and defence interests can be affected by new energy development, and as such an assessment of potential effects should be set out within the ES (paragraph 5.4.10). In addition, the Ministry of Defence (MoD), Civil Aviation Authority (CAA), National Air Traffic Services (NATS) and any aerodrome likely to be affected by the proposed development should be consulted (paragraph 5.4.11).

2.8.40 Paragraph 5.6.1 of NPS EN-1 states that "*during the construction, operation and decommissioning of energy infrastructure there is potential for the release of a range of emissions such as odour, dust, steam, smoke, artificial light and infestation of insects*." Accordingly, applicants are required to assess the potential for emissions and the impact on amenity in the ES, in particular: the type, quantity and timing of emissions; aspects giving rise to emissions; locations affected by the emissions; effects of the emissions on identified locations; and measures to be employed in preventing or mitigating emissions (paragraph 5.6.5). Paragraph 5.6.11 advises that mitigation measures may be provided in respect of engineering, lay-out or administration.

2.8.41 Paragraph 5.7.4 of NPS EN-1 states that application for energy projects of 1 ha or greater in Flood Zone 1 and all energy projects in Flood Zones 2 and 3 should be accompanied by a flood risk assessment (FRA). Where necessary, paragraph 5.7.18 of NPS EN-1 advises that flood risk should be mitigated by making

arrangements to manage surface water and the impact of the natural water cycle on people and property.

2.8.42 Paragraph 5.8.1 of NPS EN-1 advises that the construction, operation and decommissioning of energy infrastructure has the potential to result in adverse impacts on the historic environment. Accordingly, the applicant is required to *"provide a description of the significance of the heritage assets affected by the proposed development and the contribution of their setting to that significance"* (paragraph 5.8.8).

2.8.43 Paragraph 5.9.1 of NPS EN-1 acknowledges that the landscape and visual effects of energy projects will vary according to *"the type of development, its location and the landscape setting"*. Paragraphs 5.9.5 – 5.9.7 advise that the applicant should carry out a landscape and visual impact assessment of the effects during construction and operation, including light pollution effects on local amenity and nature conservation. Paragraph 5.9.21 notes that reducing the scale of the project can help to mitigate the landscape and visual impacts, however it is acknowledged that amending the design of proposed energy infrastructure may result in a significant operational constraint and reduction in function.

2.8.44 Paragraph 5.10.1 of NPS EN-1 acknowledges that an energy infrastructure project "*will have direct effects on the existing use of the proposed site and may have indirect effects on the use, or planned use, of land in the vicinity for other types of development*." Accordingly, the applicants should consult the local community (paragraph 5.10.6) and the ES should include an assessment of the impact of the proposed development on existing and proposed land uses near the project. Paragraph 5.10.19 notes that "*there may be little that can be done to mitigate the direct effects*" of the energy project on the existing use of the proposed site; however, the effects may be minimised through the "*application of good design principles, including the layout of the project.*"

2.8.45 Paragraph 5.11.1 of NPS EN-1 states that excessive noise can have wide-ranging impacts on the quality of human life, health, and use and enjoyment of areas, as well as on wildlife and biodiversity (paragraph 5.11.2). Where noise impacts arise, paragraph 5.11.4 states that a noise assessment should be provided, to include: a description of the noise generating aspects of the proposal, identification of noise sensitive areas, the characteristics of the existing noise environment, and a prediction of how the noise environment will change. Mitigation measures may include engineering, layout design, or administrative measures (paragraph 5.11.12).

2.8.46 Paragraph 5.12.1 of NPS EN-1 states that "*The construction, operation and decommissioning of energy infrastructure may have socio-economic impacts at local and regional levels*." Accordingly, an assessment should be undertaken of all relevant socio-economic impacts, which may include: the creation of jobs and training opportunities, the provision of additional local services and improvements to local infrastructure, effects on tourism, the impact of a changing influx of workers during different phases of the project, and cumulative effects (paragraph 5.12.3).

Mitigation measures could include improvements to the visual and environmental experience for visitors and the local community through high quality design (paragraph 5.12.9).

2.8.47 Paragraph 5.13.1 of NPS EN-1 notes that ”The transport of materials, goods and personnel to and from a development during all project phases can have a variety of impacts on the surrounding transport infrastructure and potentially on connecting transport networks.” The applicant should therefore undertake a transport assessment and consult with the Highways Agency and Highways Authority regarding appropriate mitigation (paragraph 5.13.3).

2.8.48 Paragraph 5.14.1 of NPS EN-1 outlines that government policy on hazardous and non-hazardous waste is intended to *“protect human health and the environment by producing less waste and by using it as a resource wherever possible.”* Paragraph 5.14.6 states that the applicant should set out the arrangements proposed for managing waste and include information on the proposed waste recovery and disposal system.

2.8.49 Paragraph 5.15.1 of NPS EN-1 advises that infrastructure development can have adverse effects during the construction, operation and decommissioning phases on the water environment, including groundwater, inland surface water, transitional waters and coastal waters. Accordingly, the applicant should undertake an assessment of *“the existing status of, and impacts of the proposed project on, water quality, water resources and physical characteristics of the water environment as part of the ES”* (paragraph 5.15.2). Paragraphs 5.15.9 and 5.15.10 advise that the impacts on the water environment and local water resources can be mitigated through careful design.

b) National Policy Statement for Fossil fuel Electricity Generating Infrastructure (NPS EN-2)

2.8.50 NPS EN-2 (Ref. 2.16) outlines considerations and factors relating to site selection and design for developers for fossil fuel generating stations. NPS EN-2 also sets out a number of specific impacts that could arise from a fossil fuel generating NSIP and criteria by which they should be assessed.

2.8.51 Paragraph 1.1.1 of NPS EN-2 states “*Fossil fuel generating stations play a vital role in providing reliable electricity supplies and a secure and diverse energy mix as the UK makes the transition to a low carbon economy…”*

2.8.52 Paragraph 1.2.1 of NPS EN-2 states that, NPS EN-2, together with NPS EN-1, provides the primary basis for decisions by the SoS on applications for nationally significant fossil fuel electricity generating stations.

2.8.53 Part 2 of NPS EN-2 provides additional guidance to Part 4 and Part 5 of EN-1 regarding the assessment of impacts specifically associated with fossil fuel generating stations.

2.8.54 Paragraph 2.2.1 of NPS EN-2, "*it is for energy companies to decide which applications to bring forward and the government does not seek to direct applicants to particular sites for fossil fuel generating stations*."

2.8.55 NPS EN-2 notes that "*Fossil fuel generating stations have large land footprints and will therefore only be possible where the applicant is able to acquire a suitably-sized site*" (NPS EN-2, paragraph 2.2.2). It also notes that "*Applicants should locate new fossil fuel generating stations in the vicinity of existing transport routes wherever possible*."

2.8.56 Section 2.3 of NPS EN-2 states that government policy criteria for fossil fuel generation stations relating to – CHP, CCR, Carbon Capture and Storage, climate change adaptation, and *"good design"* – must be met before consent is given.

2.8.57 Section 2.3.13 of NPS EN-2 sets out considerations specifically for fossil fuel generating stations in respect of climate change. NPS EN-2 suggests that as fossil fuel generating stations are likely to be proposed for coastal or estuarine sites, applicants should set out how the proposal would be resilient to: *"coastal changes and increased risk from storm surge; effects of higher temperatures, including higher temperatures of cooling water; and increased risk of drought leading to a lack of available cooling water"* (paragraph 2.3.13).

2.8.58 Paragraph 2.3.16 of NPS EN-2 states that, "*Applicants should demonstrate good design particularly in respect of landscape and visual amenity ...and in the design of the project to mitigate impacts such as noise and vibration, transport impacts and air emissions*."

2.8.59 Section 2.4 of NPS EN-2 contains additional policy for assessing the potential impacts of energy infrastructure projects for fossil fuel generating stations, relating to: *"air emissions; landscape and visual; noise and vibration; release of dust by coal-fired generating stations; residue management for coal-fired generating stations; and water quality and resources"* (paragraph 2.4.1).

2.8.60 Paragraph 2.5.2 of NPS EN-2 acknowledges that CO2 emissions are a *"significant adverse impact of fossil fuel generating stations"*. As such, paragraph 2.5.5 of EN-2 states that an assessment should be carried out at the initial stages of developing proposals, and Paragraph 2.5.8 of EN-2 states that the SoS and NRW (the relevant authority in Wales) should be satisfied that the potential adverse impacts of mitigation measures are assessed.

2.8.61 Paragraph 2.6.2 of NPS EN-2 advises that the main structures of a fossil fuel generating station – including the turbine and boiler halls, exhaust gas stacks, storage facilities, cooling towers, and water processing plant – are large and likely to *"have an impact on the surrounding landscape and visual amenity"*. A landscape and visual impact assessment should therefore be included as part of the ES, and consideration should be given to the design of the plant, the materials to be used, and the visual impact of the stack (paragraphs 2.6.3 and 2.6.4). Paragraph 2.6.5 of EN-2 states that mitigation is to *"minimise impact on visual amenity as far as reasonably practicable"*; however, the visibility of a fossil fuel generating station

should be given limited weight if the SoS is satisfied that the location is appropriate for the project and that it has been designed sensitively (paragraph 2.6.10).

2.8.62 Paragraph 2.7.1 of NPS EN-2 advises that the sources of noise and vibration from fossil fuel generating stations may include the gas and steam turbines and external noise sources such as externally-sited air-cooled condensers. Paragraph 2.7.2 of EN-2 states that the ES should include a noise assessment, and paragraph 2.7.5 of NPS EN-2 states that mitigation should be achieved through *"good design"*, including enclosure of plant and machinery in noise-reducing buildings where possible.

2.8.63 Paragraph 2.10.1 of NPS EN-2 advises that water cooling systems for fossil fuel generating stations may have additional impacts on water quality, abstraction and discharge. Where the project is likely to have an effect on water quality and resources, Paragraph 2.10.2 of EN-2 states that an assessment should be undertaken to *"demonstrate that appropriate measures will be put in place to avoid or minimise adverse impacts of abstraction and discharge of cooling water."*

c) National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4)

2.8.64 NPS EN-4 (Ref. 2.17), together with NPS EN-1, provides the primary basis for decisions by the SoS on applications for gas supply infrastructure and gas and oil pipelines (Paragraph 1.2.1). However, the DCO application does not include Gas Connection apparatus for the Project, so the decision making policies in NPS EN-4 will not be directly applicable. However, section 2.19 addresses gas and oil pipelines and identifies factors that should influence site selection by project promoters. These include noise and vibration, biodiversity, landscape and visual effects, soil and geology and effects on water quality and resources.

2.8.65 **Chapter 5: Alternatives Considered** of this ES includes a description of alternatives considered and route selection for the Gas Connection route. The environmental effects of the Gas Connection are considered within each topic-specific chapter in this ES. Accordingly, NPS EN-4 will be of relevance as a matter that the SoS may consider important and relevant in the context of the routing of the Gas Connection and powers of compulsory acquisition sought, rather than being directly applicable to the Power Generation Plant itself.

2.8.66 Relevant guidance on the assessment of impacts of gas supply infrastructure is summarised below, and regard has been had to this guidance in preparation of this ES.

2.8.67 Part 2 of NPS EN-4 provides additional guidance to Part 4 and Part 5 of EN-1 regarding the assessment of impacts specific to gas supply infrastructure and oil and gas pipelines.

2.8.68 Sections 2.20 – 2.23 of NPS EN-4 set out additional policy for assessing the potential impacts of gas and oil pipelines, relating to: noise and vibration;

biodiversity, landscape and visual; water quality and resources; and soil and geology.

2.8.69 Paragraph 2.20.2 of NPS EN-4 states that there are specific noise and vibration impacts which apply to gas pipelines, including: *"During the pre-construction phase there could be vibration effects from seismic surveys. During construction, tasks may include site clearance, soil movement, ground excavation, tunnelling, trenching, pipe laying and welding, and ground reinstatement. In addition, increased HGV traffic will be generated on local roads for the movement of materials."* The ES should include an assessment of all of the above noise and vibration effects during the pre-construction and construction phases (paragraph 2.20.5).

2.8.70 Paragraph 2.21.1 of NPS EN-4 states that the construction of a pipeline can impact upon "*specific landscape elements within and adjacent to the pipeline route, such as grasslands, field boundaries (hedgerows, hedgebanks, drystone walls, fences), trees, woodlands, and watercourses*." Accordingly, the ES should include "*an assessment of the biodiversity and landscape and visual effects of the proposed route and of the main alternative routes considered*" (paragraph 2.21.3 of EN4). Where it is not possible to restore the landscape to its original state, Paragraph 2.21.3 of EN-4 also states that "*the applicant should set out measures to avoid, mitigate, or employ other landscape measures to compensate for, any adverse effect on the landscape*."

2.8.71 Paragraph 2.22.2 of NPS EN-4 advises that "*constructing pipelines creates corridors of surface clearance and excavation that can potentially affect watercourses, aquifers, water abstraction and discharge points, areas prone to flooding and ecological receptors*." As such, an assessment should be provided in the ES "*where the project is likely to have effects on water resources or water quality,*" for example through impacts on: "*groundwater recharge or on existing surface water or ground abstraction points; associated ecological receptors*," or through: "*siltation or spillages, discharges from maintenance activities or the discharge of disposals such as wastewater or solvents*" (paragraphs 2.22.3 and 2.22.4).

2.8.72 Paragraph 2.23.1 of NPS EN-4 states that *"it will be important for applicants to understand the soil types and the nature of the underlying strata."* Accordingly, applicants should consult with the relevant statutory consultees at an early stage regarding the potential impact of gas pipelines on soil and geology (paragraph 2.23.4). Paragraph 2.23.2 states that applicants should assess the stability of the ground conditions associated with the pipeline route, including considering the options for installing the pipeline.

d) National Policy Statement for Electricity Networks Infrastructure (EN-5)

2.8.73 NPS EN-5 (Ref. 2.18), together with NPS EN-1, provides the primary basis for decisions by the SoS on applications for electricity networks infrastructure. However, the DCO application does not include Electrical Connection apparatus for the Project, and the connection will be by underground cable, so the decision

making policies in NPS EN-5 will not be directly applicable. Relevant guidance on the assessment of impacts underground electrical connections is summarised below, and regard has been had to this guidance in preparation of this ES.

2.8.74 Part 2 of NPS EN-5 provides additional guidance to Part 4 and Part 5 of EN-1 regarding the assessment of impacts specific to electricity networks infrastructure

2.8.75 Paragraph 2.8.9 of NPS EN-5 notes, "*The impacts and costs of both overhead and underground options vary considerably between individual projects (both in absolute and relative terms). Therefore, each project should be assessed individually on the basis of its specific circumstances and taking account of the fact that Government has not laid down any general rule about when an overhead line should be considered unacceptable.*"

2.8.76 Paragraph 2.10.1 of NPS EN-5 advises that "*power frequency Electric and Magnetic Fields (EMFs) arise from generation, transmission, distribution and use of electricity and will occur around power lines and electric cables...*" Paragraph 2.10.15 of EN-5 states that in order to mitigate for EMFs, the applicant should consider: height, position, insulation and protection measures; optimal phasing of high voltage overhead power lines where possible and practicable; and any new Government advice.

2.9 Other Government Policy

2.9.1 The NPSs have been informed by and followed by other government policy and evidence as to the need for viable proposals to contribute towards greater reliability of electricity supply in the UK.

2.9.2 To ensure that there is reliability of supply, it is Government policy that the electricity generation mix needs to incorporate a balance of technologies that continuously and reliably produce stable and controllable power and that within this scenario, gas-fuelled electricity generating technologies can play a significant role. In the Annual Energy Statement (AES) (latest version published October 2014) (Ref. 2.19), DECC (now BEIS) supported the role of gas in the energy sector and directed the need to build new power generation infrastructure.

2.9.3 The AES identifies the need to retain sufficient power generation capacity following the rapid closure of existing capacity, and acknowledges the role of gas in the energy sector. The Statement also sets out the Government's long-term direction for reducing energy demand and safeguarding energy security, by increasing the proportion of energy from renewable and low carbon sources.

2.9.4 The Welsh Government policy statement, *"A Low Carbon Revolution: Wales' Energy Policy Statement, March 2010"* (Ref. 2.20), reflects, in terms of energy production, the work of the UK Climate Change Commission and the UK National Policy Statements on Energy and Renewables. The statement sets out a framework for carbon reduction in Wales, provides targets and advice to local planning authorities (LPAs) for implementation of policy into Local Development Plans (LDPs). In particular it aims to maximise energy savings and energy

efficiency to make producing the majority of the energy that Wales needs from low carbon sources that are feasible and less costly. The statement recognises energy needs in a modern society will remain considerable.

2.9.5 The "*Electricity Market Reform White Paper – Planning our electric future: a White Paper for secure, affordable and low-carbon electricity*" (DECC, 2011) (Ref. 2.21) "*sets out the Government's commitment to transform the UK's electricity system to ensure that our future electricity supply is secure, low-carbon and affordable*." A key part of this wide ranging reform is the introduction of a "Capacity Mechanism" in order "*to guarantee future security of electricity supply as a quarter of ageing plant closes during this decade and the proportion of intermittent or less flexible low-carbon generation rises*" (paragraph 1.35).

2.9.6 The White Paper sets out, at page 24, a vision for the Electricity System following reform, in which it is stated "*The electricity grid has evolved to accommodate more localised and intermittent sources of generation, as well as being smarter and more responsive*." A significant focus of the White Paper is to decarbonise electricity generation in the long term, although it is acknowledged at paragraph 2.4.23 that "*we are going to need new, unabated gas in the next few years*."

2.9.7 *"The Carbon Plan - delivering our low carbon future"* (HM Government, 2011) (Ref. 2.22) sets out the Coalition Government's policies for how the UK will achieve decarbonisation within the framework of its energy policy; making the transition to low carbon economy while maintaining energy security, and minimising costs to customers. Paragraph 2.146 of the Plan recognises that the nature of the electricity network will need to change so that it becomes smarter at balancing demand and supply as generation/supply become more intermittent and demand increases. In light of this the Plan states that on the way to 2050, some flexible fossil fuel plant is likely to be needed to ensure security of supply. Paragraph 2.147 states that over the next decade, the UK will need to invest in new generation capacity to replace the coal and nuclear power stations that are set to close by the early 2020s in order to maintain our energy security, while meeting our legal commitments to reduce carbon emissions and increase renewable electricity generation. Paragraph 2.148 goes on to outline that to do this, the coming years will see a continuation of previous trends, which will include more switching from coal to gas-powered generation. Thus the Carbon Plan reinforces the position set out in the White Paper and acknowledges that to meet our energy security needs and make the transition to a low carbon economy, gas will continue to play a valuable role.

2.9.8 "*Energy Wales – a Low Carbon Transition*" (Welsh Government, March 2012) (Ref. 2.23) states, at page 10, that "*Gas will be a key transitional fuel because greenhouse gas emissions from gas are significantly less than coal subject to the method of extraction. Gas is a flexible, responsive and reliable source of energy which can play a key role in the transition to a genuinely low carbon energy system*". In the short term, gas, nuclear and bio-energy will provide the energy to compensate for the intermittency in supply from renewable resources.

2.9.9 *"Electricity System: Assessment of Future Challenges – Annex"* (DECC, August 2012) (Ref. 2.24) seeks to fully understand the implications of the challenges posed by moving to an energy mix with a greater proportion of intermittent and less flexible generation and identify means of addressing them. The overall aim is to ensure that the electricity system can facilitate future low carbon generation and expected increases in electricity demand in the most secure and affordable way, with the most efficient use of assets. Again, there is acknowledgement of the continued role for unabated gas fired generating plant. Paragraph 3.8 states that over the next two decades, gas will continue to play a key role in the UK's energy mix alongside other lower carbon electricity sources. The paragraph goes on to state that new gas generation capacity will be needed to ensure security of supply, and to balance the electricity system as more low carbon technology becomes available.

2.9.10 The *"Electricity Capacity Report"* (ECR) (National Grid, May 2017) (Ref. 2.25) summarises the modelling analysis undertaken regarding the amount of capacity to be secured for delivery in 2018/19 and 2021/22. The report states that there is expected to be an increase in capacity requirements for 2018/19, compared to the 2014 ECR, and for 2021/22, when compared to the 2016 ECR, based on a higher assumed peak demand.

2.9.11 The *"Gas Generation Strategy"* (DECC, December 2012) (Ref. 2.26) consolidates the range of government policy as set out above in setting out the important role for gas generation. It is stated that as a reliable, flexible source of electricity it will play a part in any future generation mix, supporting a secure, low-carbon and affordable electricity system. It states that *"Gas currently forms an integral part of the UK's generation mix and is a reliable, flexible source of electricity. Using gas as a fuel in our power stations currently provides a significant proportion of our electricity generation (around 40% in 2011)"* (Executive Summary). Moreover, it suggests that there could be as much as 26 gigawatts (GW) of new gas generation infrastructure required if the decarbonisation target is set at 200 g/CO2/kWh. It also indicates that in 2030 we could need more overall gas capacity than we have today, although operating at lower load factors, reflecting the role of 'peaking' plant in backing up intermittent sources of energy generation. *"The modelling shows that gas could play a more extensive role, with higher load factors, should the 4th Carbon Budget be revised upwards"* (Executive Summary). The strategy also presents scenarios at Table 2B on page 22 which indicate that up to 41 GW of new gas generation capacity will be needed by 2030 to underpin long term electricity supplies and provide back-up to nuclear and wind generation at times of peak demand.

2.9.12 The 2014 National Infrastructure Plan (HM Treasury, December 2014) (Ref. 2.27) provides explicit support for this type of project, stating: *"New gas plant is also needed and will be vital in supplying a backup for less flexible renewable generation and ensuring that the system can meet peak electricity demand"* (Paragraph 8.4). Paragraph 8.3 adds that, *"Large-scale investment in gas and low-carbon electricity generation is vital in order to replace ageing energy infrastructure, maintain secure energy supplies and meet legally-binding environmental targets."*

2.9.13 In October 2016, The Energy and Climate Change Committee published *"The energy revolution and future challenges for UK energy and climate change policy — Third Report of Session 2016–17"* (Ref 2.28). The report reflects on upcoming challenges for UK energy and climate policy. For energy supply it states that *"The Government should seek to build investor confidence, to avoid exacerbating difficulties in bringing forward investment in new electricity capacity and new indigenous resources. The Government should also examine the role of the 'solidarity principle' in managing potential gas crises, specifically how the UK can continue to participate. If excluded from the 'solidarity principle' the UK Government must urgently investigate alternative back-up arrangements to ensure security of supply in the event of a crisis"* (Paragraph 111).

2.9.14 The "*Final Report of the Industrial Strategy Commission*" (Industrial Strategy Commission, November 2017) (Ref 2.29) reinforces that *"the availability of a secure and reliable energy supply is a central concern"* and emphasises that there is a *"pressing need"* to decarbonise energy supplies due to the impacts of climate change (page 58).

2.10 Welsh Planning Policy

2.10.1 Section 104 of the PA 2008 requires the SoS to have regard to any Local Impact Report and other matters which the SoS *"thinks are both important and relevant to the Secretary of State's decision"*, which may include Planning Policy Wales (PPW), Technical Advice Notes (TANs), The Wales Spatial Plan, Unitary Development Plans (UDPs), (LDPs) or other local policy documents in Wales as set out below.

a) Planning Policy Wales (Edition 9, November 2016) (PPW) and associated Technical Advice Notes (TAN)

2.10.2 PPW (Ref. 2.30) sets out the land use planning policies of the Welsh Government and is supplemented by 24 topic-based TANs. TANs prescribe the government's policies on various planning issues that shape the preparation of development plans. The principles and objectives of TANs prescribe the overarching national guidance for specific individual environmental topics. TANs relevant to the Project include:

- TAN 5: Nature Conservation and Planning (2009) (Ref 2.31);
- TAN 6: Planning for Sustainable Rural Communities (2010) (Ref 2.32);
- TAN 11: Noise (1997) (Ref 2.33);
- TAN 12: Design (2016) (Ref 2.34);
- TAN 15: Development and Flood Risk (2004) (Ref 2.35);
- TAN 18: Transport (2007) (Ref 2.36);
- TAN 20: Planning and the Welsh Language (2017) (Ref 2.37)
- TAN 21: Waste (2014) (Ref 2.38); and
- TAN 23: Economic Development (2014) (Ref 2.39).

2.10.3 Both the PPW and TANs may be considered to be relevant and important under the PA 2008 regime. The provisions of the PPW and TANs which are of potential relevance to the Project are set out below.

2.10.4 PPW Chapter 4, *"Planning for Sustainability"*, sets out the principles and objectives underpinning the Welsh Government's approach to planning policy for sustainable development.

2.10.5 The definition of sustainable development in Wales is given in Chapter 4 as: "the process of improving the economic, social, environmental and cultural well-being of Wales by taking action, in accordance with the sustainable development principle, aimed at achieving the well-being goals." (PPW Figure 4.2).

2.10.6 PPW Paragraph 4.2.2 highlights that "the planning system provides for a presumption in favour of sustainable development to ensure that social, economic and environmental issues are balanced and integrated".

2.10.7 PPW Section 4.4 outlines the objectives for the planning system which reflect the Welsh Government's view for sustainable development and the outcomes they seek to deliver across Wales. A summary of the relevant objectives (paragraph 4.4.3) is listed below:

- *"Promote resource-efficient and climate change resilient settlement patterns…;"*
- *"Play an appropriate role in securing the provision of infrastructure to form the physical basis for sustainable communities"* (including energy supplies and distribution networks);
- *"Encourage opportunities to reduce waste and all forms of pollution and promote good environmental management and best environmental practice;"*
- *"Promote a low carbon economy and social enterprises;"*
- *"Support initiative and innovation and avoid placing unnecessary burdens on enterprises…so as to enhance the economic success of both urban and rural areas…;"*
- *"Contribute to the protection and improvement of the environment, so as to improve the quality of life, and protect local and global ecosystems;"*
- *"Minimise the risks posed by, or to, development on or adjacent to unstable or contaminated land and land liable to flooding;"*
- *"Promote quality, lasting, environmentally-sound and flexible employment opportunities;"*
- *"Contribute to the protection and, where possible, the improvement of people's health and wellbeing as a core component of sustainable development and responding to climate change;"*
- *"Promote access to employment, shopping, education, health, community, leisure and sports facilities and open and green space, maximising opportunities for community development and social welfare;"*
- *"Respect and encourage diversity in the local economy;"*
- *"Foster improvements to transport facilities and services which maintain or improve accessibility to services and facilities, secure employment, economic and environmental objectives, and improve safety and amenity;"*

- *"Foster social inclusion by ensuring that full advantage is taken of the opportunities to secure a more accessible environment for everyone that the development of land and buildings provides;"* and
- *Support the need to tackle the causes of climate change by moving towards a low carbon economy."*

2.10.8 PPW Chapter 4 is supplemented by TAN 6 *"Planning for Sustainable Rural Communities"* (2010) (Ref 2.32), which provides practical guidance on how the planning system can contribute to: sustainable rural economies; sustainable rural housing; sustainable rural services and sustainable agriculture. TAN 6 recognises that *"strong rural economies are essential to support sustainable and vibrant rural communities"* (paragraph 3.1.1) and supports the *"diversification of the rural economy by accommodating the needs of both traditional rural industries and new enterprises, whilst minimising impacts on the local community and the environment"* (paragraph 3.1.2).

2.10.9 TAN 12, *"Design,"* (2016) (Ref. 2.34) should also be considered in conjunction with Chapter 4 of PPW. This TAN sets out the objectives of good design and aims to encourage good design in all aspects of development, stating that: *"The way in which development relates to its urban or rural landscape context or seascape context is critical to its success"* (paragraph 5.5.1). *"The aim should be to achieve good design solutions, which maximise the natural landscape assets and minimise environmental impact on the landscape. It is particularly important that proposals to amend or create new landscape are not considered as an afterthought and that the long term impact of development on the landscape is fully understood"* (paragraph 5.5.2).

2.10.10 TAN 18, *"Transport,"* (2007) (Ref. 2.36) provides guidance on issues relating to sustainable development through transport, so represents a further supplementary document to Chapter 4. TAN 18 describes how to integrate land use and transport planning and explains how transport impacts should be assessed and mitigated.

2.10.11 PPW Chapter 5, *"Conserving and Improving Natural Heritage and the Coast,"* sets out the Welsh Government's overarching advice on the conservation of biodiversity and the coast in a planning context. The chapter sets out objectives for conservation that should be delivered via the planning process. It includes guidance on integrating the requirements of development and conservation, and highlights existing measures for biodiversity conservation (legislation and policy) in Wales.

2.10.12 The approach to conservation delivered through PPW is similar to the general principles contained within NPS EN-1 which states that development should aim to avoid significant harm to biodiversity and geological conservation interests through mitigation and consideration of reasonable alternatives. Paragraph 5.3.6 of NPS EN-1 does however suggest that *"the benefits of nationally significant low carbon energy infrastructure development may include benefits for biodiversity and geological conservation interests and these benefits may outweigh harm to these interests"*.

2.10.13 PPW Chapter 5 is supplemented by TAN 5 *"Nature Conservation and Planning"* (2009) (Ref. 2.31), which is concerned with the protection of statutorily designated site and habitats, the conservation of protected and priority species; and protecting and enhancing biodiversity and nature conservation in the wider countryside within Wales.

2.10.14 PPW Chapter 7, *"Economic Development,"* refers to the Welsh Government definition of economic development as development of land and buildings for activities that generate wealth, jobs and incomes (paragraph 7.1.1). This paragraph also notes that the *"construction and energy sectors are important to the economy and sensitive to planning policies"*.

2.10.15 It is likely to be relevant to consider the provisions of the NPSs in light of the Welsh Government's definition of economic development. In paragraph 2.1.2 of NPS EN-1 it states that *"energy is vital to economic prosperity and social well-being"* and as such, it is important to ensure that the UK has secure and affordable energy and the infrastructure in place to deliver this. Section 5.12 of the NPS outlines that the applicant should assess socio-economic impacts of proposals, which will include giving due consideration to the creation of jobs and training opportunities.

2.10.16 TAN 23, *"Economic Development"* (2014) (Ref. 2.39), provides additional interpretation to chapter 7. PPW chapter 7 states that the planning system should support economic and employment growth alongside social and environmental considerations within the context of sustainable development (paragraph 7.1.3). TAN 23 contains the concept of *"larger than local planning"*, which advises that market forces do not respect local authority boundaries and therefore the planning system should ensure that it steers development to the most efficient and sustainable locations. This means that strategic planning for economic development is essential. Paragraph 2.1.1 addresses the need to weigh economic benefits and states that *"it should not be assumed that economic objectives are necessarily in conflict with social and environmental objectives"*. The TAN advises that the planning system should positively and imaginatively seek win-win outcomes (paragraph 2.1.1).

2.10.17 PPW Chapter 12, "*Infrastructure and Services,*" emphasises the importance of infrastructure projects to Wales: "*Adequate and efficient infrastructure, including services such as education and health facilities along with water supply, sewers, waste management, electricity and gas (the utilities) and telecommunications, is crucial for the economic, social and environmental sustainability of all parts of Wales*" (paragraph 12.1.1).

2.10.18 The Welsh Government aims to secure the environmental and telecommunications infrastructure necessary to meet sustainable development objectives, which are listed in paragraph 12.1.4 of PPW. The objectives considered to be relevant for the purposes of this project are listed as follows:

- *"To promote the generation and use of energy from renewable and low carbon energy sources at all scales and promote energy efficiency, especially as a*

means to secure zero or low carbon developments and to tackle the causes of climate change;"

- *"To promote an integrated approach to the provision and renewal of environmental and telecommunications infrastructure;"*
- *"To ensure that environmental and telecommunications infrastructure is provided in such a way as to enable sustainable development objectives to be met, avoiding adverse impacts on the environment (including the natural and historic environment), local communities and health;"*
- *"To ensure that in considering environmental and telecommunications infrastructure account is taken of the impacts of climate change in the location, design, build, operation and, where appropriate, the decommissioning of new infrastructure (see 4.5 [of PPW6]);"* and
- *"To ensure that the vulnerability of infrastructure to severe weather events is minimised and that infrastructure is designed to cope with higher average temperatures and increasing risk of storm surges, drought and flooding."*

2.10.19 Section 12.8.6 of PPW outlines that it is the Welsh government's aim to, "secure an appropriate mix of energy provision for Wales which maximises benefits to our economy and communities, whilst minimising potential environmental and social impacts. This forms part of the Welsh Government's aim to secure the strongest economic development policies to underpin growth and prosperity in Wales recognising the importance of clean energy and the efficient use of natural resources, both as an economic driver and a commitment to sustainable development."

2.10.20 For the purposes of planning policy, 12.8.7 of PPW defines *"low carbon energy"* as the term used to cover technologies that are energy efficient (but does not include nuclear). Figure 12.2 sets out the scales of development, for planning purposes, for low carbon and renewable energy projects. It acknowledges that an energy project is deemed to be *"strategic"* when it exceeds a threshold of 50MW for all technologies other than onshore wind. Additionally the PPW recognises the role of the SoS in deciding onshore projects of an installation size of over 50 MW.

2.10.21 PPW Chapter 13, *"Minimising and Managing Environmental Risks and Pollution,"* is concerned with maximising environmental protection for people, natural and cultural resources, property and infrastructure; and preventing or managing pollution and promoting good environmental practice (paragraph 13.1.2).

2.10.22 Chapter 13 is supplemented by TAN 15, *"Development and Flood Risk"* (2004) (Ref. 2.35), which provides a precautionary framework to guide planning decisions within which risks arising from both river and coastal flooding, and from additional run-off from development in any location, can be assessed.

2.10.23 PPW Chapter 13 is also supplemented by TAN 11, "*Noise*" (1997) (Ref. 2.33), which provides advice on "*how the planning system can be used to minimise the adverse impact of noise without placing unreasonable restrictions on development or adding unduly to the costs and administrative burdens of business*". It outlines some of the main considerations which LPAs should take into account in

determining planning applications for development which will either generate noise or be exposed to existing noise sources.

2.10.24 PPW Chapter 14 sets out land use planning policy guidance in relation to mineral extraction and related development in Wales, which includes all minerals and substances in, on or under land extracted either by underground or surface working. The key principles are:

- *"To provide for an adequate supply of minerals that society needs now and in the future, together with protecting and improving amenity;*
- *To protect things that are highly cherished for their intrinsic qualities, such as wildlife, landscapes and historic features; and to protect human health and safety by ensuring that environmental impacts caused by mineral extraction and transportation are within acceptable limits; and to secure, without compromise, restoration and aftercare to provide for appropriate and beneficial after-use;*
- *To help conserve non-renewable resources for future generations through efficient use, recycling and waste prevention; to protect renewable resources from serious harm or pollution; and to promote the use of appropriate alternative materials;* and
- *To ensure an adequate supply of minerals that are needed at prices that are reasonable; and to safeguard mineral resources for future generations."*

2.10.25 TAN 20, *"Planning and the Welsh Language"* (2017) (Ref. 2.37), provides guidance on how the Welsh language may be given appropriate consideration in the planning system, particularly in respect of LDPs, development management and signs and advertisements. Paragraph 3.1.1 notes that, *"Planning decisions should be concerned with the use of land rather than the identity or personal characteristics of the user."* The appropriate use of the Welsh language has been considered throughout pre-application consultation and in the preparation of the DCO Application.

2.10.26 TAN 21, *"Waste"* (2014) (Ref. 2.38), advises on the role of land use planning in the management and control of waste. Guidance is based on the principles of the waste hierarchy, which seeks to prevent waste in the first instance, or alternatively re-use or recycle waste. The principles in TAN 21 have been applied in consideration of waste issues for the Project.

b) Minerals Technical Advice Notes

2.10.27 Minerals planning policy set out in PPW is supplemented by topic-based Minerals Technical Advice Notes (MTANs).

2.10.28 Two MTANs have been produced, one concerning aggregates (MTAN 1, March 2004) (Ref. 2.40) and the other concerning coal (MTAN 2, 2009) (Ref 2.41).

2.10.29 They set out detailed advice on the mechanisms for delivering the policy for coal extraction, through surface and underground working, by mineral planning authorities and the coal mining industry and may be material in the determination of applications under the Town & Country Planning Act 1990 ("TCPA 1990").

2.10.30 The Project Site is located on land identified within local planning policy with coal and sand and aggregate resources (section 2.10) and therefore the two MTANs may, potentially be considered relevant in relation to NSIP applications under the PA 2008, in interpreting land use criteria contained in the relevant NPS.

c) Wales Spatial Plan

2.10.31 The Wales Spatial Plan (Ref 2.42) was adopted by the Welsh Government in 2004 and updated in 2008.

2.10.32 The purpose of the Wales Spatial Plan is "*to ensure that what is done in the public, private and third sectors in Wales is integrated and sustainable, and that actions within an area support each other and jointly move towards a shared vision for Wales and for the different parts of Wales*" (paragraph 1.5). The Plan identifies six sub-regions in Wales but does not define these Spatial Plan Areas by administrative boundaries, allowing partners to work together on common issues in a flexible way. The Spatial Plan area which the Project Site falls under is "*Swansea Bay – Waterfront and Western Valleys".*

2.10.33 Chapter 11 recognises that the economy in Wales has a spatial dimension. Paragraph 11.1 recognises that while some areas adjoining the English border have economic performance characteristics fairly similar to the UK average, the more western areas and the former coal-mining areas lag behind.

2.10.34 Paragraph 11.6 states the need to take a joint approach with local authorities, travel consortia, and others to tackling regional infrastructure problems on issues of housing, transport, water, sewerage, energy, waste and information and communications technology (ICT).

d) Environment Strategy for Wales (2006)

2.10.35 The Environment Strategy for Wales (Ref 2.43) was published in 2006 and outlines the Welsh Government's long term strategy for the environment of Wales over the next 20 years. The purpose of the Strategy is to provide a framework within which to *"achieve an environment which is clean, healthy, biologically diverse and valued by the people of Wales"*, such that by 2026, the Welsh environment is *"thriving and contributing to the economic and social well-being and health of all of the people of Wales"* (page 3).

2.10.36 The Environment Strategy has 5 main environmental issues: addressing climate change; sustainable resource use; distinctive biodiversity, landscapes and seascapes; the local environment; and environmental hazards. For each of the environmental themes, the Strategy explains the issues, proposed outcomes and associated indicators and timelines for delivery.

2.10.37 The Environment Strategy is currently being reviewed by the Welsh Government to ensure that it reflects the relevant commitments in the Natural Resource Management Programme.

e) Noise Action Plan for Wales 2013 – 2018

2.10.38 The Noise Action Plan (Ref 2.44), produced by the Welsh Government, describes how and why environmental noise is managed across Wales and includes a chapter devoted to noise management in the built up area of Swansea and Neath Port Talbot. It includes the identification of Quiet Areas and Priority Areas. The Project Site does not lie within or in the vicinity of the designated areas, however the general principles of the Noise Action Plan may be of relevance.

2.11 Local Planning Policy

2.11.1 In deciding an application under the PA 2008, the SoS must have regard to the NPSs and *"any other matters which the Secretary of State thinks are both important and relevant to the Secretary of State's decision*" (Section 104(2)(d) of the PA 2008). Local planning policy guidance on land use and environmental protection may be considered by the Secretary of State to be a relevant and important matter to which regard should be had in the decision making for the Power Generating Plant.

2.11.2 The relevant development plan for the Project Site is the CCS UDP which is considered further below.

2.11.3 In addition, draft and supplementary local planning policy, referred to below, are material considerations under the TCPA 1990 regime and may also be *"important and relevant"* (Section 104(2)(d) of the PA 2008) to the determination of the DCO Application.

a) Development Plan

2.11.4 The CCS UDP (Ref 2.45) was adopted in November 2008 and comprises the UDP Proposals Map and UDP Written Statement. The UDP is the key development plan document for the area which provides a range of policies and proposals relating to future development within CCS up to 2016.

i. CCS UDP 2008 Proposals Map and site-specific policies

2.11.5 As shown on the UDP Proposals Map (Figures 2-1 and 2-2), the Project Site is located on land identified as *"Coal"* and *"Sand and Aggregates"*, where UDP Policies R2 and R4 respectively apply. Policy R2 states that development proposals that would affect the working of known potential resources will have to be accompanied by a full assessment of the potential resource and the impact of the proposal in terms of sterilising the resource. Similarly, Policy R4 states that development proposals that would affect the working of known potential mineral resources will have to be accompanied by a full assessment of the potential mineral resource and the impact of the proposal in terms of sterilising the resource.

2.11.6 The Project Site is also located adjacent to the south of a Hazardous Installation Consultation Zone and approximately 200 m to the north of a Notified High Pressure Mains Buffer where UDP Policy EV41 applies. Policy EV41 states that

development of land in the vicinity of existing hazardous installations will not be permitted if there would be a significant risk to life or health.

2.11.7 Approximately 300 m to the east of the Project Site, and therefore not affected by the Project, is land identified as having known potential for *"Crushed Rock"* mineral resources, where UDP Policy R5 applies. Policy R5 states that development proposals that would affect the working of known potential mineral resources will have to be accompanied by a full assessment of the potential mineral resource and the impact of the proposal in terms of sterilising the resource.

Figure 2.1 Extract from UDP Proposals Map (Map 2: Urban Area East)

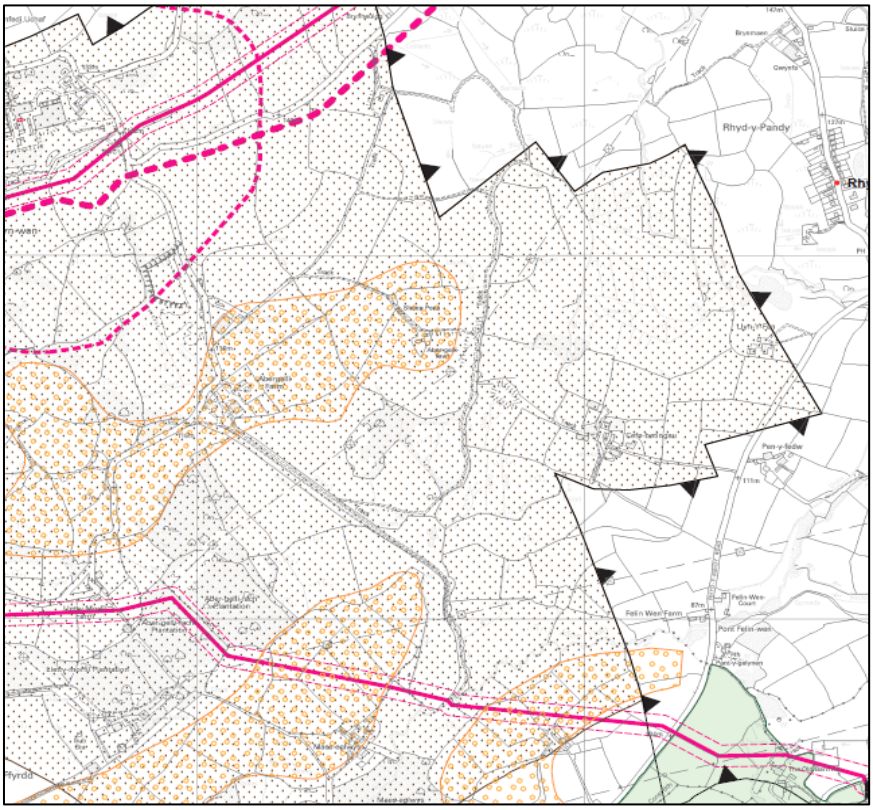
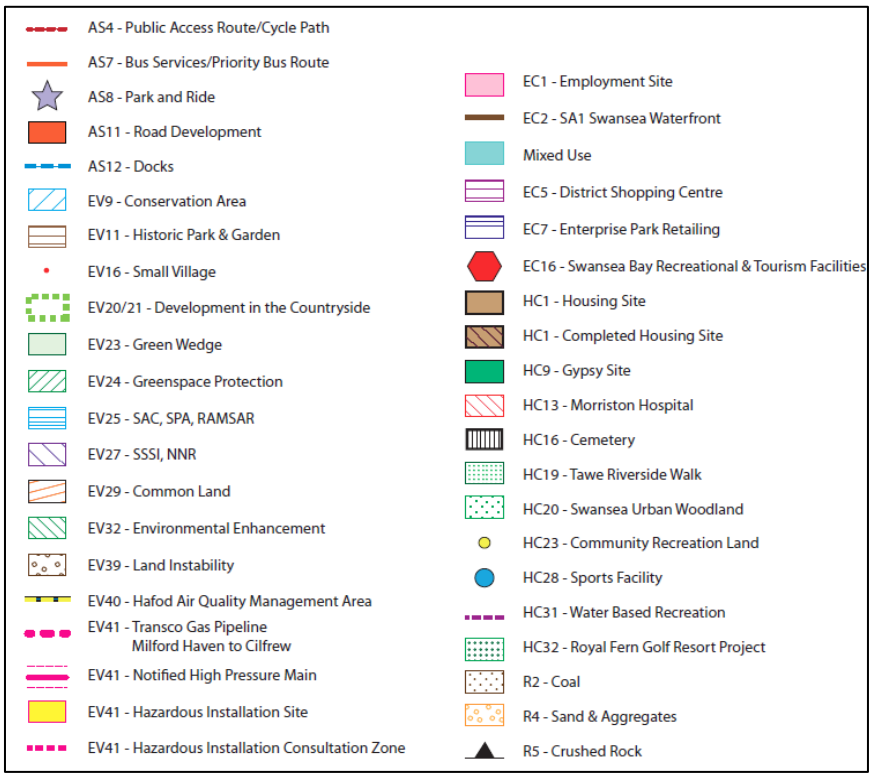


Figure 2.2 Extract from UDP Proposals Map (Key)



ii. CCS UDP 2008 Written Statement

2.11.8 The UDP Written Statement sets out the broad vision and strategy for development and conservation together with more detailed policies and development proposals.

In addition to the site-specific policies set out above, the following UDP policies are also considered to be relevant.

2.11.9 Strategic Policy SP1 states that "*sustainable development will be pursued as an integral principle of the planning and development process.*"

2.11.10 Strategic Policy SP2 states that "*the countryside will be protected and conserved…*"

2.11.11 Strategic Policy SP3 states that the natural, built, and cultural heritage of the County will be protected and enhanced to safeguard from materially harmful development.

2.11.12 Strategic Policy SP11 states that "*the upgrading of infrastructure provision and the generation of energy from renewable resources to meet the needs of existing and new development will be favoured, provided that environmental impact is kept to a minimum*".

2.11.13 Strategic Policy SP12 states that the Council will encourage development that *"makes efficient use of resources and energy"*.

2.11.14 Policy EV1 states that new development should accord with a number of objectives of *"good design,"* including:

i. "*Be appropriate to its local context in terms of scale, height, massing, elevational treatment, materials and detailing, layout, form, mix and density;"*
ii. *"Integrate effectively with adjacent spaces and the public realm;"*
iii. *"Not result in a significant detrimental impact on local amenity in terms of visual impact, loss of light or privacy, disturbance and traffic movements;"*
iv. *"Incorporate a good standard of landscape design;"*
v. *"Sensitively relate to existing development patterns and seek to protect natural heritage, the historic and cultural environment not only on-site, but in terms of potential impact on neighbouring areas of importance;"*
vi. *"Promote resource efficient and adaptable buildings and layouts using sustainable design and construction techniques, including the re-use and recycling of construction and demolition waste on site, and energy and water efficiency measures;" and*
vii. *"Provide a safe environment by addressing issues of security…"*

2.11.15 Policy EV2 states that new development should have regard to the physical character and topography of the site and its surroundings by:

i. *"Avoiding locations that would have a significant adverse impact on prominent buildings, landscapes, open spaces and the general including loss of visual amenity,*
ii. *Effectively integrating with the landscape, seascape or coastline by utilising topography to integrate into the contours of the site and avoiding conspicuous locations on prominent skylines and ridges,*
iii. *Retaining important views into and out of the site,*

iv. *Taking into account and where possible retaining site features including existing buildings, topography, landscape, archaeological and water features, trees and hedgerows, and, where appropriate:*
v. *Undertaking, at the earliest opportunity, an assessment of species and habitats on site and, where planning permission is granted, implementing any necessary mitigation measures,*
vi. *Avoiding detrimental effects on the historic environment,*
vii. *Locating near transport nodes to encourage an integrated transport system,*
viii. *Not prejudicing the viability and function of any agricultural land adjoining the site,*
ix. *Determining whether the proposal would be at risk from flooding, increase flood risk off-site, or create additional water run-off, development for infrastructure and services,*
x. *Having due regard to the implications of the development for infrastructure and services,*
xi. *Integrating with existing community facilities,*
xii. *Utilising landscape and topography to maximise energy efficiency,*
xiii. *Having full regard to existing adjacent developments and the possible impact of environmental pollution from those developments, as well as the creation of any environmental pollution to the detriment of neighbouring occupiers (including light, air and noise),*
xiv. *Identifying the location of any hazardous installations in the area and development that would be at risk from, or prejudice the operational use of, hazardous installations,*
xv. *Identifying and fully addressing issues of contamination and land instability."*

2.11.16 Policy EV3 states that proposals for new development will be required to, inter alia, *"provide access and facilities for all"* and *"contribute to a high quality public realm"*.

2.11.17 Policy EV6 states that the Council will seek to *"protect, preserve and enhance"* unscheduled archaeological site and monuments and their settings. Where proposals affect sites and areas of archaeological potential, applicants are required to undertake an assessment of the impact of development and set out measures to preserve, enhance and record features of archaeological interest.

2.11.18 Policy EV12 states that "*the character of lanes and public paths that contribute to the amenity, natural and historic qualities of an area will be protected…In rural areas the design of any necessary works should be appropriate to the character of the area and should not detract from the landscape or suburbanise the area*."

2.11.19 Policy EV21 states that non-residential development in the countryside will only be permitted where it can be demonstrated that:

i. *"It is beneficial for the rural economy or rural employment, or*
ii. *It meets the overriding social or economic needs of the local community, or*
iii. *It is an appropriate development associated with farm diversification, sustainable tourism and recreation, or nature conservation and does not adversely affect the viability of an established farm unit, or*
iv. *It provides an acceptable economic use for previously developed land or existing building(s) in accordance with Policy EC12 [which concerns the conversion and re-use of existing rural buildings], or*

v. *It is essential for communications, telecommunications, other forms of utility service provision, minerals or renewable energy generation."*

2.11.20 Policy EV22 states that the countryside will be "*conserved and enhanced for the sake of its natural heritage, natural resources, historic and cultural, environment and agricultural and recreational value*" through the control of development and practical management and improvement measures.

2.11.21 Policy EV30 states that encouragement will be given to the "*protection and improved management of woodlands, trees and hedgerows which are important for their visual amenity, historic environment, natural heritage and/or recreation value*." Priority will be given to: *"(i) protecting the remaining areas of ancient semi natural woodland and planted ancient woodland sites; (ii) promoting new planting with species appropriate to the location…; and (iii) ensuring that protection of amenity interests is achieved where management involves commercial felling and replanting*."

2.11.22 Policy EV38 states that development proposals on land where there is a risk from contamination or landfill gas will not be permitted unless it can be demonstrated that *"measures can be taken to satisfactorily overcome any danger to life, health, property, controlled waters, or the natural and historic environment."*

2.11.23 Policy EV40 states that development proposals will not be permitted that would "*cause or result in significant harm to health, local amenity, natural heritage, the historic environment or landscape character because of significant levels of air, noise or light pollution*."

2.11.24 Policy EC1 allocates 190 ha of employment land at Felindre Strategic Business Park, located approximately 1.5 km to the south-west of the Project Site, in order to meet the growth needs of the local economy.

2.11.25 Policy EC13 states that development that would result in the loss of the best and most versatile agricultural land will not normally be permitted, unless *"there is an overriding need and:*

i. *Previously developed land is unavailable, and either*
ii. *Lower grade land is unavailable, or*
iii. *Lower grade land is of a higher environmental value."*

2.11.26 Policy HC1 allocates land at Tircoed, Penllergaer, located approximately 2.5 km to the south-west of the Project Site, for the delivery of 84 units.

2.11.27 Policy R16 states that "*proposals for major new developments will be required to incorporate adequate and effective waste management facilities.*"

2.11.28 Policy AS2 states that new developments should be designed to *"allow for the safe, efficient and non-intrusive movement of vehicles"*. In addition, the means of access to new developments should be designed to ensure that impacts on the natural, historic and built environment and local communities are minimised.

2.11.29 Policy AS3 states that "*development that adversely affects the safety, enjoyment and convenient use of a Public Right of Way (PROW) will only be permitted where an acceptable alternative route is identified*."

2.11.30 Policy AS10 requires new developments to "*incorporate appropriate traffic management measures to mitigate against significant adverse impacts that would otherwise be caused by traffic movements*."

b) Other Material Considerations

i. CCS Draft LDP – Overview

2.11.31 CCS is currently in the process of preparing a new LDP (Ref 2.46), which upon adoption will replace the UDP as the key planning policy document for CCS up to 2025.

2.11.32 To date, the preparation of the LDP has been subject to the following phases of consultation and engagement:

- Stage 1: Delivery Agreement (DA) – The DA sets out the timetable for preparation of the LDP and the Council's Community Involvement Scheme. The DA was subject to consultation in April and May 2009 and was updated in 2013.
- Stage 2: Pre-Deposit Plan Preparation and Involvement – This stage included the preparation and collection of background evidence, and an invitation for the submission of candidate sites for assessment from 2010.
- Stage 3: Pre-Deposit Plan Preparation and Public Consultation – A Draft LDP Vision and Objectives document and a Draft LDP Strategic Options document were subsequently subject to consultation in 2012. Following this, the Draft LDP Preferred Strategy was subject to public consultation (via exhibitions, community information sessions, presentations and workshops) in 2013, prior to the publication of the final LDP Preferred Strategy in July 2014. In December 2014, a draft LDP proposals map was published for consultation on proposed sites and boundary changes.
- Stage 4: Deposit Plan (including consultation on a draft version of the LDP) – Further to preceding stages and review of consultation feedback, the Deposit LDP was published for consultation between July and August 2016.

2.11.33 CCS submitted the LDP to the Ministers of the Welsh Government for independent examination on 28th July 2017. Following formal acceptance on 4th August 2017, the Ministers of the Welsh Government have appointed Inspectors to conduct the independent examination and to assess the soundness of the LDP. Examination hearings commenced on 6th February 2018 and ran until late March 2018.

2.11.34 The examination hearings were scheduled on a topic basis as set out in Table 2-1:

Table 2-1 CCS LDP Examination Hearings Programme

Week 1: 6 - 9 February	Week 2: 13 - 15 February	Week 3: 27 Feb - 1 March	Week 4: 13 - 15 March	Week 5: 20-22 March	Week 6: 27-29 March
Plan preparation; vision & objectives; spatial strategy	Strategic Development Areas D, E and G	Non-strategic and rural exception site allocations	Transport, social infrastructure and open space	Green Belt, Green Wedges, settlement boundaries, key villages, rural areas	Reserve
Deliverability and infrastructure	Strategic Development Areas B, C and H	Employment, retail and tourism	Welsh language; design; built & natural environment	Alternative sites	
Housing provision	Strategic Development Areas A, F, I, J, K and L		Gypsy & Traveller sites; specialist housing	Monitoring	
Affordable housing			Energy, flood risk, environmental protection, minerals & waste		

2.11.35 Following formal closure of the examination hearings, the inspector's report will be prepared and submitted to the Council with recommendations regarding the LDP. It is anticipated the LDP would be formally adopted by CCS thereafter subject to the inspector's recommendations.

2.11.36 Prior to the commencement of examination hearings, the submitted LDP is considered to hold some weight for decision-making purposes based on the previous stages of preparation and consultation (listed above). At the closure of the examination hearings and following the publication of the inspector's report, the weight to be attached to the draft LDP may change based upon the inspector's recommendations. Upon adoption, the LDP would replace the UDP and receive full weight for decision-making purposes.

2.11.37 The submitted LDP, comprising the Proposals Maps and Written Statement, seeks to provide a planning framework that will enable the delivery of sustainable development in the right places across the county.

ii. CCS Draft LDP Proposals Map and site-specific policies

2.11.38 As shown on the draft LDP Proposals Map (Figures 2-3 and 2-4), the Project Site is located on land identified as safeguarded *"Coal Resources"* and *"Sand and Gravel"* resource, where draft LDP Policy R12 applies. Draft Policy RP 12 states that *"development within mineral safeguarding areas that would permanently sterilise identified resources of aggregates and coal will only be permitted where it can be demonstrated that:*

- *The extraction of the mineral is impracticable, uneconomic or environmentally unacceptable;*
- *The mineral has already been extracted or can be extracted satisfactorily prior to the development taking place;*
- *The scale and location of the development would have no significant impact on the potential working of the resource; or*
- *There is an overriding need for the development."*

2.11.39 The Project Site is also located within proximity of a designated Mineral Buffer Zone, where draft LDP Policy RP 14 applies. Draft Policy RP 14 states that, aside from mineral extraction and sensitive non-mineral development, any other development proposals will be *"carefully assessed to ensure that there would be no significant adverse effect on natural heritage, the amenity and well-being of neighbouring properties, or the quality and quantity of controlled waters."*

2.11.40 To the north, the Project Site is located within proximity of a Landscape Protection Area, where Policy ER5 applies, and a Strategic Search Area, where Policy EU1 applies. Draft Policy ER 5 states that *"development will not be permitted that would have a significant adverse effect on the character and quality of the landscape and setting of the County"*. Within Special Landscape Areas, including the Mawr Uplands to the north of the Project Site, priority will be given to protecting, managing and enhancing the character and quality of the area. Draft Policy EU 1 support proposals for large scale wind farms and their associated infrastructure within the Strategic Search Area.

2.11.41 To the south, the Project Site is located within proximity of a Strategic Development Area (Policy SD 1(G)) and safeguarded land at Morriston Hospital (Policy SI 4).

2.11.42 Draft Policy SD G seeks to allocate a new sustainable settlement at land north-west of M4 J46 at Llangyfelach, to the south-west of the Project Site, for *"comprehensive mixed use development of up to 850 homes during the Plan period, incorporating a mix of low-medium and high density residential, a new district centre with commercial units, primary school, a mix of public realm, open space and play provision, new community buildings, and a strategic business park."*

2.11.43 Draft Policy SI 4 safeguards land adjacent to Morriston Hospital, to the south-east of the Project Site, for future development, restricted to healthcare related uses associated with Morriston Hospital. Proposals are required to be *"delivered alongside appropriate new and enhanced highway infrastructure that will significantly improve the existing substandard road access leading to the site"*. A

new access road is proposed as part of this proposal (Strategic Transport Strategy Table 9.2) to resolve road capacity issues from the roundabout immediately north of M4 J46.

Figure 2.3 Extract from draft LDP Proposals Map (Map 13: Mawr)

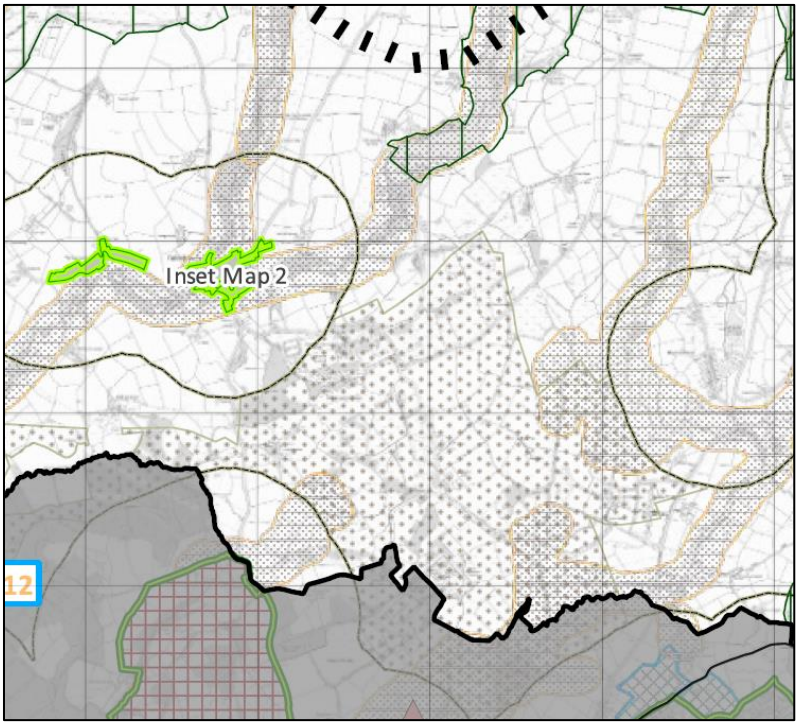
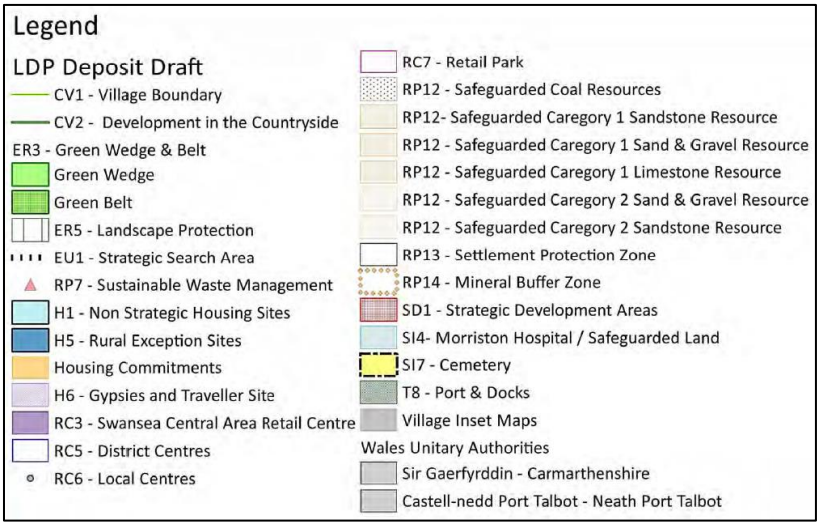


Figure 2.4 Extract from draft LDP Proposals Map (Legend)



iii. CCS Draft LDP - Written Statement

2.11.44 The LDP Written Statement sets out a vision, strategic objectives and growth strategy that addresses development opportunities and issues across the county. In addition to the site-specific policies set out above, the following draft LDP policies are also considered to be relevant.

2.11.45 Draft paragraph 1.2.2 sets out the overarching vision of the LDP, that *"The County will be a desirable place to live, work and visit that* (sic):

- *Capitalises on the distinctive relationship between its vibrant urban areas and outstanding rural and coastal environments;*
- *Supports a competitive and prosperous economy that acts as a focal point for the wider Swansea Bay City Region;*
- *Has sustainable, distinct communities, in both urban and rural locations, that benefit from sufficient good quality accommodation, supporting infrastructure, community facilities and opportunities for recreation;*
- *Is a thriving City Centre destination that offers excellent shopping facilities and supporting leisure and business opportunities, capitalising on its proximity to the waterfront;*
- *Celebrates and conserves its unique natural heritage and cultural and historic environments."*

2.11.46 The LDP vision will be delivered through a series of strategic objectives relating to "*Enhancing Communities, Facilities & Infrastructure", "Delivering Economic Growth and Prosperity*", and "*Fostering a High Quality Environment*". Of the objectives set out in Figure 4, those relevant to the Project are set out below:

- Ensure that communities have a mix of uses and facilities;
- Facilitate the provision of appropriate infrastructure to support communities and businesses;
- Encourage appropriate development of low carbon and renewable energy resources and energy infrastructure;
- Support the safeguarding and sustainable use of natural resources where appropriate;
- Support development that positions Swansea as an economically competitive place and an economic driver for the City Region;
- Facilitate growth and diversification of the local economy and an increase in high value, skilled employment;
- Promote and enhance a diverse and sustainable rural economy;
- Promote a sustainable development strategy that avoids significant adverse environmental impacts and respects environmental assets;
- Maintain and enhance green infrastructure networks;
- Support measures to minimise the causes and consequences of climate change; and
- Promote good design that is locally distinct, sustainable, innovative and sensitive to location.

2.11.47 Draft Policy PS 1 sets out the Plan's sustainable development strategy which seeks to limit development in the countryside to exceptional circumstances.

2.11.48 Draft Policy PS 2 requires that development enhances the quality of places and spaces and responds positively to local context and character. In addition, a number of design principles are set out dependant on the nature, scale and siting of the proposal, including, inter alia:

- "*Have regard to important elements of local heritage, culture, landscape, townscape, views and vistas;"*
- *"Integrate effectively with and enhance the County's green infrastructure network;"*
- *"Provide appropriate parking and circulation areas;"*

- *"Maximise opportunities for sustainable construction, resource efficiency and contributions towards increased renewable or low carbon energy generation;" and*
- *"Ensure no significant adverse impact on natural heritage and built heritage assets."*

2.11.49 Draft Policy PS 4 seeks to address opportunities for the creation of up to 14,700 additional jobs over the Plan period.

2.11.50 In addition to the proposed sustainable settlement at Llangyfelach (Policy SD G), proposed development at the following Strategic Development Areas within proximity of the Project Site is allocated within the submitted LDP:

- Draft Policy SD A seeks to allocate land south of Glanffrwd Road at Pontarddulais, to the west of the Project Site, for comprehensive, residential led, development of up to 720 homes, incorporating a primary school, leisure and recreation facilities, public open space and appropriate community facilities, employment and commercial uses.
- Draft Policy SD C seeks to allocate land south of A4240, Penllergaer, to the south-west of the Project Site, for comprehensive, residential led, mixed use development of up to 750 homes during the Plan period (and up to 1,000 homes beyond the Plan period), incorporating primary school, leisure and recreation facilities, public realm, public open space and appropriate community and commercial uses.
- Draft Policy SD E seeks to allocate land north of Clasemont Road, Morriston, to the south of the Project Site, for comprehensive, residential led, mixed use development of up to 675 homes during the Plan period, incorporating primary school, leisure and recreation facilities, public realm, public open space and appropriate community and commercial uses.

2.11.51 The following draft LDP policies seek to allocate major residential-led development at sites within proximity of the Project Site:

- LDP Policy H1.11 – 60 dwellings at Land at Ramsey Road, Clydach;
- LDP Policy H1.21 – 90 dwellings at Land east of Pontarddulais Road, Gorseinon;
- LDP Policy H1.26 – 100 dwellings at Land at Carmel Road and Bryntirion Road, Pontlliw;
- LDP Policy H1.30 – 50 dwellings at Land north of Llewellyn Road, Penllergaer; and
- LDP Policy H1.31 – 50 dwellings at Land at Bolgoed Road, Pontarddulais.

2.11.52 Draft Policy IO 1 states that "*development must be supported by appropriate infrastructure, facilities and other requirements considered necessary as part of the proposal*," which must be provided in a timely and coordinated manner. Where necessary, "*planning obligations will be sought to ensure that the effects of developments are fully addressed in order to make the development acceptable*."

2.11.53 Draft Policy IO 2 requires developers to "*maximise added benefits from the development in relation to the creation of training and job opportunities.*"

2.11.54 Draft Policy HC 1 seeks to preserve or enhance the County's distinctive historic and cultural environment by requiring high quality design standards. Similarly, draft Policy HC 2 seeks to preserve or enhance the County's buildings and features of historic importance.

2.11.55 Draft Policy SI 1 states that health inequalities will be reduced and healthy lifestyles encouraged by ensuring that development proposals, inter alia, *"do not result in significant risks to life, human health or well-being, particularly in respect of air, noise, light, water or land pollution."*

2.11.56 Draft Policy SI 8 states that development must be designed to promote safe and secure communities and minimise the opportunity for crime.

2.11.57 Draft Policy ER 1 requires that development proposals take into account the following principles to mitigate against the effects of climate change, adapt to its impacts, and to ensure resilience:

i. Reduce carbon emissions;
ii. Protect and increase carbon sinks;
iii. Adapt to the implications of climate change at both a strategic and detailed design level;
iv. Promote energy and resource efficiency and increase the supply of renewable and low carbon energy;
v. Avoid unnecessary flood risk by assessing the implications of development proposals within areas susceptible to flooding and preventing development that unacceptably increases risk, and
vi. Maintain ecological resilience.

2.11.58 Draft Policy ER 2 requires that development to maintain or enhance the County's multi-functional green infrastructure network.

2.11.59 Draft Policy ER 6 states that "*development will not be permitted that would result in a likely significant adverse effect to sites of international or national nature conservation importance*". In addition, "*development that would affect locally designated sites of nature conservation importance should maintain or enhance the nature conservation interest of the site.*"

2.11.60 Draft ER 8 states that development proposals that would have a significant adverse effect on the continued viability of habitats and species will only be permitted where:

i. "The need for development outweighs the nature conservation importance of the site";
ii. The developer demonstrates that there is no satisfactory alternative location for the development which avoids nature conservation impacts;
iii. Effective mitigation measures are provided by the developer; and
iv. Any unavoidable harm is minimised by effective mitigation to ensure that there is no reduction in the overall nature conservation value of the area."

2.11.61 Draft Policy ER 9 states that development proposals "*will be expected to maintain, protect and enhance ecological networks and features of importance for*

biodiversity…Development proposals that could result in a significant adverse effect on the connectivity of ecological networks and features of importance for biodiversity will only be permitted where:

i. *The need for the development outweighs the nature conservation value of the site;*
ii. *It can be demonstrated that there is no satisfactory alternative location for the development;*
iii. *A connected element of the natural resource is retained as part of the design of the development; and*
iv. *Compensatory provision will be made of comparable ecological value to that lost as a result of the development."*

2.11.62 Draft Policy ER 10 states that development will not be permitted that would cause significant adverse effect to geological or geomorphological Sites of Special Scientific Interest (SSSIs). Development that would affect regionally important geological or geomorphological sites (RIGs) should maintain the geological or geomorphological interests of the site.

2.11.63 Draft Policy ER 11 states that "*development that would adversely affect trees, woodlands and hedgerows of public amenity, natural/cultural heritage value, or that provide important ecosystem services will not normally be permitted.*"

2.11.64 Draft Policy CV 2 sets a presumption against development in the countryside, except where it is for, inter alia, *"necessary infrastructure provision"*. Development in the countryside is required to ensure that the integrity of the countryside is conserved and enhanced.

2.11.65 Draft Policy T 1 requires that *"development must be supported by appropriate transport measures and infrastructure"*. Development that would have an unacceptable impact on the safe and efficient operation of the transport network will not be permitted.

2.11.66 Draft Policy T 5 sets out a series of design principles for transport infrastructure, including ensuring that the design of development, inter alia:

- "*Allows for the safe, efficient and effective movement of vehicles, inclusive of service vehicles;"*
- *"Does not give rise to any significant adverse effect on the natural heritage, and the historic and cultural environment is preserved and enhanced;" and*
- *"Maintains the character of rural lanes and public paths;"*

2.11.67 Draft Policy T 7 requires that acceptable alternative routes are identified and provided where development "*significantly adversely affects the character, safety, enjoyment and convenient use of a Public Right of Way (PROW)."*

2.11.68 In addition to supporting large scale wind farm developments within the Strategic Search Area (referenced above), draft Policy EU 1 supports proposals for renewable or low carbon energy development across CCS, subject to the following criteria:

a) *"The siting, design, layout, type of installation and materials used do not have a significant adverse effect on the characteristics and features of the proposed location;*
b) *The development would not result in unacceptable loss of public amenity or public accessibility to the area;*
c) *The development would not result in significant adverse effects on natural heritage or historic environment, or visual amenity either individually or cumulatively;*
d) *There would be no significant adverse effect on the Gower AONB;*
e) *There would be no significant adverse impact on water quality and quantity;*
f) *The development would not result in the permanent sterilisation of minerals resources;*
g) *The development would not compromise the transport network;*
h) *The development would not interfere with aircraft operations or telecommunications;*
i) *There would be no loss of carbon sinks, or that on-site loss can be adequately mitigated; and*
j) *The satisfactory removal of infrastructure and remediation and/or restoration of the natural environment, would be undertaken in accordance with an aftercare scheme to be agreed with the Council prior to the development being carried out."*

2.11.69 Draft Policy RP 1 seeks to prevent development that would result in a "*significant risk to: life; human health and well-being; property; controlled waters; or the natural and historic environment,*" particularly in respect of: "*air, noise or light pollution; flood risk; water resources; land contamination; land instability or subsidence; mineral resources; and sustainable waste management.*"

2.11.70 Draft Policy RP 2 requires that, "*where development could lead to exposure to a source of air, noise or light pollution, it must be demonstrated that appropriate mitigation measures will be implemented and incorporated into the design of the development.*"

2.11.71 Draft Policy RP 3 states that "*development that compromises the quality of the water environment, or does not comply with good water resource management, will not be permitted. Development proposals must make efficient use of water resources and, where appropriate, contribute towards improvements to water quality.*"

2.11.72 Draft Policy RP 4 states that development will not be permitted in areas at risk of flooding, unless it can be demonstrated that *"the development can be justified in line with national guidance and is supported by a technical assessment that verifies that the new development is designed to alleviate the threat and consequences of flooding"*.

2.11.73 Draft Policy RP 5 states that "*development proposals on land where there is a risk from contamination or landfill gas will not be permitted unless it can be demonstrated that measures can be taken to satisfactorily overcome any significant risk to life, human health, property, controlled waters, or the natural and historic environment*."

2.11.74 Draft Policy RP 6 states that "*development which would create, affect or might be affected by unstable or potentially unstable land will not be permitted where there would be a significant direct risk to life, human health, property, buildings and structures, or the natural heritage on the site or in its vicinity.*"

2.11.75 Draft Policy RP 7 supports the development of sustainable waste management facilities in appropriate rural locations. Supporting paragraph 2.14.48 notes that preferred areas for new waste management facilities include the former Tip site at Felindre, within proximity of the Project Site. The site at Felindre is identified specifically for the potential to accommodate a Combined Heat and Power (CHP) Facility which could provide heat or power for adjacent proposed developments.

2.11.76 Draft Policy RP 9 requires development to incorporate, as appropriate, "*adequate and effective provision for the storage, recycling and other sustainable management of waste, and allow for appropriate access arrangements for recycling and refuse collection vehicles and personnel*."

iv. CCS Supplementary Planning Guidance

2.11.77 CCS has produced Supplementary Planning Guidance (SPG) to support the implementation of adopted UDP planning policies.

2.11.78 The Planning Obligations SPG (Ref. 2.47), published by CCS in March 2010, is an SPG document of potential relevance to the Project. The Planning Obligations SPG identifies the types of obligations developers may be expected to contribute towards, the likely amounts of these obligations, and the procedures involved when entering into obligations.

v. Swansea Environment Strategy 2006 and Ten Year Progress Review (2016)

2.11.79 The Swansea Environment Strategy (SES) (Ref. 2.48), published by Swansea Environmental Forum (SEF) in 2006, provides a long-term vision and strategic priorities for the natural and built environment in Swansea.

2.11.80 SEF is the lead strategic partnership for all aspects of the natural and built environment in the City and County of Swansea. It is an independent membership organisation, initially set-up in 1985, which brings together individuals, statutory bodies, businesses and voluntary groups to promote environmental sustainability and develop collaborative projects to improve our natural and urban environments.

2.11.81 The SES establishes a 2020 vision and a series of priorities for: the natural environment and biodiversity; the built environment and energy use; water, land and waste management; sustainable transport and air quality; and environmental awareness and action.

Table 2-2 SES Themes and Vision

Theme	2020 Vision
The Natural Environment and Biodiversity	Swansea's unique and diverse natural environment will be protected, enhanced and promoted to maximise social, economic and environmental well-being.
The Built Environment and Energy Use	Swansea will have strong, sustainable and distinctive communities where everyone can enjoy a clean, safe and high-quality built environment with affordable housing, public spaces and considerately-designed and resource-efficient buildings.
Water, Land and Waste Management	Swansea's water resources, land and waste will be managed sustainably to maximise benefits for everyone and minimise risks to the environment and human health.
Sustainable Transport and Air Quality	Swansea's citizens will live near to work opportunities, leisure facilities and essential services, have access to a choice of convenient and efficient transport options, and enjoy clean air.
Environmental Awareness and Action	All people living in, working in and visiting Swansea will understand, respect and appreciate our environment and will participate in positive actions towards sustainability.

2.11.82 The Ten Year Progress Review (Ref. 2.49) demonstrates that progress has been made under each of the Environment Strategy's five themes, most significantly in waste management, sustainable building and energy use, managing flood risk, and community engagement.

vi. Swansea Local Biodiversity Strategy and Action Plan

2.11.83 The Swansea Biodiversity Partnership produced the Swansea Local Biodiversity Strategy and Action Plan (Ref. 2.50) in 2005. The document provides a strategic framework and series of detailed species and habitat action plans looking at how individuals and organisations could work to try and halt biodiversity loss in Swansea.

2.11.84 The document was prepared with the following aim: "*To conserve, enhance and promote the special qualities of Swansea's unique and ecologically diverse natural environment, and to maximise the contribution it makes to the social, economic and environmental wellbeing of the area*" (page 5).

2.12 References

Ref. 2.1 European Commission, Directive 2011/92/EU. December 2011.

Ref. 2.2 European Commission. Directive 2014/52/EU. May 2014.

Ref. 2.3 European Commission. Directive 2010/75/EU. November 2010.

Ref. 2.4 European Commission. Directive 1992/43/EEC. May 1992

Ref. 2.5 European Commission. Directive 2009/147/EC. November 2009.

Ref. 2.6 European Commission. Directive 2008/50/EC. May 2008.

Ref. 2.7 European Commission. Directive 2010/75/EU: Best Available Techniques (BAT) Reference Document for Large Combustion Plants. July 2017.

Ref. 2.8 The Planning Act 2008 (as amended)

Ref. 2.9 The Wales Act 2017

Ref. 2.10 The Wales Act 2017 (Commencement No. 4) Regulations 2017

Ref. 2.11 Environment (Wales) Act 2016

Ref. 2.12 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2009 (as amended) (*"the EIA Regulations"*).

Ref. 2.13 Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 (the APFP Regulations)

Ref. 2.14 The Well-being of Future Generations (Wales) Act 2015

Ref. 2.15 Department of Energy & Climate Change. The Overarching National Policy Statement for Energy (NPS EN-1, July 2011).

Ref. 2.16 Department of Energy & Climate Change. The National Policy Statement for Fossil Fuel Electricity Generating Infrastructure (NPS EN-2, July 2011).

Ref. 2.17 Department of Energy & Climate Change. National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines (NPS EN-4, July 2011).

Ref. 2.18 Department of Energy & Climate Change. National Policy Statement for Electricity Networks Infrastructure (NPS EN-5, July 2011).

Ref. 2.19 Department of Energy and Climate, Annual Energy Statement (2014)

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Ref. 2.21 Department of Energy & Climate Change. The Electricity Market Reform White Paper (2011)

Ref. 2.22 HM Government. The Carbon Plan - delivering our low carbon future (2011)

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Ref. 2.28 The Energy and Climate Change Committee. The energy revolution and future challenges for UK energy and climate change policy — Third Report of Session 2016–17 (2016)

Ref. 2.29 Industrial Strategy Commission. Final Report of the Industrial Strategy Commission (November 2017)

Ref. 2.30 Welsh Government. Planning Policy Wales (PPW) (November 2016).

Ref. 2.31 Welsh Government. Technical Advice Note 5: Nature Conservation and Planning (2009).

Ref. 2.32 Welsh Government. Technical Advice Note 6: Planning for Sustainable Rural Communities (2010).

Ref. 2.33 Welsh Government. Technical Advice Note 11: Noise (1997).

Ref. 2.34 Welsh Government. Technical Advice Note 12: Design (2016).

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Ref. 2.38 Welsh Government. Technical Advice Note 21: Waste (2014).

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Ref. 2.43 Welsh Government. Environment Strategy for Wales (May 2006).

Ref. 2.44 Welsh Government. Noise Action Plan for Wales 2013-2018 (December 2013).

Ref. 2.45 The City and County of Swansea. Unitary Development Plan (UDP) (November 2008).

Ref. 2.46 The City and County of Swansea. The Local Development Plan (LDP) (July 2016).

Ref. 2.47 City and County of Swansea. Planning Obligations Supplementary Planning Guidance (SPG) (2010)

Ref. 2.48 Swansea Environmental Forum. Swansea Environment Strategy (2014-2016).

Ref. 2.49 Swansea Environmental Forum. Ten Year Progress Review (2016).

Ref. 2.50 City and County of Swansea. Swansea Local Biodiversity Strategy and Action Plan (2005).

Chapter 3

Project and Site Description

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3. Project and Site Description

3.1 Introduction

3.1.1 This chapter provides a description of the Project, the Project Site and of its surrounding environment. It also provides an overview of the likely construction methods, the approximate timescale over which various construction activities will take place and an overview of the operational and decommissioning phases of the Project.

3.1.2 Table 3-1 provides a summary of the Project Components and their consenting route. More detail of each element is provided in Section 3.4.

Table 3-1: Project Components

Project Component	Description	Consenting Route
Power Generation Plant	An Open Cycle Gas Turbine (OCGT) peaking power generating station, fuelled by natural gas and capable of providing a rated electrical output of up to 299 Megawatts (MW). The *Power Generation Plant* comprises: • Generating Equipment including one Gas Turbine Generator with one exhaust gas flue stack and Balance of Plant (BOP) (together referred to as the '*Generating Equipment'*) which are located within the '*Generating Equipment Site'* (see Section 3.4); • An *Access Road* (see Figure 3.2) to the Project Site from the B4489 which lies to the west, formed by upgrading an existing access road between the B4489 junction and the Swansea North Substation (the *Substation*) and constructing a new section of access road from the Substation to the Generating Equipment Site (see Section 3.4); and • A temporary construction compound for the storage of materials, plant and equipment as well as containing site accommodation and welfare facilities, temporary car parking (see Section 3.4) and temporary fencing (the *Laydown Area*, see Section 3.4). A small area within the Laydown Area will be	*Development Consent Order (DCO) through the Planning Act 2008 and EIA carried out under the Infrastructure Planning (Environmental Impact Assessment) Regulations 2009*

Project Component	Description	Consenting Route
	retained permanently (the *Maintenance Compound*). • *Ecological Mitigation Area* – area for ecological enhancement within the Project Site Boundary. • Permanent parking and drainage to include: a site foul, oily water and surface water drainage system (see Section 3.4).	
Gas Connection	The Gas Connection will be in the form of a new above ground installation (AGI) and underground gas connection (the Gas Pipeline). This is to bring natural gas to the Generating Equipment from the *National Gas Transmission System*. The Gas Pipeline will follow an approximate north-south route corridor, between the National Gas Transmission System south of Rhyd-y-pandy Road and the Generating Equipment Site (see Section 3.5).	*The Gas Connection will be consented through the Town and County Planning Act 1990 (TCPA) and is not part of the DCO Application. Though this Project element is not part of the DCO Application, APL is seeking powers of compulsory acquisition over the land required for the Gas Connection.*
Electrical Connection	This is an underground electrical cable to export power from the Generating Equipment to the *National Grid Electricity Transmission System (NETS)* (see Section 3.6).	*The Electrical Connection will be consented either through Permitted Development rights or a planning application under the TCPA and is not part of the DCO Application. Though this Project element is not part of the DCO Application, APL is seeking powers of compulsory acquisition over the land required for the Electrical Connection.*

3.2 Changes since the 2014 PEIR

3.2.1 Since the 2014 Preliminary Environmental Information Report (PEIR) there have been changes to the Project either as a result of the Project evolution and / or due to an update in environmental baseline information. In response to further surveys, ongoing at the time of Phase 2 statutory consultation on the 2018 PEIR, and as a result of the responses received on the 2018 PEIR, subtle design changes to the Project were made. Table 3-2 provides a summary of these changes to the Project since the 2014 PEIR and the 2018 PEIR.

3.2.2 Further detailed information on the design changes to the Project and why they have been made is included in **Chapter 5: Alternatives Considered**.

Table 3-2: Summary of Changes since the 2014 PEIR

Project Component	Changes in design since the 2014 PEIR
Power Generation Plant	• The Power Generation Plant is now made up of only one Gas Turbine Generator with one exhaust gas flue stack, rather than up to five. • The stack height is now a maximum of 45 m, instead of 40 m. • The Generating Equipment Site has now been moved north of the Welsh Water Main (Water Main). • Selection of an access route from the B4489 to the west of the Generating Equipment instead of the alternative construction access route from the north; and • Two onsite options for the new section of the Access Road (Option A and Option B) as shown on Figure 3.3.
Electrical Connection	The Electrical Connection now runs alongside the road rather than under for ease of maintenance.
Project Component	**Changes in design since the 2018 PEIR**
Access Road	• Option B for the new section of the Access Road has been chosen to take forward for the Application. This route has also been updated from the route presented in the 2018 PEIR to avoid ancient woodland. See Figure 3.3.

3.3 Project Site and Surroundings

a) The Project Site

3.3.1 The Project Site (see Figure 1.1) is located on open agricultural land approximately 2 km north of Junction 46 on the M4, approximately 3 km to the north of the city of Swansea, approximately 1 km southeast of Felindre and 1.4 km north of Llangyfelach. The current land use is predominantly agricultural, with sheep and horse grazing. The western extent of the Project Site encompasses parts of the Substation (comprising a 400 kV and 132 kV substation) and the existing access road leading to the Substation and Felindre Gas Compressor Station from the B4489.

3.3.2 The Power Generation Plant is accessed from Junction 46 of the M4 (see Figure 12.1). From the M4 vehicles would travel north via the B4489, then head east utilising the existing access road from the B4489, followed by a newly constructed section of road leading south from the Felindre Gas Compressor Station, then crossing east over agricultural land to reach the Generating Equipment Site.

3.3.3 Ground levels at the Project Site vary from approximately 146 m above ordnance datum (AOD) at the highest point in the north-west corner at Rhyd-y-pandy Road to approximately 80 m AOD along the southern perimeter, with ground levels generally falling in a southerly and south easterly direction. The land within the Generating Equipment Site is at approximately 90 m AOD (see site levels on Figure 3.1).

3.3.4 There are no residential dwellings located within the Project Site Boundary. Most of the Project Site is improved grassland but there are areas of marshy grassland in the south eastern part of the Generating Equipment Site. There are parts of a Site of Importance for Nature Conservation (SINC) within the Project Site (Lletty-Morfil SINC). A block of broadleaved woodland, classified as Ancient Woodland, and a SINC lie to the east. There are also further blocks of Ancient Woodland, also classified as SINCs, to the west surrounding the Substation, Felindre Gas Compressor Station, and the existing access road leading to these facilities from the B4489.

3.3.5 Within the Project Site there are springs, with their associated streams and drainage ditches which discharge into the Afon Llan (see Figure 3.1). The Afon Llan links with the Afon Lliw and the River Loughor, which discharges into the Bristol Channel. There are no Main Rivers within the Project Site.

3.3.6 The Generating Equipment Site is located primarily within fields used for grazing, bounded by a mixture of drainage ditches, fencing and poor quality hedgerows with substantial gaps in them. The Generating Equipment Site and Laydown Area are both crossed by a soft surface horse training track known as ‘the gallops’ (Figure 1.2), which runs diagonally north-west to south-east.

b) The Surrounding Area

3.3.7 The area surrounding the Project Site is, at present, predominantly rural in character, although there is the Felindre Park and Share facility to the south and a substantial amount of utility infrastructure in the area, some of which cross the Project Site (see Figure 3.5). Please refer to Table 4-6 which describes future development in the vicinity.

3.3.8 The National Gas Transmission System (see Figure 5.2), a Water Main and an Oil Pipeline (see Figure 3.5) cross the Project Site and there is also a network of electricity pylons, underground utilities and overhead lines which lead to and from the Substation (see Figure 3.5). The Felindre Water Treatment Works is located to the northwest, while the Cefn Betingau Solar Park and Abergelli Solar Farm are located to the east of Project Site. A further two solar parks are built in the vicinity, Rhyd-y-pandy solar park and Abergelli Farm. All of these features have been

considered in the design of the Project to ensure that they are safeguarded either through avoidance or minimal interaction.

3.3.9 Other features of the area include public footpaths, bridleways and tracks located in and around the Project Site (see Figure 3.3), linking it to the wider area.

3.3.10 The closest residential dwellings to the Generating Equipment Site (Figure 1.1) are:

- Abergelli Farmhouse approximately 620 m to the north of the Generating Equipment Site;
- Llwynhelig approximately 590 m to the south east of the Generating Equipment Site;
- Felin Wen Farm approximately 830 m to the east of the Generating Equipment Site;
- Lletty Morfil Farm approximately 740 m to the west of the Generating Equipment Site;
- Cefn betingau approximately 650 m to the north east of the Generating Equipment Site; and
- Maes-eglwys approximately 440 m to the south of the Generating Equipment Site.

3.3.11 The remains of Abergelli Colliery are located north of Abergelli Farmhouse.

3.4 Development Parameters and the 'Rochdale Envelope'

3.4.1 As a series of parameters have been built into the design of the Project, this ES has been prepared with reference to PINS Advice Note 9 (AN9) – 'Using the Rochdale Envelope'. AN9 states that PINS understands that '…the 'Rochdale Envelope' is an acknowledged way of dealing with an application comprising EIA development where details of a project have not been resolved at the time when the application is submitted'.

3.4.2 In the case of this Project, it is considered that the DCO Application would be flexible enough using the Rochdale Envelope approach to allow APL to construct and operate an electricity generating plant of up to 299 MW by building one Gas Turbine Generator with its own dedicated flue stack, which could be procured from a range of suppliers.

3.4.3 It is made clear in AN9 that an EIA must '...ensure that all the realistic and likely worst case variations of the project have been properly considered and clearly set out in the ES and as such that the likely significant impacts have been adequately assessed'.

3.4.4 To this end, where flexibility in parameters for the Project (such as the height of the stack) has been provided, APL has assessed the realistic worst case and it is made clear in each 'topic' assessment what this constitutes.

a) Overview

3.4.5 The maximum area for the Generating Equipment Site would be approximately 2.64 ha. Figure 3.2 shows an indicative illustration of the position and layout of the Generating Equipment with the Electrical Connection. The design would be finalised in the event that a DCO is made by the SoS and the Gas Turbine Generator has been procured. The requirements of the DCO (similar to planning conditions) would control the detail of the final design and would require approval by the relevant planning authority at that time. In addition, embedded mitigation is inherent to the design with additional mitigation secured as required. APL is therefore proposing to submit its application on the basis of a series of parameters for the Project which allows an assessment of the realistic worst case in accordance with the 'Rochdale Envelope' approach. Working areas are allocated as per the Works Plans (Document reference 2.3).

3.4.6 The nature and purpose of peaking plants such as that which is proposed for the Project is set out in paragraph 3.4.7 and the reason for selecting OCGT plant as the most appropriate technology choice is further described in **Chapter 5: Alternatives Considered**. The paragraphs below therefore describe the operation of OCGT plants in more detail.

b) Open Cycle Gas Turbine (OCGT)

3.4.7 An 'industrial' type gas turbine would be used for the Project. This type of turbine has been selected as it is suited to generating up to 299 MW using only one unit, thereby reducing potential effects of noise, air quality and visual impacts. Additionally, they are suitable for frequent and fast start-ups, flexibility, and high-availability maintenance techniques.

3.4.8 The main equipment in an OCGT is a Gas Turbine Generator, including the following components:

- Air inlet filter house;
- Air inlet duct;
- Exhaust diffuser; and
- Auxiliaries, including:
  - Lube oil system;
  - Air dryers;
  - Fuel gas filter package;
  - Instrument air system;
  - Compressor washing; and
  - A stack with an exhaust silencer would also be part of the OCGT.

3.4.9 On entering the gas turbine, air would be compressed and natural gas injected into the air. The air and natural gas mixture would then burn in the combustion chamber producing hot, high pressure gases. The gas would then expand across the blades of the gas turbine driving the compressor and the electrical generator to produce electricity.

3.4.10 The waste gases and heat produced from this process would be released into the atmosphere via the stack. The stack would contain equipment which would reduce emissions released to the atmosphere, including a silencer.

3.4.11 Further information on why the exhaust gases are emitted to the atmosphere and cannot be recovered is given in **Chapter 5: Alternatives Considered** and in a separate Combined Heat and Power (CHP) statement (Appendix 5.1).

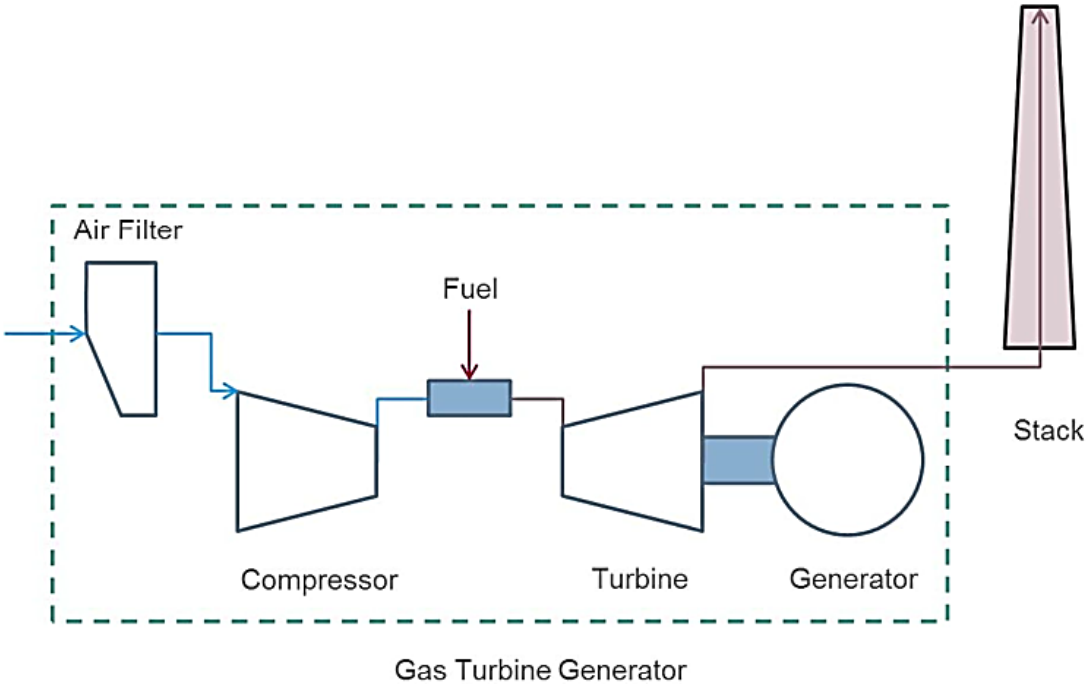
3.4.12 An initial stack height sensitivity study has been undertaken for the Project to determine the minimum stack height for the Gas Turbine Generator required for adequate dispersion of emissions to meet legislative air quality targets. The findings of this initial study setting out the height parameters are in Table 3-3.

3.4.13 Stack emissions would be continuously recorded to ensure correct and efficient operation of the Generating Equipment. Any significant deviations to emission limit values specified in the Environmental Permit required for the Project would be alarmed and corrections carried out on occurrence. Records of performance and deviation would be maintained. Full facilities for interfacing information, control and alarm systems would be installed so that the Generating Equipment can be operated from a central control room via a distributed control system (DCS). In the event of a fault in the Gas Turbine Generator or other major plant items, the Generating Equipment would shut down automatically in a controlled manner.

3.4.14 Processed natural gas sourced from the National Gas Transmission System is a clean burning fuel and does not produce the levels of particulate or sulphur emissions associated with burning coal. Further discussion of emissions characteristics from the Generating Equipment is provided in **Chapter 6: Air Quality**, which sets out the findings of the air quality assessment.

3.4.15 The Power Generation Plant consists of one Gas Turbine Generator and its associated single stack arrangement. Figure 3-1 shows a simple schematic of an OCGT operation.

Figure 3-1: Schematic of OCGT Operation



c) Other Generating Equipment Plant Items

3.4.16 In addition to the Gas Turbine Generator at the Generating Equipment Site, the following plant and buildings would also be present:

- Raw / Fire Water Tank: The fire water storage tank would be designed to comply with the relevant fire regulations and would be installed together with fire pumps, hose reels, fire hydrants and portable extinguishers;
- Demineralised Water Tank: Required to store demineralised water for the Generating Equipment (used for e.g. blade washing);
- Control Room / office / workshop Building: Required in order to monitor the plant operation and house plant controls;
- Gatehouse: Needed to provide security and maintain a log of site attendance, deliveries etc.;
- Transformer Compound: Required to connect the electrical infrastructure from the Generating Equipment to transformers before export to the Substation which is part of the NETS. This would also include a generator step-up transformer, unit and other transformers, an overhead line gantry and associated equipment;
- Natural Gas Receiving Station: Required to ensure that gas coming from the National Gas Transmission System feeds into the Generating Equipment Site at the right flow and pressure conditions. This would include a compression station, emergency generator, Joule-Thompson boilers and auxiliary control cabinets;
- Fin-Fan Coolers to provide cooling to the Generating Equipment;
- Telemetry apparatus including electrical cabinets; and

- Emergency Generator: A small diesel fired generator to provide power for the safe shutdown of the Gas Turbine Generator and running of essential security systems in emergency situations.

3.4.17 Table 3-3 provides indicative maximum and minimum dimensions for the main plant items which will be present at the Generating Equipment Site and the EIA has been prepared using these parameters following a 'Rochdale Envelope' approach, as described at the start of this section. The ground level at the Generating Equipment Site will be approximately 90 m AOD and the heights in the Table 3-3 are measured from this level.

3.4.18 Where a building or structure is included in the DCO Application, a Works number is specified in Table 3-3 that relates to the corresponding Work in Schedule 1 of the draft DCO.

Table 3-3: Parameters for Assessment

Building or Structure	Maximum Height (m)	Minimum Height (m)	Maximum Length (m)	Maximum Width (m)
Gas Turbine Generator (including gas turbine, generator, air inlet filter house, air inlet duct, exhaust diffuser, and auxiliaries such as lube oil system, air dryers, fuel gas filter package, instrument air system, compressor washing) (Work No 1A)	27	-	50	40
Exhaust gas emission flue stack (Work No 1A)	45	35	-	12
Control room/office/ workshop (Work No 1B)	7	-	45	25
Emergency Generator (Work No 1B)	6	-	13	5
Gas receiving station (including compression station, emergency generator, Joule-Thompson boilers and other auxiliary control cabinets) (Work No 1C)	10	-	70	50
Gatehouse (Work No 1E)	4.5	-	9	8
Demineralised water tank (Work No 1B)	7	-	7	7
Fire water tank (Work No 1B)	15	-	15	15
Above ground installation (AGI)*	3	-	85	35

Building or Structure	Maximum Height (m)	Minimum Height (m)	Maximum Length (m)	Maximum Width (m)
Minimum offtake connection (MOC)*	3	-	35	30
Gas Pipeline inspection gauge facility*	3	-	35	35
Fin Fan Coolers (Work No 1A)	10	-	28	14
Transformer compound (including generator step up transformer, unit and other transformers, connection to underground cable and associated equipment.) (Work No 1D)	15	-	65	60

**Not included in DCO Application*

d) Access

3.4.19 An Access Road to the Generating Equipment Site from the B4489 will be formed by upgrading an existing access road between the B4489 junction and the Substation and constructing a new section of road from the Substation to the Generating Equipment Site.

3.4.20 The existing access road between the B4489 junction and the Substation will be used. Two trees currently sited at the northern edge of the road will need to be removed to facilitate the passing of abnormal load(s). APL has consulted with National Grid on these changes and the use of the existing access road has been agreed as presented in the Outline Construction Traffic Management Plan (CTMP) (Appendix 3.3a). A Construction Staff Travel Plan (CSTP) has also been developed and presented in Appendix 3.3b.

3.4.21 Option B, slightly revised from its presentation in the 2018 PEIR, has been selected for the Project. The final route begins before the Substation and extends south before running east towards the Generating Equipment Site. The route of Option B has been amended to avoid an area of ancient woodland. This would also avoid an element of cut and fill, although some excavation is still likely.

3.4.22 The existing National Grid car park as located in Figure 3.2 is unaffected by the route of the Access Road but may be used as initial temporary laydown whilst the construction of the new section of road commences.

3.4.23 Construction traffic associated with the AGI will follow the same routeing arrangements, but will continue north along the B4489 and then east along Rhyd-y-Pandy Road. This is considered the optimum route to the AGI Access both in terms of distance and minimising disruption to local communities. These routeing arrangements form part of the Outline CTMP (Appendix 3.3a).

e) Laydown Area

3.4.24 A temporary Laydown Area during construction will be provided for the storage of materials, plant and equipment as well as containing site accommodation and welfare facilities, temporary car parking and temporary fencing. The Laydown Area will be provided adjacent to the Generating Equipment Site as shown in Figure 3.2. A small permanent area within the Laydown Area is required for maintenance during the operational phase of the Project.

f) Car Parking

3.4.25 During construction adequate car parking would be provided within the Laydown Area. During operation car parking for operational and maintenance staff would be provided within the Generating Equipment Site. The Project will take into account CCS's policy on parking standards during the operational phase of the Project and implement sustainable transport methods where possible.

g) Ecological Mitigation Area

3.4.26 An area has been allocated within the Project Site Boundary as mitigation for any habitat loss from permanent land take resulting from the construction and operation of the Project. This Ecological Mitigation Area is commensurate with the extent of mitigation required and the Landscape and Ecology Mitigation Strategy (Appendix 3.4) outlines the methods to be employed in enhancing its natural capital. The Landscape and Ecology Mitigation Plan illustrates the mitigation proposed (Appendix 3.5).

3.4.27 The Landscape and Ecology Mitigation Strategy (Appendix 3.4) also outlines how the temporary areas used for construction will be reinstated to enhance biodiversity, including the reinstatement of hedgerows.

h) Lighting and Security Fencing

3.4.28 Lighting columns would be erected around the perimeter of the Generating Equipment in order to provide security lighting and lighting for safe working in dark conditions. The lighting columns would be approximately 8 m in height and regularly spaced around the perimeter of the Generating Equipment Site. This is outlined in the Lighting Strategy (Appendix 3.5).

i) Carbon Capture Readiness (CCR) and Carbon Capture and Storage

3.4.29 On the basis that the Project's maximum rated electrical output would be 299 MW, the Project would be below the threshold set out in Directive 2009/31/EC29 on the geological storage of carbon dioxide and NPS EN-1 and EN-2 for when operators of combustion plants are required to have assessed the feasibility of: a storage site, transport facilities and economic considerations of the capture of carbon dioxide (CO_2) (e.g. CCR for Carbon Capture and Storage) produced as a result of the combustion process. Therefore, it is not considered necessary to assess the viability of CO_2 capture or include it further in this ES.

3.4.30 It is noted that the Project consented by the DCO must have a "rated electrical output" of, or less than, 299 MWe and that APL intends to procure a generating station with a rated electrical output of no more than 299 MWe measured at the terminals of the Generating Equipment.

3.4.31 APL will be required to demonstrate that it would not be possible for the operating plant to exceed 299 MWe, in order to comply with the IED that requires all new combustion plants with a rated electrical output of 300 MW or more to have met a number of conditions and ensured space is available for carbon capture and storage.

j) Drainage

3.4.32 The Project will require a site foul water drainage system, and an oily water drainage system. A surface water drainage system will also be required to adequately drain the site and prevent ponding.

3.4.33 To prevent inundation of the Project Site from surface runoff, cut off drainage ditches will be placed around the uphill site perimeter. Further details can be found in Section 3.11 and **Chapter 9: Water Quality and Resources**.

3.5 Description of Gas Connection

3.5.1 The Gas Connection would comprise all the necessary elements to enable gas to be imported to the Generating Equipment at a suitable rate and pressure to produce up to 299 MW, including a Gas Pipeline and AGI.

3.5.2 The Gas Connection will be in the form of a new AGI and underground Gas Pipeline, which is required in order to connect the Generating Equipment to the existing National Gas Transmission System so as to provide a reliable supply of fuel.

3.5.3 Connection of the Gas Pipeline to the National Gas Transmission System will require an AGI to be installed which will comprise: a Minimum Offtake Connection (MOC) facility, which will be owned by National Grid; and a Pipeline Inspection Gauge (PIG) Trap Facility (PTF) which will be owned by APL.

3.5.4 Termination of the Gas Connection will be at a second PTF located on the Generating Equipment Site. A further facility known as the Gas Receiving Station (GRS) will be situated downstream of the PTF within the Generating Equipment Site.

3.5.5 The AGI (both the MOC and PTF) will be located at the northern end of the Project Site, on the southern side of the Rhyd-y-pandy Road leading to Felindre. Once complete, maintenance access for the AGI will be from the Rhyd-y-pandy Road via a short, purpose built tarmacadam access track. The AGI will be unlit unless during routine and emergency maintenance.

3.5.6 The Gas Connection will then follow a route corridor shown on Figure 3.2 running in southerly direction to the Generating Equipment Site. It will be approximately 1.4

km in length. It will cross the National Gas Transmission System in two locations, a Public Right of Way (LC35B) in one location, two private farm tracks (see Figure 3.4) and one ditch (field drain).

3.6 Description of Electrical Connection

3.6.1 The Electrical Connection will comprise all the necessary elements to enable power to be exported from the Generating Equipment to the NETS. The connection will be approximately 900 m in length. It will consist of a 400kV underground cable to the Substation and associated works inside the Substation to connect to a gas-insulated switchgear (GIS) bay. The GIS Bay will be owned, maintained and operated by National Grid. APL will own, maintain and operate the electrical cable up to and including the Cable Sealing End. .

3.6.2 The Electrical Connection route (see Figure 3.2) leaves the Generating Equipment Site passing through open land to the east and south-east of the National Grid Gas Transmission System. The route crosses into National Grid's land to the east of tower 4YW251 heading towards the Substation. Once within National Grid's land the Electrical Connection turns to the north-west to run outside the Substation and parallel with the Substation fence line. The Electrical Connection then turns into the Substation close to the northern corner.

3.6.3 The route passes twice under one 400 kV overhead lattice tower mounted transmission line and once under one wooden pole mounted 11 kV overhead distribution line. The route crosses two ditches and a Local Transmission System pipeline within the field to the east of tower 4YW251.

3.6.4 The Electrical Connection route coincides with the alignment of the new section of Access Road for approximately 500 m of the route length before it turns north towards the Substation.

3.6.5 The Electrical Connection will be drilled (for example using drilling techniques such as Horizontal Directional Drill (HDD)) under the Water Main and Oil Pipeline with at least 2 m clearance from the underside of the Water Main. Though the route corridor of the Water Main is defined, the depth and exact location is unknown and is currently under investigation. Further consultation with Welsh Water will be undertaken as those investigations continue.

3.7 Construction and Site Preparation

a) Overview

3.7.1 Construction and commissioning of the Project would take approximately 22 months with an anticipated starting date in 2020. Typical construction activities and construction assumptions are described in this section and have been used in undertaking the assessment.

3.7.2 The main works associated with the construction phase will be excavation and site levelling for new foundations, piling (if required) and the laying of the Gas and Electrical Connections, as well as erection of the Generating Equipment.

b) Commencement and Site Preparation

3.7.3 Once a DCO has been granted and the relevant pre-commencement Requirements discharged, work can start on the Project Site. It may be necessary to undertake preliminary enabling works prior to discharge of the DCO requirements, these works would be undertaken as per the definitions of “commence” and “permitted preliminary works” described within the Schedule 2 of the DCO). This would include treatment of invasive species, assessment of ground conditions and erection of temporary means of enclosure, site notices and receipt of construction equipment.

3.7.4 Relevant authorisations under the TCPA for the Gas Connection and Electrical Connection will also be required, along with discharge of any pre-commencement conditions attached to planning permissions.

3.7.5 An Outline Construction Environmental Management Plan (see Outline CEMP in Appendix 3.1) will be developed and contain the relevant topic specific management plans on health and safety and environmental management.

3.7.6 The Project Site will be surveyed to mark out with pegs the boundaries and key features and to fix the equipment centrelines according to approved planning and engineering drawings.

3.7.7 The Access Road will cross over the Water Main and National Gas Transmission System (see Figure 3.5). There will be temporary bridges over the Water Main and National Gas Transmission System during construction, most likely temporary bailey bridges or similar. Method statements for working in proximity to the Water Main, Oil Pipeline and National Gas Transmission System will be agreed.

3.7.8 Water courses and ditches will be diverted around the Generating Equipment Site in line with the Landscape and Ecology Mitigation Strategy (Appendix 3.4). These diversions will be undertaken using silt traps, straw bale filters / sedimats and an attenuation pond formed for any surface water outlet from the Generating Equipment Site. Water from the attenuation pond will be discharged in a controlled manner to the Afon Llan.

3.7.9 The new section of the Access Road will be excavated and formed by placing and rolling stone with macadam base course from the B4489 up to the Generating Equipment Site to allow clean vehicle access. A wheel cleaning system will be installed where vehicles leave the construction site and before reaching the existing section of the Access Road. The Access Road will have a tarmacadam surface.

3.7.10 The perimeter of the Generating Equipment Site will be cleared of undergrowth and a permanent or temporary security fence placed with locked gates for main and emergency exits (capable of being opened in an emergency). A security cabin will

be established to provide accommodation for security personnel to be on site during construction 24 hours, seven days a week.

3.7.11 The Laydown Area will be cleared and surfaced with stone, and site cabins placed with offices, first aid, changing rooms, mess facilities with temporary sewage system and parking for cars and machinery.

3.7.12 Additional geotechnical investigations will be carried out post-consent to confirm details of ground properties for optimisation of foundation design.

3.7.13 Vertical drainage is established and then underground services are excavated and placed.

c) Foundations and Piling

3.7.14 The need for piling will be determined following ground investigation works prior to construction. However, it has been assumed as part of the realistic worst case scenario for certain environmental topics that piling will be required for the purposes of this assessment.

3.7.15 The main foundation building column bases for heavier structures (e.g. Gas Turbine Generator, water tanks and transformers) will be excavated to firm ground, the base rolled, blinding concrete placed, and pile caps cropped before fixing meshes of reinforcing steel. Timber shuttering boxes will then be placed, holding down bolts fixed, and concrete poured and finished for each base.

3.7.16 Shallow foundations for lighter buildings and bases will be excavated to firm ground, the base rolled, blinding concrete placed, before fixing meshes of reinforcing steel. Timber shuttering boxes will then be placed, holding down bolts fixed, and concrete poured and finished for each base.

3.7.17 Piling will be carried out using rotary driven piles in high load areas of the Generating Equipment Site such as plant and building column foundations. This technique will minimise disturbance of nearby sensitive ecological receptors. Shallow foundations for lighter buildings will be excavated.

3.7.18 The ground will be backfilled between foundations and floor slabs will be cast with polished finish with spoil from excavations.

d) Access and Traffic

3.7.19 Site roads are excavated, rolled with stone, and a base coarse of tarmacadam placed. This greatly aids the cleanliness of the Project Site during construction.

3.7.20 It is estimated that the construction and decommissioning phases will each result in a maximum of approximately 209 vehicle trips (two way) per day. This will include around 146 HGV deliveries (two way) per day during the peak construction and decommissioning periods.

3.7.21 The construction phase is anticipated to take 22 months with the peak of HGV deliveries occurring during the first quarter of construction (months 1 to 3) and the peak car and van trips occurring during the fifth quarter of construction (months 12 to 14). The car or van trips would be mainly at the start and end of the working day whilst HGV trips would be spread across the day outside of peak times (see **Chapter 12: Traffic, Transport and Access**).

3.7.22 The majority of embedded mitigation measures are set out in the Outline CEMP (Appendix 3.1) as set out at the end of this chapter.

e) Buildings

3.7.23 Factory finish painted building steelwork, columns, frames and roof trusses will be delivered and erected on to the cured foundations.

3.7.24 Liner sheet cladding will be fixed to building frames, insulation blanket attached and outer cladding fixed to walls and roof.

3.7.25 Windows, personnel and roller shutter equipment doors will be fitted to make buildings weather tight.

3.7.26 Block work internal walls will be erected where buildings are divided. All buildings will be fitted out with electrical systems, plumbing and drainage.

3.7.27 Cable draw pits and duct banks around the site would be excavated and cast.

f) Generating Plant Installation

3.7.28 The gas turbine and generator package with auxiliary equipment skid would be delivered to the Project Site and placed over completed foundations with initial alignment.

3.7.29 Prefabricated interconnecting piping spools and ducting would be fitted to the gas turbine and generator package to interconnect its auxiliaries.

3.7.30 Fuel handling equipment skids would be placed and interconnecting piping made up.

3.7.31 Electrical Switchgear is installed and cables pulled through prepared ducts to interconnect systems.

g) Gas Connection

3.7.32 The Gas Connection includes both the Gas Pipeline together with its connection with the AGI. The route for the actual Gas Pipeline will be marked out, topsoil stripped and moved to one side and the trench excavated. The exact construction method for the Gas Pipeline will be subject to further survey and dependant on the National Gas Transmission System depth and ground conditions.

3.7.33 Construction of the Gas Pipeline would likely take place within a temporary fenced strip of land called the 'working width'. The working width is required to facilitate safe construction and the protection of off-site receptors.

3.7.34 It is likely that the working width would be 30 m along the length of the Gas Pipeline route, although it may be necessary to increase / decrease the working width at specific points. For example, adjacent to road and water crossings it may be necessary to increase the working width to provide additional working areas and storage for materials or special plant. Alternatively, adjacent to areas of conservation or existing services it may be necessary to decrease the working width to reduce potential impacts.

3.7.35 Aside from the special crossings, for example, water and road crossings, where trenchless techniques (e.g. HDD) may be used to reduce impact on sensitive areas, it is expected that the Gas Pipeline would be constructed using standard open-cut cross-country pipeline construction techniques.

3.7.36 The Gas Pipeline will be delivered to the Project Site in spools and laid out along the route before welding into a string. The sections of pipe would then be lowered into the trench using side arm booms and backfilled for testing. Where the Gas Pipeline route crosses the National Gas Transmission System, an appropriate method of crossing will be undertaken which affords the appropriate level of protection to the National Gas Transmission System at its existing depth. This may include open cut techniques or a trenchless crossing such as HDD.

3.7.37 Following the laying of the Gas Pipeline, the excavated material and topsoil will be returned to its original position. The surface will then be seeded to restore it to its original state.

3.7.38 Gas systems skids will be placed and piping connected before commissioning the Gas Pipeline, pressure regulators and metering.

3.7.39 The Gas Connection and Electrical Connection will cross an existing Public Right of Way (PRoW) as shown on Figure 3.4. During construction, temporary closure(s) of all or part of the footpath and restriction of the use of the footpath at any time in order to facilitate construction of the Project. The Outline CEMP (Appendix 3.1) provides details of how these temporary arrangements will be managed. It is not envisaged that these will be stopped up.

h) Electrical Connection

3.7.40 The Electrical Connection will be constructed within the curtilage of the Access Road within a 5 m working width adjacent to the road. A cable duct will be installed adjacent to the Access Road to allow the cable to be pulled through at a later date. Short sections of open cut trench will be required at either end of the cable route where it does not coincide with the Access Road. The installation of the cable within the Substation is anticipated to be in cable ducts, although National Grid has recently started using direct buried cables within the Substation.

3.7.41 As described in Section 3.6, the Electrical Connection will require temporary bridges (for example temporary bailey bridge) over the Water Main and Oil Pipeline during the construction phase to enable access from the new section of Access Road and Laydown Area. The temporary bailey bridge will approximately 5 m in height from the anchor points on the existing ground level.

3.8 Commissioning and Completion

a) Generating Plant

3.8.1 All mechanical systems will be cold commissioned once alignment or rotating parts and pressure test of enclosed systems has been completed.

3.8.2 Electrical systems will be checked, commissioned and energised stage by stage.

3.8.3 The Gas Turbine Generator system will be checked and cold commissioned together with control room and National Grid communications.

3.8.4 When all systems are energised and cold commissioned, the gas turbine will be started and 'first fired'. The turbine is run to full speed before synchronising to the grid and producing electrical energy in increasing load steps.

3.8.5 Grid Code compliance tests will be carried out as well as performance, noise and emissions tests.

3.8.6 All buildings will be completed, with sealing, painting, floor finishes and decoration.

3.8.7 All areas of the plant and buildings will be surveyed for outstanding work and minor defects and a programme established to complete these.

3.8.8 The base course at the side of each site road will be cut back to the final width and kerbs will be placed before the final wearing course of macadam is placed. Road marking and signs will be added.

3.8.9 Lighting will be installed in accordance with the Lighting Strategy within Appendix 3.5.

3.8.10 Areas surrounding and between the Generating Equipment will be levelled and crushed stone placed where required. Stored topsoil is placed in areas free from Generating Equipment, including the temporary site laydown areas and will have silt fencing or traps installed as appropriate around these stockpiles. The Outline CEMP (Appendix 3.1) provides further details.

3.8.11 The estimated excavation volume for ground works and site levelling is approximately 19,000 m^3.

3.9 Operation and Maintenance

a) Generating Plant

3.9.1 For the purpose of this EIA it has been assumed that the Generating Equipment will be designed to have an operational life of 25 years.

3.9.2 The plant is expected to operate for up to 2,250 hours per year and 1,500 running hours rolling average over 5 years, supporting National Grid during periods of peak demand and system stress. The plant will have fast start up, response and ramping capability in order to meet the demand profile and compensate for the intermittency of certain forms of renewable power generation connected to the grid.

3.9.3 Sufficient spares would be held to ensure reliable operation of the Generating Equipment. Materials and finishes would be selected to ensure that the appearance of the Generating Equipment does not deteriorate with time. Periodic and routine maintenance would take place, on average, once every six months, to ensure optimal operation of the Generating Equipment at all times.

3.9.4 The Generating Equipment would benefit from on line monitoring and operational diagnosis to identify maintenance needs according to lifecycle use.

3.9.5 The permanent maintenance compound would be used to store/transfer spare parts should any need to be replaced during maintenance/repair. The maintenance compound would also be used periodically during operation for any maintenance activities that require movement of large plant items.

3.9.6 Materials and finishes would be selected to ensure that the appearance of the Power Generation Plant does not deteriorate with time. Periodic and routine maintenance would take place on average once yearly. Typically, planned maintenance would be carried out by one or two skilled personnel.

3.9.7 Inspections to replace or refurbish combustion and turbine hot parts equipment are typically carried out approximately every six years. For industrial gas turbines, this work can be done on site using a mobile crane and hand tools. A temporary bridge or crossing may be required for any abnormal or heavy components to be transported over the Water Main and Oil Pipeline. The shutdown duration is typically 15-20 days.

3.9.8 A gas turbine with dry low NO_x combustion will be used. This will avoid the requirement for large amounts of demineralised water for emissions control. Water will be transported to the Project Site by water tankers for multiple uses including compressor washing in the Gas Turbine Generator and for servicing welfare facilities including potable water and hygiene consumption. Water for the gas turbine compressor washing will be demineralised. Demineralised water tankers will attend site approximately once a month to maintain a store of demineralised water. Typical quality requirements are for conductivity to be lower than 0.2 µS/cm, but vary with gas turbine supplier. After use, the compressor wash water is taken by tanker from site for licensed disposal.

3.9.9 In the event of an unscheduled issue with the Generating Equipment, alarms would signal to the control room instances where there are issues with abnormal operation. These alarms would not be audible externally. The plant would be shut down immediately in such instances and an engineer would attend site. The Generating Equipment would not start up again until the issue had been resolved. Alarms would only be audible outside where there was an event affecting personnel safety such as a fire alarm.

3.9.10 No significant mode shift away from the private car is likely for the Project and there are likely to be only a maximum of five workers on site at the same time.

b) Indicative Gas Connection Maintenance Activities

3.9.11 The Gas Connection would remain operational for the entire lifetime of the Power Generation Plant. No parts of the Gas Connection would be manned. Telemetry apparatus (both within the Gas Pipeline trench and at the AGI) would report back any issues to a central control room. Should any issues be identified, the Gas Pipeline would be isolated and the supply switched off, pending investigation of any faults. Access to the AGI during maintenance / repair would be via a new permanent access off Rhyd-y-pandy Road.

3.9.12 The primary maintenance and inspection activities would be as follows:

- Visual checks;
- In-line inspection;
- Cathodic protection checks; and
- Valve operation checks.

c) Indicative Electrical Connection Maintenance Activities

3.9.13 No regular maintenance is anticipated to be carried out on the underground electrical cable. Maintenance of the electrical cable will be limited to repair in the event of a fault in the cable, in which case the cable will be isolated for repair in line with industry good practice.

3.9.14 The electrical equipment would be subject to periodic inspection. To perform such inspections, pedestrian access is adequate.

3.9.15 The route would be regularly checked to ensure that there are no excavation or construction works in the direct vicinity of the cables, that mounds of soil are not deposited above the cables and that trees are not planted above the cables; this should normally require little more than a drive past.

3.9.16 In addition, periodic inspection of any above ground equipment associated with the cable system would be required. The above ground equipment would include cable terminations, and structures, and bonding system link housings; this would require access to the equipment. In some case dirt and debris can deposit on cable termination insulators which may therefore require cleaning. It is also recommended that the integrity of the cable oversheath be tested at least once every two to three years; this would require access to the cable terminations and

the bonding system link housings. In the event that the oversheath is found degraded or damaged then a repair may be required which would necessitate some excavation along the cable route (in most cases, oversheath damage results from the actions of third parties).

3.10 Decommissioning

3.10.1 For the purpose of the EIA and in order to allow a decommissioning assessment to be presented in this ES, this assessment takes the design life of the power generation plant (25 years) as its assumption for the point in time when decommissioning is assessed.

3.10.2 For the purposes of this assessment, it is assumed that the above ground Generating Equipment would be demolished after 25 years and all structures removed to 1 metre below ground level. The ground would then be dressed with topsoil, and reseeded, with the building platforms remaining insitu. No reprofiling of the Generating Equipment Site will be undertaken.

3.10.3 The decommissioning phase would be likely to be of a similar duration to construction i.e. 22 months. The detail of future decommissioning will be determined following submission of a decommissioning strategy for approval by CCS under Requirement 19 in Schedule 2 of the DCO.

3.10.4 Again, a working assumption has been used that the Electrical Connection and Gas Connection would be decommissioned after 25 years. However, it is important to note that elements of both Connections would be owned and operated by National Grid. In accordance with its statutory duties, National Grid may use these assets in the future as part of its wider network. As such, the date of any decommissioning cannot be certain and the 25 years working assumption has been used to allow for a reasonable assessment of decommissioning effects in this ES. In addition, elements of the Gas Connection and Electrical Connection may be left in situ as this is likely to cause less environmental effects than removal. This would be the case for the Gas Pipeline, for example.

3.11 Embedded Mitigation

3.11.1 Mitigation which is either implicit in the design of the Project or its construction and operation through standard control measures routinely used, such as working within best practice guidance during construction, is known as embedded mitigation. This embedded mitigation has been assumed for the purposes of this ES to be in place from the outset, as it is mitigation without which the Project would be unlikely to be granted consent or allowed to commence. This ES has therefore assessed the likely significant effects of the Project including embedded mitigation.

3.11.2 The embedded mitigation included within the Project, discussed on a topic-by-topic basis, is set out below and in the Mitigation Register provided in Appendix 3.1 and secured by the DCO and its requirements.

3.11.3 The CEMP will be prepared and then implemented during construction to mitigate any adverse environmental effects. An Outline CEMP for the Project is provided at Appendix 3.1. It includes measures relating to the environmental topics assessed in this ES which will mitigate the effects of construction. The Outline CEMP will be finalised and followed by the Contractor on site, once the content has been agreed with CCS. The finalised CEMP will include the following information:

- Community liaison;
- Complaints procedures;
- Nuisance management including measures to avoid or minimise the impacts of construction works (covering dust, noise, vibration and lighting);
- Dust management measures;
- Site waste and materials management measures;
- Surface and ground water protection measures;
- Pollution control measures;
- Security measures and use of artificial lighting; and
- A protocol in the event that unexpected contaminated land is identified during ground investigation or construction.

3.11.4 The Outline Surface Water Management Plan (Appendix 3.2) provides details of protection of surface water features, including diversion of existing watercourse, surface water runoff and protection of private water supplies with particular reference to the Gas Connection and section of new Access Road.

a) Drainage

i. Construction

3.11.5 The Project incorporates welfare facilities which will require a site foul water drainage system. The Project Site is remote and it is believed it will be unfeasible to connect to a public sewer. Therefore, a foul water drainage system will either drain to a septic tank or a package treatment plant within the Project Site but outside any area at risk of flooding. It is likely that the latter would be the preferred option for ease of maintenance and environmental criteria. The processed water would then discharge on site or to a nearby watercourse in accordance with Environmental Permit conditions, if required.

3.11.6 An oily water drainage system will be required to receive surface water from potentially contaminated oil retaining areas and prevent contaminated water discharging from site. Oily water drainage shall be designed in accordance with National Grid Technical Specification 2.20 ‘Oil Containment at Electricity Substations and Other Operational Sites’ (Ref. 3.1), Oil Storage Regulations 2016 (Ref. 3.2) and Pollution Prevention Guidance 3: Use and Design of Oil Separators in Surface Water Drainage Systems (Ref. 3.3) or similar approved guidelines.

3.11.7 The surface water drainage system will be required to adequately drain the Project Site and prevent ponding. The surface water drainage system will adopt the principles of the SuDS Manual – Ciria C753. – Updated SuDS Manual reference 2015 (Ref. 3.4).

3.11.8 To prevent inundation of the Project Site from surface runoff cut off drainage ditches will be placed around the uphill site perimeter. These new drainage ditches will be designed to carry the surface runoff around the Project Site and downstream back to the original drainage ditches/watercourses. This is detailed in the Outline Surface Water Management Plan (Appendix 3.2).

3.11.9 Where possible, the new levels and surfacing will be designed so they naturally drain by infiltration into the surrounding ground. Where this is not economically possible or presents an unsatisfactory risk of flooding, infiltration drains will be installed. All infiltration drains will connect to the surface water drainage system.

3.11.10 It is not expected that it will be possible to connect the surface water drainage system to an infiltration basin due to the presumed predominantly clayey ground and high groundwater level in places. This will be confirmed when the Ground Investigation surveys are carried out post-consent. Instead the discharged flow of water at the Generating Equipment Site boundary from the surface water drainage system will be attenuated in order to maintain the equivalent greenfield runoff flow for a range of events up to the 1 in 100 year event (with climate change allowance). The flow will be attenuated using suitably sized attenuation ponds with restricted discharge pipes to the existing greenfield runoff rates. An emergency overflow will be provided to the attenuation ponds to prevent site flooding in the event of an extreme rainfall event with suitable pollution prevention measures installed if possible to avoid a pollution event, although priority must be given to site security and resilience.

3.11.11 Where possible, roadside swales and infiltration drains will be used to remove and convey any standing water into the surface water drainage system from internal roads within the Project Site including the new Access Road. Where there are space constraints, or there is an elevated risk of contamination, the new site roads will be kerbed and drain via road gullies with pollution control measures. It is expected that roadside swales will discharge to nearby local watercourses at the existing greenfield runoff rate.

3.11.12 Existing field drainage that will cross the new Access Road will be culverted or bridged for a short length to allow flow up to the 1 in 100 year return period.

ii. Operation

3.11.13 As per paragraph 3.11.3, the Project will require a foul water drainage system for use from operational staff. Given the limited number of workers on a rotated shift pattern, the treated discharges from this foul water drainage system is expected to negligible.

b) Air Quality

i. Construction

3.11.14 The CEMP will include standard good practice dust mitigation measures, as set out in the Outline CEMP in Appendix 3.1.

3.11.15 Daily visual inspections of dust emissions will be made in conjunction with dust emissions monitoring at locations to be agreed with NRW. If plumes of dust are visible, behind moving vehicles for example, or dust was visibly deposited on roads outside of the Project Site, more vigorous control measure may be required.

3.11.16 Institute of Air Quality Management (IAQM) guidance on monitoring air quality at construction sites (Ref. 3.5) recommends that, in addition to visual inspections, ambient air monitoring is undertaken in the vicinity of high risk sites. This data is required for two reasons: the first relates to ensuring that mitigation measures are appropriate and being applied rigorously; the second is to provide early warning of increased dust emissions which allows for the cessation or modification of activities prior to impacts occurring.

3.11.17 Monitoring will be undertaken in the vicinity of the Lletty-Morfil SINC. Since the risk for ecosystems relates to dust deposition, a real time monitor for total suspended particulate matter will be installed but this needs be an 'indicative instrument' only. Trigger levels for the instrument, which would suggest increasing risk/emissions, should be agreed with NRW prior to the commencement of construction. The monitoring stations will be mobile and would be moved around the Project Site as the principal activities move.

ii. Operation

3.11.18 The Generating Equipment will be designed to comply with Industrial Emissions Directive (IED) emission limits. In addition the stack height determination (Appendix 6.2) has demonstrated that a minimum stack height of 35 m is appropriate to ensure the adequate dispersal of pollutants to ensure that no harm is caused.

3.11.19 The Project will require an Environmental Permit to operate as required by the Environmental Permitting Regulations 2016 (as amended), and monitoring the performance of the Generating Equipment against the permit conditions will be the responsibility of APL, with NRW requiring confirmation and evidence that monitoring is being undertaken. The performance of the emissions control will require monitoring by stack emissions testing throughout operation and the Generating Equipment will be 'fine-tuned' so as to ensure that limits are not exceeded.

3.11.20 The operation of the Project will not require a significant onsite workforce. Visits by service/maintenance vehicles etc. will occur on average every year.

c) Noise and Vibration

i. Construction

3.11.21 It is anticipated that core working hours and boundary noise will be limited during construction by a Requirement in the DCO. Working hours are likely to be between 08.00 and 18.00 on weekdays, and between 08.00 and 13.00 hours on Saturdays and public holidays. Some works may be allowed to take place outside of normal working hours provided they do not cause any noise disturbance. Should it be necessary to conduct work with the potential to generate noise, outside these core hours, this would be with the prior written agreement of CCS. These limits will not apply during commissioning and testing of the Project.

3.11.22 Measures to mitigate noise and ensure compliance with any imposed maximum boundary noise limits will be implemented during the construction phase of the Project in order to minimise impacts at local residential Noise Sensitive Receptors (NSRs), particularly with respect to activities required outside of normal working hours.

3.11.23 Construction noise mitigation measures are included in the Outline CEMP (Appendix 3.1). In order to keep noise effects from the construction phase to a minimum, all construction activities relating to the Power Generation Plant, Gas Connection, and Electrical Connection would be carried out in accordance with the recommendations of British Standard (BS) 5228 'Noise and Vibration Control on Construction and Open Sites' (Ref. 3.6) as explained in **Chapter 7: Noise & Vibration**.

3.11.24 Mitigation measures for inclusion within the CEMP may contain, but is not limited to:

- Abiding by any construction noise limits at nearby NSRs;
- Ensuring that all processes are in place to minimise noise before works begin and ensuring that best practicable measures (BPM) are being achieved throughout the construction programme, including the use of localised screening around significant noise producing plant and activities;
- Ensuring that modern plant is used, complying with the latest European noise emission requirements. Selection of inherently quiet plant where possible;
- Hydraulic techniques for breaking to be used in preference to percussive techniques where practical;
- Use of lower noise piling (such as rotary bored or hydraulic jacking) rather the driven piling techniques (if required), where possible;
- Off-site pre-fabrication, where practical;
- All plant and equipment being used for the works to be properly maintained, silenced where appropriate, operated to prevent excessive noise, and switched off when not in use;
- All contractors to be made familiar with current legislation and the guidance in BS 5228 (Parts 1 and 2) (Ref. 3.6), which should form a prerequisite of their appointment;

- Loading and unloading of vehicles, dismantling of site equipment such as scaffolding or moving equipment or materials around the Project Site, to be conducted in such a manner as to minimise noise generation;
- Appropriate routing of construction traffic on public roads and along access tracks;
- Consultation with CCS and local residents to advise of potential noisy works that are due to take place; and
- Monitoring of noise complaints, and reporting to the contractor for immediate investigation.

3.11.25 Method statements regarding construction management, traffic management, and overall site management would be prepared in accordance with best practice and relevant British Standards, to help to minimise impacts of construction works. One of the key aims of such method statements would be to minimise noise disruption to local residents during the construction period.

3.11.26 Consultation and communication with the local community throughout the construction period would also serve to publicise the works schedule, giving notification to residents regarding periods when higher levels of noise may occur during specific operations, and providing lines of communication where complaints can be addressed.

3.11.27 A detailed noise assessment would be carried out once the contractor is appointed and further details of construction methods are known, in order to identify specific mitigation measures for the Project.

3.11.28 In addition, it is proposed that the contractor would be a member of the 'Considerate Constructors Scheme' which is an initiative open to all contractors undertaking building work.

ii. Operation

3.11.29 The selection of the Project Site and development of the indicative concept layout have already included consideration of potential noise effects and proximity to NSRs, with Generating Equipment being located as close to the existing electrical infrastructure as possible and as far from the NSRs as practicable.

3.11.30 Other measures with regards to noise and vibration during operation, to be incorporated into the design include:

- The gas turbine generator and major compressors are to be housed in acoustic enclosures. In addition, these will be housed within secondary acoustic enclosures specified at 75 dB(A) Sound Pressure Level at 1 m.
- Gas turbine air inlet filter and ventilation apertures are to be fitted with silencers, and designed such that all sensitive noise receptors benefit from screening and/or directivity corrections.
- Silencers are to be fitted in the exhaust stack. Due to the impracticality of screening stack noise, discharge noise will be controlled using these silencers,

which will be tuned to attenuate low frequencies from the gas turbine generator exhausts.

- All plant items will be controlled to minimise noise of an impulsive or tonal nature.
- Noise breakout from the stack will be controlled using silencers. To achieve the predicted noise levels used in this assessment, noise from the top of the stacks should not exceed the maximum octave band sound power levels identified in Table 7-8 in **Chapter 7: Noise and Vibration**.

3.11.31 During the detailed design stage, options to mitigate potential significant residual noise effects by design will be further explored.

3.11.32 Several options for configuration and suppliers of the Generation Equipment are under consideration. Preliminary modelling has shown that options are available that are capable of meeting the threshold noise levels.

3.11.33 The Project would operate in accordance with an Environmental Permit issued and regulated by NRW. This would require operational noise from the Generating Equipment to be controlled through the use of BAT, which would be determined through the Environmental Permit application.

3.11.34 If any non-normal and/or emergency operations were to lead to noise levels in excess of the agreed limits specified in the DCO Requirements, the operator will inform the local authority and residents of the reasons for these operations, the anticipated emergency period and the steps to be taken to bring it back to compliance.

d) Ecology

i. Construction

3.11.35 Local habitats and protected species would be protected during the construction works through measures included within the Outline CEMP (Appendix 3.1) such as fencing to prevent access of species to working areas and translocation of protected species (e.g. reptiles).

3.11.36 Sensitive ecology features such as the Ancient Woodland, trees and habitats have been avoided as much as possible during the Project design development and will continue to be considered in the potential improvements and widening of the existing access road from the B4489, drainage and landscape reinstatement.

3.11.37 The Landscape and Ecology Mitigation Strategy (Appendix 3.4) sets out all necessary ecological mitigation measures as necessary to sufficiently mitigate the impacts on ecological receptors. The plan also outlines procedures to manage invasive species.

ii. Operation

3.11.38 The stack has been designed to minimise impacts from emissions during operation, which includes minimising deposition that could affect ecological receptors.

e) Water Quality and Resources

i. Construction

3.11.39 Hydrological protection measures have been included in the Outline Surface Water Management Plan (Appendix 3.2) to prevent pollution events, with particular reference to the Gas Connection and section of new Access Road. The Surface Water Management Plan includes details of silt traps and / or sedimats to reduce flow of suspended solids, suitable phasing to reduce the need for unprotected slopes and avoidance of stockpiled materials. The drainage strategy is included in Appendix E of Appendix 9.1.

3.11.40 All designated oil retaining areas (e.g. oil filled transformers and oil storage areas) will be designed and constructed to contain at least 110% of the stored oil.

ii. Operation

3.11.41 Adaptation of different platform levels at the locations of key elements of the Project development. In line with this, the ground level of the Water Main easement area will be retained at the existing level in order to provide a path for any flood water to pass through the Project Site, thereby avoiding the elevated Power Generation Plant areas – with the Power Generation Plant finished floor level to be raised by approximately 150 mm above the site road crown level while keeping the plant plinths at 300 mm above the site level.

3.11.42 Provision for all process water (i.e. gas turbine compressor wash water) to be collected in a drain tank removed by road tanker and disposed by an accredited company to a designated treatment facility off-site.

3.11.43 Rainwater will be removed from oil retaining areas by an automatic pump to the oily water drainage system. The automatic pumps will be designed to shut down in the event that a major oil spillage is detected. This will help prevent large quantities of oil entering the oily water drainage system.

3.11.44 The oily water drainage system will ultimately pass through a Class 1 Full Retention Oil Separator (as defined in BS EN 858) before discharging into surface water bodies or drainage systems.

3.11.45 All oil unloading areas on site have been designed to include containment for accidental spillage of fuel during unloading with the loading system equipped such that drainage is isolated during filling and any spillage goes to the dedicated interceptor.

3.11.46 The oil separator will be fitted with an alarm to indicate when the oil coalesce requires emptying. All oil separators will be sized to suit the oily water catchment area. Routine and regular maintenance inspections will be undertaken in accordance with legislation, the manufacturer's recommendations and good practice.

f) Ground Conditions

i. Construction

3.11.47 The CEMP will be implemented during construction to mitigate any adverse environmental effects and includes working in accordance with best practices, such as the completion of all necessary ground investigation and risk assessments, maintaining safe working practices and the use of correct and appropriate Personal Protective Equipment (PPE).

3.11.48 The following information which relates specifically to geology, ground conditions and hydrogeology will be included within the CEMP:

- Surface and groundwater protection measures;
- Peat management measures as required; and
- Security measures; a protocol in the event that unexpected contaminated land is identified during ground investigation or construction.

3.11.49 Intrusive ground investigation will be conducted post-consent, to be secured via a DCO Requirement, to identify ground conditions and potential contaminants, as will risk assessments including gas, control waters and human health.

3.11.50 A detailed mining risk assessment may be required to establish the risk of untreated shallow underground workings beneath the Project Site. There is potential for mine workings and entries requiring stabilisation treatment so ground stability will be improved.

3.11.51 A mineral resources survey will be undertaken to establish the value of the sand, gravel and coal reserves.

3.11.52 A foundations risk assessment is likely to be required to assess the risk of piling foundations to controlled waters; however this will be confirmed by the ground investigation.

g) Landscape and Visual

i. Construction

3.11.53 Mitigation measures will be implemented during the construction phase as set out in the Outline CEMP (Appendix 3.1) and the Landscape and Ecology Mitigation Strategy (Appendix 3.6) in order to limit impacts on the landscape and visual resource. These measures will include:

- The use of tall hoardings to screen views of ground level construction activities in relation to sensitive receptors such as residential views and views from nearby PRoW;
- Materials and machinery will be stored tidily during the construction works in order to minimise impacts on views;
- Lighting of compounds and work sites will be restricted to agreed working hours and those which are necessary for security in accordance with the Institution of Lighting Professionals guidelines (Ref. 3.7);

- The unnecessary removal of vegetation will be avoided;
- The retention and protection of existing trees in accordance with BS5837:2012 Trees in Design, Demolition and Construction, Recommendations (Ref. 3.8);
- public roads providing access to construction site will be maintained fee of dust and mud;
- The Contractor will clear and clean all working areas and accesses as work proceeds and when no longer required for the works;
- On completion of construction works, all structures, equipment, surplus materials, waste, notice boards and temporary fences used during construction will be removed from the Project Site with minimum damage to the surrounding area; and
- Prompt reinstatement of areas that are no longer required following construction.

ii. Operation

3.11.54 Mitigation has been developed through a collaborative and iterative design process and is embedded into the Project design. These design measures are set out in the following paragraphs.

3.11.55 Utilising technology OCGT will allow a significant reduction in stack height compared to other technology types. As a result of selecting OCGT technology, there will be no visible plume arising from the stack. The high temperature of the exhaust gases means that water vapour is well above the condensation point which would give rise to a visible plume.

3.11.56 The architectural design of the buildings and structures on the Project Site has been designed to reduce glare and to assimilate the Project into the surrounding landscape as much as possible by using neutral recessive colours to lessen the contrast with the surrounding landscape and break up the overall massing of the large scale structures.

3.11.57 External lighting has been designed to reduce trespass and configured to avoid glare and spillage Details will be provided in the Lighting Strategy as submitted as part of the DCO Application and undertaken in accordance with the Institution of Lighting Professionals Guidelines (Ref. 3.7).

3.11.58 The Landscape and Ecology Mitigation Strategy (Appendix 3.4) and Landscape and Ecology Mitigation Plan (LEMP) in Figure 3.6 has been developed to both provide reinstatement planting as well as to integrate the Project into the landscape and its wider setting. The planting proposals will be developed in accordance with the various utility and service constraints within the Project Site.

3.11.59 The landscape proposals will cover a minimum period of five years of monitoring, management and maintenance to ensure the landscape objectives are successfully achieved.

h) Traffic, Transport and Access

i. Construction

3.11.60 The embedded mitigation for traffic, transport and access includes the following:

- Modifications to the B4489/Access Road junction to facilitate movements by abnormal loads;
- Widening and extension of the access road to facilitate access by construction traffic;
- Physical management of the access road to ensure the security and safety of all staff;
- A Construction Traffic Management Plan (CTMP) including details of the management of construction traffic and users of the PROW crossing the Project Site Boundary; and
- A Construction Staff Travel Plan (CSTP) to minimise the level of single occupancy car use by construction staff travelling to/from the site.

i) Cultural Heritage and Archaeology

i. Construction

3.11.61 A Written Scheme of Investigation (WSI) will be prepared in advance of construction commencing. A watching brief will then be implemented in accordance with WSI during construction for any works associated with ground disturbance.

j) Other Effects

i. Construction

3.11.62 The Outline CEMP includes a section on Site Waste Management, which will encourage reuse and recycling of waste before disposal in accordance with the waste hierarchy.

3.12 References

Ref. 3.1 National Grid. (2014). NGTS 2.20: Oil Containment at Electricity Substations and Other Operational Sites.

Ref. 3.2 Natural Resources Wales. Oil Storage Regulations (Wales) 2016

Ref. 3.3 Environment Agency. Pollution Prevention Guidance 3: Use and Design of Oil Separators in Surface Water Drainage Systems (withdrawn)

Ref. 3.4 CIRIA. (2015). C753: The SUDS [Sustainable Urban Drainage] Manual;

Ref. 3.5 IAQM. (2012). Guidance on Air Quality Monitoring in the Vicinity of Demolition and Construction Sites. [Online].
Available: http://www.iaqm.co.uk/wp-content/uploads/guidance/monitoring_construction_sites_2012.pdf

Ref. 3.6 British Standards Institute (BSI). (2014). BS 5228 -1: 2009+ A1:2014. Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise.

Ref. 3.7 ILP. (2011). Guidance Notes for the Reduction of Obtrusive Light. [Online].
Available: https://www.theilp.org.uk/resources/free-resources/ilp-guidance-notes/

Ref. 3.8 BSI. (2012). BS 5837. Trees in Relation to Design, Demolition and Construction – Recommendations.

Chapter 4

Approach to Environmental Impact Assessment

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4. Approach to Environmental Impact Assessment

4.1 Introduction

4.1.1 The purpose of this chapter is to provide a more detailed description of the EIA process, as well as outlining the methodology and relevant guidance used to undertake the EIA and the structure of the remainder of this ES.

4.2 EIA Regulations

4.2.1 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2009 (the 'EIA Regulations') require an EIA to be carried out in respect of any development listed in Schedule 1 to the EIA Regulations ('Schedule 1 development'). The Project is a Schedule 1 development as it is a thermal generating station with a heat output[1] of 300 MW or more as listed in Schedule 1, paragraph 2(1) of the EIA Regulations.

4.2.2 The Project falls under the EIA Regulations and not the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (EIA Regulations 2017). This is because a scoping opinion was requested from the Secretary of State under the EIA Regulations before the commencement of the EIA Regulations 2017. This means that, in accordance with the transitional arrangements at Regulation 37 of the EIA Regulations 2017, the EIA Regulations will continue to apply to the Project.

a) Compliance with EIA Regulations

4.2.3 The information to be included in an ES is set out in Schedule 4 of the EIA Regulations. Part 1 of the Schedule details the information that the applicant can reasonably be required to provide, whilst Part 2 identifies the information that the applicant must provide. This information is highlighted in Table 4-1 below, which also provides confirmation of where the information is provided within this ES.

Table 4-1: Compliance with EIA Regulations

Required Content of Environmental Statements	Relevant Chapter of this ES
Part 1	
1. Description of the development, including in particular (a) a description of the physical characteristics of the whole development and the land-use requirements during the construction and operational phases;	Chapter 3: Project Site and Description
(b) a description of the main characteristics of the production processes, for instance, nature and quantity of the materials used;	Chapter 3: Project Site and Description
(c) an estimate, by type and quantity, of expected residues and emissions (water, air and soil pollution, noise, vibration, light,	Detail provided in Technical Chapters 6 –

[1] Thermal output is commonly defined as the amount of 'useable heat' which is produced as part of the process of the combustion of fuel. Only a part of this useable heat can be converted to electrical energy, which is why this is a larger value than electrical output.

Required Content of Environmental Statements	Relevant Chapter of this ES
heat, radiation, etc.) resulting from the operation of the proposed development.	15
2. An outline of the main alternatives studied by the applicant and an indication of the main reasons for the applicant's choice, taking into account the environmental effects.	Chapter 5: Alternatives Considered.
3. A description of the aspects of the environment likely to be significantly affected by the development, including, in particular, population, fauna, flora, soil, water, air, climatic factors, material assets, including the architectural and archaeological heritage, landscape and the inter-relationship between the above factors.	Detail provided in the Technical Chapters 6 – 15
4. A description of the likely significant effects of the development on the environment, which should cover the direct effects and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects of the development, resulting from: (a) the existence of the development; (b) the use of natural resources; (c) the emission of pollutants, the creation of nuisances and the elimination of waste, and the description by the applicant of the forecasting methods used to assess the effects on the environment.	Detail provided in Technical Chapters 6 – 15
5. A description of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment.	Detail provided in Chapter 3, Technical Chapters 6 – 15 and Chapter 16 (including Mitigation Schedule – Appendix 3.1)
6. A non-technical summary of the information provided under Paragraphs 1 to 5 of this Part.	Separate Non-Technical Summary Report
7. An indication of any difficulties (technical deficiencies or lack of know-how) encountered by the applicant in compiling the required information.	Detail provided in Chapter 4 and Technical Chapters 6 – 15 and Mitigation Schedule (Appendix 3.1)
Part 2	
1. A description of the development comprising information on the site, design and size of the development.	Chapter 3: Project and Site Description
2. A description of the measures envisaged in order to avoid, reduce and, if possible, remedy significant adverse effects	Mitigation detailed in Chapter 3, Technical Chapters 6 – 15 and Chapter 16
3. The data required to identify and assess the main effects which	Baseline data provided in Technical Chapters 6

Required Content of Environmental Statements	Relevant Chapter of this ES
the development is likely to have on the environment.	– 15
4. An outline of the main alternatives studied by the applicant and an indication of the main reasons for the applicant's choice, taking into account the environmental effects.	Chapter 5: Alternatives Considered
5. A non-technical summary of the information provided under paragraphs 1 to 4 of this Part.	Separate Non-Technical Summary Report

4.3 Environmental Impact Assessment

4.3.1 EIA is the process of identifying, evaluating and, where possible, mitigating the likely significant environmental effects of a proposed development. It promotes the early identification and evaluation of the potentially significant environmental effects of a proposed development and enables appropriate mitigation (that is measures to avoid, reduce or offset significant adverse effects) to be identified and incorporated into the design of a development, or commitments to be made to environmentally sensitive construction methods and practices.

4.3.2 The results of the EIA also ensure that decision makers such as the SoS and statutory consultees such as planning authorities, in this case CCS, as well as other interested parties, including local communities, are aware of a Project's environmental effects. These are then taken into account by the decision-maker prior to determination of an application for planning approval.

4.3.3 The main steps outlined in the PA 2008 and the EIA Regulations are as follows:

- Production of a Scoping Report to identify the likely significant effects (scoped in) and the proposed methodology for their assessment in line with relevant legislation, guidance and methods, and justification for any significant effects that are not likely (scoped out). The Scoping Report will also seek agreement of study areas, data sources, survey methodologies and terminology;
- Baseline surveys are undertaken to identify and describe the environmental character of the area that could potentially be affected by the Project. Where baseline data indicates major constraints to the Project, this information is to be provided to the design team immediately;
- Relevant natural and manmade processes that may change the character of the site are identified;
- Consideration is then given to the possible interactions between the Development and both existing and future site conditions. These interactions or impacts are assessed using set criteria based on accepted guidance and good practice;
- Using the initial designs of the Project, the likely significant environmental effects, both direct and indirect, can be established;
- Production of a Preliminary Environmental Information report (PEIR) for consultation purposes;

- Recommendations are made to avoid, minimise or mitigate adverse effects and enhance positive effects. Alterations to the design will then be reassessed and the significance of likely residual environmental impacts ascertained; and
- Following statutory consultation, the results of the EIA in combination with the responses to the Scoping Opinion are set out in an ES that accompanies the proposed DCO Application.

4.3.4 This ES summarises the environmental impact assessment undertaken to date and has sought to address comments that were raised by consultees and stakeholders during statutory consultation carried out under s42 and s47 of the PA 2008. These comments are addressed within each individual technical chapter as necessary.

a) Scoping

4.3.5 Scoping involves focusing the EIA on those issues of greatest potential significance. It is an important tool for identifying the likely significant environmental effects of a project through its design, construction and operation and decommissioning phases and ensures that appropriate mitigation options are considered, where necessary.

4.3.6 APL requested a Scoping Opinion from the SoS in July 2014. The request was supported by a Scoping Report that described the anticipated likely significant environmental issues requiring detailed evaluation as part of the EIA process. The formal Scoping Opinion was received in August 2014. It has allowed for agreement on the potential likely significant environmental effects of the Project and, therefore, the aspects of the environment on which the EIA should focus.

4.3.7 The Scoping Report and Opinion can be found on the Planning Inspectorate's website[2] and APL's website[3] as well as at Appendix 4.1 and 4.2. APL's responses to the matters raised in the Scoping Opinion and later consultation and engagement are set out in Appendix 4.3.

4.3.8 Further consultation with those organisations that commented on the Scoping Report, as well as the Community Councils, was also carried out during Phase 1 and Phase 2 consultation including:

- Natural Resources Wales (NRW);
- South and West Wales Wildlife Trust (SWWWT);
- Abertawe Bro Morgannwy;
- Civil Aviation Authority (CAA);
- Ministry of Defence (MoD);
- Cadw;
- Brecon Beacons National Park Authority;
- City and County of Swansea Council (CCS);
- Network Rail; and
- The Coal Authority.

[2] https://infrastructure.planninginspectorate.gov.uk/
[3] http://www.abergellipower.co.uk

4.3.9 Regular meetings and telecoms were held with CCS and NRW to discuss the progress of the application for development consent and to consult with the different environmental departments.

4.3.10 The consultation process has led to the general agreement with all organisations that the EIA reported on in this ES will consider the following environmental topics:

- Air Quality;
- Noise;
- Ecology;
- Landscape;
- Water Quality and Resources;
- Geology and Hydrogeology;
- Traffic, Transport and Access;
- Historical Environment; and
- Socio-economics.

4.3.11 **Chapter 15: Other Effects** has also been included in the ES and covers issues which are not covered within the standard topic chapters but which have emerged, through the consultation process, as matters that need to be addressed.

4.3.12 Table 4-2 discusses the items that have been scoped out of the assessment, but fall under the above topic areas.

Table 4-2: Items Scoped out of the EIA

Topic / Scope	Justification
Transboundary Effects	Due to the design, proposed mitigation and implementation of best practice measures, it is considered that there will be no significant transboundary effects caused by the Project that will affect any other European Economic Area State. A Transboundary Screening assessment has been undertaken by the SoS which confirms this approach.
Air Quality [Electrical or Gas Connections]	No impacts on local air quality are anticipated from the operation of the Electrical or Gas Connections and therefore this has not been assessed. The SoS agreed with this approach in the Scoping Opinion (paragraph 3.8, Appendix 4.3).
Vibration	The identified plant/equipment items to be used are not recognised as sources of high levels of vibration and therefore operation and decommissioning vibration has not been assessed. The SoS did not disagree with this approach in the Scoping Opinion (Appendix 4.3).
Noise [Electrical or Gas Connections]	The Gas and Electrical Connections will be buried underground and therefore it is not anticipated that they will generate any noise or vibration during operation. Therefore, these elements have not been assessed. The SoS partly agreed with this approach in the Scoping Opinion (paragraph 3.8, Appendix 4.2) but requested further justification of the approach. Further justification is set out in **Chapter 7: Noise and Vibration**.

Topic / Scope	Justification
Landscape [Brecon Beacons National Park]	The Brecon Beacons National Park lies over 15 km to the north of the Project Site and, due to the intervening distance, is both physically and visually separate. Both protected landscapes have been scoped out of the assessment due to the physical and visual separation. This approach has been agreed with the Brecon Beacons National Park Authority at the request of the SoS (paragraph 3.66, Appendix 4.3).
Water Quality and Resources [Electrical or Gas Connections]	Effects on water quality and resources during operation and decommissioning of the Gas and Electrical Connections are unlikely to occur and have been scoped out of the chapter (**Chapter 9: Water Quality and Resources**). Ground levels along the route corridor of the Gas and Electrical Connections will be very similar to existing levels and any ongoing maintenance will be negligible, as described in Section 3.9. The impacts during the operation phase are therefore considered to be limited to the presence of the trench if it has different hydraulic properties to the surrounding natural ground. This can be mitigated through careful selection and placing of bedding and backfill material to try and match the natural ground as far as possible. Transport of pollutants associated with previous land uses is addressed in **Chapter 10: Geology, Ground Conditions, and Hydrogeology**.
Water Quality and Resources [AGI]	The AGI will have a small footprint and the design will include appropriate SuDS measures for control and treatment of surface water runoff in accordance with the drainage strategy for the Project Site. There will be no effluent discharges for the Gas Connection. The Gas Connection lies north of the Generating Equipment Site where flood risks are low, and will be mitigated through raised ground levels where necessary. No comments were received at Scoping stage therefore this has been scoped out of the assessment.
Carbon Capture Readiness	With a rated electrical output of less than 300MW, the Project will be below the threshold set out in Directive 2009/31/EC (as transposed by The Carbon Capture Readiness (Electricity Generating Stations) Regulations 2013) and NPS EN-1 and EN-2. Operators of combustion plants which are above this threshold are required to have assessed the feasibility of: a storage site, transport facilities and economic considerations of the capture of CO_2 produced as a result of the combustion process. As a result it is not necessary to assess the viability of CO_2 capture in this ES.

b) Preliminary Environmental Information Report

4.3.13 Under Regulation 10(b) of the EIA Regulations the applicant must consult on preliminary environmental information relating to the Project. In 2014, this information was compiled into a Preliminary Environmental Information Report (2014 PEIR) (Ref. 4.1), which provided the environmental information collected part of the way through the EIA process as well as an assessment, on a preliminary basis, of the likely significant environmental effects of the Project.

4.3.14 The 2014 PEIR was compiled along with the 2014 PEIR NTS to accompany APL's Phase 1 statutory consultation with both the local community and prescribed consultees.

4.3.15 In 2018, a second PEIR was compiled (2018 PEIR; Ref 4-3) along with the 2018 PEIR NTS to accompany APL's Phase 2 statutory consultation on a refined Project in advance of submitting its DCO Application. This ES has evolved from the 2018 PEIR, and includes an updated environmental assessment and provides more information on how the Project has developed since the Phase 2 consultation in 2018.

4.3.16 Feedback received during both the Phase 1 and Phase 2 statutory consultation helped further inform and refine the development of the design of the Project and the EIA process. More detailed analysis of this is included within the Consultation Report (Document Reference 5.1.0); however a summary of a selection of the main themes is as follows:

- Site selection;
- Landscape;
- Transport and traffic;
- Socio-economics;
- Air quality and Noise; and
- Water.

4.3.17 In order to aid the reader, this ES highlights where the technical assessments have been updated, either as a result of the Project evolution and / or due to an update in environmental baseline information which has been collated since 2014. Within the Introduction section to each technical chapter, a short summary of any changes which have been undertaken has been included where necessary. Further detailed information on the design changes to the Project is included in **Chapter 5: Alternatives Considered**.

4.4 Environmental Baseline

4.4.1 In undertaking an EIA for any project, it is important to identify the environmental baseline for the potential receptors which may be affected. This has allowed the effects of the Project to be compared and/or combined with the existing baseline in order to ensure an informed assessment of the potential effects of the Project and to allow the identification of the most appropriate mitigation which could be employed to minimise any identified likely significant adverse effects.

4.4.2 To establish the baseline, a study area that is appropriate for each assessment topic is identified which takes into consideration the surrounding context and the likely scale and range of potential significant effects. Next, a range of environmental data has been gathered from a combination of sources in respect of the study area in order to inform the preliminary assessment. This has included:

- Documentary information on the Power Generation Plant, Gas Connection and Electrical Connection, and their surroundings within each relevant study area, including information available from the previous EIA work for other projects;
- Field survey information, including: Phase 2 ecological surveys; landscape character assessments; background noise levels; ground conditions/ contaminated land assessments, location of sensitive receptors and traffic levels on the road network; and
- Data held by both statutory and non-statutory consultees.

4.4.3 It is anticipated that the construction of the Project will commence in early 2020. The assessment has therefore used a '2020 baseline' to provide a future baseline against which the assessment is undertaken. As such a number of developments are considered in the assessment of effects, where those already have planning permission and are expected to be constructed in the next three years. Cumulative Projects have been agreed with CCS and are listed in Table 4-6.

4.5 Realistic Worst Case Scenario for Assessment

4.5.1 In accordance with PINS Advice Note 9 (Rochdale Envelope) (Ref. 4.2), the assessments presented in this ES are based on an assessment of the realistic 'worst case' scenario arising from the Project parameters described in Table 3-3. This allows flexibility for APL whilst ensuring that the likely significant environmental effects are identified and adequately assessed. The realistic worst case scenario is set out in each topic chapter for clarity and transparency.

4.5.2 Taking the above into consideration, it has been determined that for all topic areas to be addressed in the EIA except air quality, the highest stack height (45 m) represents the 'worst case'. For air quality the minimum stack heights of 35 m represents the 'worst case' due to lower dispersion. The ES contains an explanation in each chapter of why the scenario assessed represents the worst case for that topic.

4.5.3 For the assessment, it has been assumed that the Generating Equipment will operate for a worst case of 2,250 hours per year in the noise and air quality assessments, although actually it is expected to be running for 1,500 hours averaged over a rolling 5 year period. In the noise assessment, it is assumed that the Generating Equipment will operate at night to represent the worst case scenario. Where there is the possibility that intermittent operation could give rise to more significant effects than continuous operation (for example start-up noise) this has been considered in the noise and air quality assessments, as well as disturbance to ecological receptors in the ecological assessment. This issue is not relevant to any other topic chapters.

4.6 Assessment Methodology

4.6.1 Methodologies for each subject area are presented within each of the technical chapters. These methodologies are based upon recognised good practice and

guidelines specific to each subject area, and take into account any consultation responses relating to the methods used in the 2014 and 2018 PEIR, the SoS Scoping Opinion and any additional requirements that have been identified in connection with the Project.

a) Assessment of Effects

4.6.2 The approach is broadly the same for all specialist topic areas with some variation in the descriptions of assessment criteria. For each topic, the assessment of significance will be informed by the sensitivity of the existing or baseline environmental conditions or character, and the magnitude of the change to the existing conditions or baseline character which occur as a result.

4.6.3 The determination of the significance of the likely environmental effects arising from development is a key stage in the EIA process. To assess the overall significance of an effect it is necessary to establish the magnitude of the effect occurring (i.e. the change to the existing baseline conditions as a result of the Project) and the sensitivity or importance of the receiving environment or receptor. Assessment of significance for environmental topics will combine professional judgement with the consideration of a number of factors including:

- The probability of the effect occurring based on the scale of certain, likely or unlikely;
- The sensitivity and value of the resource or receptor under consideration;
- The magnitude of the impact in relation to the degree of change which occurs as result (which includes the duration of the effect – short medium or long term);
- Reversibility of the effect;
- Comparison with legal requirements, policies and standards; and
- Comparison with applicable environmental thresholds.

4.6.4 The value of the receptors is assessed according to the relative importance of existing environmental features on or near to the site, or by the sensitivity of receptors i.e. whether they are likely to be robust enough to be unaffected by the Project or alternatively are highly susceptible to the type of effects likely to occur. Criteria for the determination of sensitivity or value of receptors are established based on approved guidance, legislation, statutory designation and/or professional judgment.

4.6.5 The below provides only a general framework for the determination of effects. In some cases a technical chapter may define its own interpretation of sensitivity or magnitude of effect in line with the relevant topic specific guidance.

i. Sensitivity or value of Receptors

4.6.6 Table 4-3 provides general definitions of the sensitivity criteria used within the assessment. In each specialist chapter of this ES, criteria will be explained with reference to that particular discipline which may differ to the below.

Table 4-3: Generic Guidelines for the assessment of value/ sensitivity

Value/ sensitivity	Guidelines
Very High	The receptor has little or no ability to absorb change without fundamentally altering its present character, is of very high environmental value, or of international importance.
High	The receptor has low ability to absorb change without fundamentally altering its present character, is of high environmental value, or of national importance.
Medium	The receptor has moderate capacity to absorb change without significantly altering its present character, has some environmental value, or is of regional importance.
Low	The receptor is tolerant of change without detriment to its character, is low environmental value, or local importance.
Negligible	The receptor is resistant to change and is of little environmental value.

ii. Magnitude of Effect

4.6.7 The magnitude of potential effects on environmental baseline conditions is identified through consideration of the Project taking into account the scale or degree of change from the existing situation as a result of the effect; and the duration and reversibility of the effect, as well as consideration of relevant legislative or policy standards or guidelines.

4.6.8 Table 4-4 provides general definitions of effect magnitude criteria. In each specialist chapter of this ES, effect magnitude criteria will be explained with reference to that particular discipline which may differ to the below.

Table 4-4: Generic Guidelines for the assessment of magnitude

Magnitude	Guidelines
High	Total loss or major alteration to key elements/features of the baseline conditions such that post development character/composition of baseline conditions will be fundamentally changed.
Medium	Loss or alteration to one or more key elements/features of the baseline conditions such that post development character/composition of the baseline conditions will be materially changed.
Low	Minor shift away from baseline conditions. Changes arising from the alteration will be detectable but not material; the underlying character/composition of the baseline conditions will be similar to the pre-development situation.
Negligible	Very little change from baseline conditions. Change is barely distinguishable, approximating to a “no change” situation.

iii. Assessment of Significance of Effects

4.6.9 The approach to the assessment of significance is outlined in Table 4-5. A combination of the magnitude of the effect under consideration and the sensitivity of the receiving environment determines the significance of effect.

4.6.10 It should be noted that this general approach is a framework and should not be treated as a matrix. In each specialist chapter of the ES, significance of effects will be explained with reference to that particular discipline which may differ to the below.

Table 4-5: Classification of effects

Magnitude	Value and sensitivity of receptor				
	Very High	High	Medium	Low	Negligible
High	Major	Major	Moderate	Moderate	Minor
Medium	Major	Moderate	Moderate	Minor	Negligible
Low	Moderate	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Minor	Negligible	Negligible	Negligible

4.6.11 The significance of the effects arising from the Project will be reported using a seven-point scale, as follows:

- Major Adverse;
- Moderate Adverse;
- Minor Adverse;
- Negligible;
- Minor Beneficial;
- Moderate Beneficial; and
- Major Beneficial.

4.6.12 For some specialist topics, additional categories have been added where a greater level of definition is required.

4.6.13 Effects predicted to be Minor Adverse or Negligible are considered to be manageable and are therefore 'Not Significant'. Effects assessed as Moderate Adverse or Major Adverse are considered to be 'Significant'.

4.6.14 These classifications may differ between the specialist topic chapters, but where this occurs, the variation will be explained clearly and fully.

iv. Types of Effect

4.6.15 Potential effects have been separated into three types based on the different phases of development:

- **Construction Effects**: These are effects that begin and end during the construction phase of the Project. This covers the likes of the potential effects of construction traffic, noise and vibration from construction, dust generation, site runoff, mud on roads, risk of fuel/oil spillage, visual intrusion of machinery on site for example.
- **Operational Effects**: Operational effects are those long-term effects that would occur as a result of the Project such as the land take associated with permanent physical infrastructure as well as effects which occur as a result of its operation.
- **Decommissioning Effects**: Decommissioning effects are temporary, short term effects that will occur during the removal of the Project at the end of its 25 year operational life time.

b) Mitigation and Monitoring

4.6.16 Full consideration has been given to the potential mitigation measures which could be used to ensure that any potentially adverse significant environmental effects of the Project are minimised. In the hierarchy of mitigation, likely significant adverse effects should, in the first instance, be avoided altogether; where this is not possible such effects should then reduce and, finally, be off-set.

4.6.17 Two broad types of potential mitigation measures have been applied in this EIA and are described in this ES.

Embedded mitigation: Namely design/standard control measures, such as working within best practice guidance, which would routinely be incorporated for the Project or for any similar project constructed in the UK, and as such would be taken into account in the initial assessment as to the likely significant effects of the Project (further details have been provided in Section 3.11, and in the Outline CEMP and Mitigation Register in Appendix 3.1).

- **Additional mitigation**: Mitigation which may be introduced, where appropriate, following the assessment of the likely significant effects of the Project alone

and cumulatively with other projects with embedded mitigation. It is this additional mitigation that has been assessed for effectiveness and that has been taken into account in the assessment of the residual likely significant environmental effects of the Project (i.e. the likely significant environmental effects that remain following the application of additional mitigation). .

4.6.18 These measures are described in the **Chapter 3: Project and Site Description**, and a summary is provided in the topic chapters, where relevant to the topic.

4.7 Assumptions and Limitations

4.7.1 The following assumptions have been made in each of the topic chapters when assessing the Project.

a) Construction/ Decommissioning

- The total construction programme will be approximately 22 months, with a start date of early 2020.
- The Generating Equipment will be decommissioned and removed at the end of its operational life which is 25 years;
- The decommissioning phase will be around 22 months;
- The underground elements of the Gas and Electrical Connections will be capped and left in situ at the end of their operational life to avoid any adverse environmental effects associated with their removal;
- The design, construction and decommissioning phases of the Project will satisfy minimum environmental standards, consistent with contemporary legislation, practice and knowledge.

b) Operation

- To ensure decommissioning is assessed in principle, the operational life of the Power Generation Plant has been assumed to be 25 years;
- The Generating Equipment will operate intermittently for up to 2,250 hours per annum (1,500 running hours rolling average over 5 years). This could be at any time during the year, at any time of day and for any length of time up to but not exceeding 2,250 hours;
- The Generating Equipment will have a rated electrical output of up to 299 MW;
- Existing (2017) surrounding land uses will not change, with the exception of the developments to be cumulatively assessed with the Project, which have been identified below;
- Assessments are based on published sources of information and primary data collection;
- Assessments are based on the description of the Project as set out in **Chapter 3: Project and Site Description**; and
- Any future development of the Project Site will be determined through separate planning or application or application for development consent and has not been assessed as part of the assessment presented in this ES.

4.7.2 Each topic chapter sets out any specific additional limitations and assumptions relevant to that topic.

4.8 Cumulative and In-Combination Effects

4.8.1 Schedule 4, Part 1 (paragraph 20) of the EIA Regulations requires an ES to include '*…a description of the likely significant effects of the development on the environment, which should cover….cumulative effects*'.

4.8.2 Cumulative and in-combination effects on specific resources or receptors are described, where relevant, in each of the specialist chapters of this ES.

4.8.3 Cumulative effects may occur where, for example, landscape and visual resources, land use or ecological receptors are affected by other developments in addition to the Project i.e. two effects which are not significant could combine to result in a potential cumulative effect which is significant.

4.8.4 In consultation with CCS, it has been confirmed that there are 34 projects with the potential to cause cumulative effects. Discussions with CCS have been undertaken to determine the potential for any inter-project cumulative effects. Cumulative and in-combination effects have been defined and considered within this EIA and are assessed in **Chapter 17: Cumulative Effects**.

4.8.5 Developments which may need to be considered within the cumulative assessment (in accordance with paragraph 86 of DCLG guidance and PINS Advice Note 17 (AN17) (Version 1, December 2015) include those that are:

- In the process of being built;
- Permitted application(s) but not yet implemented;
- Submitted application(s) not yet determined;
- Projects on the National Infrastructure's programme of projects;
- Projects identified in the relevant development plan (and emerging development plants – with appropriate weight being given as they move closer to adoption) recognising that information on the relevant proposals will be limited; and
- Projects identified in other plans and programmes (as appropriate) which set the framework for future DCOs/approvals, where such development is reasonably likely to come forward.

4.8.6 Using this approach, the developments listed in Table 4-6 have been identified (see Figure 4.1), with a cut-off date (end of February 2018), and have been agreed with CCS.

Table 4-6: Projects considered with the cumulative assessment

Planning Application		Name	Description
Under Construction			
1	2006/0773 (varied by 2009/1520 and 2011/1143) and consecutive temporary planning permissions 2007/2513, 2009/0062, 2009/1585, 2011/1311 and 2014/0913 (varied by 2016/1270)	Felindre Business Park	Strategic business park for B1 and B2 uses to accommodate emerging industries, high tech manufacturing, high level services, ancillary uses, associated car parking, landscaping and access roads (outline). The site has been laid out and is effectively a serviced site, however no buildings have been constructed. Park and ride schemes also operate on match days to the Liberty football stadium; and for car parking for the Driver and Vehicle Licensing Agency (DVLA) site in Longview Road, Morriston.
2	2013/0135	Abergelli Solar Farm	Installation of ground mounted array of solar panels, inverter substations and 2.4 m high fencing on land at Abergelli Farm. This development will be located adjacent to the Gas Connection.
3	2013/0865	Cefn Betingau Phase 1, Morriston	Construction of 9MW solar park consisting of installation of up to 135,000 photovoltaic panels and 9 inverter/transformer cabins and a single control building
4	2014/0739	Gelliwern Isaf solar park	6MWe solar park at Gelliwern Isaf Farm -installation of a solar PV array, construction of a storage room, invertor cabin, a substation, switchgear building and fencing
5	2014/1022	Brynwhilach Solar Park	Construction of 12.69MWe solar park consisting of installation of up to 47,000 photovoltaic panels and 8 inverter/transformer stations, 2 substations, storage container, new access tracks, security fencing/cctv and associated equipment and infrastructure work.

Planning Application		Name	Description
6	2007/1250 (varied by 2017/0325/S73)	Former J R Steelworks, Bryntywod	Retention of use of land as timber recycling centre including processing of wood, wooden materials, associated plant and machinery and previously tipped inert material together with on-site storage of wood chip material, construction of building for the dry storage of recycled wood waste and the creation of a 1m high clay bund around southern, western and northern boundaries of the site without complying with conditions 2, 3, 5, 9, 10, 11, 14 and 16 of planning permission 2007/1250 granted 11th December.
7	2012/1221	Mynydd y Gwair Wind Farm	Installation of 16 wind turbines (maximum height to blade tip of 127 m with a hub height of 80 metres), with a maximum generating capacity of 48MWe, associated tracks and ancillary infrastructure.
8	2014/0977	Parc Ceirw, Cwmrhydyceirw Quarry, Swansea	Proposed cessation of landfill and other operations enabled by residential development of circa 300 dwellings, public open space and associated highway and ancillary works (outline) This application was allowed at appeal in January 2018, subject to conditions and a Unilateral Undertaking.
Permitted but not implemented			
9	2013/0795	Tyle Coch Mawr Wind Farm	Installation of four 5 kW wind turbines 20.7 m to tip and associated infrastructure.
10	2013/1835	Felindre Business Park	Construction of park and ride/share car park (approximately 480 spaces) with new vehicular access, security office, toilet, engineering and associated works, including lighting, fencing, drainage attenuation and landscaping.
11	2015/1529 (appeal ref 4369653)	Lletty Morfil Farm	Construction of a 4.9 MW solar park (approx. 8.8 ha) including photovoltaic panels, four inverter stations, centre station, new access tracks, security fencing, security cameras and associated equipment and infrastructure works. Allowed on appeal in June 2016
12	2015/0308	Plot 8 Felindre Strategic Business Park	Two/three storey private hospital development with associated landscaping, site roads and car parking

Planning Application		Name	Description
13	2016/1522	Griffiths Waste Management Site, Bryntywod Llangyfelach Swansea SA5 7LP	Demolition of existing waste management facility buildings and construction of replacement buildings and associated infrastructure
14	2008/0912	Former Walters Yard Pontlliw Swansea	Construction of 67 dwellings with associated access, roads, parking, open space and demolition of existing buildings. Approved with S106 in March 2016.
Submitted but not determined			
15	2011/0345	Land at Llewellyn Road, Penllergaer	Construction of up to 200 residential units with associated access (outline).
16	2012/0721	Royal Fern Golf Resort	Application to vary Condition 8 of Outline Planning Permission 2008/0154 to extend the period for the submission of the reserved matters for a further three years in relation to the proposed development of 18 hole championship and 9 hole par 3 golf courses, golf club house including health facilities, sauna, swimming pool, gymnasium, golf school and academy, 80 golfing lodges, approximately 135 housing plots, green keepers flat, associated infrastructure, car parking and landscaping (outline).
17	2017/1822/OUT	Land West Of Llangyfelach Road Tirdeunaw	Outline planning application (with all matters reserved apart from strategic access junctions) for residential led mixed use development, to be developed in phases, including up to 1950 dwellings, link road, local centre provision of a primary school, community facilities, Public Open Space including facilities for children, and areas of landscaping (including sustainable drainage systems), outdoor sports provision including playing pitches, associated services, infrastructure and engineering works including new vehicular access, improvements to the existing highway network, new roads, footpaths / cycleways, and ancillary works.
18	2016/1478	Land North Of Garden Village Swansea	Hybrid planning application (with all matters reserved apart from strategic access) for residential-led mixed use development, to be developed in phases, including approximately 750 residential units; provision of 1 no. Primary school;

Planning Application		Name	Description
			circa 280m2 - 370m2 flexible A1-A3 / D1 floorspace; open space including parks; natural and semi natural green space; amenity green spaces; facilities for children and young people; outdoor sports provision including playing pitches; associated services, infrastructure and engineering works including new vehicular accesses, improvement works to the existing highway network, new roads, footpaths/cycleways; landscaping works (including sustainable drainage systems), ecological mitigation works and ancillary works. Submitted in July 2016 and currently pending determination. (The application would be referable to Welsh Ministers if the Council are minded to approve).
19	2017/0986/FUL	Former Civic Centre Penllergaer Swansea SA4 9GH	Construction of 80 no. residential units with associated access and landscaping
Identified / Allocated (and not referenced above)			
20	UDP Policy EC1(3)	Swansea Vale Strategic Mixed-Use Site	25 ha allocated employment land
21	UDP Policy EC1(10)	Land at Bryntywod, Felindre (Local Employment Site)	15.8 ha allocated employment land
22	UDP Policy EC1(12)	Penllergaer Business Park (Local Employment Site)	8.2 ha allocated employment land
23	UDP Policy HC13	West of Morriston Hospital	Hospital related activities
24	LDP Policy SD G	Northwest of M4 J46, Llangyfelach	Comprehensive mixed use development of up to 850 homes during the Plan period, incorporating a mix of low-medium and high density residential, a new district centre with commercial units, primary school, a mix of public realm, open space and play provision, new community buildings, and a strategic business park. CCS Housing Site Trajectory notes no pre-application discussions to date and

Planning Application		Name	Description
			anticipates construction from 2020-2025, subject to planning consent.
25	LDP Policy SD A	South of Glanffrwd Road, Pontarddulais	Comprehensive, residential led, development of up to 720 homes (486 during the plan period), incorporating a primary school, leisure and recreation facilities, public open space and appropriate community facilities, employment and commercial uses CCS Housing Site Trajectory notes no pre-application discussions to date and anticipates construction of 486 units from 2020-2025, subject to planning consent.
26	LDP Policy SD C	South of A4240, Penllergaer	Comprehensive, residential led, mixed use development of up to 750644 homes during the Plan period (and up to 1,000 homes beyond the Plan period), incorporating primary school, leisure and recreation facilities, public realm, public open space and appropriate community and commercial uses CCS Housing Site Trajectory notes no pre-application discussions to date and anticipates construction of 644 units from 2019-2025, subject to planning consent.
27	LDP Policy SD E	North of Clasemont Road, Morriston	Comprehensive, residential led, mixed use development of up to 675490 homes during the Plan period, incorporating primary school, leisure and recreation facilities, public realm, public open space and appropriate community and commercial uses CCS Housing Site Trajectory notes no pre-application discussions to date and anticipates construction of 490 units from 2020-2025, subject to planning consent.
28	LDP Policy SI 4	Morriston Hospital	Land adjacent to Morrison Hospital is safeguarded solely for the future development and expansion of the Hospital. Development at this location is restricted to healthcare related uses in association with the beneficial use of Morriston Hospital. Proposals must be delivered alongside appropriate new and enhanced highway infrastructure that will significantly improve the existing substandard road access leading to the site. A new access road is proposed

Planning Application		Name	Description
			as part of this proposal (Strategic Transport Strategy Table 9.2) to resolve road capacity issues from the roundabout immediately north of M4 J46.
29	LDP Policies RP7 and RP8 , paragraph 2.14.28 (Preferred Locations)	Former Tip Site, Felindre	Preferred areas for new waste management facilities include the former Tip site at Felindre. The site at Felindre is identified specifically for the potential to accommodate a Combined Heat and Power (CHP) Facility which could provide heat or power for adjacent proposed developments.
30	LDP Policy H1.11	Land at Ramsey Road, Clydach	60 dwellings
31	LDP Policy H1.21	Land east of Pontarddulais Road, Gorseinon	CCS Housing Site Trajectory anticipates construction from 2020-2022, subject to planning consent.
32	Deposit LDP Map 14	Land at Carmel Road and Bryntirion Road, Pontlliw	90 dwellings
33	LDP Policy H1.30	Land north of Llewellyn Road, Penllergaer	CCS Housing Site Trajectory anticipates construction from 2019-2021, subject to planning consent.
34	LDP Policy H1.2119	Land at Bolgoed Road, Pontarddulais	100 dwellings

4.8.7 In addition, the Project is located within the Swansea Vale Development Area (UDP Policy EC1(3)) and this policy has also been considered for assessment of any significant cumulative effects. Swansea Vale is situated approximately 5 km from the Project Site and extends to some 190 ha south of a railway line and the M4. The assessment has also considered emerging LDP Proposals for settlements at the former tinplate works (also allocated for the Felindre Sustainable Urban Village) and Penllergaer, and the solar park at Lletty Morfil Farm (CCS Ref: MA0004).

4.8.8 The GIS building within the Substation will be extended at its eastern elevation (retaining the same height and width as the existing building) in order to facilitate the connection of the Project to the NETS. These works will be implemented by National Grid and is considered as a cumulative scheme within this DCO Application.

4.8.9 Approximately 300 m of 11 kV overhead line crosses the Generating Equipment Site from north west to south east at its western boundary. This section of line, owned by Western Power Distribution, will be diverted to avoid the Generating Equipment Site either above or below ground. This is not to be considered as part of the DCO Application, and will be assessed in the cumulative assessment.

4.8.10 Projects described in Table 4-6 have been considered in the cumulative assessment in each of the topic chapters where relevant.

4.8.11 Paragraph 87 of the DCLG guidance states '*It may not always be easy for applicants to assess potential impacts fully due to lack of available information. In such circumstances, applicants should take a pragmatic approach when determining what is reasonable and feasible. They should satisfy themselves that they have made all reasonable efforts to identify the main impacts and to include mitigation in the draft Order*.' The assessment of cumulative effects in each of the topic chapters has utilised information in relation to each of the above applications where publicly available.

4.8.12 See **Chapter 17: Cumulative Effects** for further detail and the assessment.

4.9 Residual Effects

4.9.1 Residual effects are those given after taking into account additional mitigation. Effects are concluded to be significant or not significant. In some chapters, guidance is used which specifies its own variation to this assessment matrix. This will be explained and justified as appropriate. Further detail is provided in each technical chapter.

4.9.2 Judgements of significance are made based on a combination of perceived value and sensitivity of the receptor and the magnitude of change, and will also include, where necessary, an element of professional judgement by each of the technical specialists. The final evaluation of significance considers the residual effects, assuming all mitigation measures are applied. The terminology for expressing significance has been outlined in Section 4.6. Where appropriate, any topic-specific

deviation to this by guidance and best practice is described in the technical chapters.

4.10 Consultation and Engagement

a) Non-statutory Consultation

4.10.1 APL engaged with the local community and key stakeholders during an early phase of non-statutory consultation between June and September 2014, in advance of the commencement of the statutory consultation phase and at a point where the Project was still being actively refined. This was at the same time as seeking feedback from Statutory Consultees on the Scoping Report.

4.10.2 Local community representatives at the national, regional and local levels were consulted by APL and public exhibitions were held in Clydach, Felindre and Tircoed in June 2014. As part of this non- statutory phase of consultation, APL explained the rationale and key objectives of the Project, gave reasons why the Project Site had been chosen and presented opportunities for written and verbal feedback on the early, emerging project concepts.

4.10.3 Drawing on this early feedback on the proposals, APL was able to consider the consultation responses as part of the design development and environmental assessment processes. This phase of non-statutory consultation helped to shape the development of the Project. This process is described in detail in the Consultation Report.

b) Statutory Consultation

4.10.4 APL conducted Phase 1 statutory consultation under s42, s47 and s48 of PA 2008 between 13th October 2014 and 16th November 2014. Published in September 2014, and agreed with CCS prior to publication, the Statement of Community Consultation (SoCC) Notice confirmed where and when the SoCC could be inspected by members of the public. Letters inviting comments on the Project, including the Preliminary Environmental Information, were sent to s42 consultees directly. Consultation notices were published in national and local newspapers under s48 of the PA 2008.

4.10.5 The statutory consultation phase also coincided with the publication of the 2014 PEIR. The 2014 PEIR provided the environmental information collected in the early stages of the EIA process as well as an assessment, on a preliminary basis, of the likely significant environmental effects of the Project. The 2014 PEIR, together with supporting information and a Non-Technical Summary (2014 PEIR NTS), was compiled to accompany APL's statutory consultation with both the local community and prescribed consultees.

4.10.6 The Phase 2 consultation and 2018 PEIR provided updated environmental information and design changes, and on a preliminary basis, of the likely significant environmental effects of the Project. Letters inviting comments on the Project were sent to s42 consultees directly. Consultation notices were published in national and

local newspapers under s48 of the PA 2008. Consultation took place from 16th January 2018 until 19th February 2018 (inclusive) and public exhibitions were again held in Llangyfelach, Clydach, Tircoed and Felindre to update people living in close proximity to the Project and introduce it to anyone who did not participate in the 2014 consultation.

4.10.7 Between the 2014 PEIR, 2018 PEIR and this ES, there have been changes to the Project resulting from design progression, consultation and feasibility. This is further described in **Chapter 5: Alternatives Considered**.

4.11 References

Ref. 4.1 Abergelli Power Ltd. Preliminary Environmental Information Report (September 2014).

Ref. 4.2 The Planning Inspectorate. Planning Advice Note Nine: Rochdale Envelope. (April 2012).

Ref. 4.3 Abergelli Power Ltd. Preliminary Environmental Information Report (September 2018).

Chapter 5

Alternatives Considered

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5. Alternatives Considered

5.1 Introduction

5.1.1 Schedule 4, Part 1 of the EIA Regulations (Ref. 5.1) requires that an ES provides *'An outline of the main alternatives studied by the Applicant [APL] and an indication of the main reasons for the Applicant's [APL's] choice, taking into account the environmental effects*'. Under the EIA Regulations applicable to this Project there is no requirement to assess alternatives, only a requirement to provide an outline of those alternatives that have actually been considered. In this case, the need to consider alternatives is not engaged under the Habitats Regulations or pursuant to a policy requirement under Section 5.3, 5.7 and 5.9 of NPS EN-1.

5.1.2 This chapter therefore describes the site selection process followed by APL and the key factors that led to the identification of the Project Site, and provides an outline of the main generating equipment technologies, layouts and access, and Gas Connection and Electrical Connection route options, considered for the Project.

5.2 Project Site Selection

5.2.1 APL's site selection process began in 2010 and considered a range of factors, including key factors identified in section 2.2 (Factors influencing site selection by developers) of NPS EN-2. As recognised by NPS EN-2 (see further **Chapter 2: Regulatory and Policy Background**, Section 2.7), it is for energy companies to decide what applications to bring forward and the Government does not seek to direct applicants to particular sites. In addition, the specific criteria considered by applicants, and the weight they give to them, can and will vary from project to project.

5.2.2 The process followed by APL included the following main phases, in order to first identify a number of potentially feasible sites and thereafter refine this set of sites through increasingly detailed selection criteria:

- Identification of a large number of potential sites across the UK through existing data sources;
- Refinement of this set of sites, driven mainly by the need for electrical generation capacity to be located as closely as possible to the main sources of demand in the UK;
- Further refinement based on the layout of the electricity and gas transmission networks in the UK, to ensure proximity to these networks; and
- Assessment of the remaining sites based on technical, environmental and economic factors, as well as consideration of whether or not a proposed Project would be in accordance with local planning policy and with the availability of the sites.

5.2.3 Within the final phase, the key technical considerations included the size of the site (i.e. is a sufficient area available to support a power generation plant of up to 299 MWe and integral infrastructure) as well as any geographical or network-related constraints to accessing gas and electricity connections.

5.2.4 From an environmental perspective, consideration was given to the proximity of sensitive receptors, such as residential properties or sites of ecological importance (to avoid unacceptable impacts from noise and visual disturbance), the current nature of the surrounding area (to limit impacts on the landscape character of the area), previous site uses and land quality (to avoid sterilisation of the best and most versatile agricultural land) and proximity to sensitive ecological habitats.

5.2.5 The key economic criterion is the proximity of a site to appropriate gas and electrical connection points, in order to reduce the cost to the UK consumer and the environmental impact of the associated connections.

5.2.6 Based on these factors, the Project Site was considered suitable for the following main reasons:

- It is in close proximity to a suitable electrical connection point;
- It is in close proximity to a suitable gas connection point;
- The Project Site does not include any nationally important environmental designations;
- The land available is of an adequate size to accommodate the Power Generation Plant, Gas Connection and Electrical Connection;
- The Project Site is largely situated on poor quality agricultural land (improved grassland classified as Grade 4 agricultural land);
- It is in close proximity to similar industrial developments including the Felindre Gas Compressor Station and Substation;
- The surrounding network is within an area of net electricity import; and
- It is in close proximity to a well-developed road network to the Project Site.

5.2.7 As a result of the site selection process outlined above, Drax is bringing forward three other power generation projects through the PA 2008 process. They are: Progress Power Ltd at Eye Airfield in Suffolk (www.progresspower.co.uk): Hirwaun Power Ltd at Hirwaun in South Wales (www.hirwaunpower.co.uk): and Millbrook Power Ltd in Bedfordshire (www.millbrookpower.co.uk). The first two projects listed received DCOs in July 2015. A DCO application for Millbrook Power Limited was submitted to the Secretary of State in October 2017.

5.3 Power Generation Plant

5.3.1 The following technology options have been considered for the Power Generation Plant: OCGT plant; Combined Cycle Gas Turbine (CCGT) plant; Reciprocating Gas Engines (RGE) plant and CHP Plant.

5.3.2 The operation of OCGT plant has been described previously in Section 3.4. CCGT plant consist of the same plant items as OCGT, although they also utilise a heat recovery steam generator (HRSG) which uses the waste heat from the exhaust gases to produce steam which is used to power a steam turbine. RGE plant are similar in operation to a large internal combustion engine, with a crankshaft driven by pistons. CHP utilises waste heat from the combustion process to feed to other industrial users (deemed off-takers) within the vicinity of the plant. Further information is provided in a separate report prepared regarding the use of CHP at the Project (Appendix 5.1).

5.3.3 OCGT is considered to be the most suitable technology choice for generating up to 299 MW as a peaking plant and operating at up to 2,250 hours at the Project Site based on the following environmental, technical and feasibility considerations:

- Visual impact: OCGT plants require shorter stack(s) compared to CCGT plant and therefore are less visually intrusive in views from the surrounding environment;
- Water resources: Since no cooling is required for the condensing of steam, the cooling requirements of OCGT plants are significantly lower than, for example, CCGT plants. The auxiliary cooling requirements (for lubrication oil, etc.) would be met via dry air cooling through the use of fin-fan coolers or Air Cooled Condensers (ACC). The water requirement of a OCGT plant is therefore significantly lower than for CCGT plants;
- Noise and available space: noise levels from an OCGT plant would typically be lower than for an RGE plant. A larger number of RGE units would be required at the Generating Equipment Site to generate up to 299 MW. Spatially this may not be possible;
- Financial: based on the anticipated electricity market, it is essential that the Power Generation Plant of the size proposed would be particularly cost effective, as it would be called upon to operate flexibly to balance out the National Grid and meet changing demands of customers; and
- Start-up times: OCGT plants are able to start up and shut down much quicker than similar sized CCGT plants and are, therefore, better suited to meeting variable demands.

5.3.4 Uncertain market conditions in 2014 led to the consideration of a number of different OCGT technologies and, as such, the 2014 PEIR and associated Phase 1 consultation process was based on the construction and operation of between 1 and 5 Gas Turbine Generators. However, greater clarity on the capacity market rules, further engagement with the equipment manufacturers, and consultation with the local community and relevant stakeholders has led to the decision that a single Gas Turbine Generator is the best technology solution for the Project. These changes have been consulted on in the 2018 PEIR and are reported on in this ES.

a) Layout

5.3.5 The design of an OCGT is dictated by its operational requirements. A limited range of site layouts were examined, culminating in the final design of the Project taking into account the following constraints:

- Avoidance of utilities such as the 1.68 m cast iron Water Main and the oil pipeline (which bisect the site under the Gallops), and National Gas Transmission System;
- Avoidance of landfill to north;
- Avoidance of higher topography to the north west which would be more visible in key views;
- Avoidance of woodland to the East;
- Avoidance of solar farms to the north, south, east and west; and
- Avoidance of field boundaries, ancient woodland and mature trees as far as reasonably possible (being wildlife/ heritage features).

5.3.6 The final layout of the Project Site has also been determined by the following main factors in relation to each of the components, as discussed below.

i. Generating Equipment

5.3.7 The Gas Turbine Generator and stack require the largest area of land-take as compared to the other components. It is also best practice for the layout of the Generating Equipment Site to make the Generating Equipment easily accessible by the operators and maintenance staff from the control and administration building. These were key considerations which influenced the siting of the Generating Equipment Site.

5.3.8 However, the subsequent identification of the Water Main, which crosses the Generating Equipment Site and Laydown Area from northwest to southeast (see Figure 3.4), has influenced where the Generating Equipment will be located within the Generating Equipment Site. The Water Main is owned by Welsh Water, who has advised that typically a 30 m buffer (15 m either side of the Water Main) is required to be kept clear of construction activities. To accommodate this requirement, and to allow for uncertainty over the accuracy and digitisation of Welsh Water's archive drawings, a 60 m allowance has been incorporated in the configuration of the Generating Equipment.

5.3.9 The location of the Water Main is now known, however further discussions continue with Welsh Water to determine whether or not the current 60 m allowance can reasonably be reduced.

5.3.10 The 2017 engineering review of the Project identified that the site for the Generating Equipment could be contained in one location instead of being separated by the Water Main by staging or raising the ground levels to create platforms. By applying the same 60 m allowance to the location of the Water Main and as a result of the reduction in gas turbine units to a single turbine unit, it was therefore possible to fit the Generating Equipment Site into a single location to the north of the gallops, thereby avoiding the requirement for splitting the Generation Equipment and increasing the land available for potential Laydown Area and Ecological Mitigation Area.

5.3.11 The Generating Equipment is therefore positioned to the north of the Water Main.

b) Access

5.3.12 During Phase 1 statutory consultation, two options were considered for access to the Generating Equipment Site. Access Option 1 (so-called as it was identified first) would have involved taking access from the north via the Rhyd-y-pandy Road and the existing access road west of Brynheulog past Abergelli Farm which would need to be extended to the Generating Equipment Site, as shown between the points D and C on Figure 5.1. This option involved widening of the existing gravel track to 6 m and localised upgrades along the Rhyd-y-Pandy Road. The track crosses the National Gas Transmission System. It runs parallel to the Water Main but does not cross it.

5.3.13 Subsequently, a second access option, known as Access Option 2, was identified. This is from the west via the B4489, along the access road to the Substation and Felindre Gas Compressor Station, which will be widened to accommodate the abnormal loads required during construction, and then along a new section of purpose built access road to be constructed across undeveloped land to the Generating Equipment Site as shown between the points A and B on Figure 5.1. The purpose built extension from the existing access road to the Generating Equipment Site will cross under a 400 kV overhead electrical line, two watercourses and a Local Transmission System pipeline.

5.3.14 Following consultation on the 2014 PEIR, the decision was made to take forward Access Option 2. The main reasons for this choice were that the majority of the public consulted during 2014 supported Access Option 2 in preference to Access Option 1, as it would result in a lower adverse impact on traffic by using a shorter, more direct route and would avoid the roads leading to Morriston Hospital. This option would also minimise the amount of construction required, as part of the access is existing.

5.3.15 Further investigation and review resulted in the optimisation of the new section of access road proposed by Option 2. As a result, within the 2018 PEIR, two options (Option A and Option B) were considered for the purpose built new section of Access Road from the Substation to the Generating Equipment Site.

5.3.16 Option A is Option 2 from the 2014 PEIR.

5.3.17 Option B is detailed in **Chapter 3: Project and Site Description** and shown on Figure 5.1.

5.3.18 Option B had a number of advantages:

- Reduced impact on the day-to-day and major maintenance activities of National Grid by avoiding modifications to the existing layout or location of the National Grid car park. .
- Reduced level of cut and fill required to create the new section of Access Road. This is due to the fact that the embankment that borders the southwestern edge of the Substation and Felindre Gas Compressor Station has a lesser gradient at the point where the new section of Option B begins.

5.3.19 The key advantage to Option A was its complete avoidance of the Ancient Woodland area adjacent to the Substation and Felindre Gas Compressor Station.

5.3.20 Option B performed better in terms of impacts to National Grid's current and future planned operations, sustainability in relation to materials to be excavated and removed, and Project cost. However, consultation feedback in response to the 2018 PEIR highlighted the importance of avoiding the Ancient Woodland.

5.3.21 In response to the consultation feedback, APL undertook to realign the route of the new section of Access Road associated with Option B. Option B was modified (Revised Option B) to curve further south and avoid the area of Ancient Woodland. This is now the chosen internal road layout which is presented as Revised Option B in Figure 5.1 and Figure 3.3.

c) Combined Heat and Power (CHP)

5.3.22 The potential for using CHP opportunities with these technologies was also considered (Appendix 5.1). However, it is not technically or economically feasible with a peaking power station in this location for the following reasons:

- There is no existing regional heat market. From local searches, there are no suitable heat users of applicable scale available and none able to accept the unpredictable supply of heat available.
- The intermittent and peaking modes of operation of OCGT are incompatible with the likely continuous demands of heat users.
- No potential future heat requirements in the area have been identified and none are currently anticipated that would match the irregular operational pattern of a peaking plant.

5.3.23 Given the lack of applicable heat demand as outlined above, it is not considered reasonable to seek to make provision for exploiting potential future heat demand.

5.3.24 Based on the above environmental, technical and feasibility considerations, an OCGT is considered to be the most suitable technology choice for generating up to 299 MW as a peaking plant, operating up to 2,250 hours year and 1,500 running hours rolling average over 5 years at the Project Site.

5.4 Gas Connection

5.4.1 A gas connection feasibility study was undertaken in March 2014 to define and evaluate the options available for connecting the Generating Equipment to a suitable source of fuel gas. This identified Feeder 28 of the National Gas Transmission System or a nearby Local Transmission System pipeline as possible connection points. The location of these connection points in relation to the Project Site is shown on Figure 5.2.

5.4.2 Investigations to identify specific route corridor options to the National Gas Transmission System or Local Transmission System pipelines within a predetermined Gas Connection Opportunity Area (Figure 5.2) were carried out, considering in particular the length, the number of crossings required, environmental effects and cost. The Gas Connection Opportunity Area was defined as a result of a gas feasibility study undertaken by Parsons Brinkerhoff in 2014.

5.4.3 The four principal potential connection route options (shown on Figure 5.2) listed below were explored further leading to the identification of a single preferred route for the Gas Connection. Due regard has been paid to relevant factors including environmental, planning, safety, engineering and constructability in selecting the preferred route.

5.4.4 Route 1 was approximately 1.7 km in length and included: no major road crossings; four minor road crossings; no major watercourse crossings; and two minor watercourse crossings. This route was a feasible route although it presented some major risks in regards to the potential for impacts on protected species and their habitats and proximity to the development of a Solar Farm at Abergelli Farm, to the west of the National Gas Transmission System.

5.4.5 Route 2 was approximately 1.2 km in length and included: no major road crossings; one minor road crossing; no major watercourse crossings; and one minor watercourse crossing. This route avoids pasture and deciduous woodland which have been identified as favourable for protected species. Although this route would not be as straight forward as Route 4 to implement, it is more viable than Route 1. A major risk remains in the possibility of routeing through the proposed solar farm or alongside and parallel to the National Gas Transmission System. Therefore, variations to this route were considered as Routes 2a and 2b. Route 2a would travel between the National Gas Transmission System and the edge of Abergelli Solar Farm and Route 2b as proposed would cross the National Gas Transmission System twice.

5.4.6 Route 3 was approximately 1.4 km in length and included: no major road crossings; one minor road crossing; no major watercourse crossings; and three minor watercourse crossings. Route 3 was considered the most viable alternative to Route 2. The route crosses the National Gas Transmission System and therefore would require the use of the HDD crossing technique.

5.4.7 Route 4 was approximately 0.4 km in length and included: no major road crossings; no minor road crossings; no major watercourse crossings; and one minor watercourse crossing. Route 4 would connect into the Local Transmission System. The route would allow little buffer capacity and would require negotiation with Wales and West Utilities in regards to their availability of fuel gas capacity.

5.4.8 Initially, Route 2 was chosen as the preferred option as it represented the shortest distance, whilst avoiding environmental constraints and risks associated with crossing the existing National Gas Transmission System.

5.4.9 Route 2a, which was the option to route the Pipeline between the solar park and the National Gas Transmission System, was also deemed unfeasible following discussions with National Grid who are owners of the National Gas Transmission System. Proceeding with Route 2a would involve working in close proximity with the National Gas Transmission System hence working under very constrained conditions over a longer distance compared to Route 2b which crosses the National Gas Transmission System at 2 locations over a shorter distance where working conditions would be more favourable.

5.4.10 Consequently Route 2b was chosen as the preferred route for the Gas Connection and is therefore the route which has been fully assessed in this ES. Although not the shortest route, it has lower risks and avoids ecologically significant habitats, such as rough pasture and deciduous woodland which were identified during the Phase 1 Habitat Survey (see Appendix 8.1).

5.5 Electrical Connection

5.5.1 A grid connection assessment was undertaken for the Project in March 2014 in order to define and evaluate the options available for connecting the Generating Equipment to the NETS for the export of electricity. The Project will connect into a Gas Insulated Switchgear (GIS) generator bay within the Substation. APL received an offer of a Bilateral Connection Agreement and Construction Agreement from NGET on 23 February 2018 (the Connection Agreement) to connect the Generating Equipment to the NETS.

5.5.2 Both underground cables and overhead lines were initially considered. However, underground cables were selected as the preferred option in order to minimise visual impact. In the 2014 PEIR, it was noted that the cable would be installed beneath the road. It has now been decided that the cable will be laid alongside the road for ease of maintenance.

5.5.3 The Electrical Connection Opportunity Area (see Figure 5.3), to the south west of the Generating Equipment Site, is the area within which the route for the Electrical Connection has been identified. In July 2014, the chosen route (as described in Section 3.6) was identified during a site walkover of the Electrical Connection Opportunity Area. A limited number of route corridor options for the Electrical Connection were considered, as the most appropriate option i.e. the shortest, most direct route from the Generating Equipment Site to the Substation, requiring the least amount of land take and avoiding any statutory designated sites or valued habitats, was available (see Figure 5.3). This negated the need to assess any less favourable options.

5.6 Ecological Mitigation Area

5.6.1 An area has been set aside within the Project Site boundary to be available for ecological mitigation. The location and area of mitigation required was consulted on during Phase 2 consultation, and an outline Landscape and Ecology Mitigation Plan (LEMP) was produced. A finalised Landscape and Ecology Mitigation Strategy has now been prepared to show the extent of the mitigation required as presented in Appendix 3.4.

5.7 References

Ref. 5.1 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2009 (as amended) (‘the EIA Regulations’).

Chapter 6

Air Quality

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6. Air Quality

6.1 Introduction

6.1.1 This chapter provides an assessment of the likely air quality effects arising from construction, operation and decommissioning of the Project. Maintenance is included within the operational assessment of the Project.

6.1.2 A detailed description of the Project Site and the Project is provided **in Chapter 3: Project and Site Description**. A glossary of terms and list of abbreviations used in this chapter is provided in **Document Reference 1.4**.

6.1.3 The effects of the Project have been assessed using a detailed dispersion model to predict the effects of the proposed operational Open Cycle Gas Turbine (OCGT) exhaust stack emissions, based on the emission limit values set out in the Industrial Emissions Directive (IED) (Ref. 6.1).

6.1.4 In addition to air quality effects from the proposed OCGT stack emissions, an assessment has been undertaken of the potential for dust generation from the construction phase.

6.1.5 Potential effects on air quality are interrelated with impacts on ecological receptors. This chapter should be read in conjunction with **Chapter 8: Ecology** and **Chapter 12: Traffic, Transport and Access of this ES**.

a) Objectives of the assessment

6.1.6 The objectives of the assessment were to:

- Assess impacts during the construction phase of the Project in terms of construction dust;
- Determine the appropriate stack height for the Generating Equipment so as to overcome building downwash effects and minimise off-site air quality impacts; and
- Assess the impacts of the Generating Equipment stack emissions on air quality, in terms of human health and ecological impacts, based on the optimum stack height selected.

6.2 Changes since the 2014 PEIR

6.2.1 There have been changes to the design as a result of design evolution and consultation as detailed in **Chapter 3: Project and Site Description**. To aid the reader, Table 6-1 below outlines the changes to this assessment compared with the 2014 PIER.

Table 6-1: A summary of Changes since the 2014 PEIR to the Air Quality Assessment

Section	Changes since the 2014 PEIR	Section Reference
Baseline	Additional baseline data has become available since the 2014 PEIR was prepared.	Updated baseline data for 2014, 2015 and 2016 is presented in Section 6.5
Methodology	The EPUK significance criteria has been updated by IAQM//EPUK since the 2014 PEIR was prepared.	The updated IAQM//EPUK significance criteria has been used to derive the significance criteria for assessing operational impacts are detail in Section 6.4.68
	The proposed Project has been changed and rather than 5 gas turbines each served by a stack, the project will consist of a single gas turbine and single stack.	An updated stack height determination has been undertaken for the revised scheme and this is presented in Appendix 6.2
	Additional Receptors have been included within the modelling	The receptors assessed are detailed in Table 6-9
	Updated meteorological data has been used in the assessment.	The meteorological data used in the assessment is detailed in Section 6.4.18
	Dust assessment	The dust assessment has been updated to maintain consistency in the approach to assessing effects during the construction and decommissioning phases following comments on the 2018 PEIR form CCW.
	Industrial Emissions Directive (IED)	The reference to the IED (1.1a)vii) has been updated as requested by NRW following there review of the 2018 PEIR to ensure that that Annex V Part 2 is referenced not Annex V Part 1.
Significance of Effect	Updated modelling has been undertaken since the 2014 PEIR.	The result of the updated modelling using more recent meteorological data and the revised stack height of a minimum 35 m is detailed in 6.7.15 to 6.7.28, with detail on the Rochdale Envelope being applied on the Project as a whole in 6.4.

6.3 Legislation, policy and guidance

b) National and European Air Quality Legislation and Policy

i. Local Air Quality Management

6.3.1 The provisions of Part IV of the Environment Act 1995 establish a national framework for air quality management, which requires all local authorities in England, Scotland and Wales to conduct local air quality reviews. Section 82(1) of the Act requires these reviews to include an assessment of the current air quality in the area and the predicted air quality in future years. Should the reviews indicate that the objectives prescribed in the Air Quality Strategy (AQS) for England, Scotland, Wales and Northern Ireland (Ref. 6.3) and the Air Quality Standards (Wales) Regulations 2010 (Ref. 6.3) will not be met, the local authority is required to designate an Air Quality Management Area (AQMA). Action must then be taken at a local level to ensure that air quality in the area improves. This process is known as 'local air quality management' or LAQM and the approach to be followed by Welsh Local Authorities is detailed within the Local Air Quality Management in Wales Policy Guidance (Ref. 6.4).

ii. Air Quality Strategy

6.3.2 The AQS identifies nine ambient air pollutants that have the potential to cause harm to human health, with the exception of ozone which is instead considered to be a regional problem, and two for the protection of vegetation and ecosystems. The AQS defines objectives for these pollutants that aim to reduce the impacts of these pollutants to negligible levels. The objectives are not mandatory but rather policy intentions made by the UK Government and its Devolved Administrations which set targets that local authorities should try to achieve.

6.3.3 The current AQS was published in July 2007 and updates the original strategy to set out new objectives for local authorities in undertaking their local air quality management duties. The AQS objectives are based on the evidence supporting the identification of the limit values and, in some instances, objectives in the current AQS may be more onerous than the limit values set out within the relevant European Union (EU) Directives and the Air Quality Standards (Wales) Regulations 2010. It is not a specific legal requirement to comply with objectives set within the AQS except where equivalent limit values are set within the EU Directives and Air Quality Standards (Wales) Regulations 2010.

iii. European Air Quality Directives

6.3.4 The Air Quality Framework Directive (96/62/EC) (Ref. 6.5) on ambient air quality assessment and management defines the policy framework for 12 air pollutants known to have a harmful effect on human health and the environment. The limit values for the specific pollutants are set through a series of Daughter Directives.

- Directive 1999/30/EC (the 1st Daughter Directive) sets limit values (values not to be exceeded) for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter (dust) and lead in ambient air;
- Directive 2000/69/EC (the 2nd Daughter Directive) establishes limit values for concentrations of benzene and carbon monoxide in ambient air;
- Directive 2002/3/EC (the 3rd Daughter Directive) establishes long-term objectives, target values, an alert threshold and an information threshold for concentrations of ozone in ambient air;
- Directive 2004/107/EC (the 4th Daughter Directive) establishes a target value for the concentration of arsenic, cadmium, nickel and benzo(a)pyrene in ambient air so as to avoid, prevent or reduce harmful effects of arsenic, cadmium, nickel and polycyclic aromatic hydrocarbons on human health and the environment as a whole.

6.3.5 The Air Quality Standards (Wales) Regulations 2010 (Ref. 6.3) came into force on 11th June 2010, replacing the previous Air Quality Standards (Wales) Regulations 2007. The 2010 regulations transpose into national legislation the requirements of Directive 2008/50/EC and Directive 2004/107/EC. Directive 2008/50/EC consolidates existing EU air quality legislation apart from the 4th Daughter Directive and provides a new regulatory framework for $PM_{2.5}$.

6.3.6 It makes provision under Article 22 for Member States to postpone attainment deadlines and allow an exemption from the obligation to limit values for certain pollutants, subject to strict conditions and assessment by the European Commission.

iv. Air Quality Objectives and Limit Values

6.3.7 The air quality objectives and limit values currently applying to the UK can therefore be split into two groups. Each has a different legal status and is therefore handled differently within the framework of UK air quality policy. These are:

- EU limit values transcribed into UK legislation for which compliance is mandatory; and
- AQS objectives set down in regulations for the purposes of local air quality management.

6.3.8 The AQS objectives and EU limit values relevant to this assessment are set out in Table 6-1 and Table 6-2. It should be noted that while PM10 and PM2.5 are included in the following tables these are only relevant to construction dust and road vehicle emission as particulate matter emission from burning natural gas is considered to be negligible.

Table 6-2: EU Limit Values

Pollutant	Limit Value	Measured as	Date to be achieved[1]
Carbon monoxide (CO)	10.0 mg/m^3	Maximum Daily 8-Hour Mean updated hourly	1 January 2005
Nitrogen dioxide (NO_2)	200 µg/m^3 not to be exceeded more than 18 times per year	1 Hour Mean	1 January 2010
Nitrogen dioxide (NO_2)	40 µg/m^3	Annual Mean	1 January 2010
Nitrogen Oxides (NO_x) [assuming as nitrogen dioxide]	30 µg/m^3 (for the protection of vegetation)	Annual Mean	19 July 2001
Particle matter (PM_{10}) [gravimetric]	50 µg/m^3 not to be exceeded more than 35 times per year.	24 Hour Mean	1 January 2005
Particle matter (PM_{10}) [gravimetric]	40 µg/m^3	Annual Mean	1 January 2005
Particle matter ($PM_{2.5}$) [exposure reduction]	Target value 25 µg/m^3	Annual Mean	2010
Particle matter ($PM_{2.5}$)	25 µg/m^3	Annual Mean	2015
Particle matter ($PM_{2.5}$)	20 µg/m^3	Annual Mean	2020
Particle matter ($PM_{2.5}$) [exposure reduction]	Target of 20% reduction in concentrations at urban background	Annual Mean	Between 2010 and 2020

Table 6-3 - UK Air Quality Objectives

Pollutant	Concentration	Measured as	Date to be achieved[2]
Carbon monoxide (CO)	10.0 mg/m^3	Maximum Daily 8-Hour Mean	31.12.2003
Nitrogen dioxide (NO_2)	200 µg/m^3 not to be exceeded more than 18 times per year	1 Hour Mean	31.12.2005
Nitrogen dioxide (NO_2)	40 µg/m^3	Annual Mean	31.12.2005
Nitrogen Oxides	30 µg/m^3 (for the	Annual Mean	31.12.2000

[1] *Date to be achieved and maintained thereafter.*
[2] *Date to be achieved and maintained thereafter.*

Pollutant	Concentration	Measured as	Date to be achieved[2]
(NO_x)	protection of vegetation)		
Particle matter (PM_{10}) [gravimetric]	50 µg/m^3 not to be exceeded more than 35 times per year.	24 Hour Mean	31.12.2004
Particle matter (PM_{10}) [gravimetric]	40 µg/m^3	Annual Mean	31.12.2004
Particle matter ($PM_{2.5}$) [exposure reduction]	25 µg/m^3	Annual Mean	2020
Particle matter ($PM_{2.5}$) [exposure reduction UK urban areas]	Target of 15% reduction in concentrations at urban background	Annual Mean	Between 2010 and 2020

v. Environmental Permitting Regulations

6.3.9 EU Directive 96/61/EC (Ref. 6.7) concerning Integrated Pollution Prevention and Control ("the IPPC Directive") applies an integrated environmental approach to the regulation of certain industrial activities. The Environmental Permitting Regulations (EPR) 2016 (Ref. 6.8) implement the IPPC Directive relating to installations in England and Wales. The Regulations define activities that require an Environmental Permit from NRW.

6.3.10 EPR is a regulatory system that employs an integrated approach to control the environmental impacts of certain listed industrial activities including the generation of energy. The intention of the regulatory system is to ensure that Best Available Techniques (BAT), required by the IPPC Directive, are used to prevent or minimise the effects of an activity on the environment, having regard to the effects of emissions to air, land and water via a single permitting process.

6.3.11 To gain a permit, operators have to demonstrate in their applications that the techniques they are using or are proposing to use are the BAT for their installation and meet certain other requirements taking account of relevant local factors. The permitting process also places a duty on the regulating body to ensure that the requirements of the Industrial Emissions Directive 2010/75/EU (IED) (Ref. 6.1) are included for permitted sites to which these apply.

6.3.12 The essence of BAT is that the techniques selected to protect the environment should achieve a high degree of protection of people and the environment taken as a whole. Indicative BAT standards are laid out in national guidance and where relevant, should be applied unless a different standard can be justified for a particular installation. NRW, as the regulating body, is legally obliged to require more than BAT requirements where EU Air Quality Limit Values may be exceeded by an existing operator.

6.3.13 The Environment Agency's (EA) "Air emissions risk assessment for your environmental permit" guidance (Ref. 6.9) (as applied by NRW), sets out the approach that should be followed when assessing the potential air quality impacts of a development. This comprises of an initial screening assessment making it possible to identify emissions that result in "insignificant" impacts and therefore further assessment is not required.

6.3.14 The EA guidance provides further assessment criteria in the form of EALs. The EALs are additional assessment criteria outside of those that are set out in the AQS objectives/limit values and are used for regulatory purposes to assess emissions that are not under local authority control or receptors, such as ecological sites, which can cover extensive areas outside of the local authority boundary. Table 6-4 presents the EALs relevant to this assessment.

Table 6-4: Environmental Assessment Levels (EALs)

Pollutant	EAL	Measured as	Reason
Nitrogen oxides (NO_x)	75 µg/m^3	Daily	For the protection of vegetation and ecosystems

vi. Critical Loads and Levels for Sensitive Ecological Receptors

6.3.15 The UK is bound by the terms of the European Birds and Habitats Directives (Ref. 6.10) and the Ramsar Convention (Ref. 6.11). The Conservation of Habitats and Species Regulations 2017 (SI 2017/1012) (Ref. 6.12) provides for the protection of European sites created under these polices, i.e. Special Areas of Conservation (SACs) designated pursuant to the Habitats Directive, Special Protection Areas (SPAs) classified under the Birds Directive, and Ramsar Sites designated as wetlands of international importance. The 2017 Regulations apply specific provisions of the European Directives to SACs, SPAs, candidate SACs (cSACs) and proposed SPAs (pSPAs), which require them to be given special consideration and further assessment by any development which is likely to lead to a significant effect upon them.

6.3.16 The impact of emissions from the Generating Equipment on sensitive ecological receptors are quantified within this assessment in two ways:

- As direct impacts arising due to increases in atmospheric pollutant concentrations; assessed against Critical Levels (i.e. NO_x), and
- Indirect impacts arising through deposition of acids and nutrient nitrogen to the ground surface, assessed against Critical Loads.

6.3.17 The critical levels for NO_x for the protection of vegetation and ecosystems are 30 µg/m^3 as an annual mean and 75 µg/m^3 as a daily mean. The critical levels apply at all relevant ecological areas regardless of habitat type. These values have been adopted as the assessment criteria for the impact of the Generating Equipment on designated nature sites.

6.3.18 Critical loads are set to assess the impacts of a development on the ecological feature of interest in terms of eutrophication (deposition of nutrient nitrogen) and acidification (deposition of nitrogen and sulphur) and are dependent on the habitat type and species present, and are specific to the sensitive receptors considered within the assessment. The critical loads are set out on the Air Pollution Information System (APIS) website (Ref. 6.13).

6.3.19 Critical loads are set at levels below which significant harmful effects do not occur. For eutrophication critical loads are given in terms of the mass of nitrogen deposited per unit area over a year (kgN/ha/yr) and are given as a range e.g. 10-15 kgN/ha/yr. For acidification the critical load is assessed relevant to a Critical Load Function (CLF) which assesses the relative contributions of nitrogen and sulphur and the sensitivity of the habitat in question to each pollutant. To determine the CLF the sulphur deposition is plotted vs nitrogen deposition based on the following three quantities:

- Maximum critical load for sulphur - CLmax(S);
- Minimum critical load for nitrogen - CLmin(N); and
- Maximum critical load for nitrogen - CLmax(N).

6.3.20 Some habitat types are not considered sensitive to eutrophication or acidification and for these habitats there is no relevant critical load against which contributions from a development can be assessed.

6.3.21 The APIS website also provides background NO_x concentrations and nitrogen/acid deposition rates for use in assessing the impacts of a development on ecological sites where the Process Contributions (PC) from the development exceed the relevant screening criteria.

6.3.22 The critical load criteria adopted for the sensitive ecological receptors considered by this assessment are presented in the Habitats Regulation Assessment which accompanies **Chapter 8: Ecology**.

vii. Industrial Emission Directive (IED) Emission Limits

6.3.23 The Project will be designed and operated in accordance with the requirements of the IED, which requires adherence to emission limits for a range of pollutants. Emission Limit Values (ELVs) are maximum concentrations of residual pollutants that can be released at source usually from a stack from the Project. The relevant ELVs for the Generating Equipment are set out in Annex V Part 2 of the IED. The IED emission limits applicable to the Project are set out in Table 6-5.

Table 6-5: IED Emission Limit Values for Gas turbines (including CCGT), using natural gas as fuel

Pollutant	Units	Emission limit Value (ELV)
NO_x	mg/Nm^3	50
CO	mg/Nm^3	100

Note: Concentrations are normalised to a referenced temperature 273.15 K, pressure 101.3 kPa, 15% oxygen, dry gas.

c) Planning Policy

i. National Policy Statements

6.3.24 The overarching National Policy Statement for Energy (EN-1) (Ref. 6.14), National Policy Statement for Fossil Fuel Electricity Generating Infrastructure (EN-2) (Ref. 6.15), National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4) (Ref. 6.16) and National Policy Statement for Electricity Networks Infrastructure (EN-5) (Ref. 6.17) were adopted by Parliament in July 2011. EN-1 describes the requirements for an air quality assessment for energy and electricity infrastructure projects and identifies traffic emissions, air pollution, dust and odour as issues for human health that need to be taken into account in the assessment of any proposed schemes, along with the effects of nuisance on sensitive receptors. EN-2 and EN-4 do not set out additional guidance for air quality, referring the reader back to the overarching guidance and approach set out in EN1. EN-5 does not specifically reference air quality. EN-1 specifically references the issue of air quality, and these are set out below.

6.3.25 Paragraph 5.2.1 states:

6.3.26 "Infrastructure development can have adverse effects on air quality. The construction, operation and decommissioning phases can involve emissions to air which could lead to adverse impacts on health, on protected species and habitats, or on the wider countryside."

6.3.27 Paragraph 5.2.2 states that:

6.3.28 *"the Government has determined that CO_2 emissions are not reasons to prohibit the consenting of projects"* and that the *"*[IPC] *does not, therefore, need to assess individual applications in terms of carbon emissions against carbon budgets and this section* [NPS EN-1, Section 5.2 Air quality and emissions] *does not address CO_2 emissions"*.

6.3.29 Paragraph 5.2.7 states:

6.3.30 "The ES should describe:

- any significant air emissions, their mitigation and any residual effects distinguishing between the project stages and taking account of any significant emissions from any road traffic generated by the project;
- the predicted absolute emission levels of the proposed project, after mitigation methods have been applied;

- existing air quality levels and the relative change in air quality from existing levels; and
- Any potential eutrophication impact."

ii. Planning Policy Wales

6.3.31 Current land use policies for Wales are set out in Planning Policy Wales ('PPW') (9th Edition, November 2016) (Ref. 6.18). The policy document is supplemented by a series of Technical Advice Notes ('TANs'). Paragraph 13.12.1 of PPW states that:

6.3.32 "The potential for pollution affecting the use of land will be a material consideration in deciding whether to grant planning permission. Material considerations in determining applications for potentially polluting development are likely to include:

- Location, taking into account such considerations as the reasons for selecting the chosen site itself;
- Impact on health and amenity;
- The risk and impact of potential pollution from the development, insofar as this might have an effect on the use of other land and the surrounding environment (the environmental regulatory regime may well have an interest in these issues, particularly if the development would impact on an Air Quality Management Area or a SAC);
- Prevention of nuisance;
- Impact on the road and other transport networks, and in particular on traffic generation; and
- The need, where relevant, and feasibility of restoring the land (and water resources) to standards sufficient for an appropriate after use. (Powers under the Pollution Prevention and Control Act 1999 require an operator to return a site to a satisfactory state on surrender of an Integrated Pollution Prevention and Control Permit)."

iii. Local Planning Policy – City and County Swansea

6.3.33 City and County Swansea's (CCS's) Unitary Development Plan (UDP) (Ref. 6.19), adopted on 10th November 2008, is the council's most up to date Development Plan that will be used in the determination of planning applications.

6.3.34 CCS's UDP includes Policy EV40, which states, *"Development proposals will not be permitted that would cause or result in significant harm to health, local amenity, natural heritage, the historic environment or landscape character because of significant levels of air, noise or light pollution"* the policy further states that, *"planning permission will not be granted for developments that would cause significant harm to air quality by virtue of emissions from the development itself or the additional new traffic movements it would generate."*

6.3.35 CCS submitted the Swansea Local Development Plan (LDP) (Ref. 6.20) to the Ministers of the Welsh Government for independent examination, in 28 July 2017. If approved and once adopted by CCS, this will replace the UDP.

6.3.36 Section 2.14 of the LDP, Resources and Public Health Protection, re-iterates the text from CCS's UDP once more stating that "*developments that would result in significant risk to: life; human health and well-being; property; controlled waters; or the natural and historic environment, will not be permitted*".

6.3.37 RP 2 of the emerging LDP relates to air, noise and light pollution and states that:

6.3.38 "Where development could lead to exposure to a source of air, noise or light pollution it must be demonstrated that appropriate mitigation measures will be implemented, and incorporated into the design of the development to minimise the effects on future occupants.

6.3.39 ….Pollution may cause significant risk to human health, quality of life, residential amenity, and the natural and historic environment. This Policy seeks to ensure that development that would result in significantly high levels of air, noise or light pollution are appropriately located away from residential areas, other sensitive developments and areas of landscape, natural environment and heritage importance. The Policy also seeks to ensure that incompatible development and land uses are not located close to existing sources of potential pollution.

6.3.40 Where possible planning conditions will be used to minimise environmental harm and achieve environmental enhancement. The Council will look to the statutory environmental agencies to use their anti-pollution legislative powers to monitor and enforce against discharges, noise and other nuisances."

6.3.41 Section 2.14.11 of Policy RP2 states that in regards to air quality:

6.3.42 "Planning permission will not be granted for development that would cause significant risk to air quality by virtue of emissions from the development itself or the additional new traffic movements it would generate. Neither will permission be granted where a development is proposed that would increase the number of exposed individuals in an area likely to fail UK air quality objectives (proposed or in Regulations). This may be a declared Air Quality Management Area (AQMA), or an area that might become an AQMA if the application were to be granted. The Swansea Air Quality Management Area (AQMA) 2010 (Nitrogen dioxide (NO_2)) is currently the only AQMA within the County boundary and evidence suggests that the annual mean objective for NO_2 will continue to be exceeded within the AQMA. The AQMA boundary is shown on the Constraints Map. Monitoring also indicates areas of exceedances, outside the AQMA, within Mumbles and the City Centre."

iv. City and County Swansea Air Quality Action Plan

6.3.43 CCS declared parts of the lower Swansea Valley an AQMA in 2001, for exceedance of annual mean NO_2 objective. The originally declared AQMA was amended in

2010 due to further exceedance of NO_2 objective occurring within the Sketty and Fforestfach areas. The latest published Air Quality Progress report for year 2017 (Ref. 6.21) states that the latest monitoring indicates areas of exceedances of the NO_2 annual mean objective outside the current AQMA. Therefore CCS has proposed to undertake a Detailed Assessment study for an area located within City Centre. At the time of writing the results of the Detailed Assessment have not been published, however given the distance of the Project Site from the City Centre the impacts of any emissions from the Generating Equipment on any potential AQMA is anticipated to be negligible.

6.3.44 CCS published the Air Quality Action Plan (AQAP) in 2004 (Ref. 6.22) which outlined air quality improvement measures for declared AQMA. The AQAP incorporates work already undertaken by the CCS in the Local Transport Plan and Unitary Development Plan.

6.4 Methodology

a) Scope of the assessment

6.4.1 The scope of this assessment has been determined through a formal EIA scoping opinion given by the Secretary of State. Comments raised on the EIA Scoping Report have been taken into account in the development of the assessment methodology and these are detailed where relevant in this chapter. Responses to the comments raised in the EIA Scoping Opinion can be found in Appendix 4.3 and Table 6-6.

6.4.2 The approach to the assessment of emissions from the Project will involve the following key elements:

- Establish appropriate air quality assessment criteria for the Project in terms of EU Limit values, AQS objectives and EALs.
- Establishing the background ambient concentrations of each relevant pollutant.
- Qualitative assessment of construction phase dust and PM_{10} emissions in terms of the Generating Equipment Site, Gas Connection and Electrical Connection. The assessment will consider dust nuisance, human health impacts and ecological impact.
- Detailed consideration of stack height for the Generating Equipment.
- Quantitative assessment of the operational effects on local air quality from stack emissions utilising a “new generation” Gaussian dispersion model assessed in terms of process contributions (PC) from the site in isolation, and assessment of resultant predicted environmental concentrations (PEC) taking into account cumulative impacts through incorporation of the background concentration. Modelling will consider:
- For Human Health, NO_2 and CO concentrations will be predicted and compared with the relevant standard.
- For sensitive ecosystems, concentrations of NOx, and will be modelled along with nitrogen and acid depositions at the closest sensitive ecological receptor sites.

- An assessment of the significance of the potential impacts of the development will be made with reference to appropriate air quality assessment criteria and critical loads and critical levels set out in the APIS system for ecological receptors.

6.4.3 The following items have been scoped out of further detailed consideration:

- Operational emissions from the Gas Connection and Electrical Connection;
- Construction and operation traffic emissions; and
- Odour.

i. Gas Connection and Electrical Connection Operational emissions

6.4.4 There are routine or normal emission to air associated with the operational phase of either the Gas Connection or the Electrical Connection. Any emission from the Gas Connection would be due to a leak/failure of the pipeline and would be considered to an abnormal event and would be corrected as a matter of urgency. There are no emissions to air associated with the Electrical Connection. As such both these operational phases have been scoped out of detailed consideration.

ii. Traffic Emissions

6.4.5 In order to assess potential traffic impacts during construction, operation, maintenance and decommissioning the EPUK/IAQM Land-Use guidance (Ref. 6.2) provides indicative criteria to aid in determining if an air quality assessment is required. The IAQM/EPUK guidance states that in terms of road traffic and assessment is required where the development will:

- Cause a significant change in Light Duty Vehicle (LDV) traffic flows on local roads with relevant receptors. (LDV = cars and small vans <3.5 t gross vehicle weight). A change in LDV flows is considered to be an increase of more than 100 Annual Average Daily Traffic (AADT) movements within or adjacent to an AQMA or more than 500 AADT elsewhere.
- Cause a significant change in Heavy Duty Vehicle (HDV) flows on local roads with relevant receptors. (HDV = goods vehicles + buses >3.5 t gross vehicle weight). A change in LDV flows is considered to be an increase of more than 25 AADT within or adjacent to an AQMA or more than 100 AADT elsewhere.
- Realign roads, i.e. changing the proximity of receptors to traffic lanes. Where the change is 5m or more and the road is within an AQMA.

6.4.6 The Project is located over 5 km from the closest AQMA and is not anticipated to lead to a change in traffic flows on any roads covered by an AQMA, as such the factors related to non-AQMA changes are applicable to this assessment. The traffic assessment, **Chapter 12: Traffic, Transport and Access**, sets out predicted changes in traffic flows associated with the construction, operational and decommissioning phases of the development. The predicated increase in LDV and HDV movements associated with the Project is well below the limits set out in the EPUK/IAQM guidance. Therefore, impacts from vehicle emissions during

construction, operation, and decommissioning have not been considered further in this assessment (see Appendix 6.1).

iii. Odour Assessment

6.4.7 The Project will operate using natural gas. There is no residual odour associated with the combustion of natural gas and as such, odour has not been considered further within this assessment, and agreed with CCS.

b) Consultation

6.4.8 The scope of the assessment has also been informed by ongoing consultation with statutory consultees throughout the design and assessment process, including CCS.

6.4.9 A summary of the comments raised and responses are detailed in Table 6-6.

Table 6-6: Summary of consultation responses that have informed the scope and methodology of the Air Quality assessment

Consultee	Date	Comment	Response
Secretary of State (SoS) (Scoping Report paragraph 3.22)	August 2014	The SoS considers that adverse change to air quality should be assessed in relation to compliance with European air quality limit values and any impact upon AQMA	This has been addressed in Section 0 and Section 6.7.15 to 6.7.27
SoS (Scoping Report paragraph 3.23)	August 2014	There is the need to consider potential related effects due to an increase in airborne pollution including fugitive dust especially during site preparation, demolition and construction	This has been addressed in Section 6.7.1 to 6.7.12.
SoS (Scoping Report paragraph 3.24)	August 2014	The ES should also include an assessment of potential air quality impacts on the Lower Lliw Reservoir as a result of both deposition and affected rainfall. The SoS notes the comments of Dwr Cymru (Welsh Water) in this respect.	Detailed modelling has been undertaken to assess impacts at ecological receptors in terms of both NOx Concentrations and acid/nitrogen deposition and the details of this assessment are presented in the HRA Appendix of **Chapter 8 Ecology**
SoS (Scoping Report paragraph 3.25)	August 2014	The air quality assessment should use the APIS critical load function tool in order to calculate acid deposition process	Detailed modelling has been undertaken to assess impacts at ecological receptors in terms of both NOx Concentrations and

Consultee	Date	Comment	Response
		contributions/exceedances. The SoS draws attention to the comments of NRW in this respect.	acid/nitrogen deposition and the results assessed against the critical load calculation methodology set out in the APIS website. Details of this assessment are presented in the HRA Appendix of **Chapter 8 Ecology**
SoS (Scoping Report paragraph 3.26)	August 2014	The assessment should take account of the air emissions from the proposed development and emissions related to vehicular movements associated with the proposal. The SoS recommends that the implications of stack height and dispersion of the discharge be clearly explained within the ES.	Traffic movements associated with the Project are below the levels set out in the IAQM/EPUK screening levels, as such the assessment of vehicle movements have been scoped out of further assessment. A stack height determination assessment has been undertaken and this is detailed in Appendix 6.2.
SoS (Scoping Report paragraph 3.27)	August 2014	The SoS recommends that the applicant agrees all modelling receptor locations with the City and County of Swansea and also that the applicant consults the City and County of Swansea regarding the proposed data inputs for the air quality model.	Detailed discussions have been held with CCS to agree the methodology to be applied to the dispersion modelling. These consultations are summarised in Appendix 6.1
SoS (Scoping Report paragraph 3.28)	August 2014	The SoS recommends that the applicant agrees which pollutants are to be modelled and the meteorological data to be used with the City and County of Swansea.	Detailed discussions have been held with CCS to agree the methodology to be applied to the dispersion modelling. These consultations are summarised in Appendix 6.1
SoS (Scoping Report paragraph 3.29)	August 2014	The SoS recommends that dispersion modelling considers a range of possibilities and seeks to ensure that the 'worst case' scenario is assessed, for example the 'worst case' may occur as a short term impact.	Detailed modelling has looked at both annual and short-term contributions of pollutants against their respective AQS objective/EU Limit Values. The result of this are presented in both the stack height determination

Consultee	Date	Comment	Response
			Appendix 6.2 and in Sections 6.7.15 to 6.7.27
SoS (Scoping Report paragraph 3.29)	August 2014	The SoS notes the comments of NRW in relation to the village of Llangyfelach in this respect. The SoS recommends that the applicant consider extending the proposed air quality study area to incorporate this village.	Receptors 21 and 22 have been included within the dispersion modelling to represent impacts of the Project on the village of Llangyfelach
SoS (Scoping Report paragraph 3.30)	August 2014	The SoS recommends that air quality and dust levels are considered not only on site but also off site, including along access roads, local footpaths and other public rights of way. Consideration should also be given to appropriate mitigation measures and to monitoring dust complaints.	This has been addressed in Section 6.7.1 to 6.7.12.
CCS & NRW	October 2017	Detailed discussions have been held with CCS to agree the methodology to be applied to the dispersion modelling and also with NRW regarding the monitoring station to be used. These consultations are summarised in Appendix 6.1	
NRW	January 2018	Section 6.3.24 refers to the relevant Emission Limit Values (ELVs) for the Generating Equipment being set out in Annex V Part 1 of the IED. We advise that it is expected that Annex V Part 2 of the IED will apply to this project.	The reference to the IED (vii) has been updated as requested by NRW following there review of the 2018 PEIR to ensure that that Annex V Part 2 is referenced not Annex V Part 1.
CCS	January 2018	Paras 9.7.16 and 9.7.60, whilst relating to construction and decommissioning respectively, are inconsistent. The former states that the Project would not involve any demolition activities and therefore high levels of dust/ debris are unlikely. The latter considers the principle that construction will be totally reversed (in terms of	The dust assessment has been updated to maintain consistency in the approach to assessing effects during the construction and decommissioning phases following comments on the 2018 PEIR form CCS.

Consultee	Date	Comment	Response
		decommissioning) and whilst it is anticipated that the buildings will preferably be prefabricated / of metal construction to limit demolition, this cannot be guaranteed and the hard surfaced bases/ development platform for the Project would need to be demolished to restore the land in any event. Para 6.7.32 acknowledges that emissions during the earthworks (of the decommissioning phase) are expected to be large due to the size of the site. Therefore, it is considered that reference is needed to dust/ debris in the decommissioning section so that it is clearly identified as an issue at this stage, and developed further in any Decommissioning Strategy.	
CCS	January 2018	Para 15.3.11 relates to construction and decommissioning and states that the adoption of the dust control measures contained within the CEMP would result in negligible/ low effects on human health and dust nuisance during construction and decommissioning (although the CEMP would only apply to the former).	The dust assessment has been updated to maintain consistency in the approach to assessing effects during the construction and decommissioning phases following comments on the 2018 PEIR form CCW.

c) Study Area

6.4.10 The study areas are defined separately for the construction and operational phases and for the different Project components. Impacts during decommissioning are considered to mirror construction impacts and the study area is as defined for the construction phase.

6.4.11 The study area for the assessment of impacts during construction and decommissioning is defined on the following criteria detailed in the IAQM guidance:

- Human receptors within 350 m of potential dust sources and 50 m of the routes used by construction vehicles on the public highway; and
- Ecological receptors within 100 m of potential dust sources and 50 m of the routes used by construction vehicles on the public highway.

6.4.12 The potential dust sources include areas of specific construction activities, the routes of the Gas Connection and Electrical Connection, and also roads within 500 m of potential construction works (taken to be the junction of public roads and the Project Site).

6.4.13 Outside of the construction study area defined above it is reasonable to conclude that construction impacts will be negligible.

6.4.14 The study area for the assessment of impacts during the operational phase depends on the receptors being considered. For ecological sites the EA guidance "Air emissions risk assessment for your environmental permit" (Ref. 6.9) (as applied by NRW), requires that air quality impacts are assessed at all special protection areas (SPAs), special areas of conservation (SACs), Ramsar sites (protected wetlands) within 10 km of the site. While sites of special scientific interest (SSSIs) and local nature sites (ancient woods, local wildlife sites and national and local nature reserves) should only be assessed if within 2 km of the application site.

6.4.15 There are no limits set for the assessment of human health, however, representative receptors have been selected from amongst the closest residential properties, and these have been discussed with CCS (see Appendix 6.2). In addition a grid of receptors has been modelled extending 10 km from the Project Site boundary to assess maximum ground level concentrations.

d) Assessment of Stack Emission Effects

6.4.16 The assessment of emissions from the Generating Equipment has been undertaken using the latest version of Atmospheric Dispersion Modelling System (ADMS) (V5.2.1.0), supplied by Cambridge Environmental Research Consultants Limited (CERC) (Ref. 6.23). ADMS is a modern dispersion model that has an extensive published validation history for use in the UK. This model has been extensively used throughout the UK to demonstrate regulatory compliance.

i. Model Inputs

6.4.17 The physical stack properties and emission parameters used in the modelling are summarised in Table 6-7.

Table 6-7: Stack properties and Emission Parameters

Variable	Input
Stack Locations - OS co-ordinates (m)	265576, 201324
Stack Height	The stack height determination (see Appendix 6.2) has considered a range of heights from 20 to 50 m increasing in 2 metre increments. A final minimum

Variable	Input
	stack height of 35 m was selected for the Human Health and Ecological modelling.
Stack Diameter (m)	7.00
Flue temperature (°C)	589.9
Actual Volumetric Flow (m^3/sec)	1,742.0
Stack velocity (m/s)	45.26
Reference Volumetric Flow, dry, 0°C, 1 atm, 15% O_2 (Nm^3/sec)	639.1
NO_x emission concentration (mg/Nm^3)	50
NO_x mass emission rate (g/s)	31.96
CO emission concentration (mg/Nm^3)	100
CO mass emission rate (g/s)	63.91

ii. Meteorological Data

6.4.18 Hourly sequential data from Cwm Level Park for the years 2012 to 2016 inclusive, provided by CCS, were used in this study. The station is situated approximately 5 km to the south of the Project Site and is considered to be representative of meteorological conditions at the point of release. The Cwm Level Park data was supplemented with data from the Mumbles Head meteorological station located approximately 15 km to the south of the Project Site. The Mumbles Head meteorological station is located on a headland on the far side of Swansea Bay to the Project Site and, as such, the Cwm Level Park meteorological data is considered to be much more representative of meteorological conditions on the Project Site.

6.4.19 A visual representation of the meteorological data used in the assessment is shown in the wind roses presented in Figure 6.1.

iii. Terrain

6.4.20 Terrain data has been included within the dispersion modelling. A site specific terrain file has been generated for the site which accounts for the final site platform height, upon which the buildings and stack will be built, with detailed terrain data used for the area immediately off-site with more distant terrain data derived from the open OS terrain data off-site. All terrain files have been generated based on the maximum sampling resolution allowable within the ADMS terrain file creator of 64x64 points with the model run with a corresponding resolution.

iv. Surface Roughness

6.4.21 A surface roughness of 0.3 m was used to represent the conditions of the land surrounding the Project Site and fits the description of the landscape between the emission points and the closest sensitive receptors. A surface roughness value of 0.5 m was used to represent conditions at the meteorological observation site which is in a suburban park.

v. Building Downwash Effects

6.4.22 When wind passes over buildings or other structures, turbulent eddies are formed in the downwind side of the building. Those eddies can cause a plume from a stack located within about five times the height of a nearby building or structure to be forced down to the ground much sooner than it would if a building or structure were not present. The net effect of such turbulence can be to entrain emissions and to reduce the effective release height of the emission.

6.4.23 The effect can greatly increase the resulting near-by ground-level pollutant concentrations downstream of the building or structure. This phenomenon is known as building downwash. Where building heights are greater than about 30% - 40% of the stack height, downwash effects can be significant. The buildings that make up the main structure of the Generating Equipment buildings have therefore been included within the dispersion model as detailed in Table 6-8 and illustrated in Figure 6.2, please note that these are indicative dimensions and are based on the maximum building sizes and as such are considered to be the worst-case. These buildings have the greatest influence on air flow across the Project Site and have the potential to generate turbulence which will effect stack dispersion. The buildings that have been included within the dispersion modelling are presented in Figure 6.2.

6.4.24 The ADMS buildings effect module has been used to take account of building downwash effects as part of the modelling procedure. The air inlet house (Building 1) has been selected as the main building to effect dispersion as it is the tallest building on the Project Site. ADMS takes the parameters of the selected main building and applies this to the other buildings included within the model to form a single combined structure with the height of the selected main building when calculating downwash effects. This, therefore, ensures a conservative approach to building downwash effects as it treats all the buildings as if they are one large building for purposes of modelling.

Table 6-8: Building Parameters*

Building	National Grid Reference of Centre Point*		Height (m)*	Length (m)*	Width (m)*	Angle from North (°)
	X	Y				
Building 1 - Air filter	265551.8	201288.3	27.0	17.8	16.0	124.5
Building 2 - Air	265557.5	201296.5	19.5	15.3	3.92	124.5

Building	National Grid Reference of Centre Point*		Height (m)*	Length (m)*	Width (m)*	Angle from
filter duct						
Building 3 - Compressor	265562.3	201303.5	15.0	13.1	12.8	124.5
Building 4 - Turbine	265569.5	201314.1	11.0	10.0	12.5	124.5
Building 5 - Exhaust Diffuser and Generator Below Stack	265576.5	201324.2	14.0	12.0	12.0	124.5

** Indicative dimensions. The land within the Generating Equipment Site is at approximately 90 m AOD and the heights in the Table 6-8 are measured from this level.*

6.4.25 Table 6-8 presents the grid locations of the centres of each modelled buildings included within the model. This data is presented only for reference and the exact buildings centres may differ in practice once constructed within the limits of deviation being applied for. The buildings have been modelled relative to each other and to the stack; as such, any variation on building location will not significantly alter the results of the modelling as long as the buildings and stack are built in the same orientations and same relative distances to one another. Any changes in predicted pollutant concentrations would be negligible and would fall within the degree of error associated with the dispersion modelling.

vi. Modelled Domain

6.4.26 The dispersion model output is reported at specific receptors and as a nested grid of values. Three separate grid resolutions have been used:

- A 30 m resolution covering a 1.5 km radius around the Project Site, centred on the stack location, used for the stack height determination modelled at a height of 1.5 m. This has been based on ensuring that the grid spacing is 1.5 times the shortest stack height modelled (1.5 x 20 m = 30 m) and well below the resolution for the maximum stack height modelled (1.5 x 50 m = 75 m).
- A 50 m resolution grid covering all ecological areas within 10 km of the Project Site covering only ecological areas ensure that each ecological site had more than 2 receptors within it. Additional receptors were manually added to ensure that each site was sufficiently represented. Modelled concentrations were at 0 m.
- A 200 m resolution grid covering a 10 km radius around the Project Site, centred on the stack location, modelled at a height of 1.5 m and used for creating contour plots.

6.4.27 Ground-level concentrations of the modelled pollutants relevant to human health have been predicted at discrete air quality sensitive receptors, detailed in Table 6-9. The locations of the sensitive human receptors are displayed in Figure 6.3. The receptors have been selected to be representative of residential dwellings closest

to the Project Site covering each compass direction. For sensitive human receptors, the flagpole height has been set at 1.5 m.

Table 6-9: Modelled Human Health Receptors

Receptor Number	Description	National Grid Reference		Defra Mapped Background Concentration (µg/m^3)			
		X	Y	NO_2	PM_{10}	$PM_{2.5}$	CO
1	Abergelli Farm	265122	201644	6.8	10.8	7.2	220
2	Building SW of Abergelli Farm	264981	201510	6.6	10.7	7.1	215
3	Building SW of Abergelli Farm	264948	201482	6.6	10.7	7.1	215
4	Lletty Morfil Farm	264751	201064	6.6	10.7	7.1	215
5	Pen-y-waun-fach Cottage	264297	200950	8.1	11.0	7.3	226
6	Cefn-betingau	266028	201497	7.3	11.2	7.6	226
7	Pen-y-fedw	266462	201408	7.3	11.2	7.6	226
8	Felin-Wen-Court	266331	201052	7.3	11.2	7.6	226
9	Property SE of the Site	265959	200657	8.5	11.3	7.6	233
10	Maes-eglwys	265447	200694	8.5	11.3	7.6	233
11	Rhyd-y-Pandy	266614	202169	6.4	11.4	7.7	204
12	Gwynfa	266562	202531	6.4	11.4	7.7	204
13	Cynghordy	266316	203076	5.8	10.6	7.1	198
14	Salem Cottage	265900	203100	5.7	10.6	7.1	195
15	Lletty'r Bugail	265658	202821	6.1	10.8	7.2	199
16	Brynheulog	265501	202654	6.1	10.8	7.2	199
17	Property N of the Site	265472	202426	6.1	10.8	7.2	199
18	Morriston Hospital	266308	200262	9.6	11.6	7.8	239
19	Pant-Iasau	266059	200427	9.6	11.6	7.8	239
20	Pant-Iasau	265924	200116	8.5	11.3	7.6	233
21	Llangyfelach	264916	199082	13.2	12.4	8.1	235
22	Bryn-tywod	264452	199157	13.2	12.4	8.1	235
23	Tircoed	262443	199926	13.6	12.4	8.0	217
24	Tircoed	262237	200332	7.9	11.1	7.3	214
25	Brynawel	263895	201256	6.5	10.7	7.1	210
26	Gellyfeddan	264131	201807	6.6	10.7	7.1	215

Receptor Number	Description	National Grid Reference		Defra Mapped Background Concentration (µg/m^3)			
		X	Y	NO_2	PM_{10}	$PM_{2.5}$	CO
27	Area 5 of CCS LDP	264348	200043	8.1	11.0	7.3	226
28	Area 11 of CCS LDP	263931	200814	7.9	10.9	7.2	218

vii. Ecological Receptors

6.4.28 The study area includes numerous nature conservation sites relevant to the air quality assessment. The list of designated sites, their habitat and background levels of nitrogen and sulphur deposition are presented within the Habitats Regulations Assessment (HRA) will accompany **Chapter 8: Ecology** and as such are not repeated within this chapter.

viii. Oxides of nitrogen to nitrogen dioxide conversion

6.4.29 Emissions of NO_x from the stack will consist mainly of nitric oxide (NO) at the point of release. A number of mechanisms are known that result in an increasing proportion of the oxides of nitrogen being in the form of nitrogen dioxide with increasing distance from the point of release.

6.4.30 The approach undertaken in the assessment of effects from continuously operating power plant is to use conversion rates recommended by the Environment Agency's Air Quality Modelling and Assessment Unit (Ref. 6.24), which are:

- to assume 70% of oxides of nitrogen present as NO_2 at ground level, plus the background NO_2 concentration in the calculation of long-term annual mean calculations; and
- to assume 35% oxides of nitrogen present as NO_2 at ground level, plus double the background NO_2 concentration in the calculation of short-term hourly concentrations.

ix. Acid and Nitrogen Deposition

6.4.31 The deposition of nitrogen is modelled using a deposition velocity approach, where the surface flux of pollutants is modelled by multiplying the ground level concentration by a pollutant specific deposition velocity. The velocity used in the assessment of nitrogen deposition from NO_2 was 1.5 mm/s for short vegetation and 3.0 mm/s for tall vegetation.

6.4.32 For the emissions from the Generating Equipment, only nitrogen deposition need be considered. Impacts due to emissions of sulphur dioxide and, by inference deposition of sulphur, have not been assessed as natural gas is an inherently low sulphur fuel. However, background levels of sulphur deposition are considered in the assessment of acidification.

6.4.33 Relevant Critical Loads (acid and nitrogen) for each sensitive ecological area are detailed within the Habitat Risk Assessment which accompanies the **Chapter 8: Ecology** and as such are not repeated within this chapter.

x. Specialised Model Treatments

6.4.34 Emissions have been modelled such that they are not subject to dry and wet deposition or depleted through chemical reactions. The assumption of continuity of mass is likely to result in an overestimation of impacts at receptors.

xi. Realistic Worst Case Scenario for Assessment of Stack Emissions

6.4.35 In accordance with PINS Advice Note 9 (Rochdale Envelope) (Ref. 6.25), the assessments presented in this ES are based on an assessment of the realistic 'worst case' scenario. This allows flexibility for APL whilst ensuring that the likely significant environmental effects are identified and adequately assessed. The realistic worst case scenario is set out in each topic chapter for clarity and transparency.

6.4.36 Taking the above into consideration, it has been determined that for all topic areas to be addressed in the EIA apart from socio-economics, a realistic 'worst case' scenario from the perspective of environmental effects will be one gas turbine generator unit. In addition, for all topic areas except air quality and ecology, the highest stack height (45 m) represents the 'worst case'. For air quality the minimum stack height (35 m) represent the 'worst case' due to lower dispersion from the stack. This in turn results in higher predicted ground-level concentrations at both human health and ecological receptors and predicted levels of nitrogen and acid deposition at ecological receptors locations.

6.4.37 The Generating Equipment Site is a peaking plant and will therefore only operate during periods of high power demand. It is therefore anticipated that the Generating Equipment will normally operate for 1,500 hours per year, estimated as a rolling average over 5 years, but may operate for up to a maximum of 2,250 hours per year as a realistic worst-case for any given year. The maximum number of hours that the plant can operate will be set out in the site's Environmental Permit and this operating period cannot be exceeded.

6.4.38 The assessment of impacts takes into account the anticipated maximum operating hours which the plant will operate under i.e. is based on a realistic worst case. It is not possible to specify which hours of the year the plant will operate, the method by which this is taken into account in the dispersion modelling is dependent on the metric being assessed i.e. annual, daily, 8-hour or hourly mean concentrations.

6.4.39 The impacts of the Project on short term (8 hours or less) pollutant concentrations were modelled with the OCGT assumed to be operating at full load continuously for a whole year. This is appropriate since the UK objectives and EU limit values for hourly NO_2 and 8 hourly CO are based on the 18 highest and highest concentrations respectively over a year and, with 2,250 hours of operation, it is

likely that operations will, at times, coincide with examples of the poorest dispersion conditions.

6.4.40 In relation to long term (annual mean) concentrations assuming full load operation for the year will be unrealistic. Therefore, long term impacts were estimated by scaling the results for continuous full load operation by the likely operating time i.e.

6.4.41 $$\frac{\text{2,250 (maximum hours of operation)}}{\text{8,760 (total hours in a year)}} = 0.257$$

6.4.42 This approach is appropriate and is based on the assumption that the range of meteorological conditions under which the generators will operate will, over the 2,250 hours, be statistically similar to those experienced over a year. The annual stack contributions have been adjusted when presenting both the impacts at human health receptors close to the Project Site and for the ecological modelling when considering annual NO_x concentrations and annual nitrogen/acid deposition. To ensure a level of conservativeness both the human health and ecological assessments have been calculated based on the maximum annual concentrations predicted at each location from the 5 years of meteorological data used in the modelling.

6.4.43 The assessment of daily mean concentrations, applicable to the ecological assessment, falls between the cases for long and short-term concentrations. Nevertheless to ensure a conservative assessment daily mean concentrations are assessed on the basis of continuous operation.

xii. Impacts During Start Up and Shut Down

6.4.44 The start-up and shut down periods do not warrant specific assessment for the Project and impacts during these periods are robustly considered in the assessment by the assumed 2,250 hours of full load operation for the Plant, i.e. maximum annual operations rather than the anticipated normal operating hours of 1,500 per year.

6.4.45 The main element of the Generating Equipment is the Gas Turbine Generator. The OCGT is designed to meet short-term changes in electricity demand and is, therefore, specifically designed for rapid start up and shut down to benefit for these short-term changes in demand. Typical start up procedures will take around ten minutes to complete, and combustion fuel will not be introduced into the system until two to three minutes of the start-up have elapsed. During the next seven to eight minutes, fuel will be introduced into the system, first at a low rate and then at an increasing rate, up to full load operations.

6.4.46 During start up, whilst the concentration of pollutants in the engine exhaust (at reference conditions) may be higher than under partial or full load operation during the first few minutes (e.g. minutes two to eight, at <75% load), the pollutant mass release rate will actually be lower than under full load operations due to the overall lower flow rates of exhaust gases. The mass release rate (mg/s) is calculated as the concentration of pollutant (mg/Nm^3) times the exhaust gas flow rate (Nm^3/s).

Furthermore, the concentration of pollutants decreases rapidly as start-up proceeds and, by around 8 minutes into start up, has decreased to levels equivalent to full load operations.

6.4.47 In relation to air quality impacts, the mass release rate of pollutants is more important than the initial exhaust gas concentration of pollutants, since ground level impacts are proportional to the total mass release. This takes into consideration the competing effects of lower pollutant mass release rate during start up, but reduced plume buoyancy at low load (during early start up).

6.4.48 Impacts during start-up are likely to be imperceptibly different from those during full load operation. Similar conclusions hold for impacts during the ramping down from full load operations i.e. emission rates fall as the fuel flow rate is decreased but impacts of this decrease are countered by the effects of reduced plume buoyancy.

xiii. Demolition and Construction Phase Fugitive Emissions of Particulate Matter

6.4.49 Fugitive emissions (i.e. emissions which are not associated with a single fixed release point of airborne particulate matter) are readily produced through the action of abrasive forces on materials and therefore a wide range of demolition and construction activities have the potential to generate this type of emission (although not all relevant to this Project), including:

- Demolition work:
- Earthworks, including the handling, working and storage of materials;
- Construction activities; and
- The transfer of dust-making materials from the Project Site onto the local road network (Track-out).

6.4.50 Particulate matter in the air is made up of particulates of a variety of sizes, and the concept of a ‘size fraction’ is used to describe particulates with sizes in a defined range. These definitions are based on the collection efficiency of specific sampling methods and each of the size fractions is especially associated with different types of impacts. In this assessment the term ‘dust’ is used to mean particulate matter in the size fraction 1 µm – 75 µm in diameter, as defined in BS 6069:1994 (Ref. 2.26). The size fraction called ‘PM_{10}’ is composed of material with an aerodynamic diameter of less than 10 µm in diameter and overlaps with the size fraction for dust.

6.4.51 The assessment has been undertaken in accordance with the methodology set out in the IAQM (Ref. 6.27) guidance. Dust impacts are considered in terms of the change in airborne concentration and the change in the rate of deposition of dust onto surfaces. The IAQM adopts a broad definition of dust that includes the potential for changes in airborne concentration, changes in deposition rates and the risk to human health and public amenity, when considering the significance of effects from emissions of fugitive particulate matter. In this assessment, specific reference is made to the impacts associated with specific size fractions (dust, PM_{10}), before considering the overall effect on receptors.

6.4.52 For the Project this will include the areas of specific construction associated with the Generating Equipment Site and also the routes of the Access Road, Gas Connection and Electrical Connection. Outside of this study area it is reasonable to conclude that construction impacts will be negligible.

6.4.53 A qualitative assessment has been undertaken to assess the significance of any effects on sensitive receptors associated with the demolition and construction phase.

6.4.54 For each activity the following steps are applied with respect to identifying the potential impacts, before coming to an overall conclusion about the significance of the effects predicted. The approach to the assessment involves the following process:

- Identify the nature, duration and the location of activities being carried out;
- Establish the risk of significant effects occurring as a result of these activities;
- Review the proposed or embedded mitigation against good site practice;
- Identify additional mitigation measures, if necessary, to reduce the risk of a significant adverse effect occurring at receptors; and
- Summarise the overall effect of the works with respect to fugitive emissions of particulate matter and then report the significance of the effects.

6.4.55 The emphasis of the regulation and control of construction dust should be the adoption of good working practices as standard. Good practice is a process that is informed by the assessment, which seeks to avoid the potential for adverse effects. This approach assumes that this environmental management, beyond those mitigation measures inherent in the proposed design, will be implemented during works to ensure potential significant adverse effects do not occur.

6.4.56 Examples of accepted good site practice include the IAQM guidance. It has been assumed that good site practice will be implemented on-site when assessing potential dust impacts. An outline Construction Environmental Management Plan (CEMP) has been prepared for the Project (Appendix 4.1) and includes measures comprising good site practice to avoid or reduce the potential for dust impacts.

e) Sensitivity

i. Construction Dust

6.4.57 According to the IAQM, an assessment will normally be required where there are:

- Human receptors within 350 m of potential dust sources and 50 m of the routes used by construction vehicles on the public highway, up to 500 m from the Project Site entrance; and
- Ecological receptors within 50 m of potential dust sources and 50 m of the routes used by construction vehicles on the public highway, up to 500 m from the Project Site entrance.

6.4.58 The nature of particulate impact for demolition and construction works varies between different types of receptors based on their sensitivity, as summarised in Table 6-10 below. Professional judgement is required when assessing sensitivities as some hi-technology industries and horticultural activities are particularly dust sensitive.

Table 6-10: Types of Impacts from Emissions of Particulate Matter

Nature of Impact	Receptor Types Affected	Relative Sensitivity
Human Health – i.e. change in 24 hour mean PM_{10} concentrations	Residential properties, schools, hospitals and residential care homes	High
	Offices and shops , but will generally not include workers occupationally exposed to PM_{10}, as protection is covered by Health and Safety at Work legislation	Medium
	Public footpaths, playing fields, parks and shopping streets	Low
Dust Soiling – i.e. change in the rate at which dust accumulates on property	Residential properties, museums and other culturally important collections, car showrooms and medium / long term car parks	High
	Parks and places of work	Medium
	Playing fields, Farmland (unless commercially sensitive horticultural), footpaths and short term car parks	Low
Change in the rate at which mineral material is deposited onto vegetation	Internationally or nationally designated ecological sites where the designated feature may be affected by dust soiling	High
	Nationally designated ecological sites, e.g. SSSI, that may be affected by dust deposition	Medium
	Locally designated site, e.g. LNR, that may be affected by dust deposition	Low

6.4.59 Once the sensitivity of the Receptors within the assessment areas are determined the IAQM methodology requires that the number of sensitive receptors, distance of each receptor from the construction activity and background PM10 concentrations be considered. The IAQM Sensitivity Criteria are presented in Table 6-11 to 6-13.

Table 6-11: Sensitivity of the Area to Dust Soiling Effects on People and Property

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		<20	<50	<100	<350
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Table 6-12: Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM_{10} Concentrations	Number of Receptors	Distance from the Source (m)				
			<20	<50	<100	<200	<350
High	>32 µg/m^3	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32 µg/m^3	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28 µg/m^3	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24 µg/m^3	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	>32 µg/m^3	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	28-32 µg/m^3	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	24-28 µg/m^3	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<24 µg/m^3	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	-	1+	Low	Low	Low	Low	Low

Table 6-13: Sensitivity of the Area to Ecological Impacts

Receptor Sensitivity	Distance from the Source (m)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

ii. Operational Emissions

6.4.60 While there is no specific guidance as to the specific sensitivity of different receptor types, Defra's LAQM,TG(16) (Ref. 6.28) provides the following details, Table 6-14, as to where Air Quality Objectives should apply.

Table 6-14: Defra Guidance on Where the Air Quality Objectives Should Apply

Averaging Period	Objectives should apply at	Objectives should generally not apply at
Annual mean	All locations where members of the public might be regularly exposed. Building façades of residential properties, schools, hospitals, care homes etc.	Building façades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term.
24-hour mean and 8-hour mean	All locations where the annual mean objective would apply, together with hotels. Gardens of residential properties.	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term.
1-hour mean	All locations where the annual mean and 24 and 8-hour mean objectives apply. Kerbside sites (for example, pavements of busy shopping streets). Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more. Any outdoor locations where members of the public might reasonably expected to spend	Kerbside sites where the public would not be expected to have regular access.

Averaging Period	Objectives should apply at	Objectives should generally not apply at
	one hour or longer.	
15-min mean	All locations where members of the public might reasonably be exposed for a period of 15 minutes	-

f) Magnitude

i. Construction Impacts

6.4.61 The IAQM provides assessment criteria against which the magnitude of any impact can be assessed. These differ dependent on the type of construction activity being undertaken and are presented in Table 6-15. The dust emission magnitude is based on the scale of the anticipated works and is classified as Small, Medium, or Large.

Table 6-15: IAQM Potential Dust Emission Magnitude

Activity	Magnitude	Criteria
Demolition	Large	Total building volume >50,000 m3; Potentially dusty construction material (e.g. concrete); On-site crushing and screening; or Demolition activities >20 m above ground level.
	Medium	Total building volume 20,000 m3 – 50,000 m3; Potentially dusty construction material; or Demolition activities 10-20 m above ground level.
	Small	Total building volume <20,000 m3; Construction material with low potential for dust release (e.g. metal Cladding or timber), demolition activities <10 m above ground; or Demolition during wetter months.
Earthworks	Large	Total site area >10,000 m2; Potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size); >10 heavy earth moving vehicles active at any one time; Formation of bunds >8 m in height; or Total material moved >100,000 tonnes.
	Medium	Total site area 2,500 m2 – 10,000 m2; Moderately dusty soil type (e.g. silt); 5-10 heavy earth moving vehicles active at any one time; Formation of bunds 4 m - 8 m in height; or Total material moved 20,000 tonnes – 100,000 tonnes.

Activity	Magnitude	Criteria
	Small	Total site area <2 ,500 m2; Soil type with large grain size (e.g. sand); <5 heavy earth moving vehicles active at any one time; Formation of bunds <4 m in height; Total material moved <20,000 tonnes; or Earthworks during wetter months.
Construction	Large	Total building volume >100, 000 m3 On site concrete batching; or Sandblasting.
	Medium	Total building volume 25,000 m3 – 100,000 m3; Potentially dusty construction material (e.g. concrete); or On site concrete batching.
	Small	Total building volume <25,000 m3; or Construction material with low potential for dust release (e.g. metal cladding or timber).
Trackout	Large	>50 HDV (>3.5t) outward movements in any one day; Potentially dusty surface material (e.g. high clay content); or Unpaved road length >100 m.
	Medium	10-50 HDV (>3.5t) outward movements in any one day; Moderately dusty surface material (e.g. high clay content); or Unpaved road length 50 m – 100 m.
	Small	<10 HDV (>3.5t) outward movements in any one day; Surface material with low potential for dust release; or Unpaved road length <50 m.

g) Effect Definitions

i. Construction Dust

6.4.62 The level of risk is defined based on the relative sensitivity of the area vs the magnitude of the identified impact from the phase of construction works. This is determined based on the matrix set out in Table 6-16.

Table 6-16: Risk of Dust Impacts

Phase of Works	Sensitivity of Area (see Table 6-11 to Table 6-13)	Dust Emission Magnitude (see Table 6-15)		
		Large	Medium	Small
Demolition	High	High Risk	Medium Risk	Medium Risk
	Medium	High Risk	Medium Risk	Low Risk

Phase of Works	Sensitivity of Area (see Table 6-11 to Table 6-13)	Dust Emission Magnitude (see Table 6-15)		
		Large	Medium	Small
	Low	Medium Risk	Low Risk	Negligible
Earthworks	High	High Risk	Medium Risk	Low Risk
	Medium	Medium Risk	Medium Risk	Low Risk
	Low	Low Risk	Low Risk	Negligible
Construction	High	High Risk	Medium Risk	Low Risk
	Medium	Medium Risk	Medium Risk	Low Risk
	Low	Low Risk	Low Risk	Negligible
Trackout	High	High Risk	Medium Risk	Low Risk
	Medium	Medium Risk	Low Risk	Negligible
	Low	Low Risk	Low Risk	Negligible

6.4.63 For effects on amenity (including those associated with dust), the aim is to bring forward a demolition and construction phase, including mitigation measures if necessary, that avoids the potential for complaints to be generated as a result of the Project.

6.4.64 Experience in the UK is that good site practice is capable of mitigating the impact of fugitive emissions of particulate matter effectively, so that in all but the most exceptional circumstances, effects at sensitive receptors can be controlled to ensure that effects are of negligible or minor adverse significance (i.e. 'not significant') (see Table 6-17). This process can be managed through the implementation of the CEMP (Appendix 3.1).

6.4.65 The scale of the risk of adverse effects occurring due to each type of demolition or construction activity, with mitigation in place is described using the terms 'high', 'medium' and 'low' risk. The basis for the choice of description is set out for each activity, comprising demolition, earthworks, construction and track-out, and is consistent with the IAQM's Guidance.

Table 6-17: Descriptors Applied to the Predicted Effects of Fugitive Emissions of Particulate Matter

Risk level	Description
High	A significant effect that is likely to be a material consideration in its own right.
Medium	A significant effect that may be a material consideration in combination with other significant effects, but is unlikely to be a material consideration in its own right.
Low	An effect that is not significant but that may be of local concern.
Negligible	An effect that is not a significant change.

6.4.66 Construction dust effects generally occur when high risk dust generating activities coincide with adverse meteorological conditions. Therefore, even without mitigation, any impact would be limited to events that are infrequent and short-term in nature.

6.4.67 A significant impact can be anticipated should the assessment conclude that the unmitigated impacts are of medium or high risk, however, only if suitable mitigation measures are not applied to control dust emissions. It should be noted that even sites which are assessed as low risk could lead to significant impacts if appropriate mitigation is not applied. Once appropriate dust controls are applied then the residual impacts of construction dust should be not significant. On this the IAQM states, "*Once the risk of dust impacts has been determined and the appropriate dust mitigation measures identified the final step is to determine whether there are significant effects arising from the construction phase of a proposed development. For almost all construction activity, the aim should be to prevent significant effects on receptors through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be 'not significant'.*"

ii. Operational Impacts

Human Health Receptors

6.4.68 With regard to stack emissions, the change in pollutant concentrations has been described at receptors that are representative of exposure to impacts on local air quality within the study area. For consideration of a change an assessment criteria has been derived from the IAQM/EPUK (Ref. 6.2) significance criteria guidance. These are presented in Table 6-18 and Table 6-19 respectively.

Table 6-18: Effects Descriptors at Individual Receptors – Annual Mean Impacts

Background NO_2 ($\mu g/m^3$)	Change in Annual Mean Concentration of NO_2 ($\mu g/m^3$) and Percentage (%) as a proportion of the Objective				
	<0.2 $\mu g/m^3$ (0%)	0.2-<0.6 $\mu g/m^3$ (1-2%)	0.6-<2.2 $\mu g/m^3$ (2-5%)	2.2 -<4 $\mu g/m^3$ (6% - 10%	>4 $\mu g/m^3$ (>10%
≤30.2	Negligible	Negligible	Negligible	Minor	Moderate
30.2 – 37.8	Negligible	Negligible	Minor	Moderate	Moderate
37.8 – 41.0	Negligible	Minor	Moderate	Moderate	Major
41.0 – 43.8	Negligible	Moderate	Moderate	Major	Major
≥43.8	Negligible	Moderate	Major	Major	Major

Table 6-19: Effects Descriptors at Individual Receptors – Short-term Impacts

Criteria	Predicted Peak Hourly Mean NO_2 Process Contribution ($\mu g/m^3$)	Predicted Peak 8-Hour Rolling CO Process Contribution ($\mu g/m^3$)	Effect Descriptor
<10%	< 20	<1,000	Negligible
10 – 20%	20 – 40	1,000 – 2,000	Minor
20 – 50%	40 – 100	2,000 – 5,000	Medium
>50%	> 100	>5,000	Major

6.4.69 The EA's Risk Assessment guidance (Ref. 6.9) defines a development as having an insignificant impact where:

- Predicted Contributions (PC) <1% of the Environmental Standard or EAL, or the Predicted Environmental Concentrations (PEC) <70% of the Environmental Standard or EAL for long term releases;
- PC <10% of the Environmental Standard or EAL, or the PEC is less than 20% of the Environmental Standard minus twice the long term background concentration, for short term releases.

6.4.70 Impacts of the proposed Project have been assessed relative to both the adapted IAQM/EPUK criteria and EA screening criteria.

Ecological Receptors

6.4.71 For European sites (SPA, SAC or Ramsar sites) an assessment is made as to whether the installation is "likely to have a significant effect", and whether this could lead to an "adverse effect on site integrity".

6.4.72 For Sites of Special Scientific Interest (SSSIs) the assessment needs to determine whether the installation is "likely to damage" the SSSI.

6.4.73 The EA's Risk Assessment guidance (Ref. 6.9) screening criteria for significance of the emission have been applied to the outcome of the dispersion modelling for both European and SSSIs. The predicted PCs have been compared with the appropriate Critical Level to determine the significance of the pollutant emission.

6.4.74 The total pollutant emission is defined in the EA's Risk Assessment guidance as being insignificant where:

- PC <1% of the Critical Level, or the PEC <70% of Critical Level for long term releases;
- PC <10% of the Critical Level for short term releases.

6.4.75 For all other nature conservation sites, i.e. LNRs, NNRs, SINCs and ancient woodlands, the assessment needs to determine whether the installation will result in "significant pollution" i.e. where Critical Levels are exceeded. Therefore if the long and short term PC is less than 100% of the relevant Critical Level, it is considered to be not significant.

6.4.76 The assessment against Critical Loads has been carried out in accordance with AQTAG06 'Technical guidance on detailed modelling approach for an appropriate assessment for emissions to air' (Ref. 6.29). However, it should be noted that this does not provide definitive advice on interpreting the likely effects on different habitats of changes in air quality.

6.4.77 As with Critical Levels where process contributions of nitrogen and acid are less than 1% of the Critical Load impacts can be considered to be insignificant. Should PCs be greater than 1% of the critical load then there is the potential for the effects to be significant, depending upon the context, i.e. sensitivity of the habitat to acid/nitrogen or other factors such as buffering capacity of the local soils.

6.5 Baseline Environment

a) CCS Air Quality Monitoring and Reporting

6.5.1 A review of existing baseline air quality has been undertaken using information presented within the CCS Progress Report 2016 (Ref. 6.21), information published on an official CCS Air Quality website (Ref. 6.30) and Defra website (Ref. 6.31).

6.5.2 There are a number of Continuous Monitoring Stations (CMS) in the administrative area of CCS. A summary of the monitoring stations and last five years of monitoring data from each, are presented in Table 6-20 to Table 6-23 CCS agreed the use of 2016 data. The 2017 will generally not be available until mid-2018.

Table 6-20: CMS Site Details

CMS name	Type	Location		Distance to Application Site (m)
		X	Y	
Swansea AURN	Roadside	265299	194470	5.5 km south
Morriston Groundhog	Roadside	267210	197674	4 km south
Cwm Level Park	Urban Background	265912	195890	5 km south

Table 6-21: CMS Monitored NO_2 Concentrations (µg/m^3)

CMS name	Annual Mean NO_2 Concentration (µg/m^3) / Number of Daily Means > 200 µg/m^3 in Parentheses				
	2012	2013	2014	2015	2016
Swansea AURN	26.0 (0)	26.8 (0)	25.0 (0)	23.0 (0)	26.3 (0)
Morriston Groundhog	23.4 (0)	23.2 (0)	21.1 (0)	20.5 (0)	26.6 (0)
Cwm Level Park	19.6 (0)	18.5 (0)	17.1 (0)	14.8 (0)	14.5 (0)

Table 6-22: CMS Monitored PM_{10} Concentrations (µg/m^3)

CMS name	Annual Mean PM_{10} Concentration (µg/m^3) / Number of Daily Means > 50 µg/m^3 in Parentheses				
	2012	2013	2014	2015	2016
Swansea AURN	17.8 (4)	19.0 (2)	20.3 (2)	20.2 (2)	20.3
Morriston Groundhog	13.9 (0)	15.3 (0)	13.2 (1)	-	-

Table 6-23 : CMS Monitored $PM_{2.5}$ Concentrations (µg/m^3)

CMS name	Annual Mean $PM_{2.5}$ Concentration (µg/m^3)				
	2012	2013	2014	2015	2016
Swansea AURN	11.5	11.9	12.8	12.8	16.0

6.5.3 Additionally CCS managed a network of diffusion tube monitoring sites focused on roadside locations mainly at busy junctions and along narrow and congested roads. The Project Site is at a rural location and therefore monitoring data from the NO_2 diffusion tube network are not considered relevant to inform the air quality baseline at the Project Site.

b) Defra Mapped Background Data

6.5.4 A large number of small sources of air pollutants exist, which individually may not be significant, but collectively, over a large area, need to be considered in the modelling process. Pollutant emissions from these sources contribute to

background air quality, which when added to modelled emissions allow estimates of total ambient pollutant concentrations to be made.

6.5.5 Defra has produced maps of background pollutant concentrations covering the whole of the UK for use by local authorities and consultants in the completion of LAQM reports and Air Quality Assessments where local background monitoring is unavailable or inappropriate for use. The current maps are based on a background year of 2015 and provide background pollutant concentrations for NO_2, PM_{10} and $PM_{2.5}$ for each 1 km grid square within the UK for all years between 2015 and 2030. Defra also provides historic mapped estimates from 2001 for CO. While the Defra mapped backgrounds have not been updated this data is still considered appropriate to use as it will give an indication of the background concentrations in the study area, though it is anticipated that these will be conservative. The mapped Defra NO_2, PM_{10} and $PM_{2.5}$ concentrations at the Project Site are presented in Table 6-24 for 2016.

Table 6-24: Defra Mapped Annual Background Pollutant Concentrations (µg/m³) at the Application Site in 2016

Pollutant	Mapped Grid Square		Annual Mean Concentrations (µg/m³)
	X	Y	
NO_2	265500	201500	6.8
PM_{10}			10.8
$PM_{2.5}$			7.2
CO			220

6.5.6 Table 6-25 presents a comparison of measured concentrations at the CCS Cwm Level Park urban background CMS site, presented in Table 6-21, versus Defra mapped background concentration for the corresponding grid square.

Table 6-25: 2016 Mapped vs Monitored Annual Mean Background NO_2 Concentrations (µg/m^3)

Monitoring Site	Monitored NO_2 Concentration (µg/m^3)	Mapped Grid Square		Mapped NO_2 Concentration (µg/m^3)
		X	Y	
Cwm Level Park	14.5	265500	195500	12.5

Note: The DEFRA background concentrations were downloaded in November 2017 from the 2015 reference year background maps.

6.5.7 The available CCS monitoring data are likely to overestimate pollutant concentrations in the study area since the study area is predominantly rural in comparison to the more urban nature of Cwm Level Park. The comparison shows that the Defra mapped values are slightly lower than the monitored background concentration at Cwm Level Park. However, given the rural nature of the Project Site it is not considered appropriate to use the Cwm Level Park monitoring to represent background concentrations to inform the wider study, especially when considering Sensitive Receptors which are located in rural areas. Background NO_2

concentrations in for this study will, therefore, be based on the 2016 mapped Defra estimates for the relevant grid square in which the receptor is located. The use of the Defra mapped background data to represent air quality at each modelled receptor location was agreed in consultation with CCS, as set out in Appendix 6.1.

6.5.8 CCS does not undertake any background monitoring for PM_{10} or $PM_{2.5}$. As such, background concentrations will be established based on Defra mapped background concentrations for 2016.

6.6 Embedded Mitigation

6.6.1 As detailed in **Chapter 3: Project and Site Description** (Section 3.11), a number of embedded mitigation measures have been identified through the iterative EIA process and have been incorporated into the design and construction planning of the Project.

6.6.2 As these mitigation measures have been embedded into the design, are legal requirements or are standard practices that will be implemented, the assessment of likely significant effects assumes that they are in place.

6.7 Assessment of Effects

a) Construction Phase

i. Generating Equipment Site

6.7.1 The sensitivity of the human receptors to the Generating Equipment Site is classed as low in terms of both nuisance and health impacts as the closest receptors (Abergelli Farmhouse and Maes-eglwys) are over 20 m from activities on-site. In relation to ecology the sensitivity is classed as low as the only ecological sites close to dust generating activities, Lletty-Morfil SINC and an area of Ancient Woodland, are locally designated and not considered to be sensitive to dust deposition. PM_{10} concentrations are at low likelihood of exceedences of the air quality objective in the area of construction activities are mainly associated with larger particles rather than fine particles like PM_{10}. Existing PM_{10} concentrations are well below the relevant objective and are, therefore, unlikely to be exceeded due to the construction of the Generating Equipment Site.

6.7.2 There are no existing buildings on the Project Site and, as such, there are no demolition activities associated with the construction phase of the Power Generation Plant (though there will be demolition works required as part of the decommissioning phase, however this is addressed separately in Section C Decommissioning (paragraphs 6.7.29 – 6.7.32) below). The dust emission potential for earthworks during construction of the Generating Equipment Site and new section of Access Road from the Substation to the Generating Equipment Site is assessed as being large due to its size. Construction emissions are classed as medium due to the potential for on-site concrete batching even though the internal area of the buildings on-site is <25,000 m^3 there will also be the need to pour foundations and other on-site hard standing and as such a conservative approach

has been taken that construction volumes will be in the range of 25,000 to 100,000 m^3. Emissions from trackout have a large dust magnitude due to the number of vehicles which may be operating at the Generating Equipment Site.

6.7.3 Table 6-26 sets out the assessment of dust emission class from demolition activities, earthworks, construction and trackout from the Access Road.

Table 6-26: Summary Assessment of Dust Emissions Class

Phase	Magnitude	Dust Risk		
		Nuisance (Low Receptor Sensitivity)	Human Health (Low Receptor Sensitivity)	Ecology (Low Receptor Sensitivity)
Demolition	N/A	N/A	N/A	N/A
Earthworks	Large	Low	Low	Low
Construction	Medium	Low	Low	Low
Trackout	Large	Low	Low	Low

6.7.4 Using the IAQM construction dust assessment criteria the dust emission magnitude is combined with the distance to and sensitivity of the nearest receptors to assess the risk of effects associated with the construction phase of the Generating Equipment Site excluding the benefits of any embedded mitigation already proposed as part of the CEMP. Table 6-26 shows the risk of effects with no mitigation is negligible or low in terms of human health, nuisance and ecological impacts. Impacts are, therefore, anticipated to be not significant, given the low risk identified and once the embedded mitigation already proposed, as set out in the CEMP, is taken into account effects are reduced to Negligible.

ii. Gas Connection

6.7.5 The sensitivity of the human receptors to the Gas Connection is classed as low in terms of both nuisance and health impacts as the closest receptors (Abergelli Farmhouse and Maes-eglwys) are over 20 m from activities on-site. In relation to ecology the sensitivity is classed as low as the only ecological sites close to dust generating activities, Lletty-Morfil SINC and an area of Ancient Woodland, are locally designated and not considered to be sensitive to dust deposition.

6.7.6 The dust emission potential for construction of the Gas Connection is assessed as being large during earthworks due to the size of the corridor affected, which is approximately 1,400 m long and a maximum of 50 m wide, the number of earth moving machines that may be required and the volume of material that will be excavated to form the trench into which the gas pipe will be laid. Construction emissions are classed as small which is considered to be conservative given the prefabricated nature of installing the gas pipe. Emissions from trackout have a large dust potential due to the number of vehicles operating. There is no demolition associated with this phase of the works.

6.7.7 Table 6-27 sets out the assessment of dust emission class from demolition activities, earthworks, construction and trackout as a function of the works associated with the Gas Connection.

Table 6-27: Summary Assessment of Dust Emissions Class

Phase	Magnitude	Dust Risk		
		Nuisance (Low Receptor Sensitivity)	Human Health (Low Receptor Sensitivity)	Ecology (Low Receptor Sensitivity)
Demolition	N/A	N/A	N/A	N/A
Earthworks	Large	Low	Low	Low
Construction	Small	Negligible	Negligible	Negligible
Trackout	Large	Low	Low	Low

6.7.8 Using the IAQM construction dust assessment criteria the dust emission magnitude is combined with the distance to and sensitivity of the nearest receptors to assess the risk of effects associated with the construction phase of the Gas Connection with no mitigation. Table 6-27 shows the risk of effects with no mitigation is negligible or low in terms of human health, nuisance and ecological impacts. Impacts are, therefore, anticipated to be not significant, given the low risk identified. Taking account of embedded mitigation already proposed as part of the outline CEMP (Appendix 3.1) effects are considered to be Negligible. .

iii. Electrical Connection

6.7.9 The sensitivity of the human receptors to the Electrical Connection is classed as low in terms of both nuisance and health impacts as the closest receptors (Abergelli Farmhouse and Maes-eglwys) are over 20 m from activities on-site. In relation to ecology the sensitivity is classed as low as the only ecological sites close to dust generating activities, Lletty-Morfil SINC and an area of Ancient Woodland, are locally designated and not considered to be sensitive to dust deposition.

6.7.10 The dust emission potential for construction of the Electrical Connection is assessed as being small during earthworks and construction considering that the earthworks are confined to small area and construction emissions will be moderated by the largely prefabricated nature of the installation. Emissions from trackout have a small dust potential due to the number of vehicles operating and the fact there will be minimal amount of excavation/trenching needed. There is no demolition associated with this phase of the works.

6.7.11 Table 6-28 sets out the assessment of dust emission class from demolition activities, earthworks, construction and trackout as a function of the works associated with the Electrical Connection.

Table 6-28: Summary Assessment of Dust Emissions Class

Phase	Magnitude	Dust Risk		
		Nuisance (Low Receptor Sensitivity)	Human Health (Low Receptor Sensitivity)	Ecology (Low Receptor Sensitivity)
Demolition	N/A	N/A	N/A	N/A
Earthworks	Small	Negligible	Negligible	Negligible
Construction	Small	Negligible	Negligible	Negligible
Trackout	Small	Negligible	Negligible	Negligible

6.7.12 Using the IAQM construction dust assessment criteria the dust emission magnitude is combined with the distance to and sensitivity of the nearest receptors to assess the risk of effects associated with the construction phase of the Electrical Connection with no mitigation. Table 6-28 shows the risk of effects with no mitigation is negligible in terms of human health, nuisance and ecological impacts. Impacts are therefore anticipated to be not significant.

b) Operational Phase

i. Stack Height Determination

6.7.13 Stack height sensitivity testing was undertaken using meteorological data from 2012 to 2016 with the maximum ground-level concentrations predicted across a grid of receptors with a model resolution of 30 m.

6.7.14 Dispersion model runs were undertaken for various stack heights between 20 m and 50 m with the stack height models in 2 m incremental heights. The modelling demonstrated no significant improvement in ground-level concentrations of NO_2 with a stack height greater than 34 m. As such a minimum stack height of 35 m has been selected and has been used in all subsequent modelling. Further details of the stack height determination process are presented in Appendix 6.2.

ii. Impacts on Human Health

6.7.15 In this section, the modelled contributions of the Generating Equipment Site are presented as maximum ground-level concentrations of NO_2 and CO at a height of 1.5 m and at the closest sensitive receptors included within the dispersion modelling also predicted at a height of 1.5 m.

6.7.16 For comparison with the air quality objectives, all hourly concentrations of NO_2 are presented as the 99.79^{th} percentile of hourly mean concentrations. This represents the 19^{th} highest hourly concentration in the year which takes into account the 18 exceedences of the standard allowed under EU and UK regulations.

6.7.17 Furthermore, the model results are presented as the contribution of the Generating Equipment Site on its own, termed the Process Contribution (PC), and in combination with background concentrations, termed the Predicted Environment Concentration (PEC). All process contributions are modelled with the Generating

Equipment Site operating at full load limited to the maximum annual operations of 2,250 hours.

6.7.18 Table 6-29 presents the maximum predicted impacts anywhere across the grid of modelled receptor locations taken over the five meteorological years tested (2012 to 2016) for a stack height of 35 m. The data are shown as predicted PC and total PEC (i.e. PC in addition to Defra mapped background concentrations) for comparison against the relevant AQS objective.

Table 6-29: Maximum Operational Impacts over five years for a Stacks of 35 m above ground at off-site locations for Annual Mean NO_2. See Figure 6.3 for illustrated Receptor Location.

Receptor	Annual Mean NO_2					
	PC ($\mu g/m^3$)	PC as % of AQS Objective	Significance assessed against Adapted IAQM/EPUK Criteria	PEC	PEC as % of AQS Objective	Screen Out in Accordance with EA Guidance?
Maximum Off-site	0.1	0.2%	Negligible	6.9	17.2%	Yes
1	<0.1	0.1%	Negligible	6.8	17.1%	Yes
2	<0.1	<0.1%	Negligible	6.6	16.5%	Yes
3	<0.1	<0.1%	Negligible	6.6	16.5%	Yes
4	<0.1	<0.1%	Negligible	6.6	16.5%	Yes
5	<0.1	<0.1%	Negligible	8.1	20.3%	Yes
6	<0.1	0.1%	Negligible	7.3	18.4%	Yes
7	0.1	0.1%	Negligible	7.4	18.4%	Yes
8	<0.1	<0.1%	Negligible	7.3	18.3%	Yes
9	<0.1	<0.1%	Negligible	8.5	21.3%	Yes
10	<0.1	<0.1%	Negligible	8.5	21.3%	Yes
11	<0.1	0.1%	Negligible	6.4	16.1%	Yes
12	<0.1	0.1%	Negligible	6.4	16.1%	Yes
13	<0.1	<0.1%	Negligible	5.8	14.5%	Yes
14	<0.1	<0.1%	Negligible	5.7	14.3%	Yes
15	<0.1	<0.1%	Negligible	6.1	15.3%	Yes
16	<0.1	<0.1%	Negligible	6.1	15.3%	Yes
17	<0.1	<0.1%	Negligible	6.1	15.3%	Yes
18	<0.1	<0.1%	Negligible	9.6	24.0%	Yes
19	<0.1	<0.1%	Negligible	9.6	24.0%	Yes
20	<0.1	<0.1%	Negligible	8.5	21.3%	Yes
21	<0.1	<0.1%	Negligible	13.2	33.0%	Yes
22	<0.1	<0.1%	Negligible	13.2	33.0%	Yes
23	<0.1	<0.1%	Negligible	13.6	34.0%	Yes
24	<0.1	<0.1%	Negligible	7.9	19.8%	Yes

Receptor	Annual Mean NO_2					
	PC ($\mu g/m^3$)	PC as % of AQS Objective	Significance assessed against Adapted IAQM/EPUK Criteria	PEC	PEC as % of AQS Objective	Screen Out in Accordance with EA Guidance?
25	<0.1	<0.1%	Negligible	6.5	16.3%	Yes
26	<0.1	<0.1%	Negligible	6.6	16.5%	Yes
27	<0.1	<0.1%	Negligible	8.1	20.3%	Yes
28	<0.1	<0.1%	Negligible	7.9	19.8%	Yes

6.7.19 The results in Table 6-29 show that even based on the maximum predicted concentrations across the grid of receptors PCs are below 0.2 $\mu g/m^3$ and as such can be screened out as negligible in accordance with the adapted IAQM/EPUK planning guidance and the EA screening criteria. Despite the PC being well below 1% of the AQS objective Table 6-29 also presents the PEC to illustrated total annual mean NO_2 concentrations and to show that they are also well below the AQS objective even once the contributions from the Generating Equipment Site are included.

6.7.20 Table 6-30 presents the maximum predicted 99.79th percentile of hourly NO_2 impacts anywhere across the grid of modelled receptor locations taken over the five meteorological years tested (2012 to 2016) for a stack of 35 m.

Table 6-30: Maximum Operational Impacts over five years for a Stack height of 35 m above ground at off-site locations for 99.79th Percentile NO_2. See Figure 6.3 for illustrated Receptor Location.

Receptor	99.79th Percentile Hourly NO_2					
	PC ($\mu g/m^3$)	PC as % of AQS Objective	Significance assessed against Adapted IAQM/EPUK Criteria	PEC	PEC as % of AQS Objective	Screen Out in Accordance with EA Guidance
Maximum Off-site	4.4	2.2%	Negligible	18.0	9.0%	Yes
1	3.1	1.5%	Negligible	16.7	8.3%	Yes
2	2.2	1.1%	Negligible	15.4	7.7%	Yes
3	1.9	0.9%	Negligible	15.1	7.5%	Yes
4	2.4	1.2%	Negligible	15.6	7.8%	Yes
5	2.2	1.1%	Negligible	18.4	9.2%	Yes
6	3.9	1.9%	Negligible	18.5	9.2%	Yes
7	3.5	1.8%	Negligible	18.1	9.1%	Yes
8	2.3	1.1%	Negligible	16.9	8.4%	Yes

Receptor	99.79th Percentile Hourly NO_2					
	PC ($\mu g/m^3$)	PC as % of AQS Objective	Significance assessed against Adapted IAQM/EPUK Criteria	PEC	PEC as % of AQS Objective	Screen Out in Accordance with EA Guidance
9	1.4	0.7%	Negligible	18.4	9.2%	Yes
10	0.3	0.1%	Negligible	17.3	8.6%	Yes
11	2.8	1.4%	Negligible	15.6	7.8%	Yes
12	2.7	1.4%	Negligible	15.5	7.8%	Yes
13	2.1	1.0%	Negligible	13.7	6.8%	Yes
14	1.7	0.8%	Negligible	13.1	6.5%	Yes
15	1.3	0.6%	Negligible	13.5	6.7%	Yes
16	1.4	0.7%	Negligible	13.6	6.8%	Yes
17	1.5	0.7%	Negligible	13.7	6.8%	Yes
18	1.6	0.8%	Negligible	20.8	10.4%	Yes
19	1.4	0.7%	Negligible	20.6	10.3%	Yes
20	1.1	0.6%	Negligible	18.1	9.1%	Yes
21	0.1	0.1%	Negligible	26.5	13.3%	Yes
22	0.4	0.2%	Negligible	26.8	13.4%	Yes
23	1.0	0.5%	Negligible	28.2	14.1%	Yes
24	1.0	0.5%	Negligible	16.8	8.4%	Yes
25	1.6	0.8%	Negligible	14.6	7.3%	Yes
26	1.7	0.8%	Negligible	14.9	7.4%	Yes
27	2.0	1.0%	Negligible	18.2	9.1%	Yes
28	1.9	0.9%	Negligible	17.7	8.8%	Yes

6.7.21 The results in Table 6-30 show that even based on the maximum predicted concentrations across the grid of receptors PCs are well below 10% of the hourly maximum AQS objective of 200 $\mu g/m^3$ and as such can be screened out as negligible in accordance with the adapted IAQM/EPUK planning guidance and the EA screening criteria. Despite the PC being well below 10% of the AQS objective Table 6-30 also presents the PEC to illustrated total PECs are also well below the AQS objective even once the contributions from the Generating Equipment Site are included. Table 6-31 presents the maximum 8 hour rolling CO impacts anywhere across the grid of modelled receptor locations taken over the five meteorological years tested (2012 to 2016) for a stack height of 35 m.

Table 6-31: Maximum Operational Impacts over five years for a Stack height of 35 m above ground at off-site locations for Maximum 8 Hour Rolling CO. See Figure 6.3 for illustrated Receptor Location.

Receptor	Maximum 8 hour Rolling CO					
	PC ($\mu g/m^3$)	PC as % of AQS Objective	Significance assessed against Adapted IAQM/EPUK Criteria	PEC	PEC as % of AQS Objective	Screen Out in Accordance with EA Guidance
Maximum Off-site	50.1	0.5%	Negligible	490.1	4.9%	Yes
1	18.3	0.2%	Negligible	458.3	4.6%	Yes
2	21.0	0.2%	Negligible	451.0	4.5%	Yes
3	26.2	0.3%	Negligible	456.2	4.6%	Yes
4	13.5	0.1%	Negligible	443.5	4.4%	Yes
5	11.2	0.1%	Negligible	463.2	4.6%	Yes
6	24.4	0.2%	Negligible	476.4	4.8%	Yes
7	25.7	0.3%	Negligible	477.7	4.8%	Yes
8	15.4	0.2%	Negligible	467.4	4.7%	Yes
9	13.4	0.1%	Negligible	479.4	4.8%	Yes
10	6.9	0.1%	Negligible	472.9	4.7%	Yes
11	16.2	0.2%	Negligible	424.2	4.2%	Yes
12	14.1	0.1%	Negligible	422.1	4.2%	Yes
13	11.7	0.1%	Negligible	407.7	4.1%	Yes
14	8.2	0.1%	Negligible	398.2	4.0%	Yes
15	8.0	0.1%	Negligible	406.0	4.1%	Yes
16	9.3	0.1%	Negligible	407.3	4.1%	Yes
17	11.0	0.1%	Negligible	409.0	4.1%	Yes
18	10.1	0.1%	Negligible	488.1	4.9%	Yes
19	14.7	0.1%	Negligible	492.7	4.9%	Yes
20	7.7	0.1%	Negligible	473.7	4.7%	Yes
21	2.6	0.0%	Negligible	472.6	4.7%	Yes
22	6.1	0.1%	Negligible	476.1	4.8%	Yes
23	5.4	0.1%	Negligible	439.4	4.4%	Yes
24	5.1	0.1%	Negligible	433.1	4.3%	Yes
25	9.1	0.1%	Negligible	429.1	4.3%	Yes
26	11.8	0.1%	Negligible	441.8	4.4%	Yes
27	13.8	0.1%	Negligible	465.8	4.7%	Yes
28	9.6	0.1%	Negligible	445.6	4.5%	Yes

6.7.22

6.7.23 The results in Table 6-31 show that even based on the maximum predicted concentrations across the grid of receptors PCs are well below 10% of the AQS objective of 10,000 µg/m^3 and, as such, can be screened out as negligible in accordance with the adapted IAQM/EPUK planning guidance and the EA screening criteria. Despite the PC being well below 10% of the AQS objective, Table 6-31 also presents the PEC to illustrated total PECs are also well below the AQS objective even once the contributions from the Generating Equipment Site are included.

6.7.24 Contour plots of the process contribution of annual mean NO_2, 99.78th percentile hourly NO_2 and the 8 hour rolling CO are provided in Figure 6.4 to Figure 6.6. The annual and 99.78th percentile contour plots have been prepared using 2015 meteorological data from Cwm Level Park as this gave the highest maximum ground-level concentrations, while the 8 hour rolling CO contour plot has been prepared using meteorological data from 2012.

6.7.25 Annual mean and 99.79th Percentile NO_2 impacts are concentrated to the north-east of the stack reflecting the prevailing south-westerly winds in all years, whereas the rolling eight hour mean CO impacts are concentrated to the north stack.

6.7.26 The maximum impacts of the Project occur away from major roads and urban areas. It is therefore unlikely that there will be cumulative impacts at either roadside locations. Likewise, impacts are located to the north east and away from the closest AQMA which is located approximately 5 km away to the south of the Project Site in central Swansea. As such, no impacts are anticipated in the nearest AQMA.

6.7.27 In summary, the magnitude of the impacts on pollutant concentrations are considered to be negligible for all pollutant and averaging periods considered within the dispersion modelling. As such, impacts on air quality as a result of the Project are therefore not considered to be significant.

iii. Impacts on Ecosystems

6.7.28 The HRA has concluded that no likely significant effects are predicted to occur from the Project.

c) Decommissioning

6.7.29 The sensitivity of the human receptors to the Generating Equipment Site is classed as low in terms of both nuisance and health impacts as the closest receptors (Abergelli Farmhouse and Maes-eglwys) are over 20 m from activities on-site. In relation to ecology the sensitivity is classed as low as the only ecological sites close to dust generating activities, Lletty-Morfil SINC and an area of Ancient Woodland, are locally designated and not considered to be sensitive to dust deposition. It should be noted that it is assumed that no additional receptors are introduced within the assessment area, or new sensitive ecological sites declared prior to the site being decommissioned.

6.7.30 The decommissioning phase will involve the demolition of the buildings on the Generating Equipment Site and removal or hardstanding and restoration of the site. There is no construction associated with the restoration phase. The emission potential for demolition of the Generating Equipment Site is assessed as being Large, i.e. >50,000 m^3 of material to be demolished, due to the amount of concrete used on site, which has a greater dust potential, .i.e. buildings and hardstanding/foundations. A conservative approach has been made to decommissioning phase demolition activates taking account for the fact that construction volumes were conservatively assumed to be between 25,000 and 100,000m^3 (medium magnitude). Emission during earthworks are anticipated to be large due to the size of the Generating Equipment Site. It anticipated that the new section of Access Road from the Substation to the Generating Equipment Site will not be removed, that the Gas Connection will be closed off but not extracted and that there will be minimal works required to remove the electrical connection. Trackout is anticipated to have a large magnitude due to the number of vehicles anticipated to be operating at the Generating Equipment Site.

6.7.31 Table 6-32 sets out the assessment of dust emission class from demolition activities, earthworks, construction and trackout from the Access Road (to the west from the B4489).

Table 6-32: Summary Assessment of Dust Emissions Class

Phase	Magnitude	Dust Risk		
		Nuisance (Low Receptor Sensitivity)	Human Health (Low Receptor Sensitivity)	Ecology (Low Receptor Sensitivity)
Demolition	Large	Medium	Medium	Medium
Earthworks	Large	Low	Low	Low
Construction	N/A	N/A	N/A	N/A
Trackout	Large	Low	Low	Low

6.7.32 Using the IAQM construction dust assessment criteria the dust emission magnitude is combined with the distance to and sensitivity of the nearest existing receptors/designated ecological sites to assess the risk of effects associated with the decommissioning phase of the Generating Equipment Site excluding the benefits of any embedded mitigation already proposed as part of the Outline CEMP (Appendix 3.1). Table 6-32 shows the risk of effects with no mitigation is low to medium in terms of human health, nuisance and ecological impacts. Taking into account the embedded mitigation within the Outline CEMP (Appendix 3.1) impacts are, therefore, anticipated to be Negligible and therefore not significant. It is recommended that the construction phase embedded mitigation already proposed, as set out in the Outline CEMP, is included within the Decommissioning Strategy.

6.8 Mitigation and Monitoring

6.8.1 Embedded mitigation measures, which have been incorporated within the design of the Project or are standard practice measures that have been committed to are summarised in **Chapter 3: Project and Site Description.**

a) Construction Phase

6.8.2 The construction phase dust assessment concluded that nuisance dust, human health impacts and ecological impacts will be negligible. As such no additional mitigation or monitoring is proposed.

b) Operation

6.8.3 The air quality assessment has demonstrated that air quality impacts as a result of the Project are negligible. As such, no additional mitigation is proposed. Emissions from the stack will be monitored by a Continuous Emission Monitoring System (CEMS) which will be required to obtain an Environmental Permit to operate.

c) Decommissioning Phase

6.8.4 The decommissioning phase dust assessment concluded that nuisance dust, human health impacts and ecological impacts will be Negligible. As such no additional mitigation or monitoring is proposed.

6.9 Residual Effects

6.9.1 The following tables present a summary of the Air Quality assessment. They identify the receptor/s likely to be impacted, the level of effect and, where the effect is deemed to be significant, the tables include the mitigation proposed and the resulting residual effect.

Table 6-33: Air Quality summary of effects arising during construction phase

Receptor	Description of Effect	Classification of effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
Generating Equipment Site					
Residential Properties	Deposited dust	Nuisance	None	Negligible	Not Significant
	Increase in PM_{10} Concentrations	Human Health	None	Negligible	Not Significant
Designated Ecological Sites	Deposited dust	Ecological Harm	None	Negligible	Not Significant
Gas **Connection**					
Residential Properties	Deposited dust	Nuisance	None	Negligible	Not Significant
	Increase in PM_{10} Concentrations	Human Health	None	Negligible	Not Significant
Designated Ecological Sites	Deposited dust	Ecological Harm	None	Negligible	Not Significant
Electrical Connection					
Residential Properties	Deposited dust	Nuisance	None	Negligible	Not Significant
	Increase in PM_{10} Concentrations	Human Health	None	Negligible	Not Significant
Designated Ecological Sites	Deposited dust	Ecological Harm	None	Negligible	Not Significant

Table 6-34: Air Quality summary of effects arising during operational phase

Receptor	Description of Effect	Classification of Effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
Generating Equipment					
Residential Properties	Increase in NO_2 and CO Concentrations	Human Health	None	Negligible	Not Significant
Hospital	Increase in NO_2 and CO Concentrations	Human Health	None	Negligible	Not Significant
Designated Ecological Sites	Increase in NO_x Concentrations and Acid/Nitrogen Deposition	Ecological Harm	None	Negligible	Not Significant

a) Project '"in combination" Effects

6.9.2 The combined impacts from the Generating Equipment Site, Gas Connection and Electrical Connection upon receptors to air quality are limited to those assets listed in Tables 6-33 and 6-34, and as such no significant impacts are predicted from the Project.

6.10 Cumulative and In-Combination Effects

a) Construction

6.10.1 There are no other permitted or proposed developments within the study area which may result in any air quality impacts during construction. As such, no cumulative construction effects with other project are anticipated.

b) Operation

6.10.2 There are no other permitted or proposed developments within the study area that are not currently in operation. As such, all other large combustion sources are considered to be accounted for within the background selected for this project. The results have illustrated the PECs for the Generating Equipment are all within the relevant AQS objectives and, as such, in combination impacts are considered to be not significant.

c) Decommissioning

6.10.3 It is not possible to determine if there will be any other development being constructed/decommissioned at the same time as the Project is decommissioned, however, given the remote location it is not anticipated that there will be any other significant development close to the site that will require decommissioning at the same time as the Project and if a new development is proposed then this will need to take account of the decommissioning of the Project as part of the construction dust risk assessment at that time.

6.11 References

6.11.1 Ref. 6.1 Directive 2010/75/EU on industrial emissions (integrated pollution prevention and control) The Industrial Emissions Directive, Available from: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32010L0075

6.11.2 Ref. 6.2 Department for Environment Food and Rural Affairs (Defra) (2007), The Air Quality Strategy for England, Scotland, Wales and Northern Ireland.Institute of Air Quality Management (IAQM) and Environmental Protection United Kingdom (EPUK), (2016); Guidance on land-use planning and development control: Planning for air quality 2016.

6.11.3 Ref. 6.3 H.M. Government (2010), The Air Quality Standards Regulations, SI 1001, the Stationary Office

6.11.4 Ref. 6.4 Local Air Quality Management in Wales Policy Guidance June 2017, PG(W)(17), Available from: http://gov.wales/docs/desh/publications/170614-policy-guidance-en.pdf

6.11.5 Ref. 6.5 Council of European Communities (1996), Framework Directive ambient air quality assessment and management, European Council, 96/62/EC

6.11.6 Ref. 6.6 Air Quality Standards (Wales) Regulations 2010, Available from: http://gov.wales/docs/desh/policy/100624airqualityregsen.pdf

6.11.7 Ref. 6.7 EU Directive 96/61/EC on Integrated Pollution Prevention and Control (IPPC), 1996, Available from: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31996L0061:en:HTML

6.11.8 Ref. 6.8 Environmental Permitting Regulations (England and Wales) 2016, Available from: https://www.legislation.gov.uk/uksi/2016/1154/pdfs/uksi_20161154_en.pdf

6.11.9 Ref. 6.9 Environment Agency (2016), Air emissions risk assessment for your environmental permit, Available from: https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit

6.11.10 Ref. 6.10 The Habitats Directive EC 92/43/EEC, 1992, Available from: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:31992L0043

6.11.11 Ref. 6.11 Ramsar Convention on Wetlands of International Importance especially as Waterfowl Habitat, 1971.

6.11.12 Ref. 6.12 H.M. Government (2017), The Conservation of Habitats and Species Regulations 2017 (SI 2017/1012), the Stationary Office

6.11.13 Ref. 6.13 Centre for Ecology and Hydrology (CEH) (2017), Air Pollution Information System (APIS), www.apis.ac.uk

6.11.14 Ref. 6.14 Department of Energy and Climate Change (2011), Overarching National Policy Statement for Energy (EN-1).

6.11.15 Ref. 6.15 Department of Energy and Climate Change (2011), National Policy Statement for Fossil Fuel Electricity Generating Infrastructure (EN-2)

6.11.16 Ref. 6.16 Department of Energy and Climate Change (2011), National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4)

6.11.17 Ref. 6.17 Department of Energy and Climate Change (2016), National Policy Statement for Electricity Networks Infrastructure (EN-5).

6.11.18 Ref. 6.18 Planning Policy Wales 9th Edition, November 2016, Available from: http://gov.wales/docs/desh/publications/161117planning-policy-wales-edition-9-en.pdf

6.11.19 Ref. 6.19 City and County Swansea's Unitary Development Plan, November 2008, file:///C:/Users/froggattp/Downloads/UDP_Written_Statement_Final_Version.pdf

6.11.20 Ref. 6.20 City and County Swansea's Local Development, Can be viewed at: http://www.swansea.gov.uk/ldp

6.11.21 Ref. 6.21 City and County of Swansea, Air Quality Progress Report, 2016, Available from: http://www.swansea.gov.uk/media/20406/Progress-Report-2016/pdf/Swansea_Progress_Report_2017.pdf

6.11.22 Ref. 6.22 City and County of Swansea, Air Quality Action Plan (AQAP), 2004, Available from: http://www.swansea.gov.uk/media/2640/Air-Quality-Action-Plan/pdf/Swansea_Action_Plan_2004.pdf

6.11.23 Ref. 6.23 Cambridge Environmental Research Council (CERC) (2016), ADMS 5 Validation Papers, Cambridge Environmental Research Consultants Limited, accessed 20th December 2016, Available from: http://www.cerc.co.uk/environmental-software/model-validation.html

6.11.24 Ref. 6.24 Air Quality Modelling and Assessment Unit, Conversion Ratios for NO_x and NO_2, Available from: http://www.environment-agency.gov.uk/static/documents/Conversion_ratios_for__NO_x_and_NO_2_.pdf

6.11.25 Ref. 6.25 The Planning Inspectorate. Planning Advice Note Nine: Rochdale Envelope. (April 2012).

6.11.26 Ref. 6.26 BSI, BS 6069 (Part 2) (1994), Characterisation of Air Quality – Glossary.

6.11.27 Ref. 6.27 IAQM (2014) Guidance on the assessment of dust from demolition and construction, February 2014, Institute of Air Quality Management.

6.11.28 Ref. 6.28 DEFRA (2016), Local Air Quality Management, Technical Guidance, LAQM TG(16).

6.11.29 Ref. 6.29 Environment Agency. 2014. AQTAG06 Technical guidance of detailed modelling approach for an appropriate assessment for emissions to air.

6.11.30 Ref. 6.30 Swansea air quality data website, Available from: http://swansea.airqualitydata.com/

6.11.31 Ref. 6.31 Defra (2017), Background Mapping Data for Local Authorities -2015, Available from: https://uk-air.defra.gov.uk/data/laqm-background-home

Chapter 7

Noise & Vibration

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Appendix 7.1: Noise Survey

7. Noise and Vibration

7.1 Introduction

7.1.1 This chapter addresses the potential effects of noise and vibration resulting from the construction, operation and decommissioning of the Project on local NSRs. Maintenance is included within the operational assessment of the Project.

7.1.2 A detailed description of the Project Site and the Project is provided **in Chapter 3: Project and Site Description**. A glossary of terms and list of abbreviations used in this chapter is provided in **Document Reference 1.4.**

7.1.3 Effects during the construction, operation, maintenance, and decommissioning periods of the Project are assessed. In particular, the chapter considers potential effects on identified NSRs in terms of:

- Predicted noise and vibration levels during the site clearance and construction works associated with the Project;
- Qualitative assessment of changes in road traffic noise levels on the local road network during the construction phase;
- Predicted noise and vibration resulting from operation of the Project; and
- Predicted noise and vibration resulting from decommissioning of the Project based upon those that would be experienced during the construction period.

a) Objectives of the assessment

7.1.4 The objectives of the assessment are to:

- Describe the legislative, planning and technical guidance backgrounds related to noise and vibration from industrial projects;
- Determine the appropriate noise and vibration assessment method and criteria;
- Assess the proposed details of the project against these criteria; and
- Demonstrate the mitigation measures necessary to achieve the criteria.

7.2 Changes since the 2014 PEIR

7.2.1 There have been changes to the design as a result of design evolution and consultation as detailed in **Chapter 3: Project and Site Description** since the 2014 PEIR. The 2018 PEIR assessed those design changes based on the previous baseline noise survey data. To aid the reader, Table 7-1 below outlines the changes to this assessment compared with the 2014 and 2018 PIER.

Table 7-1A Summary of Changes since the 2014 PEIR to the Noise and Vibration Assessment

Section	Changes since the 2014 PEIR	Section Reference
Baseline	A detailed baseline sound survey was undertaken over a period of one week in February 2018. This allowed a more up to date, robust and representative set of baseline sound levels to be obtained than were available at the time of the 2018 PEIR. The locations selected were the	Sections 7.5 and 7.7

Section	Changes since the 2014 PEIR	Section Reference
	closest sensitive receptors in line with the recommendations of the scoping opinion. The results of the detailed survey are presented within this ES chapter and used as the basis for the noise assessments presented within it.	
Methodology	An assessment of night time noise based on BS 4142 has been added alongside the WHO based assessment. This was included in response to Section 42 response comments on the 2018 PEIR from Natural Resources Wales and the updated baseline noise data provided by the detailed survey. Different plant configuration (single unit rather than five units). Details of embedded mitigation modified accordingly.	Section 7.4 and 7.7
Significance of Effect	No change.	Section 7.7, 7.9 and 7.10

7.3 Legislation, policy and guidance

7.3.1 This section identifies and describes legislation, policy and guidance of relevance to the assessment of the potential noise and vibration impacts associated with the Project.

7.3.2 Legislation and policy has been considered on an international, national, regional, and local level. The legislation and guidance following is considered to be relevant to the noise and vibration assessment as it has influenced the assessment of the sensitivity of receptors and requirements for mitigation or the scope and/or methodology of this ES.

a) International

i. World Health Organisation

7.3.3 The World Health Organisation's (WHO) '*Guidelines for Community Noise*' (Ref. 7.1) recommend external daytime and evening environmental noise limits, and internal night-time limits to avoid sleep disturbance.

7.3.4 The WHO '*Night Noise Guidelines for Europe'* (Ref. 7.2) recommend updated guidelines on night-time noise limits to avoid sleep disturbance.

ii. ISO 9613-2:1996

7.3.5 ISO 9613-2:1996 *'Attenuation of Sound during Propagation Outdoors, Part 2: General Method of Calculation'* (Ref. 7.3) specifies an engineering method for calculating the attenuation of sound during propagation outdoors in order to predict the levels of environmental noise at a distance from a variety of sources.

iii. ISO 4866-2:1996

7.3.6 ISO 4866:2010 'Mechanical Vibration and Shock – Vibration of Fixed Structures – Guidelines for the Measurement of Vibrations and Evaluation of Their Effects on Structures' (Ref. 7.4) establishes the principals for carrying out vibration measurement and processing data with regard to evaluating vibration effects on structures.

b) National

i. Environmental Protection Act 1990

7.3.7 The Environmental Protection Act 1990 (EPA) Part 3 (Ref. 7.5) states that noise (and vibration) emitted from premises (including land) so as to be prejudicial to health or a nuisance constitutes a statutory nuisance.

7.3.8 Local Authorities are required to investigate any public complaints of noise and if they are satisfied that a statutory nuisance exists, or is likely to occur or recur, they may serve a noise abatement notice. A notice is served on the person responsible for the nuisance. It requires either simply the abatement of the nuisance or works to abate the nuisance to be carried out, or it prohibits or restricts the activity. Contravention of a notice without reasonable excuse is an offence. Right of appeal to the Magistrates Court exists within 21 days of the service of a noise abatement notice.

7.3.9 In determining if a noise complaint amounts to a statutory nuisance the Local Authority can take account of various guidance documents and existing case law; no statutory noise limits exist. Demonstrating the use of *'Best Practicable Means'* (BPM) to minimise noise levels is considered to be an accepted defence against a noise abatement notice.

ii. Control of Pollution Act 1974

7.3.10 Sections 60 and 61 of the Control of Pollution Act 1974 (CoPA) (Ref. 7.6) provide the main legislation regarding demolition and construction site noise and vibration. If noise complaints are received, a Section 60 notice may be issued by the Local Planning Authority with instructions to cease work until specific conditions to reduce noise have been adopted.

7.3.11 Section 61 of the CoPA provides a means for applying for prior consent to carry out noise generating activities during construction. Once prior consent has been agreed under Section 61, a Section 60 notice cannot be served provided the agreed conditions are maintained on-site.

7.3.12 CoPA requires that BPM (as defined in Section 72 of CoPA) be adopted for construction noise on any given site. CoPA makes reference to British Standard (BS) 5228 as BPM.

iii. Environmental Permitting (England and Wales) Regulations 2016

7.3.13 The Environmental Permitting (England and Wales) Regulations 2016 (Ref. 7.7) require the application of Best Available Techniques (BAT) to activities performed within installations regulated by the legislation in order to manage the impact of these operations on the surrounding environment. This, therefore, just applies to the operational period, not construction of the Project.

7.3.14 In terms of noise specifically, the selection of BAT will have to be considered and balanced with releases to different environmental media (air, land, and water) and to give due consideration to issues such as usage of energy and raw materials. Noise, therefore, cannot be considered in isolation from other impacts on the environment.

7.3.15 The definition of pollution includes *'emissions which may be harmful to human health or the quality of the environment, cause offence to human senses or impair or interfere with amenities and other legitimate uses of the environment'* (clause 2). BAT is therefore likely to be similar, in practice, to the requirements of the Statutory Nuisance legislation which requires the use of BPM to prevent or minimise noise nuisance. In the case of noise, *'offence of any human senses*' may be judged by the likelihood of complaints. However, the lack of complaint should not necessarily imply the absence of a noise problem. In some cases it may be possible, and desirable, to reduce noise emissions still further at reasonable costs and this may therefore represent BAT for the control of noise emissions from an installation..

7.3.16 Guidance regarding Environmental Permitting and noise is available in the Environment Agency's Integrated Pollution Prevention and Control (IPPC) H3 document '*Horizontal Guidance for Noise Part 2 - Noise assessment and Control'* (Ref. 7.8). However, *'Horizontal Guidance for Noise Part 1 – Regulation and Permitting'* (Ref. 7.9), which provided useful guidance relating to noise limits from industrial installations in terms of absolute *rating levels* and *rating levels* relative to background noise levels (as defined in BS 4142:1997 (now superseded)) was withdrawn in February 2016. Therefore, industry wide noise limits no longer apply. There is no equivalent Wales specific guidance to these documents, however in their responses to the 2018 PEIR NRW have not questioned the use of them for the derivation of noise assessment criteria.

iv. National Policy Statements

7.3.17 The Overarching National Policy Statement for Energy (NPS EN-1) (Ref. 7.10) issued by the Department for Energy and Climate Change (as was) sets out national policy with respect to energy infrastructure.

7.3.18 Section 5.11 of NPS EN-1 sets out the requirements for assessing and mitigating noise and vibration from nationally significant infrastructure projects NSIPs in the energy sector. It also sets out the approach the SoS should adopt when considering noise assessments.

7.3.19 It advises that operational noise from a proposed development and the proximity to noise sensitive receptors, quiet areas or sites designated for ecological reasons will determine the likely impact of noise.

7.3.20 Where noise impacts are likely, a noise assessment should be undertaken in line with details listed in the NPS EN-1.

7.3.21 Operational noise and vibration should be assessed using relevant British Standards (e.g. BS 4142, BS 6472, BS 8233 and BS 5228) and other guidance, including the other NPS's.

7.3.22 NPS EN-1 advises the SoS that the project should:

"*Demonstrate good design through selection of the quietest cost-effective plant available; containment of noise within buildings wherever possible; optimisation of plant layout to minimise noise emissions; and, where possible, the use of landscaping, bunds or noise barriers to reduce noise transmission*."

7.3.23 The proposal should meet the following aims before the SoS grants consent:

- *"Avoid significant impacts on health and quality of life from noise,*
- *Mitigate and minimise other adverse impacts on health and quality of life from noise,*
- *Where possible, contribute to improvements to health and quality of life through the effective management and control of noise."*

7.3.24 Paragraphs 5.11.11 to 5.11.13 of NPS EN-1 also set out advice on mitigation and states:

"5.11.11 The IPC should consider whether mitigation measures are needed both for operational and construction noise over and above any which may form part of the project application. In doing so the IPC may wish to impose requirements. Any such requirements should take account of the guidance set out in Circular 11/95 (see Section 4.1) or any successor to it.

5.11.12 Mitigation measures may include one or more of the following:

- *Engineering: reduction of noise at point of generation and containment of noise generated;*
- *Lay-out: adequate distance between source and noise-sensitive receptors; incorporating good design to minimise noise transmission through screening by natural barriers, or other buildings; and*
- *Administrative: restricting activities allowed on the site; specifying acceptable noise limits; and taking into account seasonality of wildlife in nearby designated sites.*

5.11.13 In certain situations, and only when all other forms of noise mitigation have been exhausted, it may be appropriate for the IPC to consider requiring noise mitigation through improved sound insulation to dwellings."

7.3.25 The National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4) issued by the Department for Energy and Climate Change (as was) sets out national policy with respect to energy infrastructure.

7.3.26 Paragraphs 2.20.2 to 2.20.4 of EN-4 advise that:

"2.20.2 During the pre-construction phase there could be vibration effects from seismic surveys. During construction, tasks may include site clearance, soil movement, ground excavation, tunnelling, trenching, pipe laying and welding, and ground reinstatement. In addition, increased HGV traffic will be generated on local roads for the movement of materials. These types of noise and vibration impacts will need to be assessed.

2.20.3 The commissioning of a new pipeline can involve extensive periods of drying after hydro-testing, using air compressors, and noise mitigation may be required for this type of activity.

2.20.4A new gas pipeline may require an above ground installation such as a gas compression station on the route of the pipeline to boost transmission line pressure. A new oil pipeline may require pumping stations. These may be located in quiet rural areas, and therefore the control of noise from these facilities is likely to be an important consideration."

7.3.27 Paragraph 2.20.7 of EN-4 also advises on mitigation measures and states:

"2.20.7 Noise mitigation measures for gas and oil pipelines, in particular their associated above-ground installations, include screening or enclosure of compressors and pumps. Other measures could include the use of sound attenuators on ventilation systems, acoustic lagging on pipework, multi-stage (inherently quiet) control valves, gas turbine exhaust silencers, and high efficiency low speed cooler fans, depending on the specific issues. Vibration mitigation measures could include the use of non-impact piling such as augur boring."

v. Noise Action Plan for Wales 2013-2018

7.3.28 The Noise Action Plan for Wales (Ref. 7.11) states in Section 1.1 as regards development:

7.3.29 "The challenge therefore is to take a balanced approach to managing noise which considers the needs of individuals as well as the requirements of business and industry, so that our quality of life is not reduced in other ways".

7.3.30 Section 1.2 of the Noise Action Plan for Wales goes on to state:

7.3.31 "Almost everything that people do creates sound, and noise – unwanted sound – is to a certain extent an inevitable by-product of life. Yet for the reasons described in more detail in the sections below, and in the interests of a healthy, fair and prosperous society, it is important to have a legal and policy framework in place that:

- *Protects people and wildlife from unacceptable or harmful levels of noise intrusion; and*
- *Gives everyone access to tranquil places where they can find respite from man-made sights and sounds.*

7.3.32 *In Wales, sustainable development means enhancing the economic, social and environmental wellbeing of people and communities, achieving a better quality of life for our own and future generations.*

7.3.33 *The Welsh Government's vision of a sustainable Wales includes:*

- *Healthy, biologically diverse and productive ecosystems that are managed sustainably; and*
- *Communities that are safe, sustainable, and attractive places for people to live and work, where people have access to services and enjoy good health."*

7.3.34 Guidance on the *"need to consider noise when planning a new development, be it a noise generating or a noise*-sensitive" development is set out in Planning Policy Wales and Technical Advice Note 11 (TAN) as described below:

vi. Planning Policy Wales (Edition 9, November 2016)

7.3.35 Planning Policy Wales (PPW) (Ref. 7.12) sets out the land use planning policies of the Welsh Government (WG) and is supplemented by 21 topic based Technical Advice Notes (TANs);

- Paragraph 11.1.11*: "Formal and informal open green spaces, including parks with significant recreational or amenity value, should be protected from development, particularly in urban areas where they fulfil multiple purposes, not only enhancing the quality of life, but contributing to biodiversity, the conservation of nature and landscape, air quality and the protection of groundwater".*
- Paragraph 13.13.1: *"Noise action plans, drawn up by the Welsh Ministers in relation to Wales under the Environmental Noise Directive and its transposing Regulations, aim to prevent and reduce environmental noise where necessary and preserve environmental noise quality where it is good. They are a planning consideration in the use and development of land".*
- Paragraph 13.15.2: *"Special consideration is required where a noise-generating development is likely to affect a protected species, or is proposed in or near statutorily designated areas, including urban quiet areas designated in noise action plans. The effect of noise on the enjoyment of other areas of landscape, wildlife and historic value should also be taken into account".*

7.3.36 The policy also requires best practice in construction.

vii. Technical Advice Note (TAN) 11

7.3.37 Technical Advice Note TAN 11 – Noise (1997) (Ref. 7.13) is a Welsh Government document that provides guidance on how the planning system can be used to minimise the adverse impact of noise without placing unreasonable restrictions on development.

7.3.38 The document talks about general principles in relation to noise and planning, and provides general guidance on both noise sensitive and noise generative developments, including draft planning conditions dealing with noise. The main detailed guidance provided in TAN 11 is the Noise Exposure Categories for new residential developments.

7.3.39 Some detailed guidance is provided on the assessment of noise from a variety of sources, but this guidance generally refers to other documents for methods of assessment and criteria. This guidance has been taken into consideration in this assessment

7.3.40 The documents makes reference to BS 8233, BS 4142, BS 5228 (Ref. 7.14 to Ref. 7-17).

viii. National Planning Policy Framework

7.3.41 The National Planning Policy Framework (NPPF) was published in March 2012 (Department for Communities and Local Government (DCLG), 2012a) (Ref. 7.18) and details the Government's planning policies for England and how these are to be applied. As such, the NPPF is not directly applicable in Wales but does offer guidance with a relevance to the Project particularly with reference to the evaluation of Significant Observable Adverse Effect Level (SOAEL) and Lowest Observable Adverse Effect Level (LOAEL) levels (see Table 7.2 for further details on SOAELs and LOAELs). It is a material consideration in planning decisions made by local planning authorities in England. In respect of noise, it states:

"The planning system should contribute to and enhance the natural and local environment by: preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability…" (paragraph 109)

7.3.42 The NPPF supersedes the previous guidance document PPG 24 '*Planning and Noise'* (Ref. 7.12).

7.3.43 The planning system is required to contribute to and enhance the natural and local environment. Consequently, the aim is to prevent both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of noise pollution.

7.3.44 The NPPF states that planning policies and decisions should aim to:

- "*Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;*
- *Mitigate and reduce to a minimum other adverse impacts on quality of life arising from noise from new development, including through the use of conditions;*
- *Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land*

uses since they were established [subject to the provisions of the Environmental Protect Act 1990 and other relevant law]; and

- *Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason*." (paragraph 123)

ix. Planning Practice Guidance

7.3.45 In March 2014, Department for Communities and Local Government (DCLG released its Planning Practice Guidance (PPG) web-based resource to support the NPPF (Ref. 7.19). The guidance advises that local planning authorities' should consider: Again this document is only strictly applicable to England but does give useful information on the setting of observable adverse effect levels, as described in Table 7.2.

- "*Whether or not a significant adverse effect is occurring or likely to occur;*
- *Whether or not an adverse effect is occurring or likely to occur; and*
- *Whether or not a good standard of amenity can be achieved."*

7.3.46 This guidance uses the additional concepts of NOAEL (No Observed Adverse Effect Level), and UAEL (Unacceptable Adverse Effect Level). Full details of the PPG on effects are provided in Table 7-2.

7.3.47 Factors to be considered in determining if noise is a concern are identified including the absolute noise level of the source, the existing ambient noise climate, time of day, frequency of occurrence, duration, character of the noise and cumulative impacts.

7.3.48 With particular regard to mitigating noise impacts on residential development, the guidance highlights those impacts may be partially off-set if residents have access to a relatively quiet façade as part of their dwelling or a relatively quiet amenity space (private, shared or public).

Table 7-2: Planning Practice Guidance

Perception	Examples of outcomes	Increasing effect level	Action
Not noticeable	No effect	No observed effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude; can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No observed adverse effect	No specific measures required
Lowest Observed Adverse Effect Level			
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude (e.g. turning up volume of television; speaking	Observed adverse effect	Mitigate and reduce to a minimum

Perception	Examples of outcomes	Increasing effect level	Action
	more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise). Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.		
Significant Observed Adverse Effect Level			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude (e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise). Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant observed adverse effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/ or an inability to mitigate effect of noise leading to psychological stress or physiological effects (e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, *e.g.* auditory and non-auditory).	Unacceptable adverse effect	Prevent

x. British Standard 7445-1:2003 and 7445-2:1991

7.3.49 BS 7445 *'Description and measurement of environmental noise'* (Ref. 7.20 and Ref. 7.21) defines parameters, procedures and instrumentation required for noise measurement and analysis.

xi. British Standard 5228:2009+A1:2014

7.3.50 BS 5228-1 *'Code of practice for noise and vibration control on construction and open sites. Noise'* (Ref. 7.16) provides a 'best practice' guide for noise control, and includes Sound Power Level (*L*w) data for individual plant as well as a calculation method for noise from construction activities. BS 5228-2 *'Code of practice for noise and vibration control on construction and open sites. Vibration'* (Ref. 7.17) provides comparable 'best practice' for vibration control, including guidance on the human response to vibration.

xii. British Standard 6472:2008

7.3.51 BS 6472-1 '*Guide to evaluation of human exposure to vibration in buildings Part 1: Vibration sources other than blasting*' (Ref. 7.22) presents recommended frequency weighted vibration spectra (for continuous vibration) and vibration dose values (VDV) (for intermittent vibration) above which adverse comment is likely to occur in residential properties.

xiii. British Standard 7385:1993

7.3.52 BS 7385-2 'Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration' (Ref. 7.23) presents guide values for transient and continuous vibration, above which there is a likelihood of cosmetic damage. The standard establishes the basic principles for carrying out vibration measurements and processing the data, with regard to evaluating vibration effects on buildings.

xiv. British Standard 4142:2014

7.3.53 BS 4142 '*Methods for rating and assessing industrial and commercial sound*' (Ref. 7.15) can be used for assessing the effect of noise of an industrial nature, including mechanical services plant noise. The method compares the difference between '*rating level*' of the industrial noise, with the 'background level' at the receptor position.

xv. British Standard 8233:2014

7.3.54 BS 8233 *Guidance on sound insulation and noise reduction for buildings* (Ref. 7.14) contains guidance on internal noise levels for buildings of various types and used.

xvi. Calculation of Road Traffic Noise

7.3.55 Department of Transport (DfT)/Welsh Office Memorandum '*Calculation of Road Traffic Noise*' (Ref. 7.24) describes procedures for traffic noise calculation, and is suitable for environmental assessments of schemes where road traffic noise may have an effect.

xvii. Design Manual for Road and Bridges (DMRB)

7.3.56 The Highways England '*Design Manual for Road and Bridges* (DMRB) *Volume 11 Section 3 Part 7 HD213/11 (Revision 1) Traffic Noise and Vibration*' (Ref. 7.25) provides guidance on the appropriate level of assessment to be used when assessing the noise and vibration effects arising from all road projects, including new construction, improvements and maintenance. The guidance can also be used for assessing changes in traffic noise levels as a result of non-road projects such as this.

c) Local

i. City and County of Swansea Unitary Development Plan (2008)

7.3.57 Policy EV40 (Ref. 7.26) on Air, Noise and Light Pollution states that:

7.3.58 "Development proposals will not be permitted that would cause or result in significant harm to health, local amenity, natural heritage, the historic environment or landscape character because of significant levels of air, noise or light pollution."

ii. Draft Swansea Local Development Plan (July 2017)

7.3.59 The Draft Swansea Local Development Framework is not yet adopted planning policy, but a draft has been submitted for Examination in Public. Consequently, whilst it is a material consideration, it does not yet attract full weight as adopted policy.

7.3.60 Policy 14: Safeguarding the Environment (Ref. 7.27):

"The County's environment will be protected from materially harmful development and where possible enhanced. Development that would result in unacceptable adverse environmental effects will not be permitted, particularly in respect of: Air, noise, or light pollution."

7.4 Methodology

a) Scope of the assessment

7.4.1 The scope of this assessment has been determined through a formal Environmental Impact Assessment (EIA) scoping process undertaken to obtain a formal Scoping Opinion from the Secretary of State. Comments raised on the EIA Scoping Report have been taken into account in the development of the assessment methodology and these are detailed where relevant in this chapter. Responses to the comments raised in the Scoping Opinion can be found in Table 7-4.

7.4.2 The elements of the project scoped out from this assessment are listed in Table 7-3.

Table 7-3: Summary of Elements Scoped out of Assessment

Element	Rationale
A detailed assessment construction traffic assessment has been scoped out on the basis of <50 HGVs per day over the construction Phase.	DMRB advises that an increase in road traffic flows of 25% (where the traffic speed and composition remain consistent) equates to an increase in road traffic noise of 1 dB L_A. A doubling of traffic flow would be required for an increase in 3 dB L_A. As there will be less than 25 % increase in traffic flows, the impacts will be negligible, and therefore not significant. No further assessment is deemed necessary. The actual traffic flows associated with construction for the project are expected to be below these levels except for a very brief period when a maximum of 146 movements may occur per day. This will affect very few receptors for a brief period and will be managed through the CEMP to minimise impacts when the exact details of the programme

Element	Rationale
	and construction options are known. As a result a detailed assessment would add little beneficial information at this stage.
Operational noise and vibration for AGI	The equipment on the AGI will be restricted to passive pipework with no pressure reduction valves, water bath heaters or other potential noise sources.
Operational noise and vibration for Electrical Connection	The Electrical Connection will be in the environs of the existing substation and will not introduce any new sources. The Electrical Connection will form part the Substation and is not expected to include any new noise emitting sources.
Detailed assessment of construction vibration	In the absence of specific information on likely construction activities and plant, a qualitative assessment based upon professional judgement has been undertaken at this stage. Given the significant distance to residential receptors, this qualitative judgement made is that no significant vibration (medium or high magnitude impacts) is expected to result at residential NSRs from construction and therefore assessment beyond the qualitative assessment in paras 7.7.22 and 7.7.23 is scoped out.
Assessment of generating plant operational vibration	No causes of significant vibration associated with the Project are anticipated. The primary rotating equipment within the generator set will be balanced to a high degree and constantly monitored for any changes in the vibration levels it produces. Therefore, further assessment of operational vibration has been scoped out of this assessment.

b) Consultation

7.4.3 The scope of the assessment has also been informed by ongoing consultation with statutory consultees throughout the design and assessment process, including the SoS and CCS Environmental Health Department. The discussions centred on the methodologies to be used to assess the noise emissions from the Project in the context of the area in which it is located.

7.4.4 A summary of the comments raised and responses are detailed in Table 7-4.

Table 7-4: Summary of Consultation Responses that have Informed the Scope and Methodology of the Noise and Vibration Assessment

Consultee	Date	Comment	Response
Secretary of State (SoS) (Scoping Report paragraph 3.32)	August 2014	The SoS notes the intention for noise measurement locations for the baseline assessment to be agreed with the local EHO but draws attention to the comment from NRW that the discussion on noise surveys also needs to be communicated to NRW with particular reference to an A1 EPR permit which will include noise conditions.	The baseline noise levels have been updated with a survey undertaken in February 2018.

Consultee	Date	Comment	Response
SoS (Scoping Report paragraph 3.33)	August 2014	The SoS draws attention to the comments of NRW regarding the requirements of the Environmental Noise Directive, and the Environmental Noise (Wales) (Amendment) Regulations 2009, which have introduced a 'Noise Action Plan for Wales.' This covers industrial noise sources, impacts on designated Quiet Areas and the impact of creeping background, and should be taken into consideration by the Applicant.	The Noise Action Plan for Wales has been taken into consideration within the context of a wide range of available guidance.
SoS (Scoping Report paragraph 3.34)	August 2014	The SoS recommends that information be provided on the types of vehicles and plant to be used during the construction phase. Noise impacts on people should specifically be addressed and in particular any potential noise disturbance at night and other unsocial hours such as weekends and public holidays.	Detailed assessment of construction vehicle noise has been considered and scoped out due to the insignificant expected effects. The reasoning behind this is explained in more detail in Table 7-3
SoS (Scoping Report paragraph 3.35)	August 2014	The SoS welcomes that the CEMP will set out best practice methods of limiting noise and vibration on site during construction and decommissioning.	Noise mitigation will be included in the CEMP.
SoS (Scoping Report paragraph 3.36)	August 2014	The SoS recommends that the noise and vibration assessment takes account of traffic movements along access routes during the construction phase.	Assessment of construction vehicle noise has been considered and scoped out due to the insignificant expected effects.
SoS (Scoping Report paragraph 3.37)	August 2014	The noise assessment should accurately identify the proximity of the identified noise sensitive receptors to the proposed development. With regards to the operational noise	The assessment is based on the effects at the receptors closest to the Project Site.

Consultee	Date	Comment	Response
		assessment, this should cover all modes of operation of the proposed development. The applicant's attention is drawn to NRW's comments in these respects.	
City and County of Swansea (CCS)	Consultation with Mr Tom Price (Environmental Health Officer) on 20th October 2017	Confirms that the proposed approach to assessing Noise and Vibration in PEIR is acceptable and agrees with requirements of scoping report. The methodology discussed was based on BS 4142 for the daytime and WHO Night Time Noise Guidelines for the night. The six NSR locations were discussed and agreed as appropriate	The assessment has been completed in line with the methodology set out in the discussion.
Natural Resources Wales	Section 42 Consultation response	Required action on the following points: • The night time assessment approach was questioned due to the detail available in the baseline sound data and the use of WHO for industrial sound. They suggested that BS 4142 would be more appropriate as an assessment method • The need for additional monitoring was acknowledged • More detail was required of the modelling data and assumptions.	A more detailed noise survey (Appendix 7.1) has now been completed. This has provided representative background and residual sound level data in line with that requested by NRW. This was used as the basis for day and night time BS 4142 assessments presented in the ES. At the ES stage the noise predictions are still based on example plant representative noise data and realistic worst case location of the sources within the Rochdale envelope. .

c) Study area

7.4.5 The extent of the study area has been defined to include the nearest receptors/communities in each direction from the Project Site that may be affected during the construction, operational and decommissioning phases of the Project. Representative NSRs within this study area in all directions from the Project Site have been identified for the purposes of assessment, to ensure all effects are appropriately considered.

7.4.6 Key NSR locations have been selected which are considered to be representative of the nearest and potentially most sensitive existing receptors to the Project Site. It is considered that if noise and vibration levels are suitably controlled at the key receptors identified, then noise and vibration levels would be suitably controlled at other sensitive receptors in the surrounding area, including the amenity of local footpaths and leisure facilities as the requirements for these will be less onerous. Impacts upon ecological receptors are considered in the **Chapter 8: Ecology**.

7.4.7 Those NSRs are listed in Table 7-5 and located in Figure 7.1.

Table 7-5: Noise Sensitive Receptors and Monitoring Locations

Noise Sensitive Receptor	Address	Details (distance from point source)
NSR1	Cefn-betingau	Isolated farm house 500 m east of the Project Site
NSR2	Feline Wen Farm	Isolated farm house 800 m south east of the Project Site
NSR3	Llwynhelig	Isolated farm house 750 m south east the Project Site
NSR4	Maes-eglwys	Isolated farm house 700 m south of Project Site
NSR5	Lletty Morfil Farm	Isolated farm house 875 m west of Project Site
NSR6	Abergelli Farm	Isolated farm house 600 m north west of the Project Site

d) Sensitivity

7.4.8 In accordance with the principles of EIA, the sensitivity of existing receptors to noise (or vibration) impacts has been defined in Table 7-6.

Table 7-6: Sensitivity/Value of Receptors

Sensitivity/ value of resource/ receptor	Description	Examples of receptor usage
Very high	Receptors where noise or vibration will significantly affect the function of a receptor	Auditoria/ studios Specialist medical/teaching centres, or laboratories with highly sensitive equipment
High	Receptors where people or operations are particularly susceptible to noise or vibration. Sensitive ecological receptors known to be vulnerable to the effects of noise or	Residential Quiet outdoor areas used for recreation Conference facilities Schools/ educational facilities in the daytime Hospitals/ residential care homes Libraries Ecologically sensitive areas for example

Sensitivity/ value of resource/ receptor	Description	Examples of receptor usage
	vibration	Special Protection Areas (SPAs)
Medium	Receptors moderately sensitive to noise or vibration where it may cause some distraction or disturbance	Offices Restaurants/ retail Sports grounds when spectator or noise is not a normal part of the event and where quiet conditions are necessary (*e.g.* tennis, golf)
Low	Receptors where distraction or disturbance of people from noise or vibration is minimal	Residences and other buildings not occupied during working hours Factories and working environments with existing high noise levels Sports grounds when spectator or noise is a normal part of the event

e) Magnitude

i. Assessment of Construction Noise Effects

7.4.9 Before the appointment of a construction contractor, site specific details on the construction activities, programme and number or type of construction plant are not yet available. Therefore, detailed construction noise predictions at specific NSRs have not been undertaken. As stated in the scoping report, a qualitative assessment will be undertaken, based on review of the indicative worst case construction noise predictions which were undertaken for a representative project using the calculation methods set out in BS 5228:2009+A1:2014 *'Code of practice for noise and vibration control on construction and open sites'* (Ref. 7.16). The predictions for each phase of the construction will be adjusted to reflect the distances to the actual receptors at the Project Site.

7.4.10 BS 5228 contains a number of example methodologies for identifying significant construction noise effects based on fixed thresholds or noise level changes. Taking into account this guidance the threshold values detailed in Table 7-7 have been adopted in this ES to define the SOAEL (the 'significant observed adverse effect level', as defined in Section 7.3) and the LOAEL (the 'lowest observable adverse effect level') for residential receptors.

Table 7-7: Construction Noise SOAEL and LOAEL for Residential Receptors

Time of Day	SOAEL $L_{Aeq,T}$ dB (façade)	LOAEL $L_{Aeq,T}$ dB (façade)
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	75	65
Evenings (19:00 – 23:00 weekdays) and Weekends (13:00 – 23:00 Saturdays and 07:00 –	65	55

Time of Day	SOAEL $L_{Aeq,T}$ dB (façade)	LOAEL $L_{Aeq,T}$ dB (façade)
23:00 Sundays)		
Night-time (23:00 – 07:00)	55	45

7.4.11 The criterion for the SOAEL at residential receptors corresponds to the threshold values for Category C in the BS 5228 example ABC method. Similarly, the criterion for the LOAEL corresponds to the threshold values for Category A in the BS 5228 example ABC method. This is in accordance with the NPPF and NPSE which have been referenced, as stated in the 2018 PEIR as they give more quantitative information then the Welsh national guidance and give a robust and high standard of assessment for construction noise levels in keeping with the aims of the Welsh guidance. The results have been used to consider receptors that exceed the LOAEL and propose mitigation to minimise adverse effects.

7.4.12 When considering exceedances of the SOAEL and LOAEL, other project-specific factors have been taken into account, such as the existing ambient noise levels, number of receptors affected and the frequency and duration of the impact.

7.4.13 Based upon the above, the magnitude of the impact of construction noise on residential receptors has been classified in accordance with the descriptions in Table 7-8.

Table 7-8: Construction Noise Magnitude of Impact Criteria for Residential Receptors

Magnitude of Impact	Daytime $L_{Aeq,T}$ dB (façade) Daytime (07:00 – 00) and Saturdays (07:00 – 13:00)	Evening / Weekend $L_{Aeq,T}$ dB (façade) Evenings (19:00 – 00 weekdays) and Weekends (13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays)	Night-time $L_{Aeq,T}$ dB (façade) 23:00 - 07:00
High	> 80	> 70	> 60
Medium	>75-80	>65-70	>55-60
Low	>65-75	>55-65	>45-55
Very Low	≤ 65	≤ 55	≤ 45

ii. Assessment of Demolition and Construction Vibration Effects

Effects on Humans – Annoyance

7.4.14 Vibration due to construction activities has the potential to result in adverse impacts at nearby NSRs. The transmission of ground-borne vibration is highly dependent on the nature of the intervening ground between the source and receiver and the activities being undertaken. BS 5228-2: 2009+A1: 2014 *'Code of Practice for Noise and Vibration Control on Construction and Open Sites - Vibration'* (Ref 7.17)

provides data on measured levels of vibration for various construction works, with particular emphasis on piling. Impacts are considered for both damage to buildings and annoyance to occupiers.

7.4.15 Table 7-9 details Peak Particle Velocity (PPV) vibration levels and provides a semantic scale for the description of demolition and construction vibration effects on human receptors, based on guidance contained in BS 5228-2.

Table 7-9: Construction Vibration threshold at Residential Dwellings

Peak Particle Velocity (PPV) level	Description	Magnitude of impact
>= 10 mm/s	Vibration is likely to be intolerable for any more than a very brief exposure to this level.	High
1.0 to < 10 mm/s	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.	Medium
0.3 to < 1 mm/s	Vibration might be just perceptible in residential environments.	Low
0.14 to < 0.3 mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.	Very low

7.4.16 For residential receptors and other high sensitivity receptors, the LOAEL is defined as a PPV of 0.3 mm/s (millimetres per second), this being the point at which construction vibration is likely to become perceptible. The SOAEL is defined as a PPV of 1.0 mm/s, this being the level at which construction vibration can be tolerated with prior warning.

7.4.17 At receptors above the SOAEL, further consideration of whether an effect is significant is undertaken using professional judgement, taking account of the duration and frequency of the effect, as well as the time of evening/night that the effect would be experienced.

Effects on Buildings

7.4.18 In addition to human annoyance, building structures may be damaged by high levels of vibration. The levels of vibration that may cause building damage are far in excess of those that may cause annoyance. Consequently, if vibration levels are controlled to those relating to annoyance (*i.e.* 1.0 mm/s), then it is highly unlikely that buildings will be damaged by construction vibration levels.

7.4.19 The criteria used in this assessment relate to the potential for cosmetic damage, not structural damage. The principal concern is generally transient vibration, for example due to piling.

7.4.20 BS 7385-2: 1993 *'Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from groundborne vibration'* (Ref. 7.23) provides guidance on vibration levels likely to result in cosmetic damage and is referenced in BS 5228-2: 2009+A1:2014. Guide values for transient vibration, above which cosmetic damage could occur, are given in Table 7-10.

Table 7-10: Transient Vibration Guide Values for Cosmetic Damage

Type of building	Peak component particle velocity in frequency range of predominant pulse	
	4 Hz to 15 Hz	15 Hz and above
Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
Unreinforced or light framed structures Residential or light commercial buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above
NOTE 1: Values referred to are at the base of the building. NOTE 2: For un-reinforced or light framed structures and residential or light commercial buildings, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded		

7.4.21 BS 7385-2:1993 states that the probability of building damage tends to zero for transient vibration levels less than 12.5 mm/s PPV. For continuous vibration, such as from vibratory rollers, the threshold is around half this value.

7.4.22 It is also noted that these values refer to the likelihood of cosmetic damage. ISO 4866:2010 defines three different categories of building damage:

- Cosmetic – formation of hairline cracks in plaster or drywall surfaces and in mortar joints of brick/concrete block constructions;
- Minor – formation of large cracks or loosening and falling of plaster or drywall surfaces or cracks through brick/block; and
- Major – damage to structural elements, cracks in support columns, loosening of joints, splaying of masonry cracks.

7.4.23 BS 7385-2:1993 defines that minor damage occurs at a vibration level twice that of cosmetic damage and major damage occurs at a vibration twice that of minor damage. Therefore, this guidance can be used to define the magnitude of impact identified in Table 7-11.

Table 7-11: Magnitude of Impact – Construction Vibration Building Damage

Magnitude of impact	Damage risk	Continuous vibration level ppv mm/s
High	Major	30
Medium	Minor	15
Low	Cosmetic	6
Very low	Negligible	<6

iii. Assessment of Operational Noise

7.4.24 The assessment of operational sound levels has been based upon calculations using plant emissions data available at this stage. The data currently available includes generating equipment, sound power levels (L_W), distance between the Power Generation Plant and NSRs and the acoustic screening offered by the existing landscape

7.4.25 Based upon the predicted sound levels, an assessment of potential impact at nearby NSRs has been undertaken using the guidance in BS 4142: 2014 *'Methods for rating and assessing industrial and commercial sound'* (Ref. 7.15) and the WHO Night time noise guides (Refs. 7.1 and 7.2)

7.4.26 BS 4142 describes methods for rating and assessing sound of an industrial and/or commercial nature. The method compares the rating sound level with the existing *background sound level*. The standard uses the following definitions to describe various aspects of the soundscape of the scenario being assessed:

- *Background sound level,* $L_{A90,T}$ dB - defined in the Standard as the 'A-weighted sound pressure level that is exceeded by the residual sound for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels'.
- *Specific sound level, Ls =* $L_{Aeq,Tr}$ *dB* – the 'sound source at the assessment location over a given reference time interval, T_r,'.
- *Rating level,* $L_{Ar,Tr}$ – the '*specific sound level* plus any adjustment made for the characteristic features of the sound'.
- *Ambient sound level*, $L_{Aeq,T}$ dB - defined in the standard as 'the totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far when present. The ambient sound comprises the residual sound and the specific sound.'
- *Residual sound level***,** L_r = $L_{Aeq,T}$ **–**the *'Ambient Sound* remaining at the assessment location when the *Specific Sound* source is suppressed to such a degree that it does not contribute to the *Ambient Sound'*.

7.4.27 When assessing a new sound source such as the Generating Equipment it is important to consider the context of the site and the nature of the existing noise sources in the area. The Substation is part of the background sound environment in the area and the impact of the generators should to be viewed in the context of

that existing environment. However, it is also necessary to consider the risks of new sources causing the ambient sound levels in the area to 'creep' up.

7.4.28 Whereas the previous version of BS 4142:1997 allowed for a single correction of +5 dB to be made to the Specific Noise Level if one or more of the distinguishable, impulsive or irregular features were considered to be present, BS 4142:2014 allows for corrections to be applied based upon the presence or expected presence of the following:

- Tonality: up to +6 dB penalty;
- Impulsivity: up to +9 dB penalty (this can be summed with tonality penalty); and
- Other sound characteristics (neither tonal nor impulsive but still distinctive): + 3 dB penalty.

7.4.29 Once any adjustments have been made, the *background sound level* and the *rating level* are compared. The standard states that:

"Typically, the greater the difference, the greater the magnitude of impact.

A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending upon the context.

A difference of around +5 dB is likely to be an indication of an adverse impact, depending upon the context.

The lower the rating level is to the measured background sound level, the less likely it is that the specific sound will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending upon the context." (Section 11)

7.4.30 Importantly, as suggested above, BS 4142:2014 requires that the *rating level* of the noise source under assessment be considered in the context of the environment when defining the overall significance of the impact.

7.4.31 BS 4142:2014 suggests that a one hour assessment period is considered during the day and a 15-minute assessment period at night.

7.4.32 Table 7-12 illustrates the adopted magnitude of impact scale used in this assessment based upon the numerical level difference. For BS 4142 assessment purposes the SOAEL is set at a *rating level* above the *background sound level* of +10 dB, and the LOAEL at +5 dB, although it should be remembered that the context assessment (including the absolute level of the sound under consideration) can vary the overall classification of effects.

7.4.33 For reasons that are discussed in the following paragraphs the nature and context of the site mean that BS 4142 alone would produce an incomplete assessment of operational noise impacts at night. As a result it was agreed in discussion with CCS to include a night time assessment based upon the WHO document Night Noise Guidelines for Europe (Ref. 7.2). These discussions were held before the

updated noise survey was complete and based on the baseline sound data available at the time, which was based on very limited measurements. The approach was reviewed after the more detailed and representative data provided by the 2018 survey was available. It was concluded that, although the 2018 night time data gave greater validity to a BS 4142 assessment than the previous data the WHO based method still provided useful additional context to the results.

7.4.34 The Night Noise Guidelines for Europe (Ref. 7.2) build on the earlier WHO Community Noise Guidelines (Ref. 7.1) and assess the health and sleep effects of noise experienced by people at night. It observes that below the level of 30 dB L_{night}, no effects on sleep are observed except for a slight increase in the frequency of body movements during sleep due to night noise. There is no sufficient evidence that the biological effects observed at the level below 40 dB L_{night} are harmful to health. However, adverse health effects are observed at the level above 40 dB L_{night}, such as self-reported sleep disturbance, environmental insomnia, and increased use of sleeping pills and sedatives. Therefore, 40 dB L_{night} is equivalent to the lowest observed adverse effect level (LOAEL) and 30 dB L_{night} is equivalent to the no observable adverse effect level (NOAEL) for night noise.

7.4.35 These values apply to the total ambient sound incident on a dwelling not just to the contribution from an individual source such as the Project. For this assessment it will therefore be necessary to predict the future *ambient sound level* by adding together the measured *residual sound level* and the predicted *specific sound level*. However when assessing the impact and effect of a new noise source it is important to consider the relative contributions of that source compared with other ambient sources and look at the overall change in levels that the introduction of the new source creates.

7.4.36 The WHO document recommends that for the prevention of subclinical adverse health effects related to night noise in the population, it is recommended that the population should not be exposed to night noise levels greater than 40 dB of L_{night} during the part of the night when most people are in bed. The document also suggests an interim target (IT) of 55 dB L_{night} in the situations where the achievement of the NOAEL is not feasible in the short run for various reasons.

f) Significance Criteria

7.4.37 Table 7-12 lists the magnitudes of impacts for day time noise based on BS 4142.

Table 7-12: Magnitude of Impact for Industrial Noise During Day or Night

Daytime		
Magnitude of impact	**BS 4142 descriptor**	**Excess of *rating level* over *background sound level* (dB)**
High	No BS 4142 descriptor for this magnitude level	>15
Medium	Indication of a significant adverse effect, depending upon context	+10 approx.
Low	Indication of an adverse effect, depending upon context	+5 approx.
Very low	Indication of low impact, depending upon context	≤ 0

7.4.38 Table 7-13 below lists the magnitudes of impacts for night time noise based on the WHO guidelines.

Table 7-13: Magnitude of Impact for Noise at Night

Night time		
Magnitude of impact	**Descriptor**	**Total ambient sound level outdoors (dB L_{Aeq})**
High	Based on level considered by WHO to be “increasingly dangerous to public health”	>55
Medium	Based on level considered by WHO to produce observable “adverse health effects”	>40,≤55
Low	Based on LOAEL in WHO	>30≤40
Very low	Based on NOAEL in WHO	≤ 30

g) Effect definitions

7.4.39 Effects are classified based on the magnitude of the impact and the sensitivity or value of the affected receptor. The criteria for assigning the magnitude of impacts are outlined for the various potential impacts during construction, operation and decommissioning, and these are followed by a scale of receptor sensitivity in Table 7-6 and overall classification of effects matrix in Table 7-14.

7.4.40 The following terminology has been used in the assessment to define effects:

- Adverse – detrimental or negative effects to an environmental resource or receptor;
- Neutral – effects to an environmental resource or receptor that are neither adverse nor beneficial; or

- Beneficial – advantageous or positive effect to an environmental resource or receptor.

7.4.41 The effect resulting from each individual potential impact type above is classified according to the magnitude of the impact and the sensitivity or value of the affected receptor using the matrix presented in Table 7-14 but where necessary also considering the context of the acoustic environment.

Table 7-14: Classification of Effects

Sensitivity/ value of resource/ receptor	Magnitude of impact			
	High	Medium	Low	Very low
Very high	Major	Major	Moderate	Minor
High	Major	Moderate	Minor	Negligible
Medium	Moderate	Minor	Negligible	Negligible
Low	Minor	Negligible	Negligible	Negligible

7.4.42 For the purposes of this assessment, negligible and minor effects are not considered to be significant, whereas moderate and major effects are considered to be significant.

7.5 Baseline Environment

7.5.1 This section describes the baseline environmental characteristics for the Project and surrounding areas with specific reference to noise and vibration. The baseline sound levels presented within this report were measured by AECOM in February 2018 and summarised Table 7-15.

7.5.2 The assessment in the 2018 PEIR for the project was based on a survey conducted for the 2014 PEIR before the current version of BS 4142 (2014) was published. The methodology of the 2014 version of the standard has different and more detailed requirements for the acquisition of representative baseline sound than the previous versions. As a result the results used in the PEIR would be seen as unrepresentative in the context of the 2014 version of the standard. It had always been the intention to update the baseline data when suitable on site conditions allowed. In their comments on the 2018 PEIR, Natural Resources Wales stated their opinion that updated baseline levels would be required going forward.

7.5.3 For the February 2018 survey, access could only be obtained to four of the six NSRs. Unattended loggers were installed at NSRs 1, 4, 5 and 6 over a period of six days and were located within the property boundary of each NSR following prior agreement with the residents. This was to obtain representative levels at each NSR meeting the requirements of BS 4142:2014. It was not possible to place loggers at NSRs 2 and 3, even though attempts were made to locate and contact the residents both prior to and during the monitoring period. However the four locations that were used cover the major compass directions from the proposed power plant site and include the two closest receptors (1 and 6). Therefore the lack of

monitoring data from NSRs 2 and 3 does not impact the comprehensiveness or validity of the assessments and conclusions on the impacts and effects on NSRs 2 and 3 can be drawn from application of professional judgement to the results for the other four NSRs.

7.5.4 BS 4142 gives guidance on how a representative *background sound level* can be derived from a sound measurement data set such as the six days and nights of five minute sample data gathered during the survey.

7.5.5 Section 8.1.1 of BS 4142 states that *background sound level* should be determined in "weather conditions that are representative or comparable to the weather conditions when the specific sound occurs". The propagation of sound from outdoor sources is significantly influenced by the weather. In particular the propagation down wind of a source can be 10 to 15 dB greater than that upwind. The prediction methodology used to derive the *specific sound level* for the Generating Equipment (based on ISO 9613) assumed downwind conditions for each receptor. Therefore the predicted *specific sound level*s will only occur at each receptor when that receptor is downwind of the source. Representative *background sound level*s must therefore be measured in similar conditions. Therefore, for each receptor the data set was filtered so that only measurements sessions were the average wind direction was within a 120° arc (60°s each side) of the downwind condition were included for further analysis.

7.5.6 Section 8.1.4 of BS 4142 states that to obtain a representative value the data set should be analysed statistically and then a judgment made. It clearly states that the lowest measured level should not be taken as representative. Therefore, after filtering for wind direction as described above the mean and modal values of the remaining results for each receptor were obtained. The modal value was selected as representative for each receptor based on examination of the full, filtered data set.

7.5.7 Representative *background and ambient sound levels* are summarised below in Table 7-15 for each of the four NSRs.

Table 7-15: Representative Background and Ambient Sound Levels

NSR	Observations of baseline sound environment	Day time *background sound level* L_{AF90}	Day time ambient (residual) sound level L_{Aeq}	Night time *background sound level* L_{AF90}	Night time ambient (residual) sound level L_{Aeq}
NSR1	Distant rotary engine noise and M4 motorway traffic noise, low but audible. Bird noise and cattle noises heard from the nearby area. On collection	40	46	34	40

NSR	Observations of baseline sound environment	Day time *background sound level* L_{AF90}	Day time ambient (residual) sound level L_{Aeq}	Night time *background sound level* L_{AF90}	Night time ambient (residual) sound level L_{Aeq}
	there was additional noise from farm activities as well as a low frequency plant hum which started up around 10:00. At night, low level plant hum heard, road traffic was audible to both the south and east. Very quiet site.				
NSR4	M4 motorway traffic noise and rotary engine noise low but audible. On collection dogs were barking at the nearby property. At night, low level plant hum and distant M4 traffic noise, low but audible. Very quiet site.	36	43	35	38
NSR5	On site hen noise and dogs barking. Wind rustle in the trees. Distant M4 traffic and rotary engine noises heard, low but audible. On collection a low level plant hum could be heard. At night, low level plant hum and distant M4 traffic noise, low but audible. Very quiet site.	43	54	38	40
NSR6	Wind rustle and birds heard in nearby trees, dogs barking in the distance. Distant M4 traffic and rotary engine noises heard, low but audible. Rotary engine noise, advised to be a drone, low but audible. At night, low level plant hum and distant road traffic noise heard.	40	47	36	39

NSR	Observations of baseline sound environment	Day time *background sound level* L_{AF90}	Day time ambient (residual) sound level L_{Aeq}	Night time *background sound level* L_{AF90}	Night time ambient (residual) sound level L_{Aeq}
	Very quiet site.				

7.5.8 In the absence of the Project, future baseline sound levels at NSRs would depend largely on traffic flows on surrounding road networks and the future operations at other industrial and commercial premises in the area.

7.6 Embedded Mitigation

7.6.1 As detailed in **Chapter 3: Project and Site Description**, a number of embedded mitigation measures have been identified through the iterative EIA process and have been incorporated into the design and construction planning of the Project.

7.6.2 As these mitigation measures have been embedded into the design, are legal requirements or are standard practices that will be implemented, the assessment of likely significant effects assumes that they are in place.

7.6.3 The preferred approach for controlling construction noise and vibration is to reduce levels at source where possible, but with due regard to practicality. Sometimes a greater noise or vibration level may be acceptable if the overall construction time, and therefore length of disruption, is reduced.

7.6.4 During operation, monitoring is considered appropriate in order to track the success of delivery of proposed mitigation. Ideally this monitoring would be based on regular or fixed measurements close to the Project Site Boundary to give consistency by minimising the impact of weather and extraneous sources. The measured levels at these locations must be calibrated against the levels at the receptors as part of the plant commissioning sound test procedure. Any change in Project Site Boundary levels can then be related directly to changes at the receptors.

7.7 Assessment of Effects

7.7.1 This section presents the findings of the noise and vibration assessment for the construction phase, the operational phase and the decommissioning phase of the Project.

7.7.2 This section identifies any likely significant effects that are predicted to occur and Section 7.8 highlights the additional mitigation and monitoring measures that are proposed to reduce or eliminate the identified significant effects if required.

a) Construction

7.7.3 This section sets out the preliminary assessment of the potential noise and vibration effects on sensitive receptors arising during the construction period.

7.7.4 Noise levels experienced by local receptors during such works depend upon a number of variables, the most significant of which are:

- The noise generated by plant or equipment used on-site, generally expressed as Sound Power Levels (L_w) or the vibration generated by the plant;
- The periods of use of the plant on-site, known as its on-time;
- The distance between the noise/vibration source and the receptor;
- The noise attenuation due to ground absorption, air absorption and barrier effects;
- In some instances, the reflection of noise due to the presence of hard surfaces such as the sides of buildings; and
- The time of day or night the works are undertaken.

7.7.5 At this stage, the final construction methods are not confirmed, therefore the worst case indicative construction noise levels have been based on information from other technically similar projects provided by the client and taken from published standards and AECOM archives.

i. Power Generation Plant

7.7.6 The Residential NSRs are located at a range of distances in different directions around the Project Site, where the Generating Equipment is to be installed. The closest residential NSRs are Cefn-betingau, located approximately 500 m to the east, and Abergelli Farm located approximately 600 m to the north-west of the Generating Equipment Site. The construction assessment has been based on daytime magnitude of impacts as detailed in Table 7-8, as the proposed construction hours as detailed in Paragraph 3.11.19 fall within these hours.

7.7.7 The predicted levels are given in Table 7-16 below.

Table 7-16: Predicted Construction Sound Levels $L_{Aeq,T}$

Location		Power Generation Plant
Cefn-betingau	NSR1	50
Felin Wen Farm	NSR2	46
Llwynhelig	NSR3	46
Maes-eglwys	NSR4	48
Lletty Morfil Farm	NSR5	45
Abergelli Farm	NSR6	48

7.7.8 The predicted indicative construction noise levels for the Power Generation Plant are below the LOAEL level in Table 7-7. Based on Table 7-8 the magnitude of impact is very low at all NSRs. The sensitivity of all residential receptors is high as outlined in Table 7-6. Therefore the significance of effects using the scale in Table 7-14 is predicted to be negligible at all NSRs, and is therefore considered not significant.

ii. Gas Connection

7.7.9 Abergelli Farm is located within 60 m of the closest part of the Gas Connection.

7.7.10 The predicted levels are given in Table 7-17 below.

Table 7-17: Predicted Construction Sound Levels $L_{Aeq,T}$

Location		Gas connection
Cefn-betingau	NSR1	45
Felin Wen Farm	NSR2	42
Llwynhelig	NSR3	43
Maes-eglwys	NSR4	46
Lletty Morfil Farm	NSR5	48
Abergelli Farm	NSR6	66

7.7.11 The predicted indicative construction noise levels for the Gas Connection were below the LOAEL level in Table 7-7, apart from at NSR6 where a level just exceeding the LOAEL during the day time but significantly below the SOAEL is predicted. Based on Table 7-8 the magnitude of impact is very low for NSRs 1-5, and low for NSR6. The sensitivity of all residential receptors is high, as outlined in Table 7-6. Therefore the significance of effects, using the scale in Table 7-14 is predicted to be **Negligible** at NSR1-NSR5 and **Minor** at NSR6, which is considered not significant at all NSRs.

iii. Electrical Connection

7.7.12 The Residential NSR4 and NSR5 are located close to the Electrical Connection.

7.7.13 The predicted levels are given in Table 7-18 below.

Table 7-18: Predicted Construction Sound Levels $L_{Aeq,T}$

Location		Electrical substation	Electrical cable	Electrical connection
Cefn-betingau	NSR1	40	41	33
Felin Wen Farm	NSR2	39	39	31
Llwynhelig	NSR3	42	41	33
Maes-eglwys	NSR4	48	48	40
Lletty Morfil Farm	NSR5	58	54	46
Abergelli Farm	NSR6	45	43	35

7.7.14 Predicted indicative construction noise levels for the Substation, cable and connections were below the LOAEL level in Table 7-7. Based on Table 7-8 the magnitude of impact is very low at all NSRs. The sensitivity of all residential receptors is high, as outlined in Table 7-6. Therefore the significance of effects, using the scale in Table 7-14 is predicted to be **Negligible** at all NSRs, and is therefore considered not significant.

iv. Project Inter-relationship Effects

7.7.15 The in combination effects of all construction activities taking place simultaneously on each of the receptors are summarised in Table 7-19 below.

Table 7-19: Predicted Construction Sound Levels $L_{Aeq,T}$

Location		**Predicted in combination construction noise level levels L_{Aeq}**
Cefn-betingau	NSR1	52
Felin Wen Farm	NSR2	49
Llwynhelig	NSR3	49
Maes-eglwys	NSR4	54
Lletty Morfil Farm	NSR5	60
Abergelli Farm	NSR6	66

7.7.16 The predicted indicative construction noise levels for three components of the Project were below the LOAEL level in Table 7-7, apart from at NSR6. This was due to a very brief period during construction of the Gas Connection, which passes within 60 m of that NSR. As such, the significance of effects is predicted to be **Negligible** for the NSRs during the various construction phases.

7.7.17 Based on Table 7-8 the magnitude of impact is very low for NSRs 1-5, and low for NSR6. The sensitivity of all residential receptors is high, as outlined in Table 7-6. Therefore the significance of effects, using the scale in Table 7-14 is predicted to be **Negligible** at NSR1-NSR5 and **Minor** at NSR6, which is considered not significant at all NSRs.

v. General

7.7.18 It may be necessary for some project critical construction activities, such as concrete pours, to take place continuously over day, evening and night periods during peak construction times of the Project, although the exact nature of the works is unknown. SOAEL and LOAEL threshold values during non-weekday daytime periods have been defined in Table 7-7.

7.7.19 The predicted daytime noise levels have been compared against the lower limit values for evening, weekend and night-time periods. Based on Table 7-8 the magnitude of impact for evening works would be low/very low at all NSRs apart from NSR6 during gas connection works, when the magnitude of impacts is predicted to be Medium adverse. During the night time period, the magnitude of impacts based on Table 7-8 would be low/ very low at all NSRs apart from NSR6 during gas connection works when the magnitude of impacts is High adverse and at NSR5 during the electrical substation and connections works. Therefore there is the potential for **Major/Moderate adverse** (significant) effects to occur at NSR5 and NSR6 during the evening/ night time periods if the same intensity of working as for the daytime is assumed.

7.7.20 Therefore, restrictions on construction hours are included as embedded mitigation in paragraph 3.11.19r. If construction activities outside these restricted hours cannot be avoided, these events will be planned, managed and mitigated appropriately through the CEMP, so as not to exceed the SOAEL threshold values and reduce levels towards the LOAEL (or less) where practical. Construction activities outside the hours listed in paragraph 3.11.19 will only occur with the approval of CCS. Provided the SOAEL threshold values are not exceeded, or are only exceeded for brief and planned periods, construction activities outside of normal working hours can be considered as having a **Minor adverse** effect or less, and therefore not significant. Potential measures to ensure that appropriate mitigation is in place during the works have already been discussed in Section 7.5.

7.7.21 The level of impact at different receptors would be dependent upon a number of factors, including distance between the works and receptors, ground conditions, the nature and method of works required close to receptors and the specific activities being undertaken at any given time.

7.7.22 There are no residential receptors in close proximity to the Project to be significantly affected by construction vibration. However, there is the potential for some vibration impacts upon any buildings or structures close to the Project Site. Whilst it is considered unlikely that most typical construction working routines would generate levels of vibration above which building damage would be expected to be sustained (subject to final plant and working requirements).

7.7.23 Where piling, heavy earthworks, vibratory rollers or other significant vibration producing operations are proposed in close proximity to any existing buildings, further consideration would be given to potential impacts, once the contractor is appointed and the construction methods requirements are developed. It is not possible at this stage to evaluation what the vibration levels produced might be. The vibration limits based on the values in Table 7-11 will be included as part of the CEMP. As the construction of the Project is within the control of the Applicant, any identified issues can be effectively managed by the Applicant and their contractor(s).

b) Operation

7.7.24 The preferred configuration of the Project, including Generating Equipment is yet to be confirmed but will be within the Rochdale Envelope employed for the Project. Therefore operational noise modelling has been undertaken for the indicative plant configuration outlined in **Chapter 3: Project and Site Description** in order to give a view of the noise levels that could be produced by the Generating Equipment. The predictions were undertaken based on all noise sources being located at the closest part of the Project Site within the Rochdale envelope parameters to each receptor and with no allowances for source directivity or on-site screening. This was to give a worst case within the Rochdale envelope.

7.7.25 Input L_W data was either provided by the potential suppliers or has been taken from AECOMs archive of data for similar installations. The sound power level data was provided for various source components. The typical source components included the following, although there were some minor differences in the data provided by each supplier:

- Gas turbine equipment enclosures and buildings
- Diffuser enclosure;
- Generator enclosure;
- Auxiliaries enclosure;
- Air duct;
- Air intake inlet;
- Air intake body;
- Stack body upstream silencer;
- Stack body downstream silencer; and
- Stack outlet.

7.7.26 Discussions were held with potential suppliers and the AECOM database of noise levels for similar projects was examined in order to identify the levels that can be achieved by applying the noise control measures, sound power levels for each of the major sources. Based on that research the following levels were used:

- A sound power level of 98 dB L_{WA} from the stack in the direction of the receptors;
- A total sound power level of 96 dB L_{WA} from the Generating Equipment enclosures; and
- A sound power level of 90 dB L_{WA} from the fin fan cooler.

7.7.27 These levels can be achieved by extensive use of the mitigation measures described in **Chapter 3: Project and Site Description** during the detailed design. They therefore represent the application of BAT to the design of the power station

7.7.28 The assessment described sets out the predicted impacts and effects associated with operation of the Project operating throughout the day and night. This is the plant's anticipated worst case long term operating condition.

7.7.29 The following assumptions have been made when undertaking the operational noise modelling to give a realistic worst case assessment:

- The Project would operate any time during the day or night;
- Noise levels provided by manufacturers for all principal noise emitting buildings/elements (air inlet filters, electrical buildings, transformers, workshops etc.) are understood to be external radiated sound power level.
- Prediction methodologies were based on ISO 9613:2 assuming downwind propagation to each receptor. This negates effect of any screening by rolling ground and means that the sound pressure levels are determined by distance and air absorption; and
- Corrections for tonality, impulsivity, and intermittency have not been applied on the assumption that these potential features would be designed out of the Project during the detailed design phase by the selection of appropriate plant, building cladding louvres and silencers/attenuators. However, for the daytime BS 4142 assessment a +3 dB correction has been applied to the *specific noise levels* predicted from the Project Site on the basis that the noise emissions may be distinctive above the residual acoustic environment. This is considered conservative in the context of the prevailing noise environment, which includes road traffic, the existing electrical infrastructure and agricultural equipment.

7.7.30 It is currently understood that the operation of the Generating Equipment would be driven by the dynamics of the energy market; as a result the plant could run for short or longer periods, at any time of day, up to the maximum allowed under its Environmental Permit.

7.7.31 The predicted free-field operational *specific sound levels* at the NSRs around the Project Site are presented in Table 7-20. NSRs 2 and 3 have not been included in the numerical assessments in Tables 7-20, 7-21 and 7-23 as access could not be obtained to measure representative background levels at these locations. However, the impacts at these receptors have been assessed by applying professional judgment to the results at NSR1 and NSR4. The conclusions of these judgment based assessments are discussed in the text.

Table 7-20: Predicted Operational *Specific Sound Levels* $L_{Aeq,T}$ – Generating Equipment

Location		**Predicted *specific sound levels* L_{Aeq}**
Cefn-betingau	NSR1	35
Maes-eglwys	NSR4	32
Lletty Morfil Farm	NSR5	29
Abergelli Farm	NSR6	34

7.7.32 The nature of the predictions, which allow flexibility of plant location within the Rochdale Envelope to produce a worst case at each receptor mean that exact predictions cannot be made at the Project Site Boundary at this time. However, the calculations used to predict the levels at the receptors also indicate that the average level around the site boundary will be around 50 dB L_A with a maximum level of around 55 dB L_A.

7.7.33 The BS 4142 assessments results for receptors NSR1, NSR4, NSR5 and NSR6 are presented in Table 7-21. The values are the differences between the range of representative *background sound level* at each NSR and the predicted *rating level* (the *specific sound level* $L_{Aeq,T}$ plus a +3 dB correction for a potentially distinctive character). Positive values in Table 7-21 indicate an excess of the *rating level* over the *background sound level* and negative levels indicate that the *rating level* is lower than the *background sound level*.

Table 7-21: BS 4142 Excess of Rating Over Background Sound Level

Location		*background sound level* L_{AF90}	*Specific sound level* L_{Aeq}	Rating level L_{Ar}	Excess of BS 4142 rating level over *background sound level*
Daytime					
Cefn-betingau	NSR1	40	35	38	-2
Maes-eglwys	NSR4	36	32	35	-1
Lletty Morfil Farm	NSR5	43	29	32	-11
Abergelli Farm	NSR6	40	34	37	-4
Night time					
Cefn-betingau	NSR1	34	35	38	4
Maes-eglwys	NSR4	35	32	35	0
Lletty Morfil Farm	NSR5	38	29	32	-6
Abergelli Farm	NSR6	36	34	37	1

7.7.34 The night-time WHO based assessment results for NSR1, NSR4, NSR5 and NSR6 are presented in Table 7-22.

Table 7-22: Changes to Ambient Sound Levels at Night

Location		Baseline ambient sound level (residual level) L_{Aeq}	Predicted Generation Equipment sound contribution (*specific sound level*) L_{Aeq}	Predicted total ambient sound level with proposed development L_{Aeq}
Cefn-betingau	NSR1	40	35	41
Maes-eglwys	NSR4	38	32	39
Lletty Morfil Farm	NSR5	40	29	40

Location		Baseline ambient sound level (residual level) L_{Aeq}	Predicted Generation Equipment sound contribution (*specific sound level*) L_{Aeq}	Predicted total ambient sound level with proposed development L_{Aeq}
Abergelli Farm	NSR6	39	34	40

7.7.35 In accordance with Table 7-12 (BS 4142), during the day the values in Table 7-21 produce very low impact magnitudes at all four NSRs for which representative data could be obtained. This would result in a negligible significance of effect using the scale in Table 7-14, which would therefore be considered to be not significant.

7.7.36 Examination of the locations of the proposed power plant, receptors and significant baseline sound sources indicates that the daytime conclusion of a very low impact would also apply to NSR2 and NSR3, for which baseline data could not be obtained. This would result in a **Negligible** significance of effect, which would therefore be considered to be not significant.

7.7.37 In accordance with Table 7-12 (BS 4142), during the night the values in Table 7-21 produce very low impact magnitudes at NSR4 and NSR5 and a low impact at NSR1 and NSR6. This would result in a **Negligible** significance of effect at NSR4 and NSR5 and a **Minor adverse** significance of effect at NSR1 and NSR6 using the scale in Table 7-14, which would therefore be considered not significant.

7.7.38 In accordance with Table 7-13 (WHO), the values in Table 7-22 produce low impact magnitudes at NSR4, NSR5 and NSR6. This would result in **Minor adverse** effect using the scale in Table 7-14, which is therefore considered not significant.

7.7.39 Based on the magnitude criteria in Table 7-13 the *ambient sound level* at NSR1 after inclusion of the Generation Equipment produces a medium impact magnitude and therefore a **Moderate significance** of effect due to the high pre-existing ambient levels at that location. However the addition of the Generating Equipment sound causes the ambient level at NSR1 to increase by only 1 dB. Such an increase would not be considered to be significant therefore the impact of the scheme on the sound environment is **Negligible.** The effect of the operation of the Generation Equipment is therefore not significant.

7.7.40 Examination of the locations of the proposed power plant, receptors and significant baseline sound sources indicates that the night time conclusions would also apply to NSR2 and NSR3, for which baseline data could not be obtained. This would result in a **Negligible** or **Minor adverse** significance of effect, which would therefore be considered not significant.

vi. Rochdale Envelope

7.7.41 The noise and vibration assessment has been undertaken with reference to the Rochdale Envelope (i.e. the maximum parameters for the Project and in particular its main buildings and structures). It is estimated that the potential variation in building locations and dimensions presented in **Chapter 3: Project and Site**

Description could result in a variation in predicted levels at the receptors of ± 1 dB at each location.

Table 7-23: Worst Case Predictions of Operational Noise Effects

Location		Day	Night
Cefn-betingau	NSR1	Negligible	Negligible
Felin Wen Farm*	NSR2	Negligible	Negligible
Llwynhelig*	NSR3	Negligible	Negligible
Maes-eglwys	NSR4	Negligible	Negligible
Lletty Morfil Farm	NSR5	Negligible	Negligible
Abergelli Farm	NSR6	Negligible	Negligible

** Based on the application of professional judgment to specific details of the site and the quantitative assessments at NSR1, NSR4, NSR5 and NSR6*

7.7.42 The assessment of operational effects is based on the Rochdale Envelope as defined in **Chapter 3: Project and Site Description**, which constrains the design parameters of each element of the Project. As for construction, in any event mitigation would be integrated into the detailed design, where necessary, in order to achieve the appropriate noise levels.

7.7.43 The qualitative construction noise assessment was based on the worst-case assumption of activities occurring at the closest part of the relevant part of the Project Site to each receptor for each phase of construction.

c) Decommissioning

7.7.44 At this stage no information is available on the techniques and programme necessary for decommissioning.

7.7.45 However it is considered that the location, duration and nature of the operations associated with decommissioning will be similar to those necessary for construction. Therefore it is considered that the worst case assessments presented for the construction would also apply to decommissioning.

7.8 Mitigation and Monitoring

7.8.1 As a general rule, additional mitigation measures have been proposed where a significant effect is predicted to occur. Embedded mitigation measures, which have been incorporated within the design of the Project or are standard practice measures that have been committed to are summarised in **Chapter 3: Project and Site Description.**

a) Construction

7.8.2 The qualitative assessment predicted that there is the potential for no more than minor adverse noise effects at residential NSRs during construction works. Therefore, no further specific mitigation or monitoring measures have been

identified at this stage. If work is required outside normal working hours, additional management, controls and mitigation may be required as controlled through the CEMP.

b) Operational Noise

7.8.3 The noise assessment has demonstrated that noise effects as a result of the operation of the Project are not significant, and therefore no further mitigation or monitoring is proposed.

7.9 Residual Effects

7.9.1 Tables 7-24 and 7-25 present a summary of effects from the noise and vibration assessment. The tables identifies the receptor/s likely to be impacted, the level of effect and, where the effect is deemed to be significant. The tables include the mitigation proposed and the resulting residual effect.

Table 7-24: Noise and Vibration Summary of Effects Arising during Construction Phase

Receptor	Description of Effect	Classification of effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
Project					
Cefn-betingau (NSR1)	Construction noise from the Project	Negligible during daytime and evening Minor during night time	None	Negligible/ Minor Adverse	Not significant
Felin Wen Farm (NSR2)	Construction noise from the Project	Negligible during daytime and evening Minor during night time	None	Negligible/ Minor Adverse	Not significant
Llwynhelig (NSR3)	Construction noise from the Project	Negligible during daytime and evening Minor during night time	None	Negligible/ Minor Adverse	Not significant
Maes-eglwys (NSR4)	Construction noise from the Project	Negligible during daytime and evening Minor during night time	None	Negligible/ Minor Adverse	Not significant
Lletty Morfil Farm (NSR5)	Construction noise from the Project	Negligible during daytime Minor during evening time Moderate during night time (electrical substation)	Works to be planned, managed and mitigated appropriately through the CEMP, so as not to exceed the SOAEL threshold values and reduce levels towards the LOAEL (or less) where practical	Negligible/ Minor Adverse	Not significant

Receptor	Description of Effect	Classification of effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
Abergelli Farm (NSR6)	Construction noise from the Project	Minor adverse during daytime Moderate adverse during evening Major adverse during Night time (for gas connection works)	Works to be planned, managed and mitigated appropriately through the CEMP, so as not to exceed the SOAEL threshold values and reduce levels towards the LOAEL (or less) where practical	Minor Adverse	Not significant

Table 7-25: Noise and Vibration Summary of Effects Arising during Operational Phase

Receptor	Description of Effect	Classification of Effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
Power Generation Plant					
Cefn-betingau (NSR1)	Operation of the Generation Equipment	Negligible	None	Negligible	Not significant
Felin Wen Farm (NSR2)	Operation of the Generation Equipment	Negligible	None	Negligible	Not significant
Llwynhelig (NSR3)	Operation of the Generation Equipment	Negligible	None	Negligible	Not significant
Maes-eglwys (NSR4)	Operation of the Generation Equipment	Negligible	None	Negligible	Not significant
Lletty Morfil Farm (NSR5)	Operation of the Generation Equipment	Negligible	None	Negligible	Not significant
Abergelli Farm (NSR6)	Operation of the Generation Equipment	Negligible	None	Negligible	Not significant

a) Project '"in combination" Effects

7.9.2 The predicted effects of the Project upon receptors to noise and vibration are limited to the power generation equipment (GT, ancillaries, cooling equipment, transformers etc.), Electrical Connection and Gas Connection and as such no significant effects are predicted from the Project.

7.10 Cumulative Effects

7.10.1 No receptors have been identified which could, potentially, experience cumulative effects generated by the construction, operational or decommissioning phases of the Project in combination with other schemes set out in **Chapter 4: Approach to Environmental Impact Assessment**.

7.11 References

Ref. 7.1 World Health Organization (1999) *Guidelines for Community Noise*

Ref. 7.2 World Health Organization (2009) *Night Noise Guidelines for Europe*

Ref. 7.3 International Standards Organization (1996) *ISO 9613-2 – Attenuation of Sound during Propagation Outdoors, Part 2: General Method of Calculation*

Ref. 7.4 International Standards Organization (2010) *ISO 4866:2010 – Vibration of Fixed Structures – Guidelines for the Measurement of Vibrations and Evaluation of Their Effects on Structures.*

Ref. 7.5 Her Majesty's Stationary Office (1990) *Environmental Protection Act 1990.*

Ref. 7.6 Her Majesty's Stationary Office (1974) *Control of Pollution Act 1974*.

Ref. 7.7 Her Majesty's Stationary Office (2016) *Environmental Permitting (England and Wales) Regulations 2016.*

Ref. 7.8 Environment Agency (2002a) *Integrated Pollution Prevention and Control (IPPC) H3 document Horizontal Guidance for Noise Part 2 - Noise assessment and Control.*

Ref. 7.9 Environment Agency (2002b) *Integrated Pollution Prevention and Control (IPPC) H3 document Horizontal Guidance for Noise Part 1 – Regulation and Permitting.*

Ref. 7.10 Department of Energy & Climate Change (2011) NPS EN-1 *Overarching National Policy Statement for Energy.*

Ref. 7.11 Noise Action Plan for Wales 2013-2018. Welsh Government.

Ref. 7.12 Planning Policy Wales (Edition 9 November 2016) Welsh Government

Ref. 7.13 Technical Advice Note (TAN) 11 Noise, Welsh Government 1997

Ref. 7.14 British Standards Institute (2014) *BS 8233 – Guidance on sound insulation and noise reduction for buildings*

Ref. 7.15 British Standards Institute (2014) *BS 4142 – Methods for rating and assessing industrial and commercial sound.*

Ref. 7.16 British Standards Institute (2014) *BS 5228-1:2009+A1:2014 – Code of practice for noise and vibration control on construction and open sites. Part 1: Noise.*

Ref. 7.17 British Standards Institute (2014) *BS 5228-2:2009+A1:2014 – 'Code of practice for Noise and Vibration control on construction and open sites. Part 2: Vibration.'*

Ref. 7.18 Department for Communities and Local Government (2012) *National Planning Policy Framework.*

Ref. 7.19 Department for Communities and Local Government (DCLG) (2014) *Planning Practice Guidance.*

Ref. 7.20 British Standards Institute (2003) *BS 7445-1 – Description and measurement of environmental noise. Guide to quantities and procedures.*

Ref. 7.21 British Standards Institute (1991) *BS 7445-2 – Description and measurement of environmental noise. Guide to the acquisition of data pertinent to land use.*

Ref. 7.22 British Standards Institute (2008) *BS 6472-1 – Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting.*

Ref. 7.23 British Standards Institute (1993) *BS 7385-2 – Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration.*

Ref. 7.24 Department of Transport/ Welsh Office (1998) *Calculation of Road Traffic Noise (CRTN).*

Ref. 7.25 Highways Agency (2011) *Design Manual for Road and Bridges Volume 11 Section 3 Part 7 HD213/11 (Revision 1) Traffic Noise and Vibration.*

Ref. 7.26 Swansea Urban Development Plan 2008

Ref. 7.27 Draft Swansea Local Development Plan 2010-2025 submitted 28 July 2017

Chapter 8

Ecology

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8. Ecology

8.1 Introduction

8.1.1 This chapter provides an assessment of the likely significant ecological effects arising from construction, operation, maintenance and decommissioning of the Project. Maintenance is included within the operational assessment of the Project.

8.1.2 A detailed description of the Project and Project Site is provided in **Chapter 3: Project and Site Description**. A glossary of terms and list of abbreviations used in this chapter is provided in **Document Reference 1.4**.

8.1.3 Potential effects on the valued ecological features are interrelated with effects from air quality, noise, water quality, landscape and lighting. This chapter should be read in conjunction with **Chapter 6: Air Quality**, **Chapter 7: Noise and Vibration**, **Chapter 9: Water Quality and Resources**, **Chapter 11: Landscape and Visual Effects** and **Chapter 17: Cumulative Impacts**.

8.1.4 Previous ecological surveys have been undertaken by BSG Ecology in 2014 and the baseline reports are contained within the Appendices referred to throughout this chapter. It should be noted that the current Project Site Boundary is now smaller than the site boundary used by BSG Ecology and Parsons Brinckerhoff. The current Project Site Boundary is fully within the previous site boundary and therefore the surveys previously undertaken have captured the current Project Site Boundary (Figure 8.1). A summary of the previous reports utilised in this assessment is contained within Section 8.4.

a) Objectives of the Assessment

8.1.5 The aims of the ecology assessment are to:

- Identify relevant ecological features (i.e. designated sites, habitats, species or ecosystems) which may be affected;
- Provide an objective and transparent assessment of the likely significant ecological effects and residual effects of the Project;
- Facilitate objective and transparent determination of the effects of the project in terms of national, regional and local policies relevant to nature conservation and biodiversity; and
- Set out what steps would be taken to adhere to legal requirements relating to the relevant ecological features concerned.

8.2 Changes since the 2014 PEIR

8.2.1 There have been changes to the design as a result of design evolution and consultation as detailed in **Chapter 3: Project and Site Description**. To aid the reader, Table 8-1 below outlines the changes to this assessment compared with the 2014 and 2018 PEIR.

Table 8.1: A summary of Changes since the 2014 and 2018 PEIR to the Ecology Assessment

Section	Changes since the 2014 and 2018 PEIR	Section Reference
Baseline	The following surveys have been completed since the 2014 PEIR: • Extended Phase 1 Habitat survey completed by AECOM in 2017; • Great crested newt (*Triturus cristatus*) survey completed by AECOM in 2017; • Reptile survey completed by AECOM in 2017; • Otter (*Lutra lutra*) and water vole (*Arvicola amphibius*) survey completed by AECOM in 2017; • Dormouse (*Muscardinus avellanarius*) survey completed by AECOM in 2017; • Badger (*Meles meles*) survey completed by AECOM in 2017; and, • Bat roost assessment and activity survey completed by AECOM in 2017. Survey works are ongoing for breeding birds and bat activity and will be completed by August 2018 and submitted by the time of DCO Examination. Since habitats and management within the Project Site Boundary have not changed significantly since the 2014 surveys, the 2017 results will be augmented with the results from previous surveys as follows. • Breeding bird surveys part-completed by AECOM in 2017, ongoing in February, April and May 2018 and to be augmented by breeding bird survey undertaken by BSG Ecology in 2014; and, • Bat activity surveys part-completed by AECOM in 2017, ongoing in 2018 and to be augmented by bat activity survey undertaken by BSG Ecology in 2014.	Section 8.5
Methodology	The methodology for bat surveys and assessment in 2014 paid due regard to Hundt, L. (2012) Bat Surveys: Good Practice Guidelines, 2nd Edition, Bat Conservation Trust. The methodology for bat surveys and assessment in 2017 paid due regard to Collins, J. (ed.) (2016). Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd ed.). The Bat Conservation Trust, London.	Table 8.6
	The methodology for the water vole survey in 2014 paid due regard to Strachan, R. &	

Section	Changes since the 2014 and 2018 PEIR	Section Reference
	Moorhouse, T. (2006) Water Vole Conservation Handbook 2nd Ed. WildCRU, Oxford. The methodology for the water vole survey in 2017 paid due regard to Dean, M.,Strachan, R., Gow, D. and Andres, R. (2016). The Water Vole Mitigation Handbook (The Mammal Society Mitigation Guidance Series). Eds Fiona Mathews and Paul Chanin. The Mammal Society, London.	
	All other survey methodology of the 2014 and 2017 surveys paid due regard to the same guidance.	
Assessment of Effects	The routing of the new section of Access Road (formerly described as "Option B") has been revised in order to avoid Ancient Woodland.	Section 8.7
Mitigation and Monitoring		Section 8.8
Significance of Residual Effects	Residual effects in the 2014 PEIR were assessed to be not significant for all receptors apart from Ancient Woodland where the loss of habitat was deemed to be significant at the Local level. Residual effects in the 2018 PEIR were assessed to be not significant for all receptors. Apart from the revision to the routing of the Access Road to avoid the Ancient Woodland, there has been no other change since the 2018 PEIR.	Section 8.9 Table 8.14 and Table 8.15

8.3 Legislation, Policy and Guidance

8.3.1 This section identifies and describes legislation, policy and guidance of relevance to the assessment of the likely significant ecological effects associated with the construction, operation, maintenance and decommissioning of the Project.

8.3.2 Legislation and policy has been considered on an international, national, regional and local level. The following is considered to be relevant to the ecological assessment as it has influenced the assessment of sensitivity of receptors and requirements for mitigation or the scope and/or methodology of the ES.

a) International and National Legislation

i. Designated Sites and Habitats

8.3.3 A variety of sites are designated in the UK, under Conventions, Directives and Regulations for their nature conservation importance and interest. The general aim of these designations is to conserve and protect ecological resources, as well as raising awareness and understanding. Other non-statutory sites are afforded some

protection through local plans. Table 8.2 outlines the most common statutory and non-statutory designations.

Table 8.2: Summary of relevant legislation with regards to designated sites

Designation	Brief Description
Special Areas of Conservation (SAC)	SACs are sites selected to conserve the natural habitat types and species of wild flora and fauna listed in the Annexes of the Habitats Directive (further information regarding the Habitats Directive is set out in more detail in Table 8.3 below). They are the best areas to represent the range and variety of habitats and species within the European Union (EU).
Special Protection Area (SPA)	SPAs are strictly protected sites for the most important habitats for rare and migratory birds within the EU classified in accordance with Article 4 of the Birds Directive information regarding the Birds Directive is set out in more detail in Table 8.3 below).
Ramsar Sites	Ramsar Sites are wetlands of international importance. Ramsar Sites are protected, through the planning system, under the Wildlife and Countryside Act 1981 (as amended), and the Countryside and Rights of Way Act 2000 through their notification as SSSIs and through other regulatory systems addressing water, soil and air quality.
National Nature Reserve (NNR)	NNRs are nationally important areas of wildlife habitat and geological formations in Britain. NNRs are designated and protected under the National Parks and Access to the Countryside Act 1949 and the Wildlife and Countryside Act 1981 (as amended). They receive additional protection under the Countryside and Rights of Way Act 2000. They are managed for the benefit of nature conservation.
Site of Special Scientific Interest (SSSI)	A SSSI is a site of at least national importance for nature conservation designated under the Wildlife and Countryside Act 1981 (as amended) due to its special interest in terms of flora, fauna or geological or physiographical features. Protection afforded to SSSI's was strengthened by the Countryside and Rights of Way Act 2000. It should be noted that under the Countryside and Rights of Way Act 2000 owners of SSSIs must give Natural Resources Wales (NRW) written notice before they begin any of the operations listed in the notification as likely to damage the special interest features, or if they allow others to carry out these activities. None of the listed operations can be carried out without NRW's consent.
County Wildlife Site (Local site)	A County Wildlife Site is a non-statutory site designated by a local authority as being of local nature conservation value.
Ancient Woodland Inventory	Ancient Woodland is a term applied to woodlands which have existed from at least Medieval times to the present without ever having been cleared for uses other than wood or timber production. A convenient date used to separate ancient and secondary woodland is about the year 1600. In special circumstances semi-natural woods of post-1600 but pre-1900 origin are also included.
Wildlife Trust Reserve	These non-statutory sites are managed by the Wildlife Trusts with the purpose of conserving wildlife.

ii. Species

8.3.4 In addition to habitats, a number of species have been afforded protection through international/European and national law. Other species are considered to contribute to our 'quality of life'. Although these species do not benefit from legal protection, they can be material considerations in the planning process. The Countryside and Rights of Way Act 2000, the Wildlife and Countryside Act 1981 (as amended), the Protection of Badgers Act 1992 and the Conservation of Habitats and Species Regulations 2017 are the main legislative framework for protection of wild animals in the UK. Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) covers birds which are protected by special penalties, Schedule 5 covers other animals which are protected and Schedule 8 covers plants which are protected.

8.3.5 Species including bats, otters and great crested newts are listed under Schedule 2 of the Conservation of Habitats and Species Regulations 2017. Badgers are protected under their own Act: The Protection of Badgers Act 1992. Activities affecting protected species must usually be conducted under licence obtained from the appropriate body (in Wales, this is Natural Resources Wales).

8.3.6 Developers must be able to show that all reasonable measures have been taken to ensure that protected species are not subject to disturbance. The habitats which regularly support the Conservation of Habitats and Species Regulations 2017Schedule 2 species, the Wildlife and Countryside Act 1981 (as amended) Schedule 1 species and some Wildlife and Countryside Act 1981 (as amended) Schedule 5 species are also protected from disturbance and destruction. Again, all reasonable precautions should be taken to ensure that this does not happen. The Countryside and Rights of Way Act 2000 has strengthened enforcement powers and introduced a new offence of "reckless disturbance" that applies to both protected sites and species. Table 8.3 below provides a summary of the relevant legislation with regards to protected and priority species.

Table 8.3: Summary of relevant legislation with regards to protected and priority species

Legislation	Brief Description
The Habitats Directive	The Habitats Directive 1992 (Directive 92/43/EEC) sets out the legal framework requiring EU member states to protect habitat sites supporting vulnerable and protected species, as listed within the Directive. The need for an assessment of impacts on Natura 2000 sites (the collective name for European designated sites, including SPAs and SACs) is set out within Article 6 of the Directive. The Directive is transposed into UK law through the Conservation of Habitats and Species Regulations 2017 (the "Habitats Regulations") and the Wildlife & Countryside Act 1981 (as amended).
The Birds Directive	The Directive on the Conservation of Wild Birds (Directive 2009/147/EC (the codified version of Council Directive 79/409/EEC as amended)) provides a framework for the protection, management and control of all species of naturally

Legislation	Brief Description
	occurring wild birds in the European territory of Member States, including the UK. The provisions of the Birds Directive are transposed into UK law by the Conservation of Habitats and Species Regulations, 2017 and the Wildlife & Countryside Act 1981 (as amended).
Wildlife and Countryside Act (1981) (as amended)	The Wildlife and Countryside Act 1981 (as amended) is the principal mechanism for the legislative protection of wildlife in Great Britain. This legislation is the means by which the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) and (partially) the Birds Directive and the Habitats Directive are implemented in the UK. The Countryside and Rights of Way Act 2000 has strengthened this legal protection (see below). A small number of plant species are listed under Schedule 9 of the Wildlife and Countryside Act 1981, as amended, which includes species such as Japanese knotweed (*Fallopia japonica*), Himalayan balsam (*Impatiens glandulifera*), montbretia (*Crocosmia x crocosmiiflora*), giant hogweed (*Heracleum mantegazzianum*) and some cotoneaster species (Cotoneaster sp.). It is illegal to plant or to cause these plants to grow in the wild, and legal disposal methods for vegetation and soil subject to disturbance or clearance from a site must be used.
The Natural Environment and Rural Communities Act 2006 (the NERC Act)	The Natural Environment and Rural Communities Act (NERC Act) provides that any public body or statutory undertaker in England and Wales must have regard to the purpose of conservation of biological diversity in the exercise of their functions. The intention is to help ensure that biodiversity becomes an integral consideration in the development of policies and plans.
Convention on Biological Diversity and the Countryside and Rights of Way Act 2000	The Countryside and Rights of Way Act 2000 provides a statutory framework for biodiversity conservation. The Act places a duty on Government Departments and the National Assembly for Wales to have regard for the conservation of biodiversity and maintain lists of species and habitats for which conservation steps should be taken or promoted, in accordance with the Convention on Biological Diversity. Schedule 9 of the Act amends SSSI provisions of the Wildlife and Countryside Act 1981, including provisions to change SSSIs and providing increased powers for their protection and management. The provisions extend powers for entering into management agreements; place a duty on public bodies to further the conservation and enhancement of SSSIs; increases penalties on conviction where the provisions are breached; and introduce a new offence whereby third parties can be convicted for damaging SSSIs. Schedule 12 of the Act amends the species provisions of the Wildlife and Countryside Act 1981, strengthening the legal

Legislation	Brief Description
	protection for threatened species. The provisions make certain offences 'arrestable' and create a new offence of reckless disturbance. The UK Biodiversity Action Plan (BAP) was published in 1994, and was the UK Government's response to the Convention on Biological Diversity (CBD), which the UK signed up to in 1992. It provides the framework for fulfilling the UK's responsibilities towards the Convention on Biological Diversity. Conservation of biodiversity (the variety of life on earth) is an essential element of sustainable development.
Environment (Wales) Act 2016	The Environment (Wales) Act puts in place the legislation needed to plan and manage Wales' natural resources in a more proactive, sustainable and joined-up way. Part 1 relates to the sustainable management of natural resources. This ensures that the way in which the use of and the impacts on natural resources do not result in long term decline. The aim is to sustainably manage natural resources in a way and rate that meets the needs of present and current generations without compromising the needs of future generations. The Act also contains at section 7, a duty for the Welsh Ministers to prepare and publish a list of the living organisms and types of habitat which in their opinion are of principal importance for the purpose of maintaining and enhancing biodiversity in relation to Wales. This section replaces the duty in section 42 of the NERC Act 2006.
Protection of Badgers Act 1992	The Protection of Badgers Act 1992 makes it an offence to wilfully take, kill, injure or ill-treat a badger, possess a dead badger or any part of a badger. Sett interference includes damaging or destroying a sett, obstructing access to a sett, and disturbing a badger whilst it is occupying a sett. The Act defines a badger sett as 'any structure or place, which displays signs indicating the current use by a badger' and Natural England takes this definition to include seasonally used setts. Work that may disturb badgers or their setts is illegal without a development licence from the relevant statutory body (in this case Natural Resources Wales).
The Hedgerow Regulations 1997	The Hedgerow Regulations (1997) make provision for the protection of important hedgerows in England and Wales. The regulations affect hedgerows which are 20m or more in length, or connected at both ends to another hedgerow of any length. They relate to hedgerows which are on, or adjoining land used for the following purposes: agriculture or forestry; the breeding or keeping of horses, ponies or donkeys; common land; village greens; and SSSIs (They do not include hedges that are attached to, or marking the boundaries of a private house. It is an offence to intentionally or recklessly remove or cause or permit another person to remove a hedgerow or intentionally or recklessly remove, or cause or permit another person to

Legislation	Brief Description
	remove, a hedgerow which is the subject of a hedgerow retention notice.

b) National Planning Policy

i. National Policy Statements

National Planning Policy Statement for Energy EN-1

8.3.7 Section 5.3 of the Overarching National Policy Statement for Energy (EN-1) (July 2011) (Ref. 8.1) contains policies relating to biodiversity and geological conservation; in this chapter only biodiversity will be considered.

8.3.8 Section 4.3 of EN-1 refers to the requirement to consider whether a project is likely to have a significant effect on a European site either alone or in combination with other plans or projects. EN-1 requires the EIA for an NSIP to clearly set out "any effects on internationally, nationally and locally designated sites of ecological importance, on protected species and on habitats and other species identified as being of principal importance for the conservation of biodiversity".

8.3.9 The NPS sets out policies in relation to each of the following types of designated sites of relevance to the Project:

- International sites (Ramsar, SAC, SPA (including proposed sites);
- SSSIs;
- Marine Conservation Zones;
- Regional and local sites (e.g. Local Nature Reserves (LNR));
- Ancient Woodland and veteran trees;
- Biodiversity within developments; and,
- Protection of habitats and other species (i.e. species and habitats of principle importance nationally, or species and habitats of regional importance.

International sites

8.3.10 Section 5.3.9 of EN-1 identifies Ramsar sites as the most important sites for biodiversity. Section 5.5.9 states that the applicant should be particularly careful to identify any effects of physical changes on the integrity and special features of Marine Conservation Zones, candidate SACs, coastal SACs and candidate coastal SACs, coastal SPAs and potential coastal SPAs, Ramsar sites, Sites of Community Importance (SCIs) and potential SCIs and Sites of Special Scientific Interest.

Regional and local sites

8.3.11 Regional and local sites are covered under section 5.3.13 of EN-1 which acknowledges the importance of such sites and that the Secretary of State should give due consideration to such regional or local designations. However, it goes on to state that given the need for new infrastructure, these designations should not be used in themselves to refuse development consent.

Ancient Woodland and veteran trees

8.3.12 Section 5.3.14 of EN-1 sets out that Ancient Woodland is a valuable biodiversity resource both for its diversity of species and for its longevity as woodland. It states that the Secretary of State should not grant development consent for any development that would result in its loss or deterioration unless the benefits (including need) of the development, in that location outweigh the loss of the woodland habitat.

Biodiversity within developments

8.3.13 Section 5.3.15 of EN-1 states that development proposals provide many opportunities for building-in beneficial biodiversity or geological features as part of good design. When considering proposals, the Secretary of State should maximise such opportunities in and around developments, using requirements or planning obligations where appropriate.

Protection of habitats and other species

8.3.14 Section 5.3.17 of EN-1 sets out that other species and habitats have been identified as being of principal importance for the conservation of biodiversity in England and Wales and thereby requiring conservation action. The Secretary of State should ensure that these species and habitats are protected from the adverse effects of development by using requirements or planning obligations. The Secretary of State should refuse consent where harm to the habitats or species and their habitats would result, unless the benefits (including need) of the development outweigh that harm. In this context the Secretary of State should give substantial weight to any such harm to the detriment of biodiversity features of national or regional importance which it considers may result from a proposed development.

Mitigation

8.3.15 The NPS also requires the applicant to demonstrate that its proposals include appropriate mitigation measures such as: habitats will, where practicable, be restored after construction works have finished; and opportunities will be taken to enhance existing habitats and, where practicable, to create new habitats of value within the site landscaping.

8.3.16 Where the applicant cannot demonstrate that appropriate mitigation measures will be put in place the Secretary of State should consider what appropriate requirements should be attached to any consent and/or planning obligations entered into. The Secretary of State will need to take account of what mitigation measures may have been agreed.

ii. Planning Policy Wales (9th Ed. November 2016)

8.3.17 Planning Policy Wales (PPW) sets out the land use planning policies of Welsh Government.

8.3.18 **Chapter 5: Alternatives Considered**, Conserving and Improving the Natural Heritage and the Coast, outlines Welsh Government's objectives for the

conservation and improvement of natural heritage. The relevant measures in place to conserve landscape and biodiversity include:

- Statutory designations;
- Non-statutory designations;
- LANDMAP Information System (LANDMAP describes and evaluates aspects of the landscape and provides the basis of a consistent Wales-wide approach to landscape assessment);
- Development plans and the conservation and improvement of the natural heritage;
- Development management and the conservation and improvement of the natural heritage;
- Development management and statutory designations;
- Trees and woods; and,
- Protected species.

8.3.19 Paragraph 5.3.10 states that "potential SPAs and candidate SACs (included in the list sent to the European Commission) should be treated in the same way as classified SPAs and designated SACs. Sites which the UK and the European Commission have agreed as Sites of Community Importance and which are to be designated as SACs attract the same legal protection as if they had already been designated. The same considerations should, as a matter of policy, be applied to listed Ramsar sites".

8.3.20 Paragraph 5.2.9 states that "Local planning authorities should seek to protect trees, groups of trees and areas of woodland where they have natural heritage value or contribute to the character or amenity of a particular locality. Ancient and semi-natural woodlands are irreplaceable habitats of high biodiversity value which should be protected from development that would result in significant damage."

8.3.21 Paragraph 5.5.4 states that "For all planning applications likely to result in disturbance or harm to a protected species or likely to have a significant adverse effect on sites of more than local importance, or on a designated area, local planning authorities should seek the advice of Natural Resources Wales and should always consult them before granting permission".

iii. Technical Advice Note 5 (TAN5) Nature Conservation and Planning (September 2009)

8.3.22 The Planning Policy Wales (PPW) is supplemented by a series of Technical Advice Notes. TAN 5 provides guidance on how the land use planning system should contribute to protecting and enhancing biodiversity and geological conservation. It provides advice on areas including the key principles of positive planning for nature conservation, nature conservation in Local Development Plans and development management procedures. It also provides advice on development affecting designated sites and habitats, in addition to protected or priority habitats and species.

8.3.23 Key Principles include that the town and country planning system in Wales should integrate nature conservation into all planning decisions; that the town and country

planning system should look for development to provide a net benefit for biodiversity conservation with no significant loss of habitats or populations of species, locally or nationally and that they should ensure that the UK's international and national obligations for site, species and habitat protection are fully met in all planning decisions.

c) Local Development Plans

8.3.24 Local Development Plans (LDPs) must be produced by every Local Planning Authority in Wales. Any development proposal will be tested against the policies within the LDP. The LDPs follow the planning guidance provide in PPW, including biodiversity and natural heritage policies. These include protecting designated sites and other areas of importance for biodiversity conservation; safeguarding protected species and priority species, including those listed in local biodiversity action plans and retaining, creating and enhancing features of importance for biodiversity conservation where appropriate.

8.3.25 Relevant local planning policies for CCS are detailed in the adopted City and County of Swansea Unitary Development Plan.

8.3.26 Table 8-4 provides a summary of relevant local planning policies set out in the City and County of Swansea Unitary Development Plan. For the precise wording of each specific policy please refer back to the source document.

Table 8.4: Summary of relevant Unitary Development Plan policies

Planning Policy	Purpose / Relevant Sections
SP1 Creating a Quality Environment	Sustainable development will be pursued as an integral principle of the planning and development process. Development proposals designed to a high quality and standard, which enhance townscape, landscape, sense of place, and strengthen Swansea Waterfront identity, will be favoured.
SP2 - Creating a Quality Environment	The countryside will be protected and conserved, with green wedges shaping the urban form and safeguarding the distinctive interplay of town and country. Village character will be protected.
SP3 - Creating a Quality Environment	The natural, built, and cultural heritage of the County will be protected and enhanced to safeguard from materially harmful development.
Siting and Location - EV2	The siting of new development should give preference to the use of previously developed land over greenfield sites, and must have regard to the physical character and topography of the site and its surroundings by: i. Avoiding locations that would have a significant adverse impact on prominent buildings, landscapes, open spaces and the general locality, including loss of visual amenity, ii. Effectively integrating with the landscape, seascape or coastline by utilising topography to integrate into the contours of the site and avoiding conspicuous locations on prominent skylines and ridges,

Planning Policy	Purpose / Relevant Sections
	iii. Retaining important views into and out of the site, iv. Taking into account and where possible retaining site features including existing buildings, topography, landscape, archaeological and water features, trees and hedgerows, and, where appropriate: v. Undertaking, at the earliest opportunity, an assessment of species and habitats on site and, where planning permission is granted, implementing any necessary mitigation measures, ix. Determining whether the proposal would be at risk from flooding, increase flood risk off-site, or create additional water run-off, xiii. Having full regard to existing adjacent developments and the possible impact of environmental pollution from those developments, as well as the creation of any environmental pollution to the detriment of neighbouring occupiers (including light, air and noise).
Rural Development - EV21	In the countryside non-residential development will only be permitted where it can be demonstrated that: iii. It is an appropriate development associated with farm diversification, sustainable tourism and recreation, or nature conservation and does not adversely affect the viability of an established farm unit.
Rural Development - EV22	The countryside throughout the County will be conserved and enhanced for the sake of its natural heritage, natural resources, historic and cultural environment and agricultural and recreational value through: i. The control of development, and ii. Practical management and improvement measures.
Sites of International Importance - EV25	Development, alone or in combination with other plans or projects, which is likely to adversely affect the integrity of a European protected site (SAC, Marine SAC, SPA and Ramsar Sites) and is not directly connected with or necessary to the management of the site, will not be permitted unless: i. There are imperative reasons of over-riding public interest, including those of a social or economic nature, which are sufficient to override the reasons for designation, and ii. There is no alternative solution. Where such development is permitted, planning conditions and/or obligations will be used to secure all compensatory measures necessary to ensure that the overall coherence of the European Site is protected.
SSSIs and National Nature Reserves - EV27	Development that significantly adversely affects the special interests of sites designated as SSSIs and NNRs will not be permitted unless the need for the development is of such significance that it outweighs the national importance of the designation. Where development is permitted, planning conditions and/or obligations will be used to protect and enhance those interests and

Planning Policy	Purpose / Relevant Sections
	where necessary provide effective mitigation and compensatory measures.
Sites of Local Importance - EV28	Within locally designated areas the natural heritage will be preserved and enhanced wherever possible. Development that would significantly adversely affect the special interest of Local Nature Reserves will not be permitted unless the need for the development is of such significance that it outweighs the importance of the designation. Development that would significantly adversely affect SINCs or RIGs, or which would not provide for appropriate compensatory or mitigation measures will not be permitted, unless it can be demonstrated to meet appropriate social or economic needs where the benefits in such terms would outweigh the harm to the feature concerned. Where development is permitted which would damage the nature conservation value of the site, such damage will be kept to a minimum, and appropriate mitigation or compensatory measures sought.
Trees, Woodland and Hedgerow Protection - EV30	Protection and improved management of woodlands, trees and hedgerows which are important for their visual amenity, historic environment, natural heritage, and/or recreation value will be encouraged, with priority being given to: i. Protecting the remaining areas of ancient semi natural woodland and planted ancient woodland sites, ii. Promoting new planting with species appropriate to the location, where there is no conflict with other land uses or nature conservation interests, and iii. Ensuring that where management involves commercial felling and replanting, protection of amenity interests is achieved.
Environmental Enhancement - EV32	Environmental improvement schemes will be implemented at a number of locations shown on the Proposals Map. These are intended to: i. Improve visual appearance, natural heritage value and recreation potential, ii. Improve the setting of industrial, commercial and residential developments and transport corridors, and iii. Maintain, extend and improve the quality of the urban greenspace network in line with the aims of the 'Greening the City' strategy
Protection of Controlled Waters - EV34	Development proposals that may impact upon the water environment will only be permitted where it can be demonstrated that they would not pose a significant risk to the quality and or quantity of controlled waters. Initiatives that lead to improvements in the quality of surface water will be approved subject to satisfactory ecological and visual safeguards.

Planning Policy	Purpose / Relevant Sections
Protection of Controlled Waters - EV35	Development that would have an adverse impact on the water environment due to: i. Additional surface water run off leading to a significant risk of flooding on site or an increase in flood risk elsewhere, and/or ii. A reduction in the quality of surface water run-off, will only be permitted where it can be demonstrated that appropriate alleviating measures can be implemented. Sustainable drainage systems (SUDS) will be encouraged wherever they would be effective and practicable, so as to ensure that development does not increase run off, and potentially damage important landscape features and protected species and habitats. Where SUDS are not provided then any conventional drainage system utilised must improve the status quo.
Air, Noise and Light Pollution EV40	Development proposals will not be permitted that would cause or result in significant harm to health, local amenity, natural heritage, the historic environment or landscape character because of significant levels of air, noise or light pollution.

8.3.27 CCS has also submitted the Swansea Local Development Plan 2010 – 2025 to the Secretary of State for Examination in public. This is an emerging development plan, and is not part of the statutory development plan. However, its policies are a material consideration and relevant policies are set out below.

8.3.28 Table 8.5 provides a summary of relevant local planning policies set out in the Swansea Local Development Plan 2010 – 2025. For the precise wording of each specific policy please refer back to the source document.

Table 8.5: Summary of relevant local planning policies in the emerging Swansea Local Development Plan 2010-2025

Planning Policy	Purpose / Relevant Sections
ER 1 Climate Change	To mitigate against the effects of climate change, adapt to its impacts, and to ensure resilience, development proposals should take into account: i. Reducing carbon emissions; ii. Protecting and increasing carbon sinks; iii. Adapting to the implications of climate change at both a strategic and detailed design level; iv. Promoting energy and resource efficiency and increasing the supply of renewable and low carbon energy; v. Avoiding unnecessary flood risk by assessing the implications of development proposals within areas susceptible to flooding and preventing development that unacceptably increases risk; and, vi. Maintaining ecological resilience.
ER 2 Strategic Green	Development will be required to maintain or enhance the extent,

Planning Policy	Purpose / Relevant Sections
Infrastructure Network	quality and connectivity of the County's multi-functional green infrastructure network, and where appropriate: i. Create new interconnected areas of green infrastructure between the proposed site and the existing strategic network; ii. Fill gaps in the existing network to improve connectivity; and/or, iii. In instances where loss of green infrastructure is unavoidable, provide mitigation and compensation for the lost assets.
ER 6 Designated Sites of Importance for Nature Conservation	Development will not be permitted that would result in a likely significant adverse effect to sites of international or national nature conservation importance. Development that would affect locally designated sites of nature conservation importance should maintain or enhance the nature conservation interest of the site. Where this cannot be achieved development will only be permitted where it can be demonstrated that: i. The need for the development outweighs the need to protect the site for nature conservation purposes; ii. There is no satisfactory alternative location for the development that avoids nature conservation impacts; and, iii. Any unacceptable harm is kept to a minimum by effective avoidance measures and mitigation, or where this is not feasible compensatory measures must be put in place to ensure that there is no overall reduction in the nature conservation value of the area.
ER 8 Habitats and Species	Development proposals that would have a significant adverse effect on the continued viability of habitats and species, including those identified as priorities in the UK or Swansea Local Biodiversity Action Plan, will only be permitted where: i. The need for development outweighs the nature conservation importance of the site; ii. The developer demonstrates that there is no satisfactory alternative location for the development which avoids nature conservation impacts; iii. Effective mitigation measures are provided by the developer; And, iv. Any unavoidable harm is minimised by effective mitigation to ensure that there is no reduction in the overall nature conservation value of the area. Where this is not feasible, compensation measures designed to conserve, enhance, manage and, where appropriate, restore natural habitats and species must be provided.
ER 9 Ecological Networks and Features of Importance for Biodiversity	Development proposals will be expected to maintain, protect and enhance ecological networks and features of importance for biodiversity. Particular importance will be given to maintaining and enhancing the connectivity of ecological networks which enable the dispersal and functioning of protected and priority

Planning Policy	Purpose / Relevant Sections
	species. Development proposals that could result in a significant adverse effect on the connectivity of ecological networks and features of importance for biodiversity will only be permitted where: i. The need for the development outweighs the nature conservation value of the site; ii. It can be demonstrated that there is no satisfactory alternative location for the 102 PPW sections 5.5.11 – 5.5.12 and TAN 6 Nature Conservation and Planning (2009) Chapter 6 development; iii. A connected element of the natural resource is retained as part of the design of the development; and, iv. Compensatory provision will be made of comparable ecological value to that lost as a result of the development.
ER 11 Trees and Development	Development that would adversely affect trees, woodlands and hedgerows of public amenity, natural/cultural heritage value, or that provide important ecosystem services will not normally be permitted. Ancient Woodland, Ancient Woodland Sites, Ancient and Veteran trees merit specific protection and development will not normally be permitted that would result in: i. Fragmentation or loss of Ancient Woodland; ii. The loss of an Ancient or Veteran tree; iii. Ground damage, loss of understorey or ground disturbance to an area of Ancient Woodland or Ancient or Veteran Tree's root protection area; iv. A reduction in the area of other semi natural habitats adjoining Ancient Woodland; v. Significant alteration to the land use adjoining the Ancient Woodland; vi. An increase in the likely exposure of Ancient Woodland, Ancient or Veteran Tree to air, water or light pollution from the surrounding area; vii. Alteration of the hydrology in a way that might impact on Ancient Woodland, Ancient or Veteran Trees; viii. Destruction of important connecting habitats relating to Ancient Woodland; ix. Degradation of important archaeological or historical features within Ancient Woodland or associated with Ancient or Veteran trees; x. Destruction of Plantations on Ancient Woodland Sites (PAWS); and/or, xi. Development within 15m of Ancient Woodland.

8.4 Methodology

a) Scope of the Assessment

8.4.1 The scope of this assessment has been determined through a formal Environmental Impact Assessment (EIA) scoping process. The Secretary of State (SoS) issued a scoping opinion in August 2014. Comments raised in the EIA Scoping Opinion and other consultations have been taken into account in the development of the assessment methodology and these are detailed where relevant in this chapter.

i. Desk-Based Study

8.4.2 The objectives of the desk study are to review the existing information available in the public domain concerning species and habitats to identify the following:

- Internationally, nationally and locally designated sites, up to 2 km from the Project Site Boundary using the Multi Agency Geographic Information for the Countryside (MAGIC) website (www.magic.gov.uk) in accordance with published guidelines (Figure 8.3) (Ref. 8.2);
- Natura 2000 sites, up to 10 km from the Project Site Boundary (Figure 8.2) (see Table 8.7 for justification on search distances);
- Protected and Priority species records and records of locally designated sites up to 2 km from the Project Site Boundary, using the South East Wales Biodiversity Records Centre (SEWBReC) in accordance with published guidelines (Ref. 8.2);
- SACs and SSSIs designated for bats within a 10 km radius of the Project Site Boundary in accordance with Bat Conservation Trust (Ref. 8.3) recommendations;
- Section 7 list of Species and Habitats of Principal Importance for Conservation of Biological Diversity in Wales;
- Ancient Semi-Natural Woodland (ASNW), Plantation on Ancient Woodland Site (PAWS), Restored Ancient Woodland Site (RAWS) or Ancient Woodland Site of Unknown category (AWSU) within or adjacent to the Project Site Boundary using Ancient Woodland Inventory 2011 dataset downloaded from the Lle website;
- Tree Protection Orders (TPO's) from CCS;
- Local/county recorders for bryophytes, flora, moths, butterflies, amphibians, reptiles, birds, bats, mammals, and the County Ecologist were contacted for local records or knowledge about the Project Site; and,
- Aerial photographs and Ordnance Survey (OS) maps were reviewed to identify features of ecological interest surrounding the Project Site Boundary including ponds within 500 m, nearby areas of ecological interest and features connecting these habitats (hedgerows, watercourses, railway lines).

ii. Field Survey Methods

8.4.3 A Preliminary Ecological Appraisal (PEA) (Ref. 8.4) was undertaken in May 2017. Included within the PEA were a Phase 1 Habitat survey and an appraisal of the potential of the Project Site to support protected or notable species. The results of this survey combined with the desk top assessment informed the need for further ecological surveys.

8.4.4 Table 8.6 provides a summary of the surveys undertaken, coupled with their extent and limitations. The species scoped in were determined through an assessment of known range, habitat preferences and desk-based data. The detailed methodologies are outlined in each of the respective baseline technical appendices (Appendix 8.1 – 8.11). The table explains where data from the ecology surveys undertaken by BSG Ecology in 2014 will be used to inform the assessment and why this is considered to be appropriate and identifies limitations on the survey data obtained by AECOM in 2017.

Table 8.6: A Summary of Field Surveys and their Limitations

Survey Type	Description	Date(s)	Appendix and Limitations	Comments
Phase 1 Habitat survey	The survey involved a site walkover of all accessible land within the Project Site Boundary and preliminary assessment of key habitats, land use and ecological features. The main habitats present were recorded using standard Phase 1 Habitat Survey methodology as described in the Handbook for Phase 1 Habitat Survey: A technique for Environmental Audit (Ref. 8.6). The plant species defining the habitat types within the Project Site Boundary were recorded. Evidence of any invasive plant species subject to legal controls was recorded. The Project Site was assessed for its potential to support protected or notable species in order to identify potential ecological constraints and to guide recommendations for further surveys.	May 2017	**Appendix 8.1** There were no significant limitations associated with the Phase 1 Habitat Survey. During the Phase 1 Habitat survey some areas adjacent to but outside of the Project Site Boundary were not accessible at the time of survey and as such these habitats were surveyed from the road at a distance and some areas within the Project Site Boundary were not accessible due to the presence of horses; these habitats were surveyed at a distance. It is possible that evidence of some species, including invasive non-native plant species may not have been recorded due to access limitations.	Site conditions not significantly different to those in 2014.
National Vegetation Classification (NVC) survey	BSG Ecology used the Phase 1 Habitat survey to identify Section 42 habitats of the NERC Act 2006 (now Section 7 habitats of the Environment (Wales) Act 2016); these habitats plus any designated site habitats within the Project Site Boundary were selected for inclusion in the NVC survey.	June, July, September and November 2014	**Appendix 8.2** There were no significant limitations associated with the NVC survey.	Site conditions as documented in the Phase 1 Habitat Survey undertaken by AECOM were not significantly different to those recorded in 2014 and as such the 2014 NVC survey results provide an accurate representation of the habitats currently present within the Project Site Boundary; there is no requirement for an updated NVC.
Invasive species	A dedicated survey for invasive species was undertaken by BSG Ecology in 2014. Invasive species were recorded during the 2017 Phase 1 survey.	July 2014 & May 2017	**Appendix 8.1** The scale of the Project Site and the presence of dense areas of scrub or woodland understorey in some areas mean that it is possible that small stands or individual plants of invasive species could have been missed during the walkover survey. In addition, the presence of horses in some fields restricted access to some areas of the Project Site although these areas were assessed using binoculars and it is likely, given the heavily grazed nature of these fields, that most invasive plant species would have been visible using binoculars. It is considered that the majority of the Project Site was surveyed adequately and that overall the distribution of invasive species across the Survey Site has been mapped accurately.	Site conditions when visited in 2017 were not significantly different to those recorded in 2014. An update to survey will be required prior to the production of the final management plan and/or implementation of control measures.
Invertebrates	BSG Ecology conducted invertebrate surveys for moths, marsh fritillary (adult and larval stages), terrestrial beetles, and aquatic macroinvertebrates in ponds and watercourses.	June – September 2014	**Appendix 8.3** There were no significant limitations associated with the invertebrate survey.	Site conditions as documented in the Phase 1 Habitat Survey undertaken by AECOM were not significantly different to those recorded in 2014 and as such the 2014 invertebrate survey results provide an accurate representation of the species likely to be present within the Project Site Boundary; this is no requirement for an updated invertebrate survey.

<table>
<tr><th>Survey Type</th><th>Description</th><th>Date(s)</th><th>Appendix and Limitations</th><th>Comments</th></tr>
<tr>
<td>Great crested newt</td>
<td>A total of 26 ponds were identified within proximity of the Project Site.

An HSI Assessment was undertaken on all ponds within 500m of the Site and ponds outside of the 500m but clustered with ponds within the 500m of the Project Site Boundary.

Following the HSI Assessment, of the 26 ponds identified, two were classed as poor (a further survey was undertaken on one of these) nine were dry and seven were not accessible and therefore could not be surveyed either due to no land access agreement or dense vegetation restricting access.

Manual surveys were based on English Nature ‘Great Crested Newt Mitigation Guidelines’ (2001) (Ref. 8.7), using three methods where possible.</td>
<td>May – June 2017</td>
<td>Appendix 8.4
Of the 26 ponds identified, seven were surveyed due to land access restrictions and dense vegetation. It is considered unlikely for these ponds to support great crested newt (GCN) given the lack of GCN records from the local records centre and the absence of GCN identified in other ponds during the surveys.
A summary of the manual survey and environmental DNA (eDNA) analysis limitations is given in the embedded table below.
<table>
<tr><th>Pond Number</th><th>Manual Survey Limitation</th><th>eDNA Survey Limitation</th></tr>
<tr><td>1b</td><td>Not possible to bottle trap or net due to deep and soft mud surrounding the waterbody.
Torched only from limited accessible areas.</td><td>Only 5% of pond perimeter accessible to sample.</td></tr>
<tr><td>4</td><td>Not possible to bottle trap or net due to deep and soft mud surrounding the waterbody.
Torched only from limited accessible areas.</td><td>Only 5% of pond perimeter accessible to sample.</td></tr>
<tr><td>7</td><td>A dead water shrew (Neomys fodiens) was found in one of the bottle traps during the first survey visit in Pond 7, therefore bottle trapping ceased for Pond 7 and the netting technique was used for future surveys.</td><td>None</td></tr>
<tr><td>8</td><td>A dead water shrew was found in one of the bottle traps during the first survey visit in Pond 7. Due to the proximity of Pond 8 to Pond 7 and the risk of trapping water shrews, bottle trapping ceased for Pond 8 and the netting technique was used for future surveys.</td><td>None</td></tr>
<tr><td>11</td><td>Only approximately 5% of edge is accessible. Low water level and steep sides, not suitable for bottle trapping and dense vegetation will restrict torching.
Small area was torched on 1st survey visit but ineffective. No further manual surveys were undertaken.</td><td>Only 5% of pond perimeter accessible to sample.</td></tr>
</table>
</td>
<td>Ponds 1b and 4 are within a cluster of ponds to the north west of the Project Site. No evidence of GCN was identified for other ponds within this cluster of ponds and therefore the manual survey limitation is not significant.
Pond 11 has previously been surveyed and no evidence of GCN was found Appendix 8.17). Therefore, the manual survey limitation is not significant.
Pond 19b is connected to Pond 19a. Pond 19a was assessed to be poor as part of the HSI assessment. However, due to the limitation to the surveys on Pond 19b, manual surveys and an eDNA survey was undertaken on Pond 19a. No evidence of GCN was returned for Pond 19a and therefore the manual survey limitation on Pond 19b is not significant.
Usually a GCN eDNA water sample which has been taken from such a restricted area reduces the confidence in any negative result returned as GCN eDNA can be patchy depending upon where the animals have been in the pond. However, on this occasion, given the lack of evidence of GCN within other ponds in close proximity of Ponds 1b, 4 and 11 and the previous survey undertaken on Pond 11 which returned no results for GCN (Appendix 8.17). The eDNA limitation on Ponds 1b, 4 and 11 is not significant.</td>
</tr>
</table>

Survey Type	Description	Date(s)	Appendix and Limitations	Comments
			17 — No manual surveys undertaken as access not granted within the required survey season time. — None 19b — Low water level, dense vegetation and soft mud. Not be suitable for bottle trapping, torching or egg searching. Access restricted by soft mud. Small area was torched on 1st survey visit but ineffective. No further manual surveys were undertaken on 19b. Manual surveys undertaken on Pond 19a undertaken as connected to Pond 19b. — No eDNA sample undertaken on Pond 19b. Pond 19a was sampled instead.	
Reptiles	A survey has been undertaken in accordance with the guidelines provided in Froglife (Ref. 8.8) and the Herpetofauna Workers' Manual (Gent, T and Gibson, S 2003. Herpetofauna Workers' Manual. JNCC, Peterborough) (Ref. 8.9).	August – September 2014 September 2017	**Appendix 8.5** Several areas of habitat suitable for supporting reptiles within the Project Site Boundary could not be surveyed using artificial refugia due to the presence of grazing livestock. Artificial refugia would pose a health and safety risk to the livestock as well as posing a risk of trampling to sheltering reptile utilising the artificial refugia. These areas lacked features where reptiles might be easily observed and as such a walkover survey of these areas was not considered appropriate. There is the potential for reptiles to have gone unrecorded in these areas. These areas have been indicated on Figure 2 of in Appendix 8.6.	None
Birds	Breeding bird survey follows BTO Common Bird Census methodology. Goshawk survey paid due regard to the guidance in Raptors: a field guide for surveys and monitoring [3rd Edition] (2013), Hardey, J., Crick, H.Q.P., Wernham, C.V., Riley, H., Etheridge, B. & Thompson, D.B.A.	June 2017 February 2018	**Appendix 8.6** Two survey visits were conducted in June 2017. The second visit comprised of an evening survey only due to personal threats to the surveyor's health and safety that became apparent during the following early morning survey.	Site conditions not significantly different to those in 2014. The omission of the second part of the second survey visit in June is not considered to pose a significant limitation to the survey as the initial visit in June 2017 identified a very similar assemblage as recorded in 2014. Further surveys will be conducted in April and May 2018, and will be reported and submitted by the time of DCO Examination.
Bats	Ground and climbing inspection of trees for bat roost potential, ground inspection of buildings near to the Project Site Boundary, external inspection of old mining features (trial pit and adit) with potential to support hibernating bats, emergence/re-entry surveys of suitable trees and buildings, and bi-monthly activity transects, and monthly static detector surveys. All bat work has been informed by the 2016 Bat Survey Guidelines (Ref. 8.3). Site valued as having High potential for supporting foraging and	June – October 2017	**Appendix 8.7** Following an initial ground-based assessment, trees which showed potential for supporting roosting bats were subject to a climbed survey There were 16 trees which were not climbed due to access and/or health and safety restrictions and there are two trees which were not climbed as they could not be re-found. These trees did not have their bat roost potential category altered from the ground-based assessment assigned category and all trees with a Moderate bat roost potential category subsequently had an emergence/re-entry surveys. Therefore, this is not a significant	Bat activity transect surveys will be undertaken bi-monthly in April and May 2018. Until then, the BSG Ecology activity transect survey results for April and May 2014 will be used to inform the assessment for those months. Static detectors will be deployed monthly in April and May 2018, and will be reported and submitted by the time of DCO

Survey Type	Description	Date(s)	Appendix and Limitations	Comments
	commuting bats.		limitation. Building 1 was not fully assessed due to time constraints (AECOM, 2017). However, this building is approximately 120m outside of the Project Site Boundary and no further surveys were considered necessary on this building. Therefore, this is not a significant limitation. Access was not granted to Buildings 7 and 8 (collectively known as Abergelli Farm) to the west of, but outside, the Project Site and these could not be assessed for their potential to support roosting bats. However, these buildings (BSG Buildings 4 and 5) were previously assessed by BSG Ecology (Appendix 8.8). The previous results will be used in the assessment. A number of limitations were identified for the walked transects, including occasionally missing listen points, completing the transect prior to the recommended finish time. These are not significant limitations. No bat activity transect surveys were undertaken in April or May and no static detectors were deployed in April or May. This is not considered a significant limitation as the numbers of bats were fairly homogenous across the survey months. The first two emergence/re-entry surveys of Building B4 in August are ten days apart, as opposed to 2 weeks, as recommended by guidelines. These limitations are detailed in the baseline report.	Examination. Analysis of static detector data collected in June – October 2017 has been undertaken and used to inform this assessment.
Static bat detectors	<u>Monthly static detector surveys undertaken by BSG</u> Methods for surveys undertaken during the period April and May 2014 have been informed by the 2012 Bat Survey Guidelines (Ref. 8.10). <u>Monthly static detector surveys undertaken by AECOM</u> Methods for surveys undertaken during the period June – October 2017 have been informed by the 2016 Bat Survey Guidelines (Ref. 8.3).	April – May 2014 June – October 2017	**Appendix 8.7** <u>Bat Activity Walked Transect Survey</u> The first set of June walked transect surveys had 11 listening points (LPs) per transect, this was increased to 12 LPs per transect for all subsequent surveys. This was done to increase the spread of sample points. On 10 July 2017 during the Northern Transect the SD recording card briefly came out of the EM3 bat detector and calls during that period were not recorded electronically. However, this was replaced and all bats heard during the period were recorded on the survey sheet and were of common species which the surveyor was able to determine species identification with confidence. On 13 September 2017 the dawn South Transect survey finished at 06:42 which was 5 minutes before sunrise, however no bats had been heard since 06:16. On a small number of occasions surveyors walked past LPs or LPs were not accessible meaning that bat data was not recorded for three minutes at that location. For calculations of Bat Activity Index, the survey time at each LP has been adjusted to reflect this variation and will mitigate the impact of this limitation of the comparisons of bat activity between LPs. The occasions are listed below: • On 10 July 2017 North Transect LP 4 was missed;	Based on observations in 2017, habitats have not changed significantly since 2014.

Survey Type	Description	Date(s)	Appendix and Limitations	Comments
			• On 23 August and 7, 11 and 12 September 2017, North Transect LP1 was not accessible due to horses being present in the field. A replacement LP was completed as close as possible to the original location at LP1a, as shown on Figure 5.2; • On 7 and 13 September 2017 LP7 on the South Transect not accessible due to the presence of rams in the field. On 7 September 2017, LP9 was missed, this was replaced with LP9a (see Table 1. 12, LP9a and Figure 5. 3). As LP9 was replaced with another LP close to the original location; • On 3 October 2017, LP9 was missed, this was replaced with LP9b (See Table 1.12, LP9b and Figure 5. 3). As LP9 was replaced with another LP close to the original location. The weather conditions encountered on the dusk transect surveys on 13 September 2017 were not considered wholly favourable for bats, but not so bad as to need to abandon the survey. There was light rain at 21:33 and a spell of heavy rain between 21:50 and 22:17. The North Transect was also sampled at dusk on 11 September 2017 in favourable weather conditions. It was not possible to incorporate land within the gated National Grid land in a walked bat activity transect due to access restrictions at night and during the early morning. <u>Bat Activity Static Detector Survey</u> Some of the static detectors did not record for the full five night period. Details of malfunctions and reduced survey nights are provided in Appendix 8.7: Appendix 3A Static Detector Limitations. No data was recorded at South 3 in June 2017 and South 1 in July 2017. Data in these locations was successfully collected in the other four months. No data was recorded at: Lane 2 in August and September 2017. Two other static detectors (Lane 1 and Lane 3) were positioned within the lane and have captured bat activity which is representative of the lane. <u>Data Analysis and Interpretation</u> Different bat species vary in their likelihood of detection using bat detectors and therefore it is not relevant to compare numbers of bat passes from different species (Ref. 8.3). Results of the statistical analysis could only utilise the first night of data for each location in each month, due to the variation in successful recording nights. Therefore, the results are less powerful than if the full five nights could have been compared. However, the statistical analysis provides an additional tool, alongside Bat Activity Index (BAI) and count data in the interpretation of bat activity. These are not considered to be significant limitations to the survey.	

Survey Type	Description	Date(s)	Appendix and Limitations	Comments
			Appendix 8.8 The access route in the south-west of the Project Site (Access Road Option 2) and the western part of the land surrounding the Felindre Gas Compressor Station and the two National Grid 400 kV electrical substations were not included in the static surveys as access to these areas could not be arranged until late in June. This area is a small proportion of the Project Site that does not contain habitats significantly different to those present in other parts of the Project Site, and is unlikely to support a more diverse species assemblage than the rest of the Project Site. As such, it is not considered that this is a significant limitation to the survey methods.	
Dormouse	The survey followed the guidelines set out in the Dormouse Conservation Handbook Second Edition (Ref. 8.11). Nest tubes (n = 129) were deployed in suitable habitat and checked once a month.	June – November 2017	**Appendix 8.9** On 26 June 2017 not all the tubes could be located due to extensive vegetation cover, 93 tubes were checked on this occasion; one all other occasions all of the tubes were checked. On 29 August 2017 three tubes had to be repositioned as they had fallen. On 29 September three tubes had to be repositioned as they had fallen. On 17 October 2017 it was noted that one of the tubes had fallen and snapped in half. These incidents are not considered to be a significant limitation.	Based on observations in 2017, habitats have not changed significantly since 2014.
Otter and water vole	All watercourses within the Project Site Boundary and extending to 100 m upstream/downstream of the Project Site Boundary (where access allows) have been surveyed. Survey work followed that is recommended in Monitoring the Otter (Ref. 8.12) and the Water Vole Mitigation Handbook (Ref. 8.13).	June and September 2017	**Appendix 8.10** There was heavy rain the night before the second survey in September 2017 which had the potential to wash away spraint or faeces evidence. Two watercourses (Afon Llan and a tributary of the Afon Llan) were not accessible at the time of survey due to dense vegetation obscuring the view of the banks, and land access permissions. These watercourses were partially viewed and were assessed as having suitability to support both species. There is potential for signs of both species to have gone unrecorded.	None
Badger	A search for signs of badger activity was undertaken within the study area. The survey method will be based on the standard approach detailed in the Mammal Society publication Surveying Badgers (Ref. 8.14).	November 2017	**Appendix 8.11** There was heavy rain the night before and during the survey on the 21 November 2017 and the night before the survey on the 22 November 2017 which had the potential to wash away evidence of latrines and dung pits. A number of agricultural fields, a small parcel of woodland to the south and the woodland (Waun Ffyrdd) to the south-west were not accessible at the time of survey due to presence of horses, access restrictions or dense vegetation. These habitats were partially viewed using binoculars and were assessed as having suitability to support badger. Despite access limitations the results of the survey are considered to provide an accurate representation of badger activity within the study area (see Section b) Study Area below).	Despite access limitations the results of the survey are considered to provide an accurate representation of badger activity within the study area (see Section b) Study Area below).

b) Consultation

8.4.5 The scope of the assessment has also been informed by ongoing consultation with statutory consultees throughout the design and assessment process, including NRW and CCS.

8.4.6 A summary of the comments raised and responses are detailed in Table 8-7.

Table 8.7: Summary of consultation responses that have informed the scope and methodology of the ecological assessment

Consultee	Date	Comment	Response
SoS (Scoping Opinion, para.3.38)	August 2014	The SoS recommends that surveys are thorough, up to date and take account of other development proposed in the vicinity.	Each survey report sets out the methodology used in line with standard guidance. These are summarised in Table 8.6.
SoS (Scoping Opinion, para.3.38)	August 2014	These should include surveys for otter in accordance with the Recommendations of NRW.	Otter surveys have been undertaken in line with standard methodology. The results are presented in Appendix 8.10 of this ES.
SoS (Scoping Opinion, para.3.39)	August 2014	The SoS recommends that the assessment considers any potential impacts on the nature conservation sites in this area	All designated sites within the zone of influence have been identified and assessment carried out in Section 8.7.
SoS (Scoping Opinion, para.3.40)	August 2014	The SoS notes the comments from NRW welcoming the resurveying of the locally significant habitats in Spring/Summer, and expects there to be discussions with the Planning Ecologist for the local planning authority with regards to sensitive siting of the development to mitigate impacts to nature conservation interests.	CCS and NRW have been consulted and have been provided with copies of survey reports. Detailed botanical surveys have been carried out in 2014 to inform the assessment and this information was used in the assessment in in Section 8.7.
SoS (Scoping Opinion, para.3.40)	August 2014	The SoS recommends that the proposals should fully address the need to protect and enhance biodiversity.	Addressed in Section 8.8 and in the Embedded Mitigation.
SoS (Scoping Opinion, para.3.40)	August 2014	The assessment should cover habitats species and processes.	Addressed in Section 8.7.
SoS (Scoping Opinion, para.3.41)	August 2014	The assessment should take into account air quality (including dust) and noise and vibration impacts, and cross reference should be made to these specialist reports.	This chapter takes account of the **Chapter: 6 Air Quality** and **Chapter 7: Noise** where relevant.
SoS (Scoping Opinion, para.3.43)	August 2014	The SoS notes the comments of NRW regarding the presence of peat on the Project Site, and expects the ES to contain further clarification about the location of the peat and the impact of the proposed development upon it.	Addressed in **Chapter 10: Geology, Ground Conditions and Hydrogeology**
SoS (Scoping Opinion, para.3.44)	August 2014	The SoS notes the comments of NRW regarding the potential impact to local watercourses and recommends the maintenance of open watercourses with wide buffer strips in the design of the development.	Buffer strips have been provided in the drainage strategy (Appendix E of Appendix 9.1 of this ES).
SoS (Scoping Opinion,	August 2014	The SoS notes that Burry Inlet Ramsar Site and SPA, Carmarthen Bay and Estuaries SAC and Crymlyn Bog Ramsar Site and SAC are all located with 10 km of the Project Site. The submitted information should be sufficient for the competent Authority (CA)	Habitat Regulation Screening Assessment (Stage 1) has been prepared and the assessment is presented in the No Significant Effects Report (NSER, see Document Reference 5.5.0). The Report concluded that there would be no significant effects on

Consultee	Date	Comment	Response
para.4.2)		to make an appropriate assessment (AA) of the implications for the Project Site if required by Regulation 61(1) of the Habitats Regulations. The applicant should note that the CA is the SoS.	Burry Inlet Ramsar Site and SPA Carmarthen Bay and Estuaries SAC and Crymlyn Bog Ramsar Site and SAC and Stage 2, Appropriate Assessment was not required.
SoS (Scoping Opinion, para.4.5)	August 2014	Where there may be potential impacts on the SSSIs, the SoS has duties under sections 28(G) and 28(I) of the Wildlife and Countryside Act 1981 (as amended) (the W&C Act).	All impacts in relation to SSSIs have been addressed in Section 8.7.
SoS (Scoping Opinion, para.4.8)	August 2014	If applicants consider it likely that notification may be necessary under s28(I), they are advised to resolve any issues with the NCB before the DCO application is submitted to the SoS. If, following assessment by applicants, it is considered that operations affecting the SSSI will not lead to damage of the special interest features, applicants should make this clear in the ES. The application documents submitted in accordance with Regulation 5(2)(l) could also provide this information. Applicants should seek to agree with the NCB the DCO requirements which will provide protection for the SSSI before the DCO application is submitted.	All impacts in relation to SSSIs have been addressed in Section 8.7.
SoS (Scoping Opinion, para.4.9)	August 2014	Where a potential risk to an EPS is identified, and before making a decision to grant development consent, the CA must, amongst other things, address the derogation tests in Regulation 53 of the Habitats Regulations. Therefore the applicant may wish to provide information which will assist the decision maker to meet this duty.	Addressed in Section 8.7 ES and additional information will be provided where necessary. In line with the current baseline no EPS licence is required.
NRW	13/09/2017	Email response with regards to the approach for the Natura 2000 site search radius for the HRA. <u>Air Quality - Nature Conservation Interests</u> For all SSSI within at least 2 km, and all SAC/SPA/Ramsar within 10 km, of the proposed plant, information should be included in the ES as follows: Concentrations of NO_x (and SO^2 if present in emissions) emitted by the proposed plant compared to critical levels for sensitive habitats at the above sites. Proposed plant emissions (Process Contribution/PC) should be compared as a percentage of the relevant critical level as well being compared to the PC added to the background (PEC), to give percentage figures. Levels of nutrient Nitrogen deposition and Acid deposition derived from the proposed plant (PC) should also be compared to site relevant critical loads for the above sites, and should be similarly compared to the PC and PEC for each feature's most sensitive critical load value, to give percentage values. In relation to a Peaking Power facility which operates sporadically, the assessment must assess a worst case scenario i.e. the maximum number of hours that the plant will be able to operate, over a year. <u>Habitats Regulations Assessment</u> NRW advise that a Shadow Habitats Regulations Assessment (HRA) should be recorded by the applicant (as per PINS guidance Note 10). The HRA should test the likely significant effects of the development for all relevant receptor SAC, SPA and Ramsar sites, in light of impact pathways from the development itself (for example aerial emissions). These effects should be tested alone and if no likely significant effects concluded for a particular impact pathway on a site(s) alone, in-combination effects should then be tested for those parameters, according to any residual effects from this development and other relevant plans/projects. Any likely significant effects identified should lead to the recording of a shadow Appropriate Assessment (or Report	A HRA has been undertaken in accordance with the requirement from NRW.

Consultee	Date	Comment	Response
		to Inform an Appropriate Assessment, or similar) to assess such effects further.	
CCS	23/10/2017	Email response with regards to the request for comment on the scope of the ecological surveys. CCS advised that they would not be able to comment on an application prior to all survey work being completed and submitted. CCS will also require comment from NRW and likewise will not comment before all survey work is completed and submitted. CCS noted that the BSG Ecology reports that they had seen were robust but lacked analysis, conclusions and recommendations. CCS approved that the AECOM reports would be drawing conclusions based on the BSG Ecology work as well as the updated surveys. Based on the outcomes of the survey work CCS are likely to also require the following: An Ecological Management Plan detailing retained features, mitigation and enhancement for ecology. The document needs to include how any valued receptors identified and proposed mitigation/compensation areas will be monitored and managed in the long term (minimum 5 year rolling management plan). Construction Ecological Management Plan (CEMP) outlining how retained ecological features on and adjacent to the Project Site will be safeguarded during the construction phase. A lighting design strategy to identify those areas/features on-site that are particularly sensitive for nocturnal fauna. The strategy must show how and where external lighting will be installed (through the provision of appropriate lighting contour plans and technical specifications) so that it can be clearly demonstrated that areas to be lit will not disturb or prevent the above species crossing and utilising the Project Site.	Comments noted. A Landscape and Ecology Mitigation Strategy (Appendix 3.2) and Lighting Strategy (Appendix 3.5) have been produced.
CCS	13/03/2018	There is currently a lack of detail around the total extent of habitat loss and the measures to be employed to avoid, mitigate and compensate for the unavoidable impacts. The mitigation hierarchy must be clearly presented to allow an informed decision to be made regarding the degree of loss and subsequent measures to be employed to ameliorate that loss. <u>Bats</u> Numerous species and in good numbers have been recorded as foraging and commuting across the Project Site and NRW will provide detailed advice in relation to this European Protected Species. However, particularly important routes appear to exist along the drainage ditches that cross the proposed main power generation plant area. It is suggested that this be re routed around the boundary of this working area to maintain the commuting route for these species. This boundary also needs to integrate suitable habitat for other protected species such as otter, reptile and badger. It must be kept dark. There are trees that have been identified as existing and potential bat roosts that must be fully considered as part of the application. In addition any new trees that might become affected as the scheme progresses must also be assessed for their potential to support roosting bats. There is still a question mark over the presence of hibernation roosts in an identified mine and adit. This issue must be resolved as there is the potential for these roosts to be impacted by the proposal if they are present. A detailed mitigation statement should be compiled to demonstrate how these species	Habitat loss calculations for each habitat and designated site are presented in Figure 8-4. Mitigation and compensation measures have been included in this chapter for each feature where an effect has been evaluated as being significant. This ES includes mitigation and compensation measures for each feature where the effect has been evaluated as significant. A LEMP and Strategy (Figure 3.6 and Appendix 3.4) includes details of where mitigation and compensatory habitats will be located, and how they will be created and managed. The mitigation hierarchy is presented in this ES. <u>Bats</u> Comment noted regarding NRW providing advice on bats as a European Protected Species. Mitigation with regards to bats has considered key commuting and foraging routes, and aims to continue to allow species to commute and forage across the Project Site. Other species are included in the mitigation plan for the Project Site. The LEMP and Strategy (Figure 3.6 and Appendix 3.4) includes a lighting plan and details of dark corridors designed to allow species to commute and forage across the Site during construction and operation. Comments with regards to trees and bat roosts have been noted. Any trees that will be affected by the Project will be assessed for their potential to support roosting bats if not undertaken already. Safety investigations regarding the trial shaft (mining feature) have confirmed the location of the shaft and that it has been filled in. The adit was confirmed by the respective landowner as being present next to Building 4 and is an underground

Consultee	Date	Comment	Response
		will be considered during construction works (could be incorporated into the CEMP), during plant operation and during the decommissioning phase. Lighting will be particularly important for these and the other nocturnal animals that have been identified as on and around the Project Site. A lighting strategy must be compiled that clearly demonstrates how lighting will be minimised and sensitively located in relation to the ecological constraints of the Project Site. This is to retain valuable habitat for Protected species and in accordance with UDP Policy EV41. <u>Badgers</u> There are setts present that could be impacted by the proposal and NRW will need to comment on whether a licence might be necessary if works have the potential to infringe on The Protection of Badgers Act 1992. A detailed mitigation statement should be compiled to demonstrate how these species will be considered during construction works (could be incorporated into the CEMP), during plant operation and during the decommissioning phase. <u>Otter & Water Vole</u> Although current use by water vole has been ruled out there is some evidence that they could have used the Project Site previously. Water vole should therefore be able to re-colonise the Project Site if they move back into the area. All new water features created as part of the scheme should incorporated features to enable them to be used by this species if present. A detailed mitigation statement should be compiled to demonstrate how these species will be considered during construction works (could be incorporated into the CEMP), during plant operation and during the decommissioning phase. <u>Reptiles</u> Good populations of slow worm and Grass snake have been recorded on Project Site and in areas to be affected by the works. It is not possible to rule out other species such as Adder as the habitat is suitable particularly the wet woodland edge habitat and they have been recorded within the 2km record search buffer. A full and detailed method statement must be produced in respect of these species outlining how works will be carried out to avoid killing or injuring these species as required by the Wildlife & Countryside Act (1981). Given the amount of suitable surrounding habitat the strategy should seek to systematically make the working areas unsuitable for them and effectively "push" them into safeguarded adjacent receptor areas in the first instance. Some work may be required in the receptor areas before any works begin to increase the carrying capacity ready to receive the additional numbers of reptiles. As they will not be able to use the Project Site in the same way as they currently do a certain amount of mitigation will be required to make up this short fall in the form of habitat improvement and targeted management. Some mitigation should take the form of creating suitable boundary habitats around working areas allowing reptiles to recolonise the Project Site to some degree post construction. These details should be secured within the application. This could be done by the submission of a detailed mitigation statement demonstrating how these species will be considered during construction works (could be incorporated into the CEMP), during plant operation and during the decommissioning phase.	feature that has been capped and grass now covers the feature. Therefore, there is no likelihood of hibernating bats or any suitable bat habitat being present in the trial shaft or adit. Mitigation with regards to bats during construction, operation and decommissioning is included in this chapter. Comments with regards to a lighting strategy have been noted. The LEMP and Strategy (Figure 3.6 and Appendix 3.4) includes a lighting plan and details of dark corridors designed to allow species to commute and forage across the Site during construction and operation, and Outline Lighting Strategy (Appendix 3.5) has been produced. <u>Badgers</u> Details on the requirement for any licences if works have the potential to infringe on The Protection of Badgers Act 1992 have been included in this ES. Mitigation with regards to badgers during construction, operation and decommissioning is included in this ES. <u>Otter & Water Vole</u> Mitigation with regards to water vole during construction, operation and decommissioning is included in this ES. <u>Reptiles</u> Mitigation with regards to reptiles during construction, operation and decommissioning is included in this ES. Comments with regards to a reptile method statement have been noted. The LEMP and Strategy (Appendix The Landscape and Ecology Mitigation Strategy (Appendix 3.4) includes a reptile mitigation strategy and details of enhancement measures to allow reptiles to continue to colonise habitats surrounding the Project Site. <u>Invasive and Non-native Species</u> The Landscape and Ecology Mitigation Strategy (Appendix 3.4) and LEMP (Figure 3.6) include details on the control and biosecurity measures for the <u>Invasive and Non-native Species</u> (INNS) identified on Site. A detailed management plan will be produced following determination and an updated INNS survey. <u>SINC and Section 7 Habitats</u> Habitat loss calculations for designated sites have been included in Figure 3.6. Mitigation and compensation measures have been included in this ES for each feature where an effect has been evaluated as being significant. A habitat loss figure has been included in this ES including designated sites. This ES includes mitigation and compensation measures for each feature where the effect has been evaluated as significant. The Landscape and Ecology Mitigation Strategy (Appendix 3.4) and LEMP (Figure 3.6) include details of where mitigation and compensatory habitats will be located, and how they will be created and managed.

Consultee	Date	Comment	Response
		Invasive and Non-native Species These are numerous on the Project Site and there is a substantial risk of spread and contamination without appropriate preventative measures being in place. Of particular concern is the presence of floating pennywort in one of the ponds scheduled for removal. Given the amount of ground works and movement of soils, digging of new ditches and ponds that will be required there is a significant risk of spread. A detailed and thorough plan must be produced for its eradication on Project Site and to prevent it from spreading to others. The same goes for the other species identified as present. A detailed mitigation statement should be compiled to demonstrate how these species will be considered during construction works (could be incorporated into the CEMP), during plant operation and during the decommissioning phase. SINC and Section 7 Habitats It is currently unclear exactly how much SINC and Section 7 habitat will be lost to the proposal. Whilst the PEIR sets out some figures for habitat loss these are based on the main power generation plant and does not consider other loss that may occur during associated works such as access routes construction, electrical cable installation, drainage, AGI construction etc. All these elements must be fully considered to allow a thorough mitigation package to be determined. Some loss has been identified as a temporary loss that can be reinstated once construction works are complete but this is not necessarily an easy thing to achieve, some habitat is easier than others but it must be carefully thought about and planned for it to be successful. Based on the current level of information it is not possible to determine if this strategy is feasible for example; is there sufficient receptor and storage areas for the temporarily removed habitat without harming existing habitat? How much will require new planting? More detail on how the temporary loss will be managed will be needed to properly determine the impacts of the scheme. Where long term loss of habitat will occur compensation will be necessary. Although not detailed in the submitted literature it is understood from verbal communication that the "tear drop" or southernmost part of the development boundary is being considered as an offsetting area. This area is already assessed as marshy grassland and therefore has value in its own right. It is acknowledged that improvements could be made to this area to partially offset some loss but based on current information is considered insufficient on its own. The most suitable areas for offsetting are those of low ecological value such as improved grassland which is present in the surrounding area. As a standard, twice the amount of area should be sought in compensation as that which has been lost. Wildlife Protection Plan or CEMP The Wildlife Protection Plan (WPP) should build upon the principles of the submitted Outline CEMP and include the following as a minimum; • Risk assessment of potentially damaging construction activities. • Identification of "biodiversity protection zones". • Practical measures (both physical measures and sensitive working practices) to avoid or reduce impacts during construction (including species and habitat specific method statements*).	Wildlife Protection Plan or CEMP Comments regarding elements to include in the CEMP have been noted. Details on the mitigation for designated sites, habitats and species are contained within the LEMP and Strategy (Figure 3.6 and Appendix 3.4). The LEMP and Strategy (Figure 3.6 and Appendix 3.4) establishes mitigation and monitoring for the next 5 years. This plan will be updated every 5 years post consent.

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		• The location and timing of sensitive works to avoid harm to biodiversity features. • The times during construction when specialist ecologists need to be present on the Project Site • Details of lighting during construction phase • Details of any additional survey that will be necessary prior to the start of works Method statements are required for the following habitats and species identified as present or having potential to be encountered on the Project Site: • SINC habitat • Woodland (including ASNW) and mature trees • Hedgerows • Grassland • Waterfeatures • Bats - particularly in relation to trees and foraging/commuting routes but also potentially hibernation sites • Reptiles • Nesting birds • Otters & Water vole • Badger • Invasive species All language within the WPP and the method statements within it must use enforceable language such as will and shall and avoid the use of ambiguous words such as should and could etc. <u>Ecological Management Plan</u> Once the details of the mitigation hierarchy have been established, then a long term management plan should be produced to secure the mitigation and compensation areas and maximise the benefits through appropriate management and monitoring. It should include the following. a) Description and evaluation of features to be managed. b) Ecological trends and constraints on the Project Site that might influence management. c) Aims and objectives of management e.g. to restore and enhance existing habitats, ensure successful establishment of new habitats etc. d) Appropriate management options for achieving aims and objectives. e) Prescriptions for management actions to include but not be limited to; a scheme for reptile receptor enhancement f) Preparation of a work schedule (including an annual work plan capable of being rolled forward over a five-year period). g) Details of the body or organization responsible for implementation of the plan. h) On-going monitoring and remedial measures.	
CCS	13/03/2018	It is noted in Para 8.7.40 that the impact of construction noise has been considered on the nearest bat roost, however, it is queried whether the impact of the operation of the Project would impact on bats given that Figures 5.1 and 5.3 of Appendix 8.7 (Bat	

Consultee	Date	Comment	Response
		Activity Transect and Roost Survey Report) indicate that bats utilise the gallops which traverse the Project Site. If this impact does not need to be considered, it would be useful to clarify why this element has not been considered further as it appears as an omission at the current time. Para 8.8.43 states that the detailed decommissioning....would be subject to a separate assessment and planning application at that time. Firstly, it is understood that the demolition of the Project would be included within any DCO granted so this statement is incorrect and secondly, it reiterates the general point that a full assessment of the environmental impact of the decommissioning will be required at a later date. It is appreciated that the additional mitigation measures will be required and that these have not been confirmed at this stage as they are subject to discussion with NRW and the Council's Ecologist (and some surveys are still on-going). Full details should however be provided with the DCO application.	Details on noise and bats are included in this chapter and Appendix 8.7. A Decommissioning Strategy will be secured as part of the DCO requirement. This chapter includes mitigation and compensation measures for each feature where the effect has been evaluated as significant. A Landscape and Ecology Mitigation Plan (LEMP) and Strategy have been produced (Figure 3.6 and Appendix 3.4) and includes details of where mitigation and compensatory habitats will be located, and how they will be created and managed.
NRW	13/03/2018	We note the bat surveys that have been undertaken so far and that further bat activity surveys are planned for Spring 2018, with the results to be included in the DCO submission. We welcome Figure 7 within Appendix 8.7 entitled 'Bat Activity - Areas of Potential Impact' which shows where bat flightlines along habitat features may be severed by habitat removal and/or lighting. We consider that these matters should be addressed by reinstating the hedgerows and rows of trees in the north of the Project Site, following the installation of the proposed gas pipeline. This will ensure that bat flightpaths along habitat features are maintained. In addition to the above, we advise the agreement of a lighting plan that limits lighting of the Project Site's infrastructure and not on the surrounding vegetation, by creating dark corridors within the Project Site. We note that an outline lighting strategy is to be submitted as part of the DCO submission (this should cover construction, operational and emergency lighting proposals). This should demonstrate the location of the dark corridors to continue to allow species to commute and forage across the Project Site. Focus should be on the ancient woodland area to the north/north-east of the generating station site, where figure 7 has highlighted an area of potential impacts on bats from lighting. In addition to bats, otters are thought to be using the ditches in this area, and we note that there are proposals to re-route ditches around this area, which may increase activity. We note that the mine adit and trial shaft is currently being assessed for its potential to support bats, and welcome that the results will be included in the final submission.	APL acknowledges the comments provided and confirms that a LEMP has been produced (as discussed in the meeting held on the 6th February 2018), which shows where hedgerows and trees will be removed and reinstated (Figure 3.6 and Appendix 3.4) Comments related to a Lighting Plan and dark corridors have been noted and also discussed in the meeting held on the 6th February 2018. The LEMP and Strategy (Figure 3.6 and Appendix 3.4) provides details of how dark corridors will be designed to allow species to commute and forage across the Project Site during construction and operation; an Outline Lighting Strategy has been produced (Appendix 3.5). Safety investigations regarding the trial shaft have confirmed the location of the shaft and that it has been filled in. Therefore, there is no likelihood of hibernating bats or any suitable bat habitat being present.
NRW	13/03/2018	We welcome the surveys for otters and water voles and note the results. We require clarification on the likely impacts of the proposals on the watercourses on the Project Site. We note that the internal access road has not yet been decided on, with two options in place. Further information on the final route of the access route should be submitted, along with an assessment of its impacts on the watercourses on the Project Site, to include any culverting and re-routing of watercourses, and riparian habitat retention/reinstatement. Clarification is required of the measures that will be put in place to ensure that these species can continue to move along the watercourse. The lighting impacts to the watercourses (particularly those in the eastern part of the Project Site) should be addressed by an agreed lighting plan (please see section above for further detail).	The new section of Access Road is provided in Figure 3.3. The LEMP (Figure 3.6 and Appendix 3.4) provides details of any watercourses which are diverted, removed and reinstated as part of the construction and operation of the Project, in addition to any mitigation required in relation to otters and water voles, if required. Comments related to a Lighting Plan and dark corridors have been noted and also discussed in the meeting held on the 6th February 2018. The LEMP (Figure 3.6 and Appendix 3.4) provides details of how dark corridors will be designed to allow species to commute and forage across the Project Site during construction and operation. An Outline Lighting Strategy has been produced (Appendix 3.5).
NRW	13/03/2018	We welcome that an outline Ecological Management Plan and Landscape Mitigation Strategy are to be submitted as part of the DCO submission. The PEIR has	A habitat loss is illustrated in Figure 3.6. Table 8.14 in this ES has been provided to

Consultee	Date	Comment	Response
		quantified the amount of habitat loss (permanent and temporary) expected as part of the development in section 8.7 iii (Habitats), however this has not been demonstrated on any plans submitted. We note that the final internal access road has not yet been decided on, and therefore the definitive impacts on habitats has not yet been clarified. Upon agreement of the internal infrastructure, a plan should be provided of the current habitats, overlaid with the proposed infrastructure, demonstrating the quantity and location of habitats to be affected or removed (temporarily or permanently). Table 8-17 should be updated to reflect any of these changes. In addition to this, a proposed long-term habitat management plan (HMP) detailing retained features, mitigation and enhancement of habitats should be provided. This should also detail how these areas will be managed and monitored.	show the habitats to be removed (temporarily and permanently). The LEMP outlines retained features, mitigation and enhancement of habitats, and details on how these areas will be managed and monitored.
NRW	13/03/2018	It also notes that there will be a permanent loss of 0.09ha of the Ancient Woodland 2 habitat, due to route of the new internal access road. We note however that the route of these roads has not been agreed yet, and advise that ancient woodland habitat removal should be avoided where possible. Planning Policy Wales (November 2016) Chapter 5 states in Section 5.2.9. that “Ancient and semi-natural woodlands are irreplaceable habitats of high biodiversity value which should be protected from development that would result in significant damage.” We refer you to the City and County of Swansea’s Local Development Plan Policy ‘ER 11 – Trees and Development’ in relation to Ancient Woodland.	Acknowledged. The routing of the new section of Access Road (formerly described as “Option B”) has been revised in order to avoid Ancient Woodland. Mitigation required is outlined in the LEMP and Strategy (Figure 3.6 and Appendix 3.4).
NRW	13/03/2018	The areas of marshy grassland on the Project Site have been identified within the ecological surveys as having the appropriate structure and species composition to support marsh fritillary butterflies. While we appreciate that marsh fritillaries have not been identified as currently using the Project Site, the Project Site is within the larger meta-population area, which includes Nant Y Crimp SSSI and several other areas of suitable habitat and known marsh fritillary records. We therefore recommend that suitable mitigation is included for the temporary and permanent loss of marsh grassland habitat that will occur as a result of the development. This could include managing the remaining areas of marshy grassland for the benefit of marsh fritillaries and restoring the temporary storage areas to marshy grassland once construction activities are complete, and can be included in the HMP.	Acknowledged. Mitigation required is outlined in the LEMP and Strategy (Figure 3.6 and Appendix 3.4).
NRW	13/03/2018	We advise that an assessment of Air Quality impacts (both alone, and cumulative effects) on the Sites of Special Scientific Interest (SSSI) within the relevant screening distance (2km) is required to be submitted.	Nant y Crimp SSSI is greater than 2 km from the stack of the Generating Equipment and as such there are no effects in relation to air quality from stack emissions alone or cumulatively with other plans or projects. Transport related emissions are most relevant to sites within 200 m of a major road. The Design Manual for Roads and Bridges (DMRB) (Ref. 8.17) identifies 200 m as the distance beyond which the contribution of traffic emissions to local pollutant concentrations is considered to be negligible. Nant y Crimp SSSI is greater than 200 m from any road, as such there are no effects in relation to transport related emissions alone or cumulatively with other plans or projects.

b) Study Area

8.4.7 Each study area is displayed on a figure in the applicable appendix as referred to in Table 8.6.

8.4.8 In accordance with the published guidance for the Phase 1 Habitat survey (Ref. 8.6) and the breeding bird survey (Ref. 8.15) the study area comprised the land within the Project Site Boundary (Appendix 8.1, Figure 1; and Appendix 8.6, Figure 1, respectively).

8.4.9 In accordance with the published guidance (Ref. 8.8) the reptile study area comprised suitable and accessible habitat within the Project Site Boundary (Appendix 8.5, Figure 1).

8.4.10 In accordance with the published guidance (Ref. 8.7) the great crested newt study area comprised suitable and accessible land within the Project Site Boundary and within a 500 m buffer of the Project Site Boundary, as well as a string of ponds extending outside of the buffer but in very close proximity to each other (Appendix 8.4, Figure 1).

8.4.11 The bat study area comprised the land within the Project Site Boundary and the area within the Zone of Influence (ZoI) (Appendix 8.7 Figure 2). The Bat Survey Guidelines (Ref. 8.10) state that bat roost assessments must be considered within the Project Site Boundary and the areas under the ZoI of the project. For potential bat roosts the ZoI was assessed to be all land within the Project Site Boundary; and using professional judgement, within a 50 m buffer surrounding area where the Generating Equipment Site (see Assessment Method below) will be situated due to noise, vibration and lighting during construction, operation and decommissioning. For potential bat commuting and foraging habitat the transect routes for bat activity surveys covered all accessible land within or crossed by the Project Site Boundary.

8.4.12 In accordance with the published guidance the otter (Ref. 8.12) and water vole study (Ref. 8.13) area comprised watercourses and water bodies within the Project Site Boundary and within a 100 m radius of the Project Site Boundary (Appendix 8.9, Figure 1).

8.4.13 In accordance with the published guidance (Ref. 8.11) the dormouse study area comprised suitable and accessible habitat within the Project Site Boundary (Appendix 8.9, Figure 1).

8.4.14 In accordance with the published guidance (Ref. 8.14) the badger study area comprised suitable and accessible habitat within the Project Site Boundary and within a 100 m buffer of the Project Site Boundary (Appendix 8.11, Figure 1).

8.4.15 The study areas for the NVC survey (Appendix 8.2, Figures 1 & 2), invasive species, invertebrates (Appendix 8.3, Figures 1 & 2) and static bat detectors (Appendix 8.8, Figure 1) undertaken by BSG Ecology in 2014 (Appendix 8.8) were undertaken for a larger study area. The current Project Site Boundary is smaller than the previous site boundary used by BSG Ecology but is encompassed by it

(Figure 8.1). Therefore the surveys undertaken by BSG Ecology have captured the current Project Site Boundary. The results of the BSG Ecology surveys have been reviewed to extrapolate those results that are within the Project Site Boundary only.

c) Assessment Method

8.4.16 The Ecological Impact Assessment (EcIA) has been undertaken with reference to the Chartered Institute for Ecology and Environmental Management (CIEEM) Guidelines for Ecological Impact Assessment in the UK and Ireland (Ref. 8.2).

8.4.17 The following principles underpin EcIA and have been applied throughout the process:

- Avoidance: Seek options that avoid harm to ecological features.
- Mitigation: Adverse effects should be avoided or minimised through mitigation measures, either through the design of the project or subsequent measures that can be guaranteed.
- Compensation: Where there are significant residual adverse ecological effects despite the mitigation proposed, these should be offset by appropriate compensatory measures.
- Enhancements: Seek to provide net benefits for biodiversity over and above requirements for avoidance, mitigation or compensation.

8.4.18 A matrix-based approach has been used to ensure consistency across the ES. As per the CIEEM guidelines rankings are used with a clear definition of the criteria and thresholds that underpin them. See 'Sensitivity or Value of Receptors' and 'Magnitude' below.

8.4.19 The assessment describes the methods used to identify and assess the likely significant effects of the Project during the construction, operation, maintenance and decommissioning phases. Baseline conditions are then described and subsequently the impact assessment is undertaken taking into account avoidance and mitigation measures that are inherent to the design, including the use of best practice construction.

8.4.20 If necessary, additional mitigation, compensation and enhancement measures are then described followed by an assessment of the significance of residual effects. A summary of the assessment is provided, together with relevant conclusions.

8.4.21 The assessment is undertaken for each components of the Project as detailed in **Chapter 3: Project and Site Description**.

8.4.22 Data received through consultation, desk-based investigations and field-based investigations will be used to allow relevant ecological features (including designated sites, ecosystems, habitat and species) of value (or potential value) to be identified, and the main factors contributing to their value described and related to available guidance.

8.4.23 Ecological features may be important for multiple different reasons (e.g. rarity in a particular geographic context; role in habitat connectivity; or a species on the edge

of their range). Relevant reasons for which an ecological feature is important are described and considered in order to assign each relevant ecological feature an overall value.

8.4.24 The value of ecological receptors identified is determined according to a geographical frame of reference and the conservation importance of a receptor. The value of receptors to be used in the EcIA is defined in Table 8-8.

Table 8.8: Evaluation of Value

Value / Sensitivity	Guidelines
Very High	The receptor has little or no ability to absorb change without fundamentally altering its present character, is of very high environmental value, or of international importance. For example: An internationally designated site e.g. SPA, SAC, Ramsar, or site considered worthy of such designation. A regularly occurring globally threatened species. A viable area of a habitat type listed in Annex 1 of the Habitats Directive (92/43/EEC), or smaller area of such habitat which is essential to maintain the viability of a larger whole. A regularly occurring population of internationally important species listed in Annex II of the Habitats Directive (92/43/EEC). Any regularly occurring population of internationally important species that are rare or threatened in the UK or of uncertain conservation status (including individual species listed on Annex 1 of the EC Birds Directive) and/or listed as a qualifying feature of an SPA, SAC or Ramsar site.
High	The receptor has low ability to absorb change without fundamentally altering its present character, is of high environmental value, or of national importance. For example: A nationally designated site e.g. a SSSI, NNR or site that meets the criteria for such designation. A regularly occurring population of individual species listed or included on a SSSI citation as a reason for designation of a SSSI. A regularly occurring significant population/number of any nationally important species i.e. listed on the Wildlife and Countryside Act (1981) (as amended). A viable area of priority habitat type as identified in the Section 7 List of Habitats of Principal Importance for Conservation of Biological Diversity in Wales, or smaller areas of such habitat which are essential to maintain the viability of a larger whole. A regularly occurring, substantial population of a nationally rare species i.e. a species that contributes to the integrity of an SAC or SSSI but which are not cited as species for which the site is designated (SACs) or notified (SSSIs).

Value / Sensitivity	Guidelines
	Species present in nationally important numbers (>1% UK population). Any regularly occurring highly significant population of any bird listed on the RSPB Red List of High Conservation Concern. A species assemblage that includes one or more nationally important species (as defined above) that occurs regularly in significant numbers.
Medium	The receptor has moderate capacity to absorb change without significantly altering its present character, has some environmental value, or is of regional importance. For example: Areas of internationally or nationally important habitats which are degraded but which could be readily restored. A regularly occurring, substantial population of a nationally scarce species i.e. priority species in the Section 7 List of Species of Principal Importance for Conservation of Biological Diversity in Wales. Viable areas of a Local BAP Priority habitat or small areas of such habitat which are essential to maintain the viability of the larger whole. A regularly occurring regionally significant population of a Local BAP Priority Species. Any regularly occurring significant population that is listed in a Local Red Data Book or a highly significant population of any bird listed on the RSPB Amber List of Medium Conservation Concern or substantial population of a regionally scare species. Species present in regionally important numbers (>1% regional population). Species occurring within SACs and SSSIs locally but not crucial to the integrity of the site. A site designated as a Local Nature Conservation Site (LNCS), Wildlife Site or Site of Interest for Nature Conservation (SINC).
Low	The receptor is tolerant of change without detriment to its character, is low environmental value, or local importance. For example: Areas identified as areas of conservation interest by organisations such as the local Wildlife Trust. A regularly occurring, substantial population of a species scarce in the local area or sites/features that are scarce within the locality or which appreciably enrich the local area's habitat resource. Species, habitats or features that are a key component of a Local Nature Conservation Site (LNCS) or LNR. Locally significant populations of Red and Amber List species. A good example of a common or widespread habitat in the local area.
Negligible	The receptor is resistant to change and is of little environmental value. For example: A degraded/impoverished example of a common or widespread habitat in the local area. A habitat which offers little value for nature

Value / Sensitivity	Guidelines
	conservation e.g. arable field. Populations of common and widespread species. A species considered to enrich the local ecological resource within the context of the Parish or Neighbourhood.

iii. Magnitude

8.4.25 Magnitude refers to size, amount, intensity and volume. It has been quantified where possible and expressed in absolute or relative terms e.g. the amount of habitat lost, percentage change to habitat area, percentage decline in a species population.

8.4.26 Magnitude will then be ascribed a value as per **Chapter 4: Approach to Environmental Impact Assessment.**

iv. Effect Definitions

8.4.27 In line with the CIEEM (2016) guidelines, the terminology used within the EcIA draws a clear distinction between the terms 'impact' and 'effect'. For the purposes of the EcIA these terms are defined as follows:

- Impact – Actions resulting in changes to an ecological feature. For example, demolition activities leading to the removal of a building utilised as a bat roost; and,
- Effect – Outcome resulting from an impact, acting upon the conservation status or structure and function of an ecological feature. For example, killing/injury of bats and reducing the availability of breeding habitat because of the loss of a bat roost may lead to an adverse effect on the conservation status of the population concerned.

8.4.28 When describing potential impacts (and where relevant the resultant effects) reference is made to the following characteristics:

- Beneficial/adverse – i.e. is the change likely to be in accordance with nature conservation objectives and policy:
  - Beneficial (i.e. positive) – a change that improves the quality of the environment, or halts or slows an existing decline in quality e.g. increasing the extent of a habitat of conservation value; or,
  - Adverse (i.e. negative) – a change that reduces the quality of the environment e.g. destruction of habitat or increased noise disturbance.
- Magnitude – the 'size', 'amount' or 'intensity' of an impact – this is informed on a quantitative basis where possible, and considers:
  - Spatial extent – the spatial or geographical area or distance over which the impact/effect occurs;
  - Duration – the time over which an impact is expected to last prior to recovery or replacement of the resource or feature. The likely duration of the impact should be quantified. Consideration has been given to how this

duration relates to relevant ecological characteristics such as a species' lifecycle. However, it is not always appropriate to report the duration of impacts in these terms. The duration of an effect may be longer than the duration of an activity or impact;

- Reversibility – i.e. is the impact temporary or permanent. A temporary impact is one from which recovery is possible or for which effective mitigation are both possible and an enforceable. A permanent effect is one from which recovery is either not possible, or cannot be achieved within a reasonable timescale (in the context of the feature being assessed); and
- Timing and frequency – i.e. consideration of the point at which the impact occurs in relation to critical life-stages or seasons.

8.4.29 For each phase of the Project the assessment is structured and reported by valued ecological receptor with relevant potential impacts on that feature described in turn, and then the overall effect arising from those impacts reported. For example, the impacts of roost loss, and light disturbance on retained roosts is documented, before a conclusion is reached on the overall effect on the conservation status of the local bat population concerned.

v. Assessment of Significance of Effects

8.4.30 A combination of the magnitude of the effect under consideration and the sensitivity of the receiving environment determines the significance of effect. This approach to the assessment of significance is outlined in **Chapter 4: Approach to Environmental Impact Assessment**.

8.4.31 It should be noted that this general approach is a framework and should not be treated as a matrix. Within the chapter the significance of effects will be explained with reference to that particular discipline.

8.5 Baseline Environment

8.5.1 This section describes the baseline environmental characteristics for the Project Site and surrounding areas with specific reference to ecology.

8.5.2 A summary of the baseline conditions has been provided in the following sections. Detailed information such as survey data has been provided for each element in Appendices 8.1 – 8.19.

a) Designated Sites

8.5.3 In addition to land within the Project Site, the primary effects on the designated sites in the vicinity of the Project Site are as a result of emissions from the stack, which have the potential to alter the concentration of NOx and lead to a change in acid and nitrogen deposition. In lieu of any specific guidance on the NRW website, NRW have provided the following advice in consultation.

8.5.4 "Nature conservation-sites should be screened against the relevant standards if they occur within specified distance criteria, as detailed below:

- SPAs, SACs or Ramsar sites within 10 km of the Project; and,

- SSSIs within 2 km of the location of the Project."

8.5.5 Given the advice provided within the recently withdrawn Environment Agency H1 guidance (Annex F Air Emissions) and the *Air emissions risk assessment for your environmental permit* guidance on the gov.uk website, it has been deemed appropriate to include a search for NNRs, LNRs, local wildlife sites and ancient woodland within 2 km of the Project also.

i. Statutory Designated Sites

8.5.6 Using the MAGIC website three internationally designated sites were identified within 10 km of the proposed exhaust gas flue stack of the Power Generation Plant within the Project Site Boundary (given as SN 65577 01324 at the time of conducting the desk study); and one nationally designated site within 2 km of the Project Site Boundary. The details of the sites are presented below in Table 8.9. The location of these sites in relation to the Project Site Boundary is shown on Figure 8.2 – 8.3.

8.5.7 Statutory designated sites have been scoped in or out for further assessment in the EcIA, as detailed in Table 8.9, based upon a number of factors:

- Distance between the site and the Project Site Boundary;
- Designation features e.g. habitats, species;
- Ecological connectivity or linkages (e.g. connecting watercourse/hydrology or movement of species) between the designated site and the Project Site; or
- A combination of the above.

8.5.8 Two distances have been provided; one from the Project Site Boundary and another giving the distance from the proposed exhaust gas flue stack of the Power Generation Plant (given as SN 65577 01324 at the time of conducting the desk study) for assessing air quality effects.

Table 8.9: Statutory designated sites

Site and Statutory Designation and approximate distance/direction at nearest point	Distance to the proposed exhaust gas flue stack	Summary Designating Features	Scoped In/Out of EcIA and Justification;
Crymlyn Bog SAC and Ramsar 6.4 km south-east	6.8 km	**SAC** Annex I habitats that are a primary reason for selection of this site: • Transition mires and quaking bogs; and, • Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*. Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: • Alluvial forests with Alnus glutinosa *and Fraxinus excelsior* (Alno-Padion, *Alnion incanae*, *Salicion albae*). **Ramsar** <u>Designated under Ramsar Criterion 1:</u> Largest example of valley floodplain topogenous mire in South Wales, and one of the largest surviving fens in the west of Britain. Very few other sites are known to support a comparable complexity and diversity of vegetation. <u>Designated under Ramsar Criterion 2:</u> Supports a substantial population of the nationally-rare slender cotton-grass *Eriophorum gracile*, and a rich invertebrate fauna including many rare and highly localised species. <u>Designated under Ramsar Criterion 3:</u> The site supports 199 vascular plant species including 17 regionally-uncommon and one nationally rare.	**Scoped In**. Supports habitats sensitive to nutrient and nitrogen acid deposition.
Carmarthen Bay	7.2 km	A component part of the Carmarthen Bay and Estuaries/Bae Caerfyrddin ac Aberoedd European Marine Site. Partially overlaps	**Scoped In**. Supports habitats sensitive to

Site and Statutory Designation and approximate distance/direction at nearest point	Distance to the proposed exhaust gas flue stack	Summary Designating Features	Scoped In/Out of EcIA and Justification;
SAC 5.7 km west		Burry Port SPA and Ramsar. Annex I habitats that are a primary reason for selection of this site: • Sandbanks which are slightly covered by sea water all the time; • Estuaries; • Mudflats and sandflats not covered by seawater at low tide; • Large shallow inlets and bays; • Salicornia and other annuals colonizing mud and sand; and, • Atlantic salt meadows (Glauco-Puccinellietalia maritimae). Annex II species that are a primary reason for selection of this site: • Twaite shad Alosa fallax. Annex II species present as a qualifying feature, but not a primary reason for site selection: • Sea lamprey Petromyzon marinus; • River lamprey *Lampetra fluviatilis*; • Allis shad *Alosa alosa*; and, • Otter.	nutrient deposition; receptors are not sensitive to nitrogen acidity deposition; hydrological connectivity between the Project Site via the Afon Llan and Afon Lliw.
Burry Inlet SPA and Ramsar 7.2 km south-west	8.9 km	A component site of the Carmarthen Bay and Estuaries/Bae Caerfyrddin ac Aberoedd European Marine Site. Partially overlaps the Carmarthen Bay SAC. Burry Inlet is a large estuarine complex located between the Gower Peninsula and Llanelli in South Wales. It includes extensive areas of intertidal sand- and mud-flats, together with large sand dune systems at the mouth of the estuary. The site contains the largest continuous area of saltmarsh in Wales (2,200 ha). The estuary experiences large tidal fluctuations (about 8 m) which has the consequence of exposing a large extent of intertidal sediments on a	**Scoped In**. Supports habitats sensitive to nutrient and nitrogen acid deposition; hydrological connectivity between the Project Site via the Afon Llan and Afon Lliw.

Site and Statutory Designation and approximate distance/direction at nearest point	Distance to the proposed exhaust gas flue stack	Summary Designating Features	Scoped In/Out of EcIA and Justification;
		regular basis. These are mostly sandy, but muddy substrates are to be found in more sheltered areas. The Burry Inlet regularly supports large numbers of overwintering wildfowl and waders that feed in the saltmarshes and on the intertidal areas. **SPA** This site qualifies under Article 4.2 of the Birds Directive (2009/147/EC) by supporting populations of European importance of the following migratory species: <u>Over winter</u>: • Oystercatcher *Haematopus ostralegus*, 13,590 individuals representing at least 1.5% of the wintering Europe& Northern/Western Africa population (5 year peak mean 1991/2 - 1995/6); and, • Pintail *Anas acuta*, 1,772 individuals representing at least 3.0% of the wintering Northwestern Europe population (5 year peak mean 1991/2 - 1995/6). <u>Assemblage qualification: A wetland of international importance.</u> The area qualifies under Article 4.2 of the Directive (2009/147/EC) by regularly supporting at least 20,000 waterfowl. Over winter, the area regularly supports 34,962 individual waterfowl (5 year peak mean 1991/2 – 1995/6) including: curlew *Numenius arquata*, black-tailed godwit *Limosa limosa islandica*, dunlin *Calidris alpina alpina*, knot *Calidris canutus*, shoveler *Anas clypeata*, shelduck *Tadorna tadorna*, oystercatcher *Haematopus ostralegus*, pintail *Anas acuta*, whimbrel *Numenius phaeopus*.	

Site and Statutory Designation and approximate distance/direction at nearest point	Distance to the proposed exhaust gas flue stack	Summary Designating Features	Scoped In/Out of EcIA and Justification;
		Ramsar Designated under Ramsar Criterion 5: *Assemblages of international importance.* Species with peak counts in winter: 41,655 waterfowl (5 year peak mean 1998/99-2002/2003). Designated under Ramsar Criterion 6: *Species/populations occurring at levels of international importance.* Qualifying Species/populations (as identified at designation): Species with peak counts in spring/autumn: • Common redshank, *Tringa totanus*, 857 individuals, representing an average of 0.7% of the GB population (5 year peak mean 1998/9 – 2002/3). Species with peak counts in winter: • Northern pintail, *Anas acuta*, NW Europe 2,687 individuals, representing an average of 4.4% of the population (5 year peak mean 1998/9 – 2002/3); • Eurasian oystercatcher, *Haematopus ostralegus*, Europe & NW Africa – wintering 14,861 individuals, representing an average of 1.4% of the population (5 year peak mean 1998/9 – 2002/3); and, • Red knot, *Calidris canutus islandica*, W & Southern Africa (wintering) 3618 individuals, representing an average of 1.2% of the GB population (5 year peak mean 1998/9 – 2002/3). Species/populations identified subsequent to designation for possible future consideration under Criterion 6.	

Site and Statutory Designation and approximate distance/direction at nearest point	Distance to the proposed exhaust gas flue stack	Summary Designating Features	Scoped In/Out of EcIA and Justification;
		Species with peak counts in winter: • Northern shoveler, *Anas clypeata*, NW & C Europe 467 individuals, representing an average of 1.1% of the population (5 year peak mean 1998/9 – 2002/3).	
Nant Y Crimp SSSI 1.3 km west	2.3 km	Nant y Crimp is of special interest for its wet pastures, species-rich neutral grasslands and semi-natural woodland as well as associated scrub, which are host to several uncommon plant species. Notable plant species recorded at the site include petty whin *Genista anglica*, cranberry *Vaccinium oxycoccos*, narrow buckler fern *Dryopteris carthusiana* and whorled caraway *Carum verticillatum*, the latter an Atlantic species characteristic of unimproved pastures in the South Wales coalfield. In addition, there is also a colony of the marsh fritillary butterfly *Euphydryas aurinia* at the site. This is a declining species confined, in South Wales to wet agriculturally unimproved pastures where its food plant, devil's bit scabious *Succisa pratensis*, grows in profusion.	**Scoped In**. Supports habitats sensitive to nutrient and nitrogen acid deposition.

ii. Non-Statutory Designated Sites

8.5.9 The desk study identified 12 non-statutory designated sites within 2 km of the Project Site Boundary, one is a Wildlife Trust Reserve and 11 are SINCs. Details of the sites are presented below in Table 8.10. The location of these sites in relation to the Project Site is shown on Figures 8.2 – 8.3.

8.5.10 Non-statutory designated sites have been scoped in or out for further assessment in the EcIA, as detailed in Table 8.10, based upon a number of factors:

- Distance between the site and the Project Site Boundary;
- Designation features e.g. habitats;
- Ecological connectivity or linkages (e.g. connecting watercourse/hydrology or movement of species) between the site and the Project Site; or
- A combination of the above.

8.5.11 Two distances have been provided; one from the Project Site Boundary and another giving the distance from the proposed exhaust gas flue stack of the Power Generation Plant for assessing air quality effects.

Table 8.10: Non-statutory designated sites

Site and Statutory Designation and approximate distance/direction at nearest point from boundary	Distance to the proposed exhaust gas flue stack	Summary Designating Features	Scoped In/Out of EcIA and Justification
Lletty-Morfil SINC Within the Project Site Boundary	6 m	Supporting the habitats: native wet woodland, ancient woodland, structurally-diverse and species-rich scrub, and purple moor-grass and rush pasture; and the Section 7 listed butterfly, wall *Lasiommata megera*.	**Scoped In**. Within the Project Site Boundary.
Coed Barcud Wildlife Trust Reserve Adjacent to the north-eastern Project Site Boundary.	1.1 km	A previously improved grassland field, planted up to become future woodland. Within the boundary of Rhoas Fawr SINC.	**Scoped In**. Close proximity to the Project Site Boundary.
Rhos Fawr SINC Adjacent to the northern Project Site Boundary	1.1 km	Supporting the habitats: woodland containing ancient woodland indicator species, structurally-diverse and species-rich scrub, species-rich neutral grassland, purple moor-grass and rush pasture, and watercourse with exposure/erosion features; and a number of Section 7 listed bird species.	**Scoped In**. Close proximity to the Project Site Boundary.
Felindre Grasslands SINC Adjacent to the west of the Project Site Boundary.	1.6 km	Native wet woodland, lowland mixed deciduous woodland, structurally-diverse and species-rich gorse scrub, and purple moor-grass and rush pasture; and a number of Section 7 listed invertebrate and bird species, and the Schedule 1 listed birds barn owl *Tyto alba* and Northern goshawk *Accipiter gentilis*.	**Scoped In**. Close proximity to the Project Site Boundary.
Middle Llan SINC Adjacent to the southern Project Site Boundary	450 m	Supporting the habitats: Continuous semi-natural linear vegetation and watercourse with exposure/erosion features.	**Scoped In**. Close proximity to the Project Site Boundary.

Site and Statutory Designation and approximate distance/direction at nearest point from boundary	Distance to the proposed exhaust gas flue stack	Summary Designating Features	Scoped In/Out of EcIA and Justification
Rhyd-Y-Pandy Valley and Grasslands SINC 70m east	530 m	Supporting the habitats: native wet woodland, woodland containing ancient woodland indicator species, gorse stands, lowland meadow, species-rich neutral grassland, structurally-diverse and species-rich scrub, purple moor-grass and rush pasture, reedbeds, and watercourse with exposure/erosion features; and a number of Section 7 listed invertebrate and bird species, and the Schedule 1 listed birds barn owl and red kite *Milvus milvus*.	**Scoped In**. Close proximity to the Project Site Boundary.
Waun Garn Wen SINC 130m west	630 m	Supporting the habitats: native wet woodland, structurally-diverse and species-rich scrub, purple moor-grass and rush pasture, and watercourse with exposure/erosion features; and a number of Section 7 listed invertebrate and bird species.	**Scoped In**. Close proximity to the Project Site Boundary.
Pant Lasau SINC 120m south	690 m	Supporting the habitats: native wet woodland, lowland mixed deciduous woodland, gorse stands, lowland fen, structurally-diverse and species-rich scrub, purple moor-grass and rush pasture, and watercourse with exposure/erosion features; and a number of Section 7 listed invertebrate and bird species.	**Scoped In**. Close proximity to the Project Site Boundary.
Lower Lliw Resivoir SINC 460m north	1.6 km	Supporting the habitats: woodland containing ancient woodland indicator species, gorse stands, species-rich bracken, structurally-diverse and species-rich scrub, purple moor-grass and rush pasture, and watercourse with exposure/erosion features; and a number of Section 7 listed invertebrate and bird species, and the Schedule 1 listed birds kingfisher *Alcedo atthis*, merlin *Falco columbarius* and red kite.	**Scoped In**. Potential hydrological pathway via field drains and the Nant y Tarw; potential for aerial deposition.
Cefn Forest Stream SINC	1.6 km	Supporting the habitats: woodland containing ancient woodland indicator species, upland mixed ash woodland, native wet	**Scoped In**. No hydrological

Site and Statutory Designation and approximate distance/direction at nearest point from boundary	Distance to the proposed exhaust gas flue stack	Summary Designating Features	Scoped In/Out of EcIA and Justification
230m west		woodland, lowland mixed deciduous woodland, lowland meadow, species-rich neutral grassland, structurally-diverse and species-rich scrub, degraded lowland heath, lowland fen, purple moor-grass and rush pasture, ponds, and watercourse with exposure/erosion features; and a number of Section 7 listed invertebrate and bird species, and the Schedule 1 listed barn owl.	pathways; however, potential for aerial deposition.
Cilfaen SINC 760m west	1.5 km	Supporting the habitats: wet woodland, woodland containing ancient woodland indicator species, and purple moor-grass and rush pasture.	**Scoped In**. Potential for aerial deposition.
Middle Lliw SINC 670m west	1.7 km	Supporting the habitats: ancient semi-natural woodland, woodland containing ancient woodland indicator species, structurally-diverse and species-rich scrub, gorse stands, species-rich neutral grassland, semi-improved lowland dry acid grassland, acid grassland with anthills, purple moor-grass and rush pasture, watercourse with exposure/erosion features, and species-rich bracken; and a number of Section 7 listed invertebrate species.	**Scoped In**. Potential hydrological pathway via field drains and the Nant y Tarw; potential for aerial deposition.
Ancient Woodland 1 Adjacent to the eastern Project Site Boundary.	130 m	Ancient Semi Natural Woodland.	**Scoped In**. Potential for aerial deposition.
Ancient Woodland 2 Within Project Site Boundary.	450 m	Ancient Woodland Site of Unknown Category.	**Scoped In**. Potential for aerial deposition.
Ancient Woodland 3	470 m	Restored Ancient Woodland Site.	**Scoped In**. Potential

Site and Statutory Designation and approximate distance/direction at nearest point from boundary	Distance to the proposed exhaust gas flue stack	Summary Designating Features	Scoped In/Out of EcIA and Justification
Adjacent to the northern Project Site Boundary.			for aerial deposition.
Ancient Woodland 4 120 m south	570 m	Restored Ancient Woodland Site.	**Scoped In**. Potential for aerial deposition.
Ancient Woodland 5 320 m west	970 m	Restored Ancient Woodland Site.	**Scoped In**. Potential for aerial deposition.
Ancient Woodland 6 Within Project Site Boundary.	1.1 km	Restored Ancient Woodland Site.	**Scoped In**. Potential for aerial deposition.
Ancient Woodland 7 470 m north-west	1.1 km	Ancient Semi Natural Woodland.	**Scoped In**. Potential for aerial deposition.
Ancient Woodland 8 580 m north-west	1.1 km	Ancient Semi Natural Woodland.	**Scoped In**. Potential for aerial deposition.
Ancient Woodland 9 360 m west	1.2 km	Restored Ancient Woodland Site.	**Scoped In**. Potential for aerial deposition.
Ancient Woodland 10 750 m north-east	1.3 km	Ancient Semi Natural Woodland.	**Scoped In**. Potential for aerial deposition.
Ancient Woodland 11 200 m north	1.4 km	Ancient Semi Natural Woodland.	**Scoped In**. Potential for aerial deposition.
Ancient Woodland 12	1.4 km	Plantation on Ancient Woodland Site.	**Scoped In**. Potential

Site and Statutory Designation and approximate distance/direction at nearest point from boundary	Distance to the proposed exhaust gas flue stack	Summary Designating Features	Scoped In/Out of EcIA and Justification
Within Project Site Boundary.			for aerial deposition.
Ancient Woodland 13 810 m north-east	1.4 km	Ancient Semi Natural Woodland.	**Scoped In**. Potential for aerial deposition.
Ancient Woodland 14 960 m north-west	1.6 km	Ancient Semi Natural Woodland.	**Scoped In**. Potential for aerial deposition.
Ancient Woodland 15 970 m north-east	1.6 km	Ancient Semi Natural Woodland.	**Scoped In**. Potential for aerial deposition.
Ancient Woodland 16 1.3 km south-east	1.7 km	Ancient Semi Natural Woodland.	**Scoped In**. Potential for aerial deposition.
Ancient Woodland 17 730 m north-west	1.8 km	Ancient Semi Natural Woodland.	**Scoped In**. Potential for aerial deposition.
Ancient Woodland 18 1.1 km north-east	1.8 km	Restored Ancient Woodland Site.	**Scoped In**. Potential for aerial deposition.
Ancient Woodland 19 720 m north	1.8 km	Ancient Semi Natural Woodland.	**Scoped In**. Potential for aerial deposition.
Ancient Woodland 20 1.1 km north-east	1.9 km	Ancient Semi Natural Woodland.	**Scoped In**. Potential for aerial deposition.
Ancient Woodland 21 1.6 km south-east	2.0 km	Ancient Semi Natural Woodland.	**Scoped In**. Potential for aerial deposition.

Site and Statutory Designation and approximate distance/direction at nearest point from boundary	Distance to the proposed exhaust gas flue stack	Summary Designating Features	Scoped In/Out of EcIA and Justification
Ancient Woodland 22 960 m north-west	2.0 km	Ancient Semi Natural Woodland.	**Scoped In**. Potential for aerial deposition.

b) Protected Species Records

8.5.12 A wide range of historical records of protected and/or notable species were received from SEWBReC. Relevant records are reported in the PEA and corresponding technical baseline reports (Appendices 8.1 – 8.19). Historic records and survey results are considered together in the evaluation of ecological features below.

c) Phase 1 Habitat Survey

8.5.13 The land within the Project Site Boundary supports woodland, rows of trees, standalone trees, dense and scattered scrub, improved grassland, semi-improved grassland, marshy grassland, tall ruderal vegetation, running water, fences and bare ground (hard standing).

8.5.14 A summary of data collected during the Phase 1 Habitat survey is presented in Table 8.11.

Table 8.11: Phase 1 Habitats within the Project Site Boundary

Habitat Type	Description	Extent
Broadleaved Woodland – Semi-Natural	There are areas of semi-natural broadleaved woodland, including areas of wet woodland, RAWS and ASWU, within the Project Site Boundary.	1.76 ha
Broadleaved Woodland – Plantation	There is one small area of broadleaved plantation woodland located within the south of the Project Site Boundary.	0.02 ha
Scrub – Dense/ Continuous	There are several areas of dense scrub, predominantly found in the south of the Project Site Boundary, but with one are in the north and one in the centre of the Project Site Boundary.	0.25 ha
Scrub – Scattered	Several areas of scattered scrub are found within the south of the Project Site Boundary.	0.04 ha
Rows of Trees – Broadleaved	Rows of trees are predominantly located in between grassland fields and along road edges. The majority of these are located on top of earth banks constructed with stone and earth and covered in grass.	1.4 km
Standalone Trees	There are four standalone oak trees within the Project Site Boundary.	4
Ruderal – Tall Herb and Fern	There are two areas of tall ruderal vegetation.	0.02 ha
Semi-Improved Neutral Grassland	There is semi-improved neutral grassland present on road and track sides both within and adjacent to the Project Site Boundary. There are several semi-improved grassland fields within the centre of the Project Site Boundary.	5.08 ha
Marshy Grassland	There are frequent areas of marshy grassland dominated within the Project Site Boundary. Marshy grassland areas are predominantly located in the south.	9.08 ha

Habitat Type	Description	Extent
Improved Grassland	Areas of improved grassland are dominant throughout the Project Site Boundary. The majority of these are sheep and horse grazed.	16.55 ha
Running Water	There are several wet ditches (watercourses) across the Project Site Boundary.	2.6 km
Standing Water	There are three ponds within the Project Site Boundary.	3
Hedgerow with Trees – Species – Rich	There is one native species-rich hedgerow alongside the access road to the Felindre Gas Compressor Station.	72 m
Hedgerow with Trees – Species – Poor	There is one species-poor hedgerow within the Project Site Boundary.	91 m
Intact Hedgerow – Species – Poor	There are two intact species-poor hedgerows within the Project Site Boundary.	236 m
Earth Bank	There are several grass covered raised earth banks within the Project Site Boundary.	274 m
Buildings	There are two buildings within the Felindre Gas Compressor Station within the south of the Project Site Boundary.	0.02 ha
Fences	There is frequent fencing including security and barbed wire fencing throughout the Project Site Boundary. The fences have no ecological value.	3.9 km

d) NVC Survey

8.5.15 Land within the Project Site Boundary identified as being potentially 'habitats of principal importance for nature conservation' or identified as a SINC was selected for inclusion in the NVC survey by BSG Ecology; habitats included areas of woodland, grassland and mire.

8.5.16 NVC habitats within the Project Site Boundary comprise:

- Two woodland communities/sub-communities;
  - W6e *Alnus glutinosa – Urtica dioica* woodland, *Betula pubescens* sub-community;
  - W10 *Quercus robur – Pteridium aquilinum – Rubus fruticosus woodland*.
- Two mire sub-communities
  - M23a *Juncus effusus/acutiflorus - Galium palustre* rush-pasture, *Juncus acutiflorus* sub-community;
  - M25a *Molinia caerulea – Potentilla erecta* mire, *Erica tetralix* sub-community.

- Two neutral grassland NVC sub-communities;
  - MG6a *Lolium perenne – Cynosurus cristatus* grassland, typical sub-community; and
  - MG10a *Holcus lanatus – Juncus effusus* rush pasture, typical sub-community.

8.5.17 All of these NVC communities are situated in one area within the Project Site Boundary, adjacent to and partially within an area of Lletty-Morfil SINC.

e) Invasive Plant Species

8.5.18 Three invasive species subject to legal controls were identified within the Project Site Boundary during the Phase 1 Habitat survey – Rhododendron *Rhododendron ponticum*, Japanese knotweed and Himalayan balsam.

8.5.19 During the 2014 survey, BSG Ecology identified five invasive species subject to legal controls: Japanese knotweed; Himalayan balsam; rhododendron; floating pennywort *Hydrocotyle ranunculoides*; and montbretia *Crocosmia × crocosmiiflora*.

8.5.20 The most frequently recorded species in both surveys were Japanese knotweed and Himalayan balsam. Japanese knotweed was found to be strongly associated with roads and trackways within the Project Site. Himalayan balsam was found to be strongly associated with woodland, stream corridors and ditches across the Project Site.

8.5.21 Rhododendron was found on the edge of woodlands and dense scrub in the south of the Project Site.

8.5.22 Montbretia was recorded in one location within the Project Site Boundary along the existing access road.

8.5.23 Floating pennywort was found in Pond 16.

f) Protected Species Surveys

i. Invertebrates

8.5.24 Several records of notable moths and the protected marsh fritillary butterfly *Euphydryas aurinia* were returned from the local records centre.

8.5.25 Invertebrate surveys were carried out by BSG Ecology for moths, beetles, and aquatic macroinvertebrates (in ponds and watercourses). There is no habitat with the potential to support marsh fritillary within the Project Site Boundary and they are considered to be absent from the survey area.

8.5.26 Only one pond was sampled by BSG Ecology within the Project Site Boundary (Pond 16). Thirty two different species were recorded during the pond survey. The samples were generally dominated by Coleoptera (beetles), followed by Hemiptera (bugs). No scarce or threatened aquatic invertebrates were identified within the samples.

8.5.27 The watercourses were sampled and samples were analysed to at least family level as required to obtain a score for water quality for the watercourse sections sampled; where possible species were also recorded for completeness and so that any rare species collected would be identified. The report did not highlight any rare species and concluded the watercourses were of generally good quality.

8.5.28 Notable or Priority beetle, butterfly and moths species identified during the survey from within the Project Site Boundary are given in Table 8-11 below. Thirteen Section 7 species of moth were recorded during the survey. Their habitat requirements fit with the habitats present within the Project Site Boundary, and as such it is likely they are present across the Project Site.

Table 8.12: Notable and Priority beetle, butterfly and moth species from within the Project Site Boundary

Species	Status	Notes
Nitulid beetle *Epuraea distincta*	Nationally Scarce	This saproxylic species is associated with fungi (notably bracket fungi) on trees, especially in wet woodland. Samples were taken from two pitfall traps in the woodland in the east of the Project Site.
Melandryid beetle *Orchesia micans*	Nationally Scarce	This saproxylic species was found on the remnants of fungus on a single birch tree in the woodland in the east of the Project Site.
Small heath butterfly *Coenonympha pamphilus*	Section 7 species	Widespread and common, and found in a fairly wide variety of habitats with its main food plants being grasses. Specific location not given, although majority of butterflies were recorded in a narrow strip of flower-rich habitat in the southern-most part of the area that was surveyed.
Dusky brocade moth *Apamea remissa*	Section 7 species	The moth is associated with grasses, and there are patches of tall grassland along tracks, roads and on waste ground within the Survey Site.
Garden tiger moth *Arctia caja*	Section 7 species	This species has become scarce in eastern Glamorgan, but remains common in the south and west.
Latticed heath moth *Chiasmia clathrata*	Section 7 species	Common and widespread in southern Glamorgan.
Broom moth *Melanchra pisi*	Section 7 species	Locally, the favoured larval food plant is bracken.
Shoulder-striped wainscot moth *Mythimna comma*	Section 7 species	The larvae feed on a range of grasses.
White ermine moth *Spilosoma lubricipeda*	Section 7 species	The larvae feed on a range of herbaceous plants.
Buff ermine moth *Spilosoma luteum*	Section 7 species	The larvae have wide ranging feeding preferences.

Species	Status	Notes
Blood vein moth *Timandra comae*	Section 7 species	Common across England and Wales. The moth is associated with a variety of herbaceous plants, but docks in particular, so it would have been well suited to the field margins and woodland within the Project Site Boundary.
Cinnabar moth *Tyria jacobaeae*	Section 7 species	The moth is almost exclusively associated with common ragwort (*Jacobaea vulgaris*) and there are some small patches of this plant within the Survey Site, many of which support larvae of this species.
Ear moth agg. moth *Amphipoea oculea*	Section 7 species	The three ear moths that have been recorded in Glamorgan are all either uncommon or rare in the county.
Small phoenix moth *Ecliptopera silaceata*	Section 7 species	Common, widespread resident in Glamorgan, and found in a range of habitats.
Dusky thorn moth *Ennomos fuscantaria*	Section 7 species	Occurs wherever the food plant, ash is found.
Rosy rustic moth *Hydraecia micacea*	Section 7 species	Occurs in a wide range of habitats including gardens, waste ground, pasture, fens, marshes and woodland rides.

ii. Amphibians

8.5.29 Records of common toad *Bufo bufo*, palmate newt *Lissotriton helveticus* and common frog *Rana temporaria* were returned from the local records centre.

8.5.30 Twenty-six ponds were subject to a Habitat Suitability Index (HSI) assessment to assess suitability for support breeding GCN. From the results of the HSI assessment and where access allowed seven ponds were subject to further surveys for GCN including eDNA analysis.

8.5.31 No GCNs were recorded during the surveys and the eDNA analysis returned negative results for each of the ponds for GCN. A number of the ponds were found to support common toads, smooth newts *Lissotriton vulgaris*, and/or palmate newts.

8.5.32 The majority of the habitat suitable for supporting common amphibians is present in the south of the Project Site Boundary. The dominance of improved grassland fields with fenced boundaries in the north limits the suitability of the area for supporting amphibians.

8.5.33 It is considered unlikely that GCN will be present within any of the ponds that were not surveyed or within 500 m of these ponds in surrounding habitat given the absence of GCN from all nearby ponds surveyed. The development will require the removal of three ponds (Ponds 16, 22 and 23). Pond 22 currently supports palmate newts and is likely to support other amphibians including frogs and toads

as well as a range of common aquatic invertebrates. Pond 16 was dry. Pond 23 could not be assessed but if it contains water has the potential to support common amphibians.

iii. Reptiles

8.5.34 The desk study confirmed the presence of slow-worm *Anguis fragilis*, grass snake *Natrix helvetica helvetica*, adder *Vipera berus* and common lizard *Zootoca vivipara* within 2 km, and the presence of grass snake and common lizard within the Project Site Boundary.

8.5.35 During the 2017 reptile survey, a total of 51 adult and juvenile common lizard observations were recorded, with a peak count of six adults recorded on one survey visit. Observations of common lizard were recorded from across the reptile survey area within the Project Site Boundary. The majority of records were from the verges either side of the grassy track running through the centre of the Project Site and from the semi-improved neutral grassland present around the National Grid site.

8.5.36 During the course of the reptile survey, male, female, and juvenile common lizards were recorded, which confirmed that there was a breeding population present within the Project Site Boundary.

8.5.37 Based on the survey results and the criteria laid out in Froglife Advice Sheet 10 (Ref. 8.8), the Site supports a 'Good population' of common lizard.

8.5.38 The Project Site does not meet the criteria for a 'Key Reptile Site'.

8.5.39 No grass snakes were identified within the 2017 reptile survey area including the area with the highest abundance during the 2014 surveys. However, there is the potential for grass snake to be present within the Project Site Boundary and to have gone unrecorded since:

- Grass snake are wide ranging;
- Pond 16, where the majority of the 2014 records were from, was mostly dry throughout the 2017 reptile survey period, making the areas less suitable for supporting grass snake; and,
- The area in the north of the reptile survey area where grass snake was recorded in 2014 could not be accessed for survey in 2017 due to grazing livestock.

8.5.40 As such, it should be assumed grass snake is likely to be present at low densities within the Project Site Boundary and surrounding habitat.

iv. Breeding Birds

8.5.41 The BSG Ecology surveys identified nine Section 7 bird species (previously referred to as species of principal importance for nature conservation in S42 of the NERC Act 2006, now repealed by Environment (Wales) Act 2016) comprising cuckoo *Cuculus canorus*, grasshopper warbler *Locustella naevia*, dunnock *Prunella modularis*, house sparrow *Passer domesticus*, linnet *Carduelis cannabina*, lesser

redpoll *Acanthis cabaret*, skylark *Alauda arvensis*, song thrush *Turdus philomelos*, and tree pipit *Anthus trivialis* were considered likely to breed on-site.

8.5.42 All nine Section 7 species recorded are also red-listed species of conservation concern in Wales, with the exception of dunnock (which is amber-listed). An additional seven amber-listed species, bullfinch *Pyrrhula pyrrhula*, mistle thrush *Turdus viscivorus*, meadow pipit *Anthus pratensis*, reed bunting *Emberiza schoeniclus*, common redstart *Phoenicurus phoenicurus*, whitethroat *Sylvia communis* and willow warbler *Phylloscopus trochilis* were also considered to have bred.

8.5.43 No territories of species listed under Schedule 1 Part 1 of the Wildlife & Countryside Act 1981 (as amended) (Schedule 1 species) were recorded, although two Schedule 1 species were recorded during the surveys, as follows. A pair of red kite was recorded mobbing a peregrine falcon *Falco peregrinus* in May. A pair of red kite was also recorded flying over the breeding bird survey area on the same survey day. Given the timing of the records, and that at least one pair were recorded during survey it is likely that red kite breed locally but that the single record of peregrine referred to a transient bird. No evidence was found to suggest breeding of either species occurred within the breeding bird survey area during 2014.

8.5.44 The single breeding bird survey undertaken in 2017 revealed the same nine Section 7 bird species as recorded during the 2014 survey (cuckoo, grasshopper warbler, dunnock, house sparrow, linnet, lesser redpoll, skylark, song thrush and tree pipit). Nine further species listed on the Amber List were also recorded (bullfinch, common redstart, meadow pipit, mistle thrush, meadow pipit, reed bunting, stock dove, whitethroat and willow warbler) although no species listed on Schedule 1 were recorded within the Project Site Boundary. The survey results from 2017 are largely found to be in line with what was identified in 2014 and there is no significant difference in species breeding within the Project Site between the two surveys.

8.5.45 A survey for goshawk was undertaken in February 2018 of habitats suitable for supporting the species and with the potential to be impacted by the Project. During the survey there were no observations of goshawk.

v. Bats

8.5.46 The desk study identified no sites designated for bats within 10 km of the Project Site Boundary. The desk study confirmed the presence of the following species from within 2 km of the Project Site Boundary: Daubenton's *Myotis daubentonii*, Natterer's *Myotis nattereri*, Noctule *Nyctalus noctule*, pipistrelle species *Pipistrellus sp.*, common pipistrelle *Pipistrellus pipistrellus,* soprano pipistrelle *Pipistrellus pygmaeus,* long-eared species *Plecotus sp.,* brown long-eared *Plecotus auritus* and generic records of bat species *Chiroptera*. None of these records of bats were from within the Project Site.

8.5.47 The desk study identified the following records of known roost sites within 2 km of the Project Site:

- A noctule tree roost approximately 1 km north-west of the Project Site Boundary;
- Common pipistrelle roost approximately 1.3 km east of the Project Site Boundary;
- A common pipistrelle roost approximately 1.8 km south-east of the Project Site Boundary;
- A common pipistrelle roost approximately 1 km southeast of the Project Site Boundary;
- A common pipistrelle roost approximately 1 km north-west of the Project Site Boundary;
- A soprano pipistrelle roost approximately 2 km south-west of the Project Site Boundary;
- A soprano pipistrelle roost approximately 2 km north-west of the Project Site Boundary;
- A long-eared bat and brown-long-eared bat roost approximately 1.6 km east of the Project Site Boundary; and,
- A long-eared bat and brown long-eared bat roost approximately 1.1 km north-west of the Project Site.

8.5.48 The specific locations of the bat roosts are confidential.

Bat Roosts

8.5.49 There are no buildings suitable for supporting bats within the Project Site.

8.5.50 Buildings adjacent to the Project Site were assessed. None of the buildings surveyed by AECOM in 2017 supported bat roosts. Previous surveys by BSG in 2014 confirmed roosts in buildings not surveyed by AECOM in 2017 (Appendix 8.8).

- AECOM Building 1: Unknown Roost Status. Not surveyed by AECOM or BSG Ecology, Building is approximately 125m from the Project Site Boundary;
- AECOM Building 2: Confirmed as a long-eared and pipistrelle roost by BSG in 2014 (Appendix 8.8). Not surveyed by AECOM. It is approximately 120 m outside of the Project Site Boundary;
- AECOM Building 3: No Roost;
- AECOM Building 4: No Roost;
- AECOM Building 5: No Roost;
- AECOM Building 6: No Roost;
- AECOM Building 7: Confirmed as a lesser horseshoe, long-eared and pipistrelle roost by BSG Ecology in 2014 (Appendix 8.8). To be surveyed by AECOM in May, June & July 2018. It is approximately 90 m outside of the Project Site Boundary; and,

- AECOM Building 8: Unknown Roost Status. BSG Ecology internal inspection did not find evidence of bats but not all areas were accessible (Appendix 8.8). Due to the bat roost features identified by BSG Ecology an internal inspection only is not sufficient to determine if this building is being used as a bat roost. To be surveyed by AECOM in May, June & July 2018. The building is approximately 65 m outside of the Project Site Boundary.

8.5.51 Tree 19 is a lone male or non-breeding female common pipistrelle summer roost. No other trees were identified as bat roosts.

8.5.52 Safety investigations regarding the trial shaft (mining feature) have confirmed the location of the shaft and that it has been filled in. The adit was confirmed by the respective landowner as being present next to Building 4 and is an underground feature that has been capped and grass now covers the feature. Therefore, there is no likelihood of hibernating bats or any suitable bat habitat being present in the trial shaft or adit.

Bat Activity – Walked Transects

8.5.53 At least 10 species of bat were recorded foraging and/or commuting in close proximity of and within the Project Site. The following species have been identified during bat surveys at the Project Site during the bat surveys undertaken in 2017:

- Lesser horseshoe;
- Common pipistrelle;
- Soprano pipistrelle;
- Nathusius' pipistrelle;
- Mytois species (including those with characteristics of Daubenton's and Natterer's);;
- Noctule;
- Serotine;
- Long-eared species; and,
- Indeterminate species.

8.5.54 Nathusius' pipistrelle and serotine were not identified during the BSG 2014 activity transect surveys (Appendix 8.8). Leisler's bat was identified during the BSG Ecology 2014 activity transect surveys (Appendix 8.8) but was not identified during the 2017 transect surveys.

8.5.55 Common and soprano pipistrelles were the most commonly recorded species in the Project Site during 2017. Overall pipistrelle species comprised 86.8 % of all passes recorded on the transect surveys; they were also the most commonly recorded species during the emergence/re-entry surveys. Pipistrelle species comprised of 89.5% of the passes recorded on the North Transect and 84.6% of the passes recorded on the South Transect.

8.5.56 Pipistrelle species were similarly the most commonly recorded species during the BSG Ecology 2014 transects surveys (Appendix 8.8).

8.5.57 Two passes of Nathusius' pipistrelle were recorded during the July transect surveys, one record from the South Transect and one record from the North Transect, making up 0.2% of total bat passes.

8.5.58 Overall Myotis species comprised 9.8% of the total calls recorded on the transect surveys. Myotis species comprised 7.7% of the passes recorded on the North Transect and 11.5% of the calls recorded on the South Transect

8.5.59 Activity levels for Myotis species during the 2017 transects surveys were comparable with the activity levels recorded during the BSG Ecology 2014 transect surveys (Appendix 8.8).

8.5.60 Overall noctule and serotine bats comprised 1.8% of the passes recorded on transect surveys. Noctule and serotine bats comprised of 1.9% of the passes recorded on the North Transect and 1.8% of the passes recorded on the South Transect. BSG Ecology did not breakdown these species into percentages but figures are comparable between years.

8.5.61 Long-eared and possible long-eared bat comprised a total of 0.5% of the passes recorded on the North Transect and 0.6% recorded on the South Transect surveys. BSG Ecology did not breakdown these species into percentages but figures are comparable between years.

8.5.62 There was a single lesser horseshoe bat pass, recorded on the South Transect, equating to 0.2% of the total passes for the South Transect and 0.1% of the total passes for the Project Site. This was recorded in August 2017. BSG Ecology also recorded a single pass of lesser horseshoe on the South Transect.

8.5.63 Higher levels of activity were recorded in the Southern Transect (513 bat passes; 15.2 Bat Activity Index (BAI)), compared to the Northern Transect (427 bat passes, 13. 2 BAI). The bat activity levels across the Project Site however are broadly similar. In total 940 bat passes were recorded.

8.5.64 Bat activity was recorded across the Project Site (Figure 5.1). Vegetated stream or wet ditch corridors appear to be important for bats within the Project Site. The distribution of bat calls suggests the following general patterns of activity. This is a qualitative assessment only:

- Pipistrelle bats were recorded across the Project Site;
- Myotis Species showed some association with mature tree lines and/or areas near water;
- Noctule and Serotine bats were primarily recorded at height over open fields across the Project Site;
- Long-eared bats showed some association with mature tree lines and are focused more towards the centre and south-east of the Project Site. The passes recorded are within approximately 315m to 700m of the BSG confirmed long-eared roost in Building 7 and approximately 270m and 850m of the BSG confirmed long-eared roost in Building 2; and

- The single lesser horseshoe was recorded on the South Transect along a mature tree line approximately 900 m south of the closest known lesser horseshoe roost in Building 2.

8.5.65 Bat activity was recorded at the Project Site between June and October 2017. Bat surveys for April and May are due to be undertaken in 2018 with the results to be included in an addendum in August 2018 for DCO examination,].

8.5.66 August had the highest BAI for both transects. The North Transect had a BAI of 8.5 and the South Transect had a BAI of 4.8.

8.5.67 For the North Transect, the second highest BAI was 7.0, both in June and July.

8.5.68 For the South Transect, the second highest BAI was 3.0 in July and the third highest was 2.8 in October.

8.5.69 Young bats are typically born in June and July and during August the young are starting to leave the roosts to fly and feed. October is part of the bat mating period and a time when bats are extensively foraging for food as they are looking to store fat for the winter hibernation period. The general ecology of bat species is likely to influence the temporal activity for the Project Site.

Bat Activity – Static Detectors from June – October 2017

8.5.70 One pass of Nathusius' pipistrelle was recorded at Lane 1 in June 2017 and one pass of Nathusius' pipistrelle at North 2 in October 2017, making up <0.1% of the total bat passes.

8.5.71 One pass of Nathusius' pipistrelle was recorded during the BSG static detector surveys in 2014 at Location D8 (Appendix 8.8)). Location D8 is in a similar area to the AECOM South 1. Nathusius' pipistrelle were not identified during the BSG 2014 activity transect surveys (Appendix 8.8).

8.5.72 A total of 1881 Myotis bat passes, 5.6% of the total calls, were recorded during the static detector surveys. Myotis species were recorded in every month, with the highest level of activity recorded in July with BAI of 20.6, and the second highest level recorded in June with a BAI of 17.0.

8.5.73 Some of the Myotis bat echolocation calls from the static detector surveys were considered to have characteristics of Bechstein's (85 passes), Brandt's (50 passes) and whiskered (87 passes). BSG did not identify Myotis to species level (ES Appendix 8.8).

8.5.74 Noctule, serotine and Leisler's (N/S/L) bats comprised 0.4% of the passes recorded during the static detector surveys.

8.5.75 Noctule, serotine and Leisler's were recorded during the BSG 2014 static detector surveys Serotine were not identified during the BSG 2014 activity transect surveys (ES Appendix 8.8).

8.5.76 Long-eared bats comprised 0.1% of the passes recorded during the static detector surveys.

8.5.77 A total of 14 lesser horseshoe passes were recorded during the static detector survey:

- Three passes recorded in July; one pass at South 3 and two passes at Lane 3;
- Eight passes recorded in August; six passes at South 2, one pass at South 3 and one pass at Lane 1:
- Two passes in September: one at Lane 1 and one at Lane 3; and,
- One pass in October at Lane 3.

8.5.78 BSG recorded a single lesser horseshoe pass at Location D3 (ES Appendix 8.8), which is in a similar area to AECOM South 3.

8.5.79 A single greater horseshoe pass was recorded at Lane 2 in July during the static detector surveys. BSG recorded two greater horseshoe passes in 2014, in Locations D5 and D8 (ES Appendix 8.8). Location D5 was located along the Gallops near to Abergelli Farm and is not comparable with any of the AECOM locations as this is outside of the Project Site Boundary. Location D8 is relatively close to AECOM South 1.

8.5.80 In total 33,764 bat passes were recorded during the static detector surveys. Table 1.22 gives the bat activity by the Static Detector Location Groups. Higher levels of activity were recorded in the Southern Static Detector Locations (7,779 total bat passes; 148.2 BAI), compared to the Northern Static Detector Locations (5,847total bat passes, 87.3 BAI), reflecting the pattern of the walked transect.

8.5.81 Using the first night data from static detector surveys, the species richness recorded across different locations was not statistically significant. Therefore, similarly to the walked transect results, the bat activity levels between North and South are broadly similar.

8.5.82 The highest level of activity was recorded in the Lane Static Detector Locations (20,138 total bat passes, 372.9 BAI). The Lane Static Detector Locations (even with the equipment malfunctions, see Limitations) had higher levels of activity compared to both the North and South Static Detector Locations combined. This may be because the Lane is likely used for foraging, along the sheltered woodland edge, and detectors may have been recording multiple passes by the same bats up and down the Lane.

8.5.83 The distribution of bat echolocation calls detected during the static detector surveys suggests the following general patterns of activity. This is a qualitative assessment only:

- Pipistrelle bats were recorded across the Project Site;
- Myotis species were recorded across the Project Site;
- Noctule, Serotine and Leisler bats were recorded across the Project Site;
- Long-eared bats were recorded at the majority of Static Detector Location except for North 1 and Lane 2;

- The single greater horseshoe was recorded at Lane 2 in the south-west of the Project Site; and,
- Lesser horseshoe bats were recorded within the south and south-west of the Project Site at South 2, South 3, Lane 1 and Lane 2.

Bat Activity – Temporal Distribution

8.5.84 Bat activity was recorded at the Project Site between June and October 2017. Bat surveys for April and May are due to be undertaken in 2018.

8.5.85 August had the highest BAI for both transects. The North Transect had a BAI of 8.5 and the South Transect had a BAI of 4.8.

8.5.86 For the North Transect, the second highest BAI was 7.0, both in June and July.

8.5.87 For the South Transect, the second highest BAI was 3.0 in July and the third highest was 2.8 in October.

8.5.88 For the static detector surveys, July had the highest BAI of 377.3, the second highest BAI was 238.9 in June.

8.5.89 Higher levels of Myotis species activity in June and July during the 2017 static detector surveys were comparable with the higher activity levels recorded in June and July during the BSG 2014 static detector surveys, although it should be noted that BSG did not have any static detectors placed within the lane area to the west of the Project Site.

8.5.90 The statistical analysis of the first night of static detector data showed that bat species richness is influenced by month. August and October had a statistically significant greater species richness than September.

8.5.91 The statistical analysis of the first night of static detector data showed that bat passes is influenced by month. June has a significantly higher bat echolocation call frequency than August and October. This result differs from the walked transect results which showed highest level of bat activity in July and June as the second highest. Both survey methods indicate that the summer months had the highest level of activity. This is likely due to general bat ecology, with bats being most active in mid-summer.

8.5.92 Young bats are typically born in June and July and during August the young are starting to leave the roosts to fly and feed. October is part of the bat mating period and a time when bats are extensively foraging for food as they are looking to store fat for the winter hibernation period. The general ecology of bat species is likely to influence the temporal activity for the Project Site.

8.5.93 The species composition, pattern of activity and temporal distribution are broadly similar between the 2014 survey and 2017 survey. It is considered likely that the surveys in April and May 2018 will provide similar results and the valuation of the feature (bat species) will remain the same (Table 8.13).

8.5.94 An addendum to this ES will be provided in August 2018 once the survey data from April and May 2018 is available.

vi. Dormouse

8.5.95 No records of dormouse were returned from the local records centre. No evidence of dormouse was identified during the field surveys.

vii. Water Vole

8.5.96 No records of water vole were returned during the desk study.

8.5.97 Four watercourses that had potential for supporting water vole were recorded within the water vole survey area. Two of these had limited potential for water vole due to the relative isolation of these watercourses within the landscape (i.e. not connected to watercourses with potential to support water vole). Burrows suitable for water vole were found but there was no evidence of current occupancy. It was therefore not possible to determine if the burrows had been excavated by brown rat or water vole. It is likely that water vole is absent from the water vole survey area.

viii. Otter

8.5.98 A total of thirteen watercourses within the otter survey area were suitable for supporting commuting otter and two watercourses were suitable for supporting foraging otter, holt and couch creation. One potential couch was identified with a trampled vegetation track leading to it which suggested occasional use by a mammal. Two mammal tracks were identified; these may have been fox or another mammal. No spraints, holts, footprints, anal jelly or other signs were identified during the otter surveys.

8.5.99 One couch and slide next to a watercourse with a pathway leading from an area of marshy grassland, and feeding remains and a spraint were identified during the badger survey. These were recorded outside of the otter survey area but adjacent to a watercourse that flows through and immediately adjacent to the Project Site Boundary.

8.5.100 Due to the confirmed presence of otter upstream from the Project Site in 2015, the presence of spraints and a footprint from a nearby pond in May 2017 and the presence of a couch, slide pathway, feeding remains and a spraint from a watercourse that flows through and immediately adjacent to the Project Site Boundary it can be concluded that otters are still active in the locality. As such it is likely that otters use the suitable watercourses within the otter survey area and Project Site Boundary for occasional forging, commuting, resting and holt creation; although no evidence of holts was identified during the survey.

ix. Brown Hare

8.5.101 No records of brown hare Lepus europaeus were returned from the local records centre.

8.5.102 Sightings of brown hare were made during surveys for other species. A targeted survey for brown hare was not undertaken.

8.5.103 Scrub, woodland edge and grassland habitat present throughout the Project Site Boundary are suitable for supporting the species.

x. Badger

8.5.104 A number of badger records were returned from the local records centre, including:

- Adjacent to the Project Site Boundary, near to the Felindre Gas Compressor Station site;
- 350 m south;
- Penllergaer Valley Woods;
- 1 km south;
- 1.4 km south; and,
- 1.5 km north.

8.5.105 The badger survey area contains suitable habitat for supporting badgers. The scrub, woodland edge and grassland habitat present throughout the Project Site Boundary are suitable for supporting the species. A total of five badger setts were recorded during the survey (one of which was immediately adjacent to the Project Site Boundary and the other four were well outside of the Project Site Boundary).

8.5.106 The survey identified signs of badger actively using the Project Site. Badger signs recorded included latrines, dung pits and mammal paths. It is therefore likely that badger use the Project Site on a regular basis for foraging and to commute between foraging areas within the wider landscape.

g) Evaluation of Ecological Features

8.5.107 Table 8.13 below summarises the evaluation of ecological features of nature conservation interest within the Project Site Boundary for each habitat and species/species group, and within 2 km of the Project Site Boundary for each designated site, which could potentially be affected by the Project and are assessed within the EcIA.

Table 8.13: Evaluation of Ecological Features

Feature – Site/Habitat/Species	Evaluation Rationale	Value / Sensitivity of Feature
Statutory Designated Sites		
Crymlyn Bog SAC and Ramsar	A statutory designated site that supports habitats and species assessed to be of international and national importance.	Very High
Carmarthen Bay SAC	A statutory designated site that supports habitats and species assessed to be of international importance.	Very High
Burry Inlet SPA and	A statutory designated site that supports habitats	Very High

Feature – Site/Habitat/Species	Evaluation Rationale	Value / Sensitivity of Feature
Ramsar	and species assessed to be of international importance.	
Nant Y Crimp SSSI	A statutory designated site that supports habitats and species assessed to be of national importance.	High
Non-Statutory Designated Sites		
Lletty-Morfil SINC	A non-statutory designated site that supports habitats and species assessed to be of county importance.	Medium
Coed Barcud Wildlife Trust Reserve boundary.	A non-statutory designated site that supports habitat assessed to be of local importance.	Low
Rhos Fawr SINC	A non-statutory designated site that supports habitats and species assessed to be of county importance.	Medium
Felindre Grasslands SINC	A non-statutory designated site that supports habitats and species assessed to be of county importance.	Medium
Middle Llan SINC	A non-statutory designated site that supports habitats assessed to be of county importance.	Medium
Rhyd-Y-Pandy Valley and Grasslands SINC	A non-statutory designated site that supports habitats and species assessed to be of county importance.	Medium
Waun Garn Wen SINC	A non-statutory designated site that supports habitats and species assessed to be of county importance.	Medium
Pant Lasau SINC	A non-statutory designated site that supports habitats and species assessed to be of county importance.	Medium
Cefn Forest Stream SINC	A non-statutory designated site that supports habitats and species assessed to be of county importance.	Medium
Lower Lliw Reservoir SINC	A non-statutory designated site that supports habitats and species assessed to be of county importance.	Medium
Cilfaen SINC	A non-statutory designated site that supports habitats assessed to be of county importance.	Medium
Middle Lliw SINC	A non-statutory designated site that supports habitats and species assessed to be of county importance.	Medium
Ancient Woodland 1	A non-statutory designated site that supports	Medium

Feature – Site/Habitat/Species	Evaluation Rationale	Value / Sensitivity of Feature
	habitats and species assessed to be of county importance.	
Ancient Woodland 2	A non-statutory designated site that supports habitats and species assessed to be of county importance.	Medium
Ancient Woodland 3	A non-statutory designated site that supports habitats and species assessed to be of county importance.	Medium
Ancient Woodland 4	A non-statutory designated site that supports habitats and species assessed to be of county importance.	Medium
Ancient Woodland 5	A non-statutory designated site that supports habitats and species assessed to be of county importance.	Medium
Ancient Woodland 6	A non-statutory designated site that supports habitats and species assessed to be of county importance.	Medium
Ancient Woodland 7	A non-statutory designated site that supports habitats and species assessed to be of county importance.	Medium
Ancient Woodland 8	A non-statutory designated site that supports habitats and species assessed to be of county importance.	Medium
Ancient Woodland 9	A non-statutory designated site that supports habitats and species assessed to be of county importance.	Medium
Ancient Woodland 10	A non-statutory designated site that supports habitats and species assessed to be of county importance.	Medium
Ancient Woodland 11	A non-statutory designated site that supports habitats and species assessed to be of county importance.	Medium
Ancient Woodland 12	A non-statutory designated site that supports habitats and species assessed to be of county importance.	Medium
Ancient Woodland 13	A non-statutory designated site that supports habitats and species assessed to be of county importance.	Medium
Ancient Woodland 14	A non-statutory designated site that supports habitats and species assessed to be of county importance.	Medium

Feature – Site/Habitat/Species	Evaluation Rationale	Value / Sensitivity of Feature
Ancient Woodland 15	A non-statutory designated site that supports habitats and species assessed to be of county importance.	Medium
Ancient Woodland 16	A non-statutory designated site that supports habitats and species assessed to be of county importance.	Medium
Ancient Woodland 17	A non-statutory designated site that supports habitats and species assessed to be of county importance.	Medium
Ancient Woodland 18	A non-statutory designated site that supports habitats and species assessed to be of county importance.	Medium
Ancient Woodland 19	A non-statutory designated site that supports habitats and species assessed to be of county importance.	Medium
Ancient Woodland 20	A non-statutory designated site that supports habitats and species assessed to be of county importance.	Medium
Ancient Woodland 21	A non-statutory designated site that supports habitats and species assessed to be of county importance.	Medium
Ancient Woodland 22	A non-statutory designated site that supports habitats and species assessed to be of county importance.	Medium
Habitats		
Broadleaved Woodland – Semi-Natural	This habitat is botanically diverse and contributes to the variety of resources in the local area. Lowland mixed deciduous woodland is a Section 7 habitat. Areas of semi-natural broadleaved woodland within the Project Site Boundary that are also designated as SINC and Ancient Woodland are evaluated under the designated sites section of this table.	Medium
Broadleaved Woodland – Plantation	This habitat contributes to the variety of resources in the local area. Lowland mixed deciduous woodland is a Section 7 habitat.	Medium
Scrub – Dense/ Continuous	This habitat contributes to the variety of resources in the local area, but consists of widespread and abundant species.	Low
Scrub – Scattered	This habitat contributes to the variety of resources in the local area, but consists of	Low

Feature – Site/Habitat/Species	Evaluation Rationale	Value / Sensitivity of Feature
	widespread and abundant species. Areas of scrub within the Project Site Boundary that are also designated as SINC are evaluated under the designated sites section of this table.	
Rows of Trees – Broadleaved	This habitat contributes to the variety of resources in the local area, but consists of widespread and abundant species.	Low
Standalone Trees	This habitat contributes to the variety of resources in the local area, but consists of widespread and abundant species.	Low
Ruderal – Tall Herb and Fern	This habitat contributes to the variety of resources in the local area, but consists of widespread and abundant species.	Low
Semi-Improved Neutral Grassland	Although this habitat is botanically diverse and contributes to the variety of resources in the local area, it consists of widespread and abundant species and is currently tightly grazed, reducing the value. Neutral grassland lowland meadows are a Section 7 habitat.	Low
Marshy Grassland	This habitat is botanically diverse and contributes to the variety of resources in the local area. Areas of marshy grassland within the Project Site Boundary that are also designated as SINC are evaluated under the designated sites section of this table. Purple moor grass and rush pastures are a Section 7 habitat; a small area of marshy grassland within the Project Site Boundary can be classified as this habitat type. Areas of marshy grassland within the Project Site Boundary that are also designated as SINC are evaluated under the designated sites section of this table.	Medium
Improved Grassland	Improved grassland is the dominant habitat within the Project Site Boundary and beyond in the wider landscape. At the time of survey, it was being utilised for grazing horses and sheep. Improved grassland is botanically poor and has no more than local value. Due to the negligible valuation, this feature will be scoped out of any further assessment.	Negligible

Feature – Site/Habitat/Species	Evaluation Rationale	Value / Sensitivity of Feature
Running Water	This habitat contributes to the variety of resources in the local area.	Low
	One watercourse (Afon Llan) can be classed as a Section 7 habitat (river).	Medium
Standing Water	This habitat contributes to the variety of resources in the local area. Ponds are a Section 7 habitat.	Medium
Hedgerow with Trees – Species – Rich	This habitat is botanically diverse and contributes to the variety of resources in the local area. Hedgerows are a Section 7 habitat.	Medium
Hedgerow with Trees – Species – Poor	This habitat contributes to the variety of resources in the local area. Hedgerows are a Section 7 habitat.	Medium
Intact Hedgerow – Species – Poor	This habitat contributes to the variety of resources in the local area. Hedgerows are a Section 7 habitat.	Medium
Earth Bank	Earth banks are evaluated under the habitat which they support – for example, grassland. As such, this feature will be scoped out of any further assessment.	N/A
Buildings	Buildings within the Project Site Boundary have no ecological value.	Negligible
Fences	Fences have no ecological value. Due to the negligible valuation, this feature will be scoped out of any further assessment.	Negligible
Hard Standing	Hard standing has no ecological value. Due to the negligible valuation, this feature will be scoped out of any further assessment.	Negligible
Protected / Priority Species		
Invertebrates	Nationally Scarce beetle species were identified during the field surveys. These species have a restricted distribution across the UK and are important at the regional level. Priority invertebrate (beetle, butterfly and moth) species were identified during the field surveys. The majority of the Section 7 invertebrate species identified are known to be common throughout the region and/or UK. The Section 7 species identified are important at the local level.	Medium

Feature – Site/Habitat/Species	Evaluation Rationale	Value / Sensitivity of Feature
Amphibians	Populations of common toads, palmate newts and/or smooth newts were identified during field surveys. Common toad is a Section 7 species. Amphibians are important at the local level.	Medium
Reptiles	A 'Good' breeding population of common lizard was identified during the field surveys. It is assumed that grass snake is present based on the results of the 2014 survey. Reptiles are protected under the Wildlife and Countryside Act 1981 (as amended) and both species recorded during the surveys are Section 7 species. Reptiles are important at the district level.	Medium
Breeding Birds	Surveys identified a locally important breeding bird assemblage. Included within the assemblage are nine Section 7 species, eight red-listed species and eight amber-listed species. No Schedule 1 species were identified as breeding during the field surveys.	Medium
Bats	Surveys identified a regularly occurring significant population/number of internationally important and protected species. Included within the assemblage are six Section 7 species.	High
Dormouse	No dormice were identified survey any of the field surveys. It is likely dormice are absent from the Project Site and will be scoped out of any further assessment.	N/A
Water Vole	No current evidence of water vole was identified during the field surveys and it is likely that water vole are absent from the water vole survey area. However, the habitat within the Project Site remains suitable for water vole. Water vole is protected under the Wildlife and Countryside Act 1981(as amended) and is listed as a Section 7 species. Water vole is important at the site level.	Low
Otter	It is likely that otters use the suitable watercourses within the otter survey area and Project Site Boundary for occasional forging, commuting, resting and holt creation; although no evidence of holts was identified during the	Low

Feature – Site/Habitat/Species	Evaluation Rationale	Value / Sensitivity of Feature
	survey. Otters are protected under The Conservation of Habitats and Species Regulations 2010 (as amended) and the Wildlife and Countryside Act 1981(as amended), and are listed as a Section 7 species. Otter are important at the site level.	
Brown Hare	The presence of brown hare was confirmed through field surveys. The species is abundant throughout the UK although is declining nationally. Brown hare is a Section 7 species. Brown hare is important at the site level.	Low
Badger	Current legislation protects badger setts from disturbance, damage and/or destruction and the badger from persecution but does not confer any special conservation status.	Low

8.6 Embedded Mitigation

8.6.1 As detailed in **Chapter 3: Project and Site Description**, a number of embedded mitigation measures have been identified through the iterative EIA process and have been incorporated into the design and construction planning of the Project.

8.6.2 As these mitigation measures have been embedded into the design, are legal requirements or are standard practices that will be implemented, the assessment of effects assumes that they are in place.

8.7 Assessment of Effects

8.7.1 This section presents the findings of the ecological assessment for the construction phase, operation and maintenance phase and the decommissioning phase of the Project.

8.7.2 This section identifies any significant effects that are predicted to occur and Section 8.8 highlights any additional mitigation and monitoring measures that are proposed to reduce or eliminate the identified significant effects.

a) Construction

8.7.3 Approximate habitat loss calculations below are provided for each of the Project elements. Figure 3.6 shows the areas of habitat loss, and Table 8.14 provides a summary.

i. Statutory Designated Sites

8.7.4 There is a hydrological link between the Project Site and Carmarthen Bay SAC and Burry Inlet SPA and Ramsar via the Afon Llan. There are springs, with their associated streams and drainage ditches within the Project Site which discharge into the Afon Llan. The Afon Llan links with the Afon Lliw and the River Loughor. The Afon Llan flows for approximately 12 km before reaching the designated sites.

8.7.5 Discharges into to Afon Llan or any other watercourses linking to the Afon Llan will be controlled via various measures as outlined in the embedded mitigation. The embedded mitigation covers drainage and following best practice and guidelines, controlling pollution, storage of potential pollutants, and precautionary measures will help to limit the likelihood and effects of pollution incidents and/or runoff. Discharges will not perceptively increase the flow of the Afon Llan.

8.7.6 There are considered to be no effects on statutory designated sites with regards to water discharges due to the Site preparation works and embedded mitigation measures, in addition to the large dispersal distance within the Afon Llan from the Project Site to the designated sites.

8.7.7 Transport related emissions are most relevant to sites within 200 m of a major road. The Design Manual for Roads and Bridges (DMRB) identifies 200 m as the distance beyond which the contribution of traffic emissions to local pollutant concentrations is considered to be negligible. Crymlyn Bog SAC and Ramsar, Carmarthen Bay SAC, and Burry Inlet SPA and Ramsar are all within 200 m of a major road; there are no roads within 200 m of any of these statutory sites that are forecast to receive anything other than a nominal change in vehicle flows as a result of this Project. There are no roads within 200 m of Nant Y Crimp SSSI. There are considered to be no effects associated with transport-related emissions generated during construction and therefore no additional mitigation is required.

8.7.8 There are considered to be no additional effects on statutory designated sites in relation to the construction of the Project due to the distances between the Project and the site and the lack of pathways between the Project and the sites and therefore no additional mitigation is required.

ii. Non-Statutory Designated Sites

8.7.9 The embedded mitigation within the CEMP (Appendix 3.1) will control movement of people, vehicles and machinery on to and around the Project Site during the construction phase and to help prevent the degradation and destruction associated with increased foot traffic, trampling and/or tracking over of retained non-statutory designated site habitat.

8.7.10 As detailed in Section 8.7 (a)(i), all non-statutory designated sites within 200 m of the Project Site Boundary are greater than 200 m from a major road. There are deemed expected to be no effects associated with transport-related emissions generated during construction.

8.7.11 As defined by the Institute of Air Quality Management (IAQM) guidance, ecological receptors should be considered within 50 m of potential dust sources and 50 m of the routes used by construction vehicles on the public highway, up to 500 m from the Project Site entrance. The following non-statutory designated sites are present within 500 m of the Project Site entrance to the north: Rhos Fawr SINC, Rhyd-Y-Pandy Valley and Grasslands SINC, Waun Garn Wen SINC, Coed Barcud Wildlife Trust Reserve, Ancient Woodland 11; and within 500 m of the Project Site entrance to the south: Cefn Forest Steam SINC, Felindre Grasslands SINC, Lletty-Morfil SINC, Ancient Woodland 6, Ancient Woodland 12. Part of the Power Generation Plant construction site falls within the Lletty-Morfil SINC. There are no additional non-statutory designated sites within 50 m of the construction routes or potential dust sources.

8.7.12 Indirect impacts on the sites listed above (Table 8-15) from dust generation have been considered but vehicle flows on the access route and Access Road will be temporary and little dust generation is expected, particularly given the embedded mitigation with regards to measures for controlling dust generation which could include wetting of the Access Road if needed. Moreover these impacts are reversible as soon as construction ceases. There are expected to be no effects associated with dust generated during construction requiring additional mitigation.

8.7.13 The embedded mitigation with regards to following good practice and guidelines, controlling pollution, storage of potential pollutants, and precautionary measures will help to limit the likelihood and effects of pollution incidents and/or runoff; and the embedded mitigation with regards to measures for controlling dust will help to limit the likelihood of increases of nutrient inputs non-statutory designated site habitats.

8.7.14 There are no designated features within the non-statutory designated sites that are sensitive to lighting. Construction-related lighting on non-statutory designated sites has not been considered any further.

8.7.15 For woodlands with root protection zones within the Project Site Boundary the embedded mitigation for all retained trees to be protected from any damage in accordance with BS5837:2012 Trees in Design, Demolition and Construction, Recommendations will help protect trees, scrub, woodland and hedgerows within non-statutory designated sites from direct damage and implement root protection zones.

8.7.16 There will be loss of Lletty-Morfil SINC habitats and Ancient Woodland habitat, as detailed below. There will be no loss of habitat within the other non-statutory designated sites.

Lletty-Morfil SINC

8.7.17 During the construction of the Power Generation Plant there will be a permanent loss of 0.43 ha (representing 1.20% of total Lletty-Morfil SINC area – 36 ha) of Lletty-Morfil SINC comprising 0.26 ha of broadleaved semi-natural woodland and 0.17 ha of marshy grassland. The SINC is considered to be of medium sensitivity

with the extent of habitat loss being a medium magnitude, therefore resulting in a **Moderate** effect. This is considered to be significant.

8.7.18 During construction of the Gas Connection there will be a temporary loss of 0.36 m^2 (<0.01%) of Lletty-Morfil SINC comprising broadleaved semi-natural woodland. Given the same sensitivity as above, the extent of habitat loss is considered to negligible magnitude, therefore resulting in a **Negligible** effect. This is not considered to be significant and therefore no further mitigation is required.

Middle Llan SINC, Pant Lasau SINC and Ancient Woodland 4

8.7.19 There is a hydrological link between the Project Site and Middle Llan SINC, Pant Lasau SINC and Ancient Woodland 4 via the Afon Llan. There are springs, with their associated streams and drainage ditches within the Project Site which discharge into the Afon Llan. The Afon Llan flows through each of these sites.

8.7.20 Discharges into Afon Llan or any other watercourses linking to the Afon Llan will be controlled via various measures as outlined in the embedded mitigation. The embedded mitigation covers drainage and following best practice and guidelines, controlling pollution, storage of potential pollutants, and precautionary measures will help to limit the likelihood and effects of pollution incidents and/or runoff. Discharges will not perceptively increase the flow of the Afon Llan.

8.7.21 There are considered to be no effects on non-statutory designated sites with regards to water discharges due to the Site preparation works and embedded mitigation measures.

Ancient Woodland 2 and Ancient Woodland 6

8.7.22 Ancient Woodland is shown to be present over non-wooded habitats such as open grassland, hard standing and buildings. The habitat loss calculations for Ancient Woodland have only considered those areas which are wooded.

8.7.23 The location of the new section of Access Road seeks to avoid Ancient Woodland 2. No habitat loss is anticipated for Ancient Woodland 6 with regards to the widening of the existing Access Road. There is no affect on Ancient Woodland as a result of the avoidance measures.

iii. Habitats

8.7.24 The embedded mitigation for a CEMP (Appendix 3.1) will control movement of people, vehicles and machinery on to and around the Project Site during the construction phase and to help prevent the degradation and destruction associated with increased foot traffic, trampling and/or tracking over of retained habitats.

8.7.25 As detailed in Section 8.7 (a)(i), all habitats within the Project Site Boundary are greater than 200 m from a major road. There are expected to be no effects associated with transport-related emissions generated during construction.

8.7.26 For reasons given in Section 8.7 (a)(ii), indirect impacts on the sites from dust generation have been considered but vehicle flows on the access route and Access Road will be temporary and little dust generation is expected, particularly given the embedded mitigation with regards to measures for controlling dust generation which could include wetting of the Access Road if needed. Moreover these impacts are reversible as soon as construction ceases. There are deemed to be no effects associated with dust generated during construction requiring additional mitigation.

8.7.27 The embedded mitigation with regards to following best practice and guidelines, controlling pollution, storage of potential pollutants, and precautionary measures will help to limit the likelihood and effects of pollution incidents and/or runoff; and the embedded mitigation with regards to measures for controlling dust will help to limit the likelihood of increases of nutrient inputs on retained habitats.

8.7.28 The embedded mitigation for all retained trees to be protected from any damage in accordance with BS5837:2012 Trees in Design, Demolition and Construction, Recommendations will help protect trees, scrub and hedgerows from direct damage and implement root protection zones.

8.7.29 Where habitats are present within designated sites (for example, Lletty-Morfil SINC), the habitat loss calculations have been undertaken for the designated site only so as to not falsely over-represent habitat loss. A breakdown of habitat types to be removed has been provided for the designated sites above.

Broadleaved Woodland – Semi-Natural and Broadleaved Woodland – Plantation

8.7.30 During the construction of the Power Generation Plant there will be a permanent loss of 0.79 ha of broadleaved semi-natural woodland and a permanent loss of 0.02 ha of broadleaved plantation woodland. Due to the small area and isolated nature of the habitats to be removed habitat loss is afforded Low magnitude resulting in a **Minor** effect. Loss of broadleaved semi-natural woodland habitat is not considered a significant effect and therefore no additional mitigation is required.

8.7.31 There is no requirement to remove broadleaved semi-natural woodland habitat or broadleaved plantation woodland for the Gas Connection and Electrical Connection elements of the Project.

Dense/Continuous Scrub

8.7.32 During the construction of the Power Generation Plant there will a permanent loss of 0.18 ha of dense/continuous scrub.

8.7.33 During the construction of the Gas Connection there will be a temporary loss of 0.02 ha of dense/continuous scrub.

8.7.34 During the construction of the Electrical Connection there will be a temporary loss of 54 m^2 of dense/continuous scrub.

8.7.35 Due to the small area and isolated nature of the habitats to be removed habitat loss is afforded Low magnitude resulting in a **Negligible** effect. Loss of dense-

continuous scrub is not considered a significant effect and therefore no additional mitigation is required.

Rows of Trees – Broadleaved

8.7.36 During the construction of the Power Generation Plant there will be a permanent loss of approximately 530 m of the row of trees habitat and a temporary loss of 40 m for laydown areas.

8.7.37 During the construction of the Gas Connection there will be a temporary loss of approximately 350 m of the row of trees habitat.

8.7.38 During the construction of the Electrical Connection there will be a temporary loss of approximately 15 m of the row of trees habitat.

8.7.39 Loss of this habitat type will reduce connectivity across the Project Site and to the wider landscape. Although there is an abundance of this habitat type within the Project Site Boundary and wider landscape the loss of this habitat may have a long term effect on species utilising the habitat. As such this habitat loss for each element is afforded High magnitude resulting in a **Moderate** effect for each element. Loss of the row of trees habitat is therefore a significant effect and will require additional mitigation for each element.

Standalone Trees

8.7.40 During the construction of the Power Generation Plant there will potentially be a loss of up to two standalone trees.

8.7.41 During the construction of the Gas Connection there will potentially be a loss of up to two standalone trees.

8.7.42 During the construction of the Electrical Connection there will potentially be a loss of up to one standalone tree.

8.7.43 The trees are located on the edge of the Project Site Boundary, and as such construction works may be able to avoid removing them. There is an abundance of this habitat type within the Project Site Boundary and wider landscape. Habitat loss is afforded Medium magnitude resulting in a **Minor** effect. Loss of standalone trees is not considered a significant effect and therefore no additional mitigation is required.

Semi-Improved Neutral Grassland

8.7.44 During the construction of the Power Generation Plant there will be a permanent loss of 0.65 ha and a temporary loss of 0.15 ha for laydown areas of semi-improved neutral grassland.

8.7.45 During the construction of the Gas Connection there will be a temporary loss of 1.02 ha of semi-improved neutral grassland.

8.7.46 During the construction of the Electrical Connection there will be a temporary loss of 0.07 ha of semi-improved neutral grassland.

8.7.47 There is an abundance of this habitat type within the Project Site Boundary and wider landscape. Habitat loss is afforded Medium magnitude resulting in a minor effect. Loss of semi-improved neutral grassland is therefore not a significant effect and therefore no additional mitigation is required.

Marshy Grassland

8.7.48 During the construction of the Power Generation Plant there will a permanent loss of 1.45 ha loss and a temporary loss of 1.94 ha for laydown areas of marshy grassland. There is an abundance of this habitat type within the Project Site Boundary and wider landscape. Habitat loss is afforded Medium magnitude resulting in a **Moderate** effect. Loss of marshy grassland is therefore a significant effect and will require additional mitigation.

8.7.49 During the construction of the Gas Connection there will be a temporary loss of 0.01 ha of marshy grassland. Due to the small area of the habitat to be temporarily removed habitat loss is afforded Low magnitude resulting in a **Negligible** effect. Loss of marshy grassland is not considered a significant effect and therefore no further mitigation is required.

8.7.50 During the construction of the Electrical Connection there will be a temporary loss of 0.15 ha of marshy grassland. Due to the small area of the habitat to be temporarily removed habitat loss is afforded Low magnitude resulting in a **Negligible** effect. Loss of marshy grassland is not considered a significant effect and therefore no further mitigation is required.

Running Water

8.7.51 During the construction of the Power Generation Plant and the Gas Connection there is shown to be a loss of the running water habitat; however, cut off drainage ditches will be placed around the uphill perimeter of the Project Site. These new drainage ditches will be designed to carry the surface runoff around the Project Site and downstream back to the original drainage ditches/watercourses; and existing field drainage that will cross the Access Road will be culverted or bridged for a short length. Overall there will be no loss of running water habitat and therefore the effect is **Negligible** and no mitigation is required.

8.7.52 The embedded mitigation with regards to the CEMP (Appendix 3.1), following best practice and guidelines, controlling pollution and runoff, sediment loads, storage of potential pollutants, and precautionary measures will help to limit the likelihood and effects of pollution incidents and/or runoff, and control dust and sediment loads on aquatic habitats.

Running Water – Afon Llan

8.7.53 Discharges into Afon Llan or any other watercourses linking to the Afon Llan will be controlled via various measures as outlined in the embedded mitigation. The

embedded mitigation covers drainage and following best practice and guidelines, controlling pollution, storage of potential pollutants, and precautionary measures will help to limit the likelihood and effects of pollution incidents and/or runoff. Discharges will not perceptively increase the flow of the Afon Llan and as such there will be no scouring of the watercourse. Effect on Afon Llan is **Negligible** and no mitigation is required.

Standing Water

8.7.54 The Power Generation Plant component of the Project will require the removal of standing water – Pond 16 and Pond 22. Pond 16 is temporal and Pond 22 holds water year round.

8.7.55 The construction of the Gas Connection may require the removal of Pond 23. Pond 23 holds water year round. Pond 23 is on the edge of the Project Site Boundary and it may be possible that construction works can avoid the pond.

8.7.56 Although there is an abundance of this habitat type within the Project Site Boundary and wider landscape, the loss of this habitat may have a long term effect on species utilising the habitat. Habitat loss is afforded Medium magnitude resulting in a **Moderate** effect. Loss of standing water is therefore a significant effect and will require additional mitigation.

8.7.57 The embedded mitigation with regards to the CEMP (Appendix 3.1), following best practice and guidelines, controlling pollution and runoff, sediment loads, storage of potential pollutants, and precautionary measures will help to limit the likelihood and effects of pollution incidents and/or runoff, and control dust and sediment loads on aquatic habitats.

Hedgerows – Species-Poor

8.7.58 During the construction of the Power Generation Plant there will be a permanent loss of approximately 140 m of species-poor hedgerow habitat.

8.7.59 During the construction of the Gas Connection there will be a temporary loss of approximately 180 m of hedgerow habitat.

8.7.60 Loss of this habitat type will reduce connectivity across the Project Site and to the wider landscape. Although there is an abundance of this habitat type within the Project Site Boundary and wider landscape the loss of this habitat may have a long term effect on species utilising the habitat. As such this habitat loss is afforded Medium magnitude resulting in a **Moderate** effect. Loss of the hedgerow habitat is therefore a significant effect and will require additional mitigation.

Scattered Scrub, Hedgerows – Species-Rich and Tall Ruderal

8.7.61 There will be no removal of scattered scrub, and tall ruderal vegetation. There are considered to be no significant effects requiring mitigation.

iv. Species

Invertebrates

8.7.62 The Power Generation Plant requires the permanent removal of:

- A small proportion of Lletty-Morfil SINC (0.43 ha representing 1.20% of total Lletty-Morfil SINC area – 36 ha), this has the potential to have a limited impact on the Section 7 listed butterfly, wall due to loss of habitat;
- A proportion (0.5 ha) of broadleaved semi-natural woodland, this has the potential to have a limited impact on the two Nationally Scarce beetles through partial loss of a habitat;
- Running and standing water, this has the potential to have a limited impact on common species only; and,
- Marshy grassland, semi-improved neutral grassland, scrub, standing water, this has the potential to have an impact on the Section 7 species of moth and butterfly identified during the field surveys.

8.7.63 The partial loss of a small proportion of the suitable invertebrate habitat available in the wider area is unlikely to have a long term effect on invertebrate species utilising the habitat. As such this habitat loss is afforded Low magnitude resulting in a **Minor** effect. Loss of habitat is therefore not a significant effect and will not require additional mitigation.

8.7.64 The Gas Connection requires the temporary removal of:

- A small proportion of Lletty-Morfil SINC (0.36m^2), this is likely to have a negligible impact on the Section 7 listed butterfly, wall due to loss of habitat;
- Running and standing water, this has the potential to have a limited impact on common species only; and,
- Marshy grassland, semi-improved neutral grassland, scrub, standing water, this has the potential to have an impact on the Section 7 species of moth and butterfly identified during the field surveys.

8.7.65 The Electrical Connection requires the temporary removal of marshy grassland, semi-improved neutral grassland and scrub, this has the potential to have an impact on the Section 7 species of moth and butterfly identified during the field surveys.

8.7.66 Temporarily removed habitats will be reinstated once construction works are complete. Temporary habitat loss is afforded Low magnitude resulting in a **Minor** effect. Temporary loss of habitat is therefore not a significant effect and will not require additional mitigation.

Amphibians

8.7.67 The Power Generation Plant requires the permanent removal of standing water, scrub, broadleaved semi-natural woodland, species-poor hedgerows and semi-improved neutral grassland and the temporary removal of semi-improved neutral grassland, marshy grassland and rows of trees.

8.7.68 The Gas Connection requires the temporary removal of standing water (may be possible to avoid), scrub, semi-improved neutral grassland, marshy grassland, rows of trees and species-poor hedgerows.

8.7.69 The Electrical Connection requires the temporary removal of a single tree, scrub, semi-improved neutral grassland, marshy grassland and rows of trees.

8.7.70 Habitat removal has the potential to impact common amphibians due to the permanent and temporary reduction in suitable habitat, including permanent loss of suitable breeding habitat (standing water). There is an abundance of suitable habitat within the Project Site Boundary and the wider landscape. Loss of habitat is afforded Medium magnitude resulting in a **Moderate** effect. Loss of habitat is therefore a significant effect and will require additional mitigation.

8.7.71 During construction activities there is the potential for common amphibians to be injured or killed through removal of habitats. Injury of killing of common amphibians is afforded Medium magnitude, resulting in a **Moderate** effect. Injury or killing is therefore a significant effect and will require additional mitigation.

8.7.72 The embedded mitigation with regards to the CEMP (Appendix 3.1), following best practice and guidelines, controlling pollution and runoff, storage of potential pollutants, dust, and precautionary measures will help to limit the likelihood and effects of trampling, pollution incidents and/or runoff, and dust on terrestrial and aquatic habitats with the potential to support amphibians.

Reptiles

8.7.73 The Power Generation Plant requires the permanent removal of standing water, scrub, broadleaved semi-natural woodland, species-poor hedgerows and semi-improved neutral grassland, and the temporary removal of semi-improved neutral grassland, marshy grassland and rows of trees.

8.7.74 The permanent removal of habitats has the potential to impact reptiles due to the loss of breeding, sheltering and foraging habitat. The loss of this habitat may have a long term effect on reptile species utilising the habitat. As such this habitat loss is afforded Medium magnitude resulting in a **Moderate** effect. Loss of reptile habitat is therefore a significant effect and will require additional mitigation.

8.7.75 The Gas Connection requires the temporary removal of breeding, sheltering and foraging habitat (standing water (may be possible to avoid), scrub, semi-improved neutral grassland, marshy grassland, rows of trees and species-poor hedgerows). Habitats will be reinstated once works are complete. Temporary habitats loss is afforded Low magnitude resulting in a **Minor** effect. Temporary loss of habitat is therefore not a significant effect and will not require additional mitigation.

8.7.76 The Electrical Connection requires the temporary removal of breeding, sheltering and foraging habitat (a single tree, scrub, semi-improved neutral grassland, marshy grassland and rows of trees). Habitats will be reinstated once works are complete. Temporary habitats loss is afforded Low magnitude resulting in a **Minor** effect.

Temporary loss of habitat is therefore not a significant effect and will not require additional mitigation.

8.7.77 Although the works are temporary in these areas (Electrical Connection and Gas Connection), the loss of standing water and/or mature trees must be considered permanent due to the time required for mature trees to grow and the change in ground conditions making it unlikely for the pond (within the Gas Connection route) to reform without human intervention. Therefore, permanent loss of standing water and/or trees for the Electrical Connection and Gas Connection is afforded Medium magnitude resulting in a **Moderate** effect for each of the elements. Habitat loss is therefore a significant effect and will require additional mitigation.

8.7.78 During all construction activities there is the potential for reptiles to be injured or killed through removal of habitats. Injury of killing of reptiles is afforded High magnitude resulting in a **Moderate** effect; and is therefore a significant effect and will require additional mitigation.

8.7.79 The embedded mitigation with regards to the CEMP (Appendix 3.1), following best practice and guidelines, controlling pollution and runoff, storage of potential pollutants, control of dust, and precautionary measures will help to limit the likelihood and effects of trampling, pollution incidents and/or runoff, and dust on habitats with the potential to support common reptiles.

Breeding Birds

8.7.80 The Power Generation Plant requires the permanent removal of habitat with the potential to support breeding birds (trees, woodland, hedgerows and scrub) and the temporary removal of habitat with the potential to support breeding birds (trees).

8.7.81 The Gas Connection requires the temporary removal of habitat with the potential to support breeding birds (trees, woodland, hedgerows and scrub).

8.7.82 The Electrical Connection requires the temporary removal of habitat with the potential to support breeding birds (trees).

8.7.83 The removal of habitat with the potential to support breeding birds will reduce the availability of suitable breeding habitat within the Project Site Boundary. However, there is an abundance of suitable habitat within the Project Site Boundary and wider landscape, and as such the loss of suitable breeding habitat within the Project Site Boundary is unlikely to have a long term significant effect on breeding bird populations. Loss of habitat is afforded Low magnitude resulting in a **Minor** effect; and is therefore not a significant effect and will not require additional mitigation.

8.7.84 During the winter months working within the core hours (08:00 – 18:00) will require night time illumination. There will be illumination of the security cabin (24 hour, seven days a week facility). Night time illumination of and construction noise in the vicinity of features with the potential to supporting nesting birds have the potential to cause localised disturbance to nesting birds. Disturbance will be temporary and

localised. Disturbance is afforded Low magnitude resulting in a **Minor** effect. As such disturbance is not significant and will not require additional mitigation.

8.7.85 There will be temporary impacts as a result of noise generated during construction and this may cause disturbance to breeding birds. Birds have been shown to quickly adapt to changes in noise levels. Noise levels for various type of construction equipment typically range from 55 dB to 83dB in the immediate vicinity of the equipment. As such there will be localised disturbance to birds and the increases are not going to be significant enough to effect the distribution or activity of breeding species. All species recorded during surveys are tolerant of regular noise where habitat remains suitable as evidenced by the distribution of breeding species recorded alongside busy roads for example. Effects of noise will be temporary and localised. Noise is afforded Low magnitude, resulting in a **Minor** effect, and as such noise effects are not significant and will not require additional mitigation.

8.7.86 The embedded mitigation with regards to the CEMP (Appendix 3.1), following best practice and guidelines, controlling pollution and runoff, storage of potential pollutants, and precautionary measures will help to limit the likelihood and effects of pollution incidents and/or runoff, and dust on habitats with the potential to support breeding birds.

8.7.87 The embedded mitigation with regards the CEMP and protection of protected species during construction would include seeking to avoid vegetation removal during breeding bird season (breeding season March – September) wherever possible, or an ecologist examining the vegetation for active nests immediately prior to removal.

Bats

8.7.88 Based on the current known distribution of bat roosts within the Project Site, there is no risk of killing or injuring bats during construction.

8.7.89 There is no potential for hibernating bats to be present within the mine trial shaft or adit.

8.7.90 There is the potential for new roosts to be formed in trees previously identified as having potential to support roosting bats, but not confirmed as roosts during any of the surveys; there is the potential for new roosts to be disturbed, or bats to be injured or killed during construction. Disturbance, injury or killing is afforded High magnitude, resulting in a **Major** effect, and is considered a significant effect requiring further mitigation.

8.7.91 The Power Generation Plant requires the permanent removal of habitat with the potential to support foraging and commuting bats (broadleaved semi-natural woodland, hedgerows, mature trees lines semi-improved grassland and marshy grassland). Without mitigation, this will sever the connectivity to habitats either side of the Access Road, resulting in fragmentation of retained areas. This will impact on bats using the existing features in the landscape to commute and forage

between these two areas. There is an abundance of foraging habitat within the wider landscape, and as such loss of small amounts of foraging habitat is afforded Low magnitude; due to the High value of the receptor (bats) this is considered a significant effect (**Moderate** Adverse) requiring mitigation. Severance of connectivity and fragmentation is afforded Medium magnitude resulting in a **Moderate** effect; this is considered a significant effect requiring mitigation.

8.7.92 The Gas Connection requires the temporary removal of habitat with the potential to support foraging and commuting bats (hedgerow, mature trees lines and woodland edges). There is potential for roosting bats to be present within Buildings 7 and 8, and potential for roosting bats to use linear features to cross the Project Site Boundary. Removal or severance of tree lines and hedgerow will sever the connectivity they provide and create fragmentation of retained habitat. This will impact on bats using the existing features in the landscape to commute and forage between these two areas. Severance of connectivity and fragmentation is afforded Medium magnitude, resulting in a **Moderate** effect; this is considered a significant effect requiring mitigation.

8.7.93 The Electrical Connection requires the temporary removal of habitat with the potential to support foraging and commuting bats (mature trees lines). Removal or severance of tree lines will sever the connectivity they provide and create fragmentation of retained habitat. This will impact on bats using the existing features in the landscape to commute and forage between these two areas. Severance of connectivity and fragmentation is afforded Medium magnitude, resulting in a **Moderate** effect; this is considered a significant effect requiring mitigation. There will be an increase in external lighting at the Project Site during construction. There is currently no external lighting within the majority of the Project Site. Many species of bat are averse to light, with different species having different tolerances. External lighting can make areas of previous foraging habitat unsuitable and fragment commuting routes. If external lighting for the Project is poorly designed there is potential for a light spill onto hedgerows, tree lines, woodland edges and vegetated areas which will negatively impact on bats, severing commuting routes and impeding access to foraging habitat. Poorly designed lighting also has the potential to affect areas outside the Project Site Boundary. During the winter months working within the core hours (08:00 – 18:00) will require night time illumination. There will be illumination of the security cabin (24hr, seven days a week facility). Night time illumination of and construction noise in the vicinity of features with the potential to supporting bats has the potential to cause localised disturbance to commuting or foraging. The embedded mitigation measures with regards to lighting seek to limit impacts on bats. Effects from lighting as set out in the LEMP and Landscape and Ecology Mitigation Strategy (Figure 3.6 and Appendix 3.4) and in the Outline Lighting Strategy (Appendix 3.5) are afforded Negligible magnitude, resulting in a **Minor** effect. This is not considered a significant effect and does not require additional mitigation.

8.7.94 The nearest known bat roost to the Project is approximately 90 m (300 feet) from the Gas Connection element; the nearest possible bat roost (yet to be surveyed) is Building 8 and 65 m (213 feet) from the Electrical Connection. Noise dissipates at

a rate of 6 dB with the doubling of the distance (in feet). Given the loudest equipment used during construction will be 90 dB, the noise will be imperceptible at the nearest known bat roost and in line with background noise (farm machinery and vehicles) at Building 8. Similarly, vibration from construction equipment will not be perceptible at these distances. Effects from noise and construction equipment vibration are afforded Negligible magnitude resulting in a **Negligible** effect. This is not considered a significant effect and does not require mitigation.

8.7.95 The need for piling, and the type of any piling potentially required is not yet confirmed. Where piling, heavy earthworks, vibratory rollers or other significant vibration producing operations are proposed in close proximity to any existing sensitive receptors, further consideration would be given to potential impacts, once the contractor is appointed and the construction methods requirements are developed.

Water Vole

8.7.96 The Power Generation Plant is close to an area with potential for supporting water vole burrows (Watercourse 45). Although no recently occupied burrows were identified during the survey, it is possible that prior to construction new burrows are created in this area. There is the potential for this to cause disturbance of, harm or kill individual water voles during construction within 10 m of Watercourse 45. Disturbance, injury or killing are afforded High magnitude, resulting in a **Moderate** effect; and is therefore considered a significant effect and will require additional mitigation.

8.7.97 There will be temporary impacts as a result of noise and vibration generated during construction and this may cause disturbance to water voles.

8.7.98 The predicted noise level from construction equipment is expected to be a maximum of 90 dB 10 m from the source. The construction area at the boundary of the Power Generation Plant is between approximately 20 m (65 feet) and 80 m (260 feet) from the section of Watercourse 45 suitable for supporting water voles. In general background noise levels at watercourses are around 45 dB and noise dissipates at a rate of 6 dB with the doubling of the distance (in feet). The noise would therefore be around 60 dB at the closest point to Watercourse 45.

8.7.99 Water voles have been shown to quickly adapt to changes in noise levels and the occasional change in noise level is unlikely to be enough to deter water voles where Watercourse 45 is 20 m from the Power Generation Plant boundary. Further afield, as the noise level reduces in line to the background level it is likely that water voles will not be deterred from using these areas. Similarly, vibration from construction equipment will not be perceptible at this distance.

8.7.100 Effects of noise will be temporary and localised. Noise and construction equipment vibration is afforded Low magnitude, resulting in a **Negligible** effect, and as such noise effects are not significant and will not require additional mitigation.

8.7.101 The need for piling, and the type of any piling potentially required is not yet confirmed. Where piling, heavy earthworks, vibratory rollers or other significant vibration producing operations are proposed in close proximity to any existing sensitive receptors, further consideration would be given to potential impacts, once the contractor is appointed and the construction methods requirements are developed.

8.7.102 The embedded mitigation with regards to the CEMP (Appendix 3.1), following best practice and guidelines, controlling pollution and runoff, storage of potential pollutants, and precautionary measures will help to limit the likelihood and effects of pollution incidents and/or runoff, and control dust on aquatic habitats with the potential to support water vole.

8.7.103 The embedded mitigation measures with regards to lighting and noise seeks to limit impacts on water vole.

8.7.104 There are no effects associated with the Electrical Connection or Gas Connection on water vole requiring mitigation.

Otter

8.7.105 The Power Generation Plant is shown to be near areas deemed suitable for supporting otters (Watercourses 9, 11, 12, 41 and 45 and Watercourses 27, 28 and 29, respectively). Although no recent activity was identified during the survey, it is possible that prior to construction new holts/couches are created or activity is present in this area. There is the potential to cause disturbance of otters during construction within 100 m of Watercourses 9, 11 12, 41 and 45 and Watercourses 27, 28 and 29. There is the potential to harm or kill individual otters during construction within 10 m of Watercourses 9, 11 12, 41 and 45 and Watercourses 27, 28 and 29. Additionally, night time illumination in the vicinity of Watercourses 9, 11 12, 41 and 45 and Watercourses 27, 28 and 29 has the potential to cause disturbance of otters. Disturbance, injury or killing are afforded High magnitude, resulting in a **Moderate** effect, and as such are considered significant effects and will require further mitigation.

8.7.106 The predicted noise level from construction equipment is expected to be a maximum of 90 dB at a distance of 10 m from the source. The construction area at the boundary of the Power Generation Plant are between approximately 80 m (260 feet) and immediately adjacent to Watercourses 9, 11, 12, 41 45 and the Access Road is immediately adjacent to Watercourses 27, 28 and 29. In general background noise levels at watercourses are around 45 dB and noise dissipates at a rate of 6 dB with the doubling of the distance (in feet). The noise would therefore be 90 dB at the closest point to the watercourses, and would dissipate to being imperceptible at about 40 m away.

8.7.107 The increase in perceptible noise level is likely to be enough to deter otter. However, no evidence of otter was found to be using these areas and any effects will be temporary and localised. Further afield, as the noise level reduces in line with the background level it is likely that otters will not be deterred from using these

areas. Otters are known to use noisy areas (for example they are known to cross under busy roads) and will habituate to noise levels over time. Similarly, vibration from construction equipment will be perceptible only in the vicinity of the construction works.

8.7.108 Effects of noise will be temporary and localised. Noise and construction equipment vibration is afforded Low magnitude, resulting in a **Negligible** effect, and as such noise effects are not significant and will not require additional mitigation.

8.7.109 The need for piling, and the type of any piling potentially required is not yet confirmed. Where piling, heavy earthworks, vibratory rollers or other significant vibration producing operations are proposed in close proximity to any existing sensitive receptors, further consideration would be given to potential impacts, once the contractor is appointed and the construction method requirements are developed.

8.7.110 The Gas Connection is near an area suitable for supporting otters (Watercourse 6). Although no recent activity was identified during the survey, it is possible that prior to construction new holts/couches are created or recent activity is present in this area. There is the potential for this to cause disturbance of otters during construction within 100 m of Watercourse 6. There is the potential to harm or kill individual otters during construction within 10 m of Watercourse 6. Additionally, night time illumination and in the vicinity of Watercourse 6 have the potential to disturb otters. Disturbance, injury or killing are afforded High magnitude, resulting in a **Moderate** effect, and as such are considered significant effects and will require further mitigation.

8.7.111 Construction noise and vibration at Watercourse 6 will be imperceptible since it is approximately 90 m (290 feet) from the Gas Connection. Noise and construction equipment vibration at the Gas Connection is afforded Negligible magnitude, and as such noise effects are not significant and will not require additional mitigation.

8.7.112 The Electrical Connection is near areas suitable for supporting otters (Watercourses 27, 28 and 29). Although no recent activity was identified during the survey, it is possible that prior to construction new holts/couches are created or recent activity is present in this area. There is the potential to cause disturbance of otters during construction within 100 m of Watercourses 27, 28 and 29. There is the potential harm or kill individual otters during construction within 10 m of Watercourses 27, 28 and 29. Disturbance, injury or killing are afforded High magnitude, resulting in a **Moderate** effect, and as such are considered significant effects and will require further mitigation.

8.7.113 The effects of noise and vibration for the Electrical Connection will be the same as for the Access Road. Effects of noise will be temporary and localised. Noise and construction equipment vibration is afforded Low magnitude, resulting in a **Negligible** effect, and as such noise effects are not significant and will not require additional mitigation.

8.7.114 The embedded mitigation with regards to the CEMP (Appendix 3.1), following best practice and guidelines, controlling pollution and runoff, storage of potential pollutants, and precautionary measures will help to limit the likelihood and effects of pollution incidents and/or runoff, and control dust on aquatic habitats with the potential to support otter.

8.7.115 The embedded mitigation measures with regards to lighting and noise seeks to limit impacts on otter.

Brown Hare

8.7.116 The removal of grassland, broadleaved woodland and scrub habitats during construction of the Power Generation Plant and Gas Connection are unlikely to significantly impact local brown hare populations due to the abundance of this habitat type within the Project Site Boundary and the wider landscape. Loss of habitat is afforded Low magnitude, resulting in a **Negligible** effect, and as such is not considered a significant effect and will not require further mitigation.

8.7.117 All construction work has the potential to disturb, injure or kill breeding, sheltering and foraging brown hares. Disturbance, injury or killing are afforded Medium magnitude, resulting in a **Minor** effect, and as such are not considered significant effects and will not require further mitigation.

Badger

8.7.118 Currently no construction works impede on badger setts. However, it is possible that prior to construction new setts are created within 30 m of the construction areas. Any works, in particular heavy machinery and ground breaking works, that takes place within 30 m of an active badger sett has the potential to cause a collapse of a sett and disturb, harm or kill a badger. Injury or killing are afforded High magnitude, resulting in a **Moderate** effect, and as such are considered significant effects and will require further mitigation.

8.7.119 The excavation of open trenches to facilitate the Gas Connection may obstruct badgers from commuting across the Project Site and badgers may become trapped in open trenches or excavations. Trapping is afforded High magnitude, resulting in a **Moderate** effect, and is considered a significant effect. As such it will require further mitigation.

8.7.120 Night time illumination in the vicinity of badger setts or foraging areas may deter badgers from using these areas and as such will be avoided. This is deemed to be of **Negligible** magnitude, resulting in a negligible effect, and not a significant effect requiring mitigation.

8.7.121 There is the potential for disturbance of badger during construction due to increased noise. The predicted noise level from construction equipment is expected to be a maximum of 90 dB 10 m from the source. The construction area at the boundary of the Power Generation Plant and Gas Connection is between

approximately 100 m (330 feet) and 200 m (655 feet) from the active badger setts, and noise from construction equipment at these setts will be imperceptible.

8.7.122 There are no changes to the existing road along the Access Track that will have any direct impacts on badgers, and any badgers in this area will already be habituated to vehicle noise and vibration. As such, post development there will be no impact on badgers in this area.

8.7.123 Noise and vibration disturbance is afforded Negligible magnitude, resulting in a **Negligible** effect. This is not considered a significant effect and will not require further mitigation.

8.7.124 Badgers using the Project Site for commuting and foraging are likely to be disturbed in the immediate vicinity of the construction works at night but are likely to habituate to the higher background noise over time. The temporary increase in noise levels is not considered significant enough to deter them from returning. Therefore this effect is considered to be of Negligible magnitude, resulting in a **Negligible** effect. This is not considered a significant effect and will not require further mitigation.

8.7.125 The removal of scrub, woodland edge and grassland habitat during construction of the Power Generation Plant and Gas Connection will reduce the availability of suitable habitat for badgers within the Project Site Boundary. However, there is an abundance of suitable habitat within the Site Boundary and wider landscape, and as such the loss of suitable habitat within the Site Boundary is unlikely to have a long term significant effect on badger populations. Loss of habitat is afforded Low magnitude, resulting in a **Negligible** effect; and is therefore not a significant effect and will not require additional mitigation.

Invasive Species

8.7.126 The potential for the construction of the Project to cause the spread of invasive species will be controlled due to the embedded mitigation to implement measures contained in relevant best practice guidance on the control and removal of invasive weed species, resulting in a **Minor adverse** effect; and is therefore not a significant effect and will not require additional mitigation.

b) Operation

i. Statutory Designated Sites

8.7.127 The four statutory designated sites were scoped in for assessment of air quality effects relating to the Power Generation Plant component of the Project only. A Habitat Regulations Assessment Screening exercise was undertaken and report written (Ref. 8.5). The results of the air quality modelling (**Chapter 6: Air Quality**) show that the Project's Process Contribution (PC) of NOx, and consequently the PC of nitrogen deposition and nitrogen acidity deposition are very small and so low as to be effectively zero (less than 0.01 kg/N/ha/yr and less than 0.01 keqH+/ha/yr, respectively). For all sites, the PC does not cause Critical Loads to be exceeded. In the case of Crymlyn Bog SAC and Ramsar site where the Critical Load for nitrogen

and nitrogen acid is already in exceedance, the influence of nitrogen and nitrogen acid from the Project is not at a level where it would cause a significant effect. No project or plans were considered to have an in-combination effect with the Project associated with air quality- nitrogen and nitrogen acid deposition, as a result of NO_x emissions from the Project. Effects in relation to air quality are considered **Negligible** and as such are not considered significant and will not require further mitigation.

8.7.128 There is a hydrological link between the Project Site and Carmarthen Bay SAC and Burry Inlet SPA and Ramsar via the Afon Llan. The Afon Llan flows for approximately 12 km before reaching the designated sites. There are springs, with their associated streams and drainage ditches within the Project Site which discharge into the Afon Llan. The Project incorporates welfare facilities (two toilets) which will require a site foul water drainage system. The foul water drainage system will either drain to a septic tank or a package treatment plant within the Project Site. During operation the Project will have a maximum of three shifts of five workers in a 24 hour period. Due to the very small quantity of foul water generated during operation, it is anticipated that treated water can be discharged via infiltration (soakaway) on the Project Site. The foul water drainage system will be positioned to minimise the risk of inundation by floodwaters. Where there is an inadequate unsaturated zone beneath the Project Site, the option of discharging to local watercourses will be adopted. A manned site with discharges to local watercourses will contribute nitrogen to Carmarthen Bay SAC and Burry Inlet SPA and Ramsar. Any discharges will be subject to the Environmental Permitting Regulations and will need to meet quality criteria set by NRW.

8.7.129 **Chapter 9: Water Quality and Flood Risk** states that due to the quantity of treated foul waste/wastewater likely to be generated from the packaged sewage treatment plant and dilution properties of these receiving receptors, the magnitude of pollution impacts from discharges is considered to be Negligible. Hence, the significance of effect on Carmarthen Bay SAC and Burry Inlet SPA and Ramsar is considered to be **Negligible**.

8.7.130 As stated in **Chapter 12: Traffic, Transport and Access** the Project will employ 15 permanent staff in shifts, which will likely generate 30 movements per day (two movements per staff member). A demineralised water trailer and diesel fuel tanker will visit the Project Site periodically. Maintenance periods will occur annually. During these periods, there may be up to 40 additional staff on-site for a period of one month. Based on a vehicle occupancy level of 1.6, this will equate to an additional 50 movements per day (25 arrivals during the AM peak hour, 25 departures during the PM peak hour). Transport related emissions are most relevant to sites within 200 m of a major road. The DMRB (Ref. 8.17) identifies 200m as the distance beyond which the contribution of traffic emissions to local pollutant concentrations is considered to be negligible. Crymlyn Bog SAC and Ramsar, Carmarthen Bay SAC, and Burry Inlet SPA and Ramsar are all within 200 m of a major road; there are no roads within 200 m of any of these statutory sites that are forecast to receive anything other than a nominal change in vehicle flows as a result of this Project. There are no roads within 200 m of Nant Y Crimp SSSI.

There are considered to be no effects associated with transport-related emissions generated during operation. There are considered to be no effects on statutory designated sites in relation to the Gas Connection or Electrical Connection components of the Project due to the distances between the Project and the designated sites and the lack of pathways between the Project and the designated sites.

ii. Non-Statutory Designated Sites

8.7.131 Thirty-four non-statutory designated sites (one Wildlife Trust Reserve, 11 SINCSs and 22 Ancient Woodlands) were scoped in for assessment of air quality effects relating to the Power Generation Plant component of the Project. The results of the air quality modelling (**Chapter 6: Air Quality**) show that the Project's PC of NOx, and consequently the PC of nitrogen deposition and nitrogen acidity deposition are very small (less than 0.01 kg/N/ha/yr and less than 0.01 keqH+/ha/yr, respectively). For all sites, the PC does not cause Critical Loads for the most sensitive habitat type within the site to be exceeded. In the cases where the Critical Loads for nitrogen and nitrogen acidity are already in exceedance, the very slight increase in nitrogen or nitrogen acidity from the Project is not at a level where it would cause a significant effect. Effects in relation to air quality are considered **Negligible** and as such are not considered significant and will not require further mitigation.

8.7.132 Transport related emissions are most relevant to non-statutory designated sites within 200 m of a major road. The DMRB identifies 200 m as the distance beyond which the contribution of traffic emissions to local pollutant concentrations is considered to be negligible. All non-statutory designated sites within 200 m of a major road are not forecast to experience anything other than a nominal change in vehicle flows as a result of this Project. There are deemed to be no effects associated with transport-related emissions generated during operation.

8.7.133 As defined by the IAQM guidance, ecological receptors should be considered within 50 m of potential dust sources and 50 m of the routes used by vehicles on the public highway, up to 500 m from the Project Site entrance. The following non-statutory designated sites are present within 500 m of the Project Site entrance: Cefn Forest Steam SINC, Felindre Grasslands SINC, Lletty-Morfil SINC, Ancient Woodland 6, and Ancient Woodland 12. Lletty-Morfil SINC will be within 50 m of the operation access route. There are no additional non-statutory designated sites within 50 m of the operation access routes or potential dust sources. As stated in **Chapter 12: Traffic, Transport and Access**, the Project will employ 15 permanent staff in shifts, which will likely generate 30 movements per day (two movements per staff member). A demineralised water trailer and diesel fuel tanker will visit the Project Site periodically. Maintenance periods will occur annually. During these periods, there may be up to 40 additional staff on-site for a period of one month. Based on a vehicle occupancy level of 1.6, this will equate to an additional 50 movements per day (25 arrivals during the AM peak hour, 25 departures during the PM peak hour). Increase to traffic during operation is afforded Low magnitude resulting in a **Minor adverse** effect, and is therefore not a significant effect and will not require additional mitigation.

8.7.134 There are no designated features within the non-statutory designated sites that are sensitive to lighting. Furthermore, embedded mitigation will help to limit light spill outside of the Power Generation Plant, and the Gas Connection and Electrical Connection will not be lit. Operation-related lighting on non-statutory designated sites has not been considered any further.

8.7.135 Runoff and pollution during any operational maintenance or repair works will be controlled and managed in a similar way as during construction. There are deemed to be no significant effects on statutory designated sites in relation to the Gas Connection or Electrical Connection components of the Project.

Middle Llan SINC, Pant Lasau SINC and Ancient Woodland 4

8.7.136 There is a hydrological link between the Project Site and Middle Llan SINC, Pant Lasau SINC and Ancient Woodland 4 via the Afon Llan. There are springs, with their associated streams and drainage ditches within the Project Site which discharge into the Afon Llan. The Afon Llan flows through each of these sites.

8.7.137 The Project incorporates welfare facilities (two toilets) which will require a site foul water drainage system. During operation the Project will have a maximum of three shifts of five workers in a 24 hour period. The foul water drainage system will either drain to a septic tank or a package treatment plant within the Project Site but outside any area at risk of flooding. The processed water would then discharge on-site or to a nearby watercourse. Discharges will not perceptively increase the flow of the watercourse. Discharges will be controlled via various measures as outlined in the embedded mitigation.

8.7.138 The retained semi-improved neutral grassland, marshy grassland and woodland within the Project Site Boundary are sensitive to nitrogen deposition and nitrogen acidity deposition. The results of the air quality modelling (**Chapter 6: Air Quality**) show that the Project's PC of NOx, and consequently the PC of nitrogen deposition and nitrogen acidity deposition are very small (less than 0.01 kg/N/ha/yr and less than 0.01 keqH+/ha/yr, respectively). For all habitats, the PC does not cause Critical Loads to be exceeded. In the cases where the Critical Loads for nitrogen and nitrogen acidity are already in exceedance, the influence of nitrogen or nitrogen acidity from the Project is not at a level where it would cause a significant effect. Effects in relation to air quality are considered **Negligible** and as such are not considered significant and will not require further mitigation.

8.7.139 The embedded mitigation covers drainage and following best practice and guidelines, controlling pollution, storage of potential pollutants, and precautionary measures will help to limit the likelihood and effects of pollution incidents and/or runoff. In line with the drainage strategy the Project Site drainage will include filter drains / swales or oil interceptors as necessary to remove pollutants and all necessary treatment will take place on the Project Site before it is discharged to the existing watercourses. Effects in relation to discharges are considered **Negligible** and as such are not considered significant and will not require further mitigation.

8.7.140 It is assumed that the potential effects on habitats for any partial underground cable or pipeline replacement or repairs in relation to the Gas Connection or Electrical Connection components of the Project will be the same or similar to those identified during the construction phase of the Project.

8.7.141 There will be no additional effects on habitats during the operational phase of the Project.

iii. Protected or Priority Species

8.7.142 It is assumed that the potential effects on species for any partial underground cable or pipeline replacement or repairs in relation to the Gas Connection or Electrical Connection components of the Project will be the same or similar to those identified during the construction phase of the Project.

8.7.143 Operational external lighting has been designed to reduce trespass and configured to avoid glare and spillage, and otherwise in accordance with the Outline Lighting Strategy (Appendix 3.5) undertaken in accordance with the Institution of Lighting Professionals guidelines. The strategy will seek to limit effects of lighting on habitats (and therefore species) adjacent to the Project Site. During the hours of darkness, only critical light sources will remain in operation, these include emergency exit illumination and Project Site security lighting at a low level. The Access Road shall not be lit. A curfew will be implemented for all non-critical lighting from 23.00 to 05.00 hrs; all non-critical lighting will be switched off during these hours via a time clock. Routes and entrances not in constant use will be controlled via a movement detector or manual switch, ensuring that lighting in these areas will be switched off the vast majority of the time.

8.7.144 The sensitivity of the infrared motion detectors will be set so as not to be activated by the movement of large mammals such as badgers and otters. The lighting strategy will ensure that all lighting columns will be fitted with cowls to reduce light spill and will be directed away from boundary features. A ‘dark corridor’ (as shown in Figure 3.6) has been designed to keep lighting to less than 1 lux along adjacent woodland edges and watercourses that are likely to be used by nocturnal species such as bats, badgers and otters.

8.7.145 The Gas Connection and Electrical Connection will not be lit.

Invertebrates

8.7.146 Invertebrate species such as moths are very sensitive to lighting and light levels as low as 0.1 lux has been shown to affect invertebrate activity (Ref. 8.18). The embedded mitigation will help to limit light spill outside of the Power Generation Plant. However, some types of lights have spectrums and wavelengths that are attractive to invertebrates. Effects in relation to lighting are deemed to be of Low magnitude, resulting in a **Minor** effect, and as such are not considered a significant and will not require further mitigation.

8.7.147 The Project incorporates welfare facilities which will require a site foul water drainage system. During operation, the Project will have a maximum of two toilets on site with approximately three shifts of five workers in a 24 hour period. The foul water drainage system will either drain to a septic tank or a package treatment plant within the Project Site but outside any area at risk of flooding. The processed water would then discharge on-site or to a nearby watercourse. There are deemed to be no effects on aquatic invertebrates as a result of waste water discharges.

Amphibians

8.7.148 The Project incorporates welfare facilities which will require a site foul water drainage system. During operation the Project will have a maximum of two toilets on site with approximately three shifts of five workers in a 24 hour period. The foul water drainage system will either drain to a septic tank or a package treatment plant within the Project Site but outside any area at risk of flooding. The processed water would then discharge on-site or to a nearby watercourse. There are deemed to be no effects on amphibians as a result of waste water discharges.

Breeding Birds

8.7.149 Lighting can cause disruptions to bird behaviour. However, the embedded mitigation will limit light spill outside of the Project Site Boundary and this will help limit the effects on breeding birds. There will be no significant operational effects on breeding birds as a result of lighting.

8.7.150 Operational noise can cause disturbance to birds although the assemblage of species recorded are tolerant of changes in noise and as such will become habituated to noise levels nearby. There will be no significant operational effects on breeding birds as a result of noise.

Reptiles

8.7.151 Reptiles are not considered to be sensitive to disturbance during operation in the form of noise or lighting. There will be no significant operational effects on reptiles as a result of noise or lighting.

8.7.152 Reptiles are sensitive to vibration. Vibration from the operation of the Power Generation Plant is unlikely to be perceptible to reptiles and therefore **Negligible** effects are anticipated, and as such are not considered significant and will not require further mitigation.

8.7.153 There is a risk of direct mortality from the use of the Access Road by operational traffic. However, this is considered to be of Low magnitude given the infrequent traffic envisaged, the numbers of reptiles likely to be moving across the Access Road and the low speed limits in place. This results in a **Minor** effect, and as such is not considered significant and will not require further mitigation.

Bats

8.7.154 There will be an increase in external lighting at the Power Generation Plant during operation. There is currently no external lighting within the majority of the Project Site. Many species of bat are averse to light, with different species having different tolerances. External lighting can make areas of previous foraging habitat unsuitable and fragment commuting routes. If external lighting for the Power Generation Plant is poorly designed there is potential for a light spill onto hedgerows, tree lines, woodland edges and vegetated areas which will negatively impact on bats, severing commuting routes and impeding access to foraging habitat. Poorly designed lighting also has the potential to affect areas outside the Project Site Boundary. The embedded mitigation measures with regards to lighting will limit impacts on surrounding habitats and bats. As such the impact from lighting is afforded Negligible magnitude resulting in a **Minor** effect; this is not considered a significant effect and will not require additional mitigation.

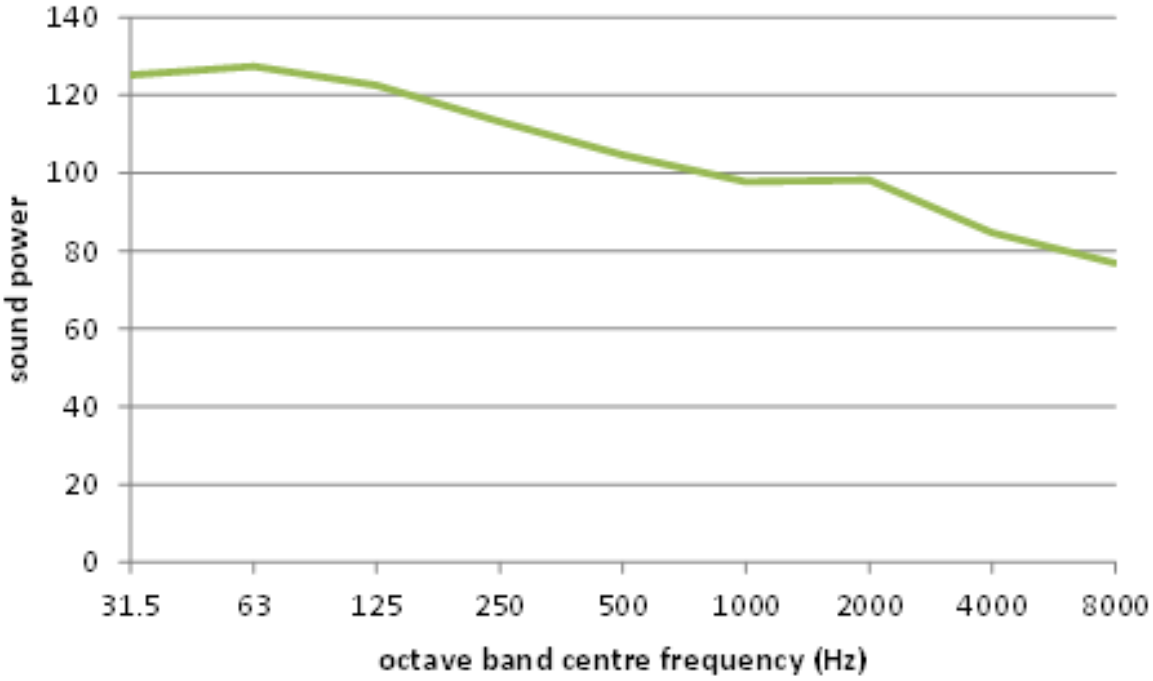
8.7.155 The nearest known bat roost to the Project is approximately 330m (1000 feet) from the Power Generation Plant boundary. Noise dissipates at a rate of 6 dB with the doubling of the distance (in feet). Given the noise during operation will be 55 dB L_A or lower at the Power Generation Plant boundary fence, the noise will not effect echo location at the nearest known bat roost. Similarly, vibration from operation will not be perceptible at this distance.

8.7.156 Noise during operation has the potential to disrupt commuting and foraging bats. However, noise is considered unlikely to have an impact on bats and is unlikely to cause any indirect habitat loss through disturbance to foraging areas. The Generating Equipment will only be operational intermittently at times of peak demand and will not emit ultrasonic noise (ultrasonic being noise which is higher than the upper audible limit of human hearing and typically considered to be above 20kHz).

8.7.157 The Generating Equipment is predicted to emit a sound power level of around 100dB $_{LWA}$, the power peaks at a frequency of around 50/63 Hz and roughly halves with every doubling of frequency above that. A typical attenuated power station sound power spectrum is shown in Insert 8.1. This only goes up to 8,000Hz (8kHz) but the tail off in the spectrum continues with increased frequency, showing that there will be little sound power (dBA) above 10,000Hz (10kHz).

8.7.158 The specific sound level near the Project Site Boundary is estimated to be approximately 55dB LAeq (**Chapter 7: Noise and Vibration**, Figure 7.1) (this term is the Equivalent Continuous Level, a type of average, where noisy events have a significant influence). The theoretical average sound pressure level (dBA) at the Project Site Boundary approximately 30 m from the Generating Equipment will be approximately 55 dBA to 63 dBA. Equivalent general sounds comparisons are: 50 dBA is light traffic or rainfall; 60-65 dBA is normal conversation; and 85 dBA is heavy traffic.

Insert 8.1: A Typical Attenuated Power Station Sound Power Spectrum (Not Site Specific)



8.7.159 There is limited research on the impact of anthropogenic noise on foraging bats and no directly comparable research on the impacts of power station noise have been identified. Research that exists shows that increased anthropogenic noise can negatively impact foraging activity of some species of bats, particularly low frequency bats (<35 kHz), as a result of prey masking and avoidance of noise. Two of these are summarised below.

8.7.160 Bunkley *et. al*. (Ref. 8.20) investigated the potential effects of gas compressor station noise in the USA on the activity levels of the local bat assemblage. The gas compressor stations run 24 hour a day, 365 days a year. The mean background sound level (dBA) recorded at 50 m from the gas compressor site centre was between 70 dBA and 85 dBA. The frequency of the compressor noise was 24 kHz.

8.7.161 Bunkley *et. al.* (Ref. 8.20) found that activity levels for the Brazilian free-tailed bat (*Tadarida brasiliensis*) were 40% lower at loud compressor sites compared to quieter oil well pads, whereas the activity levels of four other species (*Myotis californicus, M. cillolabrum, M. lucifugus, Parastrellus hesperus*) were not affected by noise. The assemblage of bat species emitting low frequency (<35 kHz) echolocation calls showed a 70% reduction in activity levels at loud sites compared to quieter oil well pad sites whereas the assemblage using high frequency (>35 kHz) echolocation did not exhibit altered activity levels. Bunkley *et. al*. (Ref. 8.20) concluded that lower activity levels of Brazilian free-tailed bats at loud sites indicate a potential reduction in habitat for this species and that this species modifies its echolocation search calls in noise, producing longer calls with a narrower bandwidth, which might affect prey detection.

8.7.162 Luo *et al.*, 2015 (Ref. 8.21) investigated how anthropogenic noise impairs foraging, which has direct consequences for animal survival and reproductive success, using

Daubenton's bats, which find prey by echolocation. The study looked to identify the potential mechanisms of disturbance in any species capable of detecting the noise, namely acoustic masking of prey echoes, reduced attention and noise avoidance. The study used playback of traffic noise and was laboratory based. Traffic noise was played at around 76 dBA, at nonoverlapping frequencies below 25 kHz (not spectrally overlapping the minimum call frequency of Daubenton's, which is at 28 kHz), and overlapping frequencies above 25 kHz.

8.7.163 Luo *et al.*, 2015 (Ref. 8.21) found that traffic noise reduced foraging efficiency in most Daubenton's bats. This effect was present even if the playback noise did not overlap in frequency with the prey echoes. Neither overlapping noise nor nonoverlapping noise influenced the search effort required for a successful prey capture. Hence, noise did not mask prey echoes or reduce the attention of bats. Instead, traffic noise acted as an aversive stimulus that caused avoidance response, thereby reducing foraging efficiency.

8.7.164 The frequency emitted from the Generating Equipment (between 50 Hz and 10,000 Hz (10 kHz)) is unlikely to mask the frequencies of large bat prey items, which are generally in the range of 20 – 35 kHz and frequencies less than 1 kHz are probably inaudible to bats (Ref. 8.21).

8.7.165 Bunkley et. al. (Ref. 8.20) suggests that bat species emitting low frequency (<35 kHz) echolocation calls may be more affected by noise than other species. At the Project Site, bats which echolocate at frequencies <35 kHz include the large bats; noctule, serotine and Leisler's. Lower frequency bats at the Project Site make up 5.8% of the total composition of bat species, the rest are higher frequency bat species (>35kHz). However, the predicted frequencies emitted from the Generating Equipment (between 50 Hz and 10,000 Hz (10 kHz)) were much lower than in Bunkley et. al. (Ref. 8.20) and, as above, are unlikely to mask prey items for any bat species.

8.7.166 There may be some noise avoidance by some bat species when the Generating Equipment is operating, as there is little research available to be able to completely rule out potential avoidance from noise of 55 – 63 dBA. However, the generation of noise would be sporadic and the sound power anticipated at the Project Site Boundary is lower than that in the studies summarised above and it would be anticipated that any impact from avoidance would therefore be comparably lower. No studies were identified which looked at potential foraging impacts from sound power (dBA) less than 70 dBA to be able to draw any direct conclusion.

8.7.167 At the Project Site, the nature of the noise generated will be sporadic and the sound power will peak at a frequency well below the typical frequency used by echolocating bats. As such, effects from noise and vibration are afforded Negligible magnitude, resulting in a **Minor** effect. This is not considered a significant effect and does not require mitigation.

Badger

8.7.168 The new section of Access Road has the potential to result in road traffic mortality of badgers. The Project will employ 15 permanent staff in shifts, which will likely generate 30 movements per day (two movements per staff member). A demineralised water trailer and diesel fuel tanker will visit the Project Site periodically. Regular night time access (when badgers are more active) is likely to comprise approximately fifteen one way journeys. Maintenance periods will occur annually. During these periods, there may be up to 40 additional staff on-site for a period of one month. Based on a vehicle occupancy level of 1.6, this will equate to an additional 50 movements per day (25 arrivals during the AM peak hour, 25 departures during the PM peak hour). A 20 mph speed limit will be in place along the Access Road. This will reduce the likelihood of badger mortality incidents. This impact is considered to be of Low magnitude, resulting in a **Negligible** effect, and is therefore not significant and does not require additional mitigation.

8.7.169 There is the potential to cause disturbance of badger during operation due to increased lighting. The embedded mitigation will help to limit light spill outside of the Power Generation Plant. Effects in relation to lighting are deemed to be of Low magnitude, resulting in a **Negligible** effect, and as such are not considered a significant and will not require further mitigation.

8.7.170 Any new fencing has the potential to inhibit commuting routes across the Project Site. This impact is considered to be of Low magnitude and therefore not significant. However, where possible, measures should be put in place to allow the continued movement of badgers across the Project Site.

8.7.171 There is the potential for disturbance of badger during operation due to increased noise. The background noise as identified in **Chapter 7: Noise and Vibration** within the Project Site ranges from between 17dB (night time noise in an isolated location) and 50 dB (day time noise near a road/active farm). The predicted operational noise level from plant is expected to be an average of 50 dB and a maximum of 55 dB at the boundary of the Power Generation Plant. The noise level at the nearest setts (an active annex and active main sett) is expected to be between 40 dB and 50 dB (similar to the noise of a babbling brook or light traffic). It is considered that badgers will habituate to the higher background noise since the area near to the setts will already be subject to sudden loud noises such as agricultural machinery passing nearby and farm workers. Badgers are known to tolerate high levels of noise, setts have been found next to motorways, major roads and railway lines (Ref. 8.22). Noise levels at the other setts are expected to be between 32 dB and 22 dB. This is unlikely to be enough to deter badgers from using these setts. Disturbance at the active annex and active main sett is afforded Low magnitude, resulting in a **Negligible** effect. This is not considered a significant effect and will not require further mitigation.

8.7.172 Badgers using the Project Site for commuting and foraging are likely to be disturbed in the immediate vicinity of the Power Generation Plant during the start-up of the facility only but are likely to habituate to the higher background noise over

time and at increased distances from the Power Generation Plant. The increase in noise levels is not considered significant enough to deter them from returning. Therefore this effect is considered to be of Low magnitude, resulting in a **Negligible** effect. This is not considered a significant effect and will not require further mitigation.

8.7.173 There are no additional effects associated with the Electrical Connection or Gas Connection on otters requiring mitigation.

Water Vole

8.7.174 The Power Generation Plant is close to an area suitable for supporting water vole burrows (Watercourse 45). Although no recently occupied burrows were identified during the survey, it is possible that prior to construction new burrows are created in this area.

8.7.175 There is the potential for disturbance of water voles during operation due to increased noise. The predicted operational noise level from plant is expected to be an average of 50 dB and a maximum of 55 dB at the boundary of the Power Generation Plant, which is between approximately 20 m and 80 m from the section of Watercourse 45 suitable for supporting water voles. In general background noise levels at watercourses are around 45 dB. The change in noise level is unlikely to be enough to deter water voles where Watercourse 45 is 20 m from the Power Generation Plant boundary. Further afield, as the noise level reduces in line to the background level it is likely that water voles will not be deterred from using these areas. Given the extremely localised impact, noise is afforded Low magnitude, resulting in a **Negligible** effect and as such noise effects are not significant and will not require additional mitigation.

8.7.176 The Project incorporates welfare facilities which will require a site foul water drainage system. During operation the Project will have a maximum of two toilets on site with approximately three shifts of five workers in a 24 hour period. The foul water drainage system will either drain to a septic tank or a package treatment plant within the Project Site but outside any area at risk of flooding. The processed water would then discharge on-site or to a nearby watercourse. There are considered to be **Negligible** effects on water vole as a result of waste water discharges, therefore not significant and no additional mitigation will be required.

8.7.177 There are no effects associated with the Electrical Connection or Gas Connection on water vole requiring mitigation.

Otter

8.7.178 The new section of Access Road has the potential to result in road traffic mortality of otters. The Project will employ 15 permanent staff in shifts, which will likely generate 30 movements per day (two movements per staff member). A demineralised water trailer and diesel fuel tanker will visit the Project Site periodically. Regular night time access (when otters are more active) is likely to comprise approximately fifteen one way journeys. Maintenance periods will occur

annually. During these periods, there may be up to 40 additional staff on-site for a period of one month. Based on a vehicle occupancy level of 1.6, this will equate to an additional 50 movements per day (25 arrivals during the AM peak hour, 25 departures during the PM peak hour). A 20 mph speed limit will be in place along the Access Road. This will reduce the likelihood of otter mortality incidents. This impact is considered to be of Negligible magnitude, resulting in a **Negligible** effect, and therefore is not considered significant and does not require additional mitigation.

8.7.179 There is the potential for disturbance of otter during operation due to increased lighting. The embedded mitigation will help to limit light spill outside of the Power Generation Plant. Effects in relation to lighting are considered to be of Low magnitude, resulting in a **Negligible** effect, and as such are not considered significant and will not require further mitigation.

8.7.180 Any new fencing has the potential to inhibit commuting routes across the Project Site. This impact is considered to be of Low magnitude and therefore not significant. However, where possible, measures should be put in place to allow the continued movement of otters across the Project Site.

8.7.181 There is the potential for disturbance of otter during operation due to increased noise. The predicted operational noise level from plant is expected to be an average of 50 dB and a maximum of 55 dB at the boundary of the Power Generation Plant, which is between 80 m and immediately adjacent to water courses suitable for supporting otter. In general, background noise levels at watercourses are around 45 dB. The change in noise level is unlikely to be enough to deter otter in these areas. Otters have been shown to use areas with high levels of background noise such as under roads, in industrial buildings and close to quarries (Ref. 8.24). Further afield, as the noise level reduces in line to the background level it is likely that otters will not be deterred from using these areas. As otters generally use the Project Site for commuting and foraging the increase in noise levels is not considered significant enough to deter them from returning as they are tolerant of relatively high levels of disturbance (Ref. 8.24) and will resume their previous activity. It is considered that otters will habituate to the higher background noise. Therefore this effect is considered to be of Negligible magnitude, resulting in a **Negligible** effect and therefore is not significant and does not require additional mitigation.

8.7.182 The Project incorporates welfare facilities which will require a site foul water drainage system. During operation the Project will have a maximum of two toilets on site with approximately three shifts of five workers in a 24 hour period. The foul water drainage system will either drain to a septic tank or a package treatment plant within the Project Site but outside any area at risk of flooding. The processed water would then discharge on-site or to a nearby watercourse. There are considered to be no effects on otter as a result of waste water discharges.

8.7.183 There are no additional effects associated with the Electrical Connection or Gas Connection on otters requiring mitigation.

c) Decommissioning

8.7.184 The detailed decommissioning methodology cannot be finalised until immediately prior to decommissioning, but would be in line with relevant legislation and policy at that time.

8.7.185 The working assumption has been made for the purposes of this assessment that after 25 years, the Generating Equipment would be removed and the Generating Equipment Site re-instated to a similar condition as before construction. Any decommissioning phase would be likely to be of a similar duration to construction i.e. 22 months.

8.7.186 A working assumption has been used that the Electrical Connection and Gas Connection would be decommissioned after 25 years. Elements of the Gas Connection and Electrical Connection may be left in situ as this is likely to cause less environmental effects than removal. This would be the case for the Gas Pipeline, for example.

8.8 Mitigation and Monitoring

8.8.1 Additional mitigation measures have been proposed where a significant effect is predicted to occur. Embedded mitigation measures, which have been incorporated within the design of the Project or are standard practice measures that have been committed to are summarised in **Chapter 3: Project and Site Description**.

8.8.2 This section describes the proposed additional mitigation measures for the ecological assessment. Where other additional mitigation is required to reduce or eliminate a significant effect, this is referred to as additional mitigation. Additional mitigation measures have not been incorporated into the design of the Project and are therefore described in this section.

8.8.3 This section also describes any required monitoring regimes, including monitoring of specific receptors/resources, or monitoring the effectiveness of a mitigation measure. The requirements, scope, frequency and duration of a given monitoring regime are set out, as far as possible, in this section.

a) Mitigation

i. During Construction

8.8.4 Throughout the construction mitigation section areas of replacement habitats are referred to within the LEMP and Strategy presented in Figure 3.6 and Appendix 3.4. Indicative areas based on the Project layout presented Figure 3.2. The overall totals are as follows and that the same areas are referred to more than once:

- 1.07 ha of woodland/scrub;
- 2.50 ha of grassland (acid grassland/marshy grassland mosaic);
- 900 m of hedgerow; and,
- Two wildlife ponds and 180 m^2 of attenuation pond.

Lletty-Morfil SINC

8.8.5 Mitigation for the loss of SINC habitat (broadleaved semi-natural woodland, dense/continuous scrub and marshy grassland) will include the provision of replacement habitats. A LEMP and Strategy are presented in Figure 3.6 and Appendix 3.4.

8.8.6 Indicative areas, based on the plan are as follows:

- 1.07 ha of woodland/scrub;
- 2.50 ha of grassland (acid grassland/marshy grassland mosaic);
- 900 m of hedgerow; and,
- Two wildlife ponds and 180 m^2 of attenuation pond.

Row of Trees – Broadleaved and Hedgerows – Species-Poor

8.8.7 Loss of rows of trees and hedgerows utilised by wildlife such as commuting and foraging bats, and commuting badgers will be mitigated for through the introduction of hedgerows and linear woodland features as shown on the LEMP and Strategy presented in Figure 3.6 and Appendix 3.4.

8.8.8 Mitigation measures include that habitats temporarily removed will be reinstated and that mature trees removed may be replaced by standards of the same species or transplanted to a suitable location elsewhere within the Project Site Boundary.

Marshy Grassland

8.8.9 Temporarily removed habitats will be reinstated. Mitigation for the loss of marshy grassland habitat will include the provision of replacement habitat, as shown on the LEMP and Strategy, presented in Figure 3.6 and Appendix 3.4. The indicative area, based on the previous layout of the landscaping plans, is 2.50 ha of grassland (acid grassland/marshy grassland mosaic); however, this area is subject to change.

Standing Water

8.8.10 Mitigation for the loss of standing water habitat will include the provision of replacement habitat, as shown on the LEMP and Strategy, presented in Figure 3.6 and Appendix 3.4. Provisionally, it has been suggested that two attenuation ponds will be provided and function as wildlife ponds as well as two wildlife ponds within the acid grassland/marshy grassland mosaic replacement habitat. The attenuation ponds will be planted with native wetland species and where possible maintained as wetland features. The wildlife ponds will be planted with native wetland species and maintained as wetland features.

Amphibians

8.8.11 Recommendations for reptiles below will help to limit the injury or killing of amphibians.

Reptiles

8.8.12 Mitigation for the loss of habitat suitable for supporting reptiles (dense/continuous scrub and grassland) will include the provision of replacement habitats, as shown on the LEMP and Strategy, presented in Figure 3.6 and Appendix 3.4.

8.8.13 Indicative areas, based on the plan are as follows:

- 1.07 ha of woodland/scrub;
- 2.50 ha of grassland (acid grassland/marshy grassland mosaic);
- 900 m of hedgerow; and,
- Two wildlife ponds and 180 m^2 of attenuation pond.

8.8.14 Based on the positive result from the surveys reptile translocation will be required in areas of suitable habitat with the Project Site Boundary that are to be permanently or temporarily lost during construction.

8.8.15 The trapping and translocation programme will be designed following the guidance set out in Herpetofauna Groups of Britain and Ireland 1998 publication (Ref. 8.25).

8.8.16 Due to the 'Good' population of common lizard and the presence of low numbers of grass snakes within the survey area it is recommended that a trapping and translocation programme is undertaken to help protect any reptiles from being injured or killed. Due to the presence of suitable habitat for adder, the programme will include measures for this species. The actions involved in the proposed trapping and translocation are outlined below:

- Any construction areas suitable or known to support reptiles, including any routes in and out, areas for site compounds, offices or storage of materials/waste, will be fenced off using suitable fencing (drift or semi-permanent) to limit individuals attempting to enter the Project Site from the adjacent land;
- No construction activities, including pedestrian access will be allowed outside of the fencing in areas of habitat suitable for supporting reptiles.
- A number of refugia (at a density of 50/ha) will be placed within the fenced area to attract reptiles;
- Each day, up to twice a day for a minimum of 60 days an ecologist will check the refugia for the presence of reptiles;
- Any reptiles or amphibians found will be captured for relocation to suitable habitat outside of the fenced areas.
- After 60 days the trapping can cease once there have been five consecutive days where no reptiles have been found;
- After the fenced area has been cleared of reptiles and prior to soil stripping the vegetation can undergo a process of habitat management and hand searches for reptiles;
- Supervision of the soil strip during construction work by a suitably qualified ecologist will be required to help protect injury or killing of reptiles; and,
- Any litter or rubble piles will be removed by hand under the supervision of an ecologist to avoid injuring or killing any reptiles. If the material is too heavy to be removed by hand it can be done so using a mini excavator carefully and slowly removing the material, under the supervision of an ecologist.

8.8.17 Due to the relatively low numbers of reptiles likely to be present within the fenced area it is considered appropriate to move any captured reptiles to the areas of habitat suitable for supporting reptiles being retained outside of the fenced area. Project Site Boundary The habitats will be maintained in such a condition as to be suitable for receiving reptiles once the programme commences (i.e. not recently cut).

8.8.18 Any amphibians captured during the reptile trapping programme will be moved to a suitable location within the Project Site Boundary.

8.8.19 To reduce the risk of individual reptiles being injured or killed, all works will proceed under a Method Statement agreed with the Local Biodiversity Officer/Council Ecologist prior to works commencing.

8.8.20 The risk of reptiles and the mitigation measures will be included in the Project Site induction package and prior to any site clearance and construction tasks.

8.8.21 Full details are provided in the LEMP and Strategy in Figure 3.6 and Appendix 3.4.

Breeding Birds

8.8.22 Habitat creation measures relating to the loss of the SINC, broadleaved woodland, marshy grassland, hedgerows and lines of trees will provide additional areas for breeding birds post construction. Embedded landscape planting will also provide additional habitat for the species assemblage recorded. Badger

8.8.23 A pre-construction check for badger setts and activity will be undertaken where construction works are within 30 m of suitable habitats for badger sett creation.

8.8.24 Works likely to damage or destroy a badger sett will require a license to close the sett prior to works commencing. The terms of the license may stipulate the requirement for compensatory setts to be created should any main setts be destroyed and/or temporarily closed.

8.8.25 Excavations, if left unfilled overnight, should be covered to avoid badgers and other animals becoming trapped. Sloping escape ramps for badgers should be created by edge profiling trenches/excavations and/or excavations should be fitted with a scaffolding board ramp to allow any trapped animals to exit. Crossing places will be provided across open excavations for the duration of the works on the sections where known badger paths have been identified. Open pipework greater than 150 mm diameter that is left over night will be made secure by either filling in the end of the pipe or covering the end with a solid timber panel or similar.

8.8.26 Night time working with its associated need for additional lighting should be avoided as far as possible within areas near to setts and areas of known activity to reduce disturbance to badger when they are out of their setts and foraging. There should be no night time illumination of the hedgerows, woodland or setts.

8.8.27 The introduction of new woodland, scrub, species-rich grassland and hedgerows will increase opportunities for resting, breeding and foraging badger.

Invasive Species

8.8.28 An invasive species management plan will be produced to control and eradicate the invasive species within the Project Site Boundary. An updated invasive species survey should be undertaken to accurately assess invasive species and extents within the Project Site Boundary prior to the implementation of control measures.

8.8.29 Details of control and eradication are provided in the LEMP (Figure 3.6) and Strategy (Appendix 3.4).

ii. During Operation

Protected Species

8.8.30 The mitigation for partial underground cable or pipework replacement or repairs will follow best practice and any intrusive works will only commence after consultation with an ecologist to assess whether there are any impacts associated with the work.

8.8.31 Management of newly created habitats or compensatory features are detailed in the LEMP and Strategy and will be designed to minimise disturbance or adverse effects on protected and/or priority species, such as avoiding vegetation management during nesting bird season, and cutting grass and scrub within the reptile receptor area to a height of no less than 150 mm.

Bats

8.8.32 The lighting should utilise warm light luminaire such as yellow or amber LED. White LED lamps have a broad spectrum of light with whilst yellow and amber LED lamps each have a specific, narrower spectrum and have peak wavelengths between 590 and 660 nm, which is less attractive to invertebrates. This in turn will reduce the number of bats that will be attracted to feed and be open to predation through increased visibility.

Badger and Otter

8.8.33 Any new fencing along the Access Road will continue to allow the movement of badger across the Project Site through the inclusion of badger/otter gates or large gaps between the bottom of the fence and the ground. Speed limits on the Access Road will be enforced to help reduce the likelihood of any traffic mortalities or collisions.

iii. During Decommissioning

8.8.34 The detailed decommissioning methodology cannot be finalised until immediately prior to decommissioning, works associated with decommissioning would be subject to a separate assessment (likely EcIA) at that time, and as such appropriate mitigation would be decided upon during that process.

8.8.35 A Decommissioning Strategy will be secured as part of the DCO requirement.

b) Monitoring and Management

8.8.36 Monitoring will be undertaken on any newly created or relocated habitats for at least five years from establishment.

8.8.37 Monitoring will be undertaken for any species with newly created compensatory habitats for at least five years following establishment; for example, artificial badger setts, the reptile receptor site and bat boxes to assess their effectiveness and inform any ongoing management.

8.8.38 Management of newly created habitats will continue for the operational lifetime of the Project. Details of monitoring and management are contained within the Landscape and Ecology Mitigation Strategy (Appendix 3.4).

8.9 Residual Effects

8.9.1 The following tables (Table 8.14 and Table 8-17) present a summary of the ecological impact assessment. They identify the receptor/s likely to be impacted, the level of effect and, where the effect is deemed to be significant, the tables include the mitigation proposed and the resulting residual effect.

Table 8.14: Ecology summary of effects arising during construction phase

Receptor	Description of Effect	Classification of effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
Power Generation Plant					
Lletty-Morfil SINC	Habitat loss – there will be a permanent loss of 0.43 ha (1.20%), comprising 0.26 ha of broadleaved semi-natural woodland and 0.17 ha of marshy grassland.	Moderate adverse	Provision of replacement habitats. Indicative areas are as follows: • 1.07 ha of woodland/scrub; • 2.50 ha of grassland (acid grassland/marshy grassland mosaic); • 900 m of hedgerow; and, • Two wildlife ponds and 180 m2 of attenuation pond. •	Minor adverse	Not Significant
Broadleaved Woodland – Semi-Natural	Habitat loss – there will be a permanent loss of 0.79 ha.	Minor adverse	None	Minor adverse	Not Significant
Broadleaved Woodland – Plantation	Habitat loss – there will be a permanent loss of 0.02 ha.	Minor adverse	None	Minor adverse	Not Significant
Rows of Trees – Broadleaved	Habitat loss – there will be a permanent loss of approximately 500 m and a temporary loss of 40 m for laydown areas.	Moderate adverse	Replacement of features through the introduction of linear habitat with similar properties such as hedgerows. Mature trees will be replaced by standards of the same species or transplanted to a suitable location elsewhere within the Project Site Boundary.	Minor adverse	Not Significant
Standalone Trees	Loss of up to two	Minor adverse	None	Minor adverse	Not

Receptor	Description of Effect	Classification of effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
	trees.				Significant
Semi-Improved Neutral Grassland	Habitat loss – there will be a permanent loss of 0.65 ha and a temporary loss of 0.15 ha for laydown areas of semi-improved neutral grassland.	Minor adverse	None	Minor adverse	Not Significant
Marshy Grassland	Habitat loss – there will be a permanent loss of 1.45 ha loss and a temporary loss of 1.94 ha for laydown areas of marshy grassland.	Moderate adverse	Temporarily removed habitats will be reinstated. Mitigation for the loss of marshy grassland habitat will include the provision of replacement habitat. The indicative area, based on the previous layout, is 5.04 ha of grassland (acid grassland/marshy grassland mosaic).	Minor adverse	Not Significant
Standing Water	Habitat loss – permanent removal of Ponds 16 and 22.	Moderate adverse	Mitigation for the loss of standing water habitat will include the provision of replacement habitat. Provisionally, it has been suggested that two wildlife ponds will be provided.	Minor adverse	Not Significant
Hedgerows	Habitat loss – there will be a permanent loss of 140 m of species-poor hedgerow.	Moderate adverse	Replacement of features through the introduction of linear habitat with similar properties such as hedgerows. Mature trees will be replaced by standards of the same species or transplanted to a suitable location	Minor adverse	Not Significant

Receptor	Description of Effect	Classification of effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
			elsewhere within the Project Site Boundary.		
Invertebrates	Loss of habitat - permanent removal of habitat suitable for supporting a Section 7 listed butterfly, wall, two Nationally Scarce beetles, common species, and Section 7 species of moth and butterfly.	Minor adverse	None	Minor adverse	Not Significant
Amphibians	Permanent partial loss of suitable breeding, foraging and sheltering habitat including two ponds, broadleaved semi-natural woodland and semi-natural neutral grassland.	Moderate adverse	Mitigation for the loss of habitat suitable or supporting amphibians will include the provision of replacement habitats. Indicative areas are as follows: • 1.07 ha of woodland/scrub; • 2.50 ha of grassland (acid grassland/marshy grassland mosaic); • 900 m of hedgerow; and, • Two wildlife ponds and 180 m^2 of attenuation pond.	Minor adverse	Not Significant
	Potential for	Moderate adverse	The mitigation in place for reptiles will	Minor adverse	Not

Receptor	Description of Effect	Classification of effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
	injuring or killing of amphibians during habitat removal, trampling and vehicular movements.		help to limit the injury or killing of amphibians.		Significant
Reptiles	Permanent partial loss of suitable breeding, forging and sheltering habitat including three ponds, broadleaved semi-natural woodland and semi-natural neutral grassland.	Moderate adverse	Mitigation for the loss of habitat suitable or supporting reptiles will include the provision of replacement habitats. Indicative areas are as follows: • 1.07 ha of woodland/scrub; • 2.50 ha of grassland (acid grassland/marshy grassland mosaic); • 900 m of hedgerow; and, • Two wildlife ponds and 180 m^2 of attenuation pond.	Minor adverse	Not Significant
	Potential for injuring or killing of reptiles during habitat removal, trampling and vehicular movements.	Moderate adverse	Due to the 'Good' population of common lizard within the survey area a trapping and translocation programme including exclusion fencing will be undertaken to help protect any reptiles from being injured or killed. All works will proceed under a Method Statement agreed with the Local Biodiversity Officer/Country Ecologist	Minor adverse	Not Significant

Receptor	Description of Effect	Classification of effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
			prior to works commencing.		
Breeding Birds	Permanent partial loss of suitable breeding, foraging and sheltering habitat including trees, woodland, hedgerows and scrub.	Minor adverse	None	Minor adverse	Not Significant
	Localised disturbance from night time illumination in winter months.	Minor adverse	None	Minor adverse	Not Significant
	Birds will adapt to localised construction noise.	Minor adverse	None	Minor adverse	Not Significant
Bats	Disturbance, injury or killing of bats in newly formed roosts in trees previously confirmed as not supporting roosting bats during felling.	Major adverse	Pre-construction checks will be undertaken on trees scheduled for removal for their current bat roost potential with consideration of the seasonal survey timings. Results will be used to inform any further mitigation to seek to avoid impacts on roosting bats.	Minor adverse	Not Significant
	Loss of foraging habitat.	Moderate adverse	Mitigation for the loss of habitat suitable or supporting bats will include the provision of replacement habitats.	Minor adverse	Not Significant

Receptor	Description of Effect	Classification of effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
			Indicative areas are as follows: • 1.07 ha of woodland/scrub; • 2.50 ha of grassland (acid grassland/marshy grassland mosaic); • 900 m of hedgerow; and, • Two wildlife ponds and 180 m^2 of attenuation pond.		
	Severance of habitat connectivity either side of Access Road.	Moderate adverse	Maintain connectivity of foraging and commuting habitats by the retention of trees and hedgerows wherever possible and utilising 'brown hedgerows' of brash, to maintain connectivity during construction.	Minor adverse	Not significant
	Localised disturbance from night time illumination in winter months.	Moderate adverse	Night time working with its associated need for additional lighting should be avoided as far as possible within areas near to known roosts. There should be no night time illumination of the hedgerows, woodland or mature tree lines.	Minor adverse	Not Significant
Water Vole	There is the potential cause disturbance of, harm or kill individual water voles during	Moderate adverse	A pre-construction check for water vole burrows and activity of will be undertaken where construction is present within 100 m of watercourses as identified as suitable for supporting the species during the 2017 field	Minor adverse	Not Significant

Receptor	Description of Effect	Classification of effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
	construction within 10 m of Watercourse 45.		surveys. Habitat management will be undertaken to help reduce the quality of the habitats for burrow creation for the period leading up to and for the duration of construction in that area. Additional mitigation may be required as a result of the survey.		
Otter	There is the potential harm or kill individual otters during construction within 10 m of Watercourses 9, 11 12, 41 and 45 and Watercourses 27, 28 and 29.	Moderate adverse	A pre-construction check for otter holts/couches and activity of will be undertaken where construction is present within 100 m of watercourses as identified as suitable for supporting the species during the 2017 field surveys. Habitat management will be undertaken to help reduce the quality of the habitats for holt/couch creation for the period leading up to and for the duration of construction in that area.	Minor adverse	Not Significant
Brown Hare	There is the potential cause disturbance of, harm or kill individual brown hares during construction.	Minor adverse	None	Minor adverse	Not Significant
Badger	There is the potential harm or kill individual	Moderate adverse	A pre-construction check for badger setts and activity will be undertaken where construction works are within	Minor adverse	Not Significant

Receptor	Description of Effect	Classification of effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
	badgers during construction within 30 m of a sett.		30 m of suitable habitats for badger sett creation. Additional mitigation may be required as a result of the survey.		
	Permanent partial loss of suitable breeding, foraging and sheltering habitat including woodland, hedgerows, scrub and grassland.	Minor adverse	The introduction of new woodland, scrub, species-rich grassland and hedgerows will increase opportunities for resting, breeding and foraging badger.	Minor adverse	Not Significant
Invasive Species	Potential for the construction of the Project to cause the spread of invasive species will be reduced due to the embedded mitigation to implement measures contained in relevant best practice guidance on the control and removal of invasive weed species.	Minor adverse	Recommend management plan is produced to control and eradicate the invasive species within the Project Site Boundary. An updated invasive species survey will be undertaken to accurately assess invasive species and extents within the Project Site Boundary prior to the implementation of control measures.	Minor adverse	Not Significant

Receptor	Description of Effect	Classification of effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
Gas Connection					
Dense/Continuous Scrub	Habitat loss – there will be a temporary loss of 0.02 ha	Minor adverse	None	Minor adverse	Not Significant
Rows of Trees – Broadleaved	Habitat loss – there will be a temporary loss of 350 m.	Moderate adverse	Temporarily removed habitats will be reinstated. Mature trees will be replaced by standards of the same species or transplanted to a suitable location elsewhere within the Project Site Boundary.	Minor adverse	Not Significant
Standalone Trees	Loss of up to two trees.	Minor adverse	None	Minor adverse	Not Significant
Semi-Improved Neutral Grassland	Habitat loss – there will be a temporary loss of 1.02 ha of semi-improved neutral grassland.	Minor adverse	None	Minor adverse	Not Significant
Marshy Grassland	Habitat loss – there will be a temporary loss of 0.01 ha of marshy grassland.	Minor adverse	Temporarily removed habitats will be reinstated. Mitigation for the loss of marshy grassland habitat will include the provision of replacement habitat. The indicative area, based on the previous layout, is 2.50 ha of grassland (acid grassland/marshy grassland mosaic).	Negligible	Not Significant
Standing Water	Habitat loss – temporary removal	Moderate adverse	Mitigation for the loss of standing water habitat will include the provision	Minor adverse	Not Significant

Receptor	Description of Effect	Classification of effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
	of Pond 23.		of replacement habitat. Provisionally, it has been suggested that two wildlife ponds will be provided.		
Hedgerows	Habitat loss – there will be a temporary loss 180 m of species-poor hedgerow.	Moderate adverse	Temporarily removed habitats will be reinstated. Mature trees will be replaced by standards of the same species or transplanted to a suitable location elsewhere within the Project Site Boundary.	Minor adverse	Not Significant
Invertebrates	Loss of habitat - temporary removal of habitat suitable for supporting the Section 7 listed butterfly, common species, and Section 7 species of moth and butterfly. Habitats will be reinstated after works are complete.	Minor adverse	None	Minor adverse	Not Significant
Amphibians	Temporary loss of suitable breeding, foraging and sheltering habitat including a pond (may be possible to	Moderate adverse	Mitigation for the loss of habitat suitable or supporting amphibians will include the provision of replacement habitats. Indicative areas are as follows: • 1.07 ha of woodland/scrub;	Minor adverse	Not Significant

Receptor	Description of Effect	Classification of effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
	avoid), scrub, semi-improved neutral grassland, marshy grassland, rows of trees and species-poor hedgerows. Habitats will be reinstated once works are complete.		• 2.50 ha of grassland (acid grassland/marshy grassland mosaic); • 900 m of hedgerow; and, • Two wildlife ponds and 180 m^2 of attenuation pond.		
	Potential for injuring or killing of amphibians during habitat removal, trampling and vehicular movements.	Moderate adverse	The mitigation in place for reptiles will help to limit the injury or killing of amphibians.	Minor adverse	Not Significant
Reptiles	Temporary loss of suitable breeding, foraging and sheltering habitat including scrub, semi-improved neutral grassland, marshy grassland and species-poor hedgerows. Habitats will be	Minor adverse	None	Minor adverse	Not Significant

Receptor	Description of Effect	Classification of effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
	reinstated once works are complete.				
	Although the works are temporary in this area, the loss of standing water (may be possible to avoid) and mature rows of trees must be considered permanent due to the time required for mature trees to grow and the change in ground conditions making it unlikely for the pond to reform without human intervention.	Moderate adverse	Mitigation for the loss of habitat suitable or supporting reptiles will include the provision of replacement habitats. Indicative areas are as follows: • 1.07 ha of woodland/scrub; and, • Two wildlife ponds and 180 m^2 of attenuation pond.	Minor adverse	Not Significant
	Potential for injuring or killing of reptiles during habitat removal, trampling and vehicular movements.	Moderate adverse	Due to the 'Good' population of common lizard within the survey area a trapping and translocation programme including exclusion fencing will be undertaken to help protect any reptiles from being injured or killed. All works will proceed under a Method Statement agreed with the Local	Minor adverse	Not Significant

Receptor	Description of Effect	Classification of effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
			Biodiversity Officer/Country Ecologist prior to works commencing.		
Breeding Birds	Temporary removal of habitat with the potential to support breeding birds (trees, woodland, hedgerows and scrub). Habitats will be reinstated once works are complete.	Minor adverse	None	Minor adverse	Not Significant
	Localised disturbance from night time illumination in winter months.	Minor adverse	None	Minor adverse	Not Significant
	Noise generated during construction. Birds will adapt to localised construction noise.	Minor adverse	None	Minor adverse	Not Significant
Bats	Disturbance, injury or killing of bats in newly formed roosts in trees	Major adverse	Pre-construction checks will be undertaken on trees scheduled for removal for their current bat roost potential with consideration of the	Minor adverse	Not Significant

Receptor	Description of Effect	Classification of effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
	previously confirmed as not supporting roosting bats during felling.		seasonal survey timings. Results will be used to inform any further mitigation to seek to avoid impacts on roosting bats.		
	Severance of linear features used by bats roosting in Buildings 7 & 8.	Moderate adverse	Building assessments and further bat surveys will be undertaken on Buildings 7 and 8. Results will be used to inform any further mitigation to seek to avoid impacts on bats from the roost commuting and foraging across the Project Site Boundary.	Minor adverse	Not Significant
	Loss of foraging habitat.	Minor adverse	None	Minor adverse	Not Significant
	Severance of habitat connectivity through removal of hedgerows and tree lines.	Moderate adverse	Maintain connectivity of foraging and commuting habitats by the retention of trees and hedgerows wherever possible and utilising 'brown hedgerows' of brash, to maintain connectivity during construction. For linear features identified as key forging or commuting habitat, where possible the Gas Connection should be installed using drilling to retain feature and connectivity across the Project Site.	Minor adverse	Not Significant
	Localised disturbance from night time illumination in	Minor adverse	None	Minor adverse	Not Significant

Receptor	Description of Effect	Classification of effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
	winter months are limited due to the embedded mitigation in the lighting plan.				
Otter	There is the potential harm or kill individual otters during construction within 10 m of Watercourse 6.	Moderate adverse	A pre-construction check for otter holts/couches and activity of will be undertaken where construction is present within 100 m of watercourses as identified as suitable for supporting the species during the 2017 field surveys. Further mitigation measures may be required if activity is found. Habitat management will be undertaken to help reduce the quality of the habitats for holt/couch creation for the period leading up to and for the duration of construction in that area. Additional mitigation may be required as a result of the survey.	Minor adverse	Not Significant
Brown Hare	There is the potential cause disturbance of, harm or kill individual brown hares during construction.	Minor adverse	None	Minor adverse	Not Significant

Receptor	Description of Effect	Classification of effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
Badger	There is the potential harm or kill individual otters during construction within 30 m of a sett.	Moderate adverse	A pre-construction check for badger setts and activity will be undertaken where construction works are within 30 m of suitable habitats for badger sett creation. Additional mitigation may be required as a result of the survey.	Minor adverse	Not Significant
	Trapping of badgers in open excavations and obstructing the movement of badger across the Project Site.	Moderate adverse	Sloping escape ramps for badgers should be created by edge profiling trenches/excavations and/or excavations should be fitted with a scaffolding board ramp to allow any trapped animals to exit. Crossing places will be provided across open excavations for the duration of the works on the sections where known badger paths have been identified. Open pipework greater than 150 mm diameter that is left over night will be made secure by either filling in the end of the pipe or covering the end with a solid timber panel or similar.	Minor adverse	Not Significant
Invasive Species	Potential for the construction of the Project to cause the spread of invasive species will be reduced due to the embedded	Minor adverse	Recommend management plan is produced to control and eradicate the invasive species within the Project Site Boundary. An updated invasive species survey will be undertaken to accurately assess invasive species and extents within the Project Site	Minor adverse	Not Significant

Receptor	Description of Effect	Classification of effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
	mitigation to implement measures contained in relevant best practice guidance on the control and removal of invasive weed species.		Boundary prior to the implementation of control measures.		
Electrical Connection					
Rows of Trees – Broadleaved	Temporary loss of approximately 15 m.	Moderate adverse	Temporarily removed habitats will be reinstated.	Minor adverse	Not Significant
Standalone Trees	Potentially be a loss of up to a single tree	Minor adverse	None	Minor adverse	Not Significant
Invertebrates	Temporary reduction of suitable habitat, this has the potential to have an impact on the Section 7 species of moth and butterfly.	Minor adverse	None	Minor adverse	Not Significant
Amphibians	Temporary reduction of suitable habitat,	Moderate adverse	Temporarily removed habitats will be reinstated.	Minor adverse	Not Significant

Receptor	Description of Effect	Classification of effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
	this has the potential to have an impact on common amphibians.				
Reptiles	Temporary reduction of suitable habitat.	Minor adverse	None	Minor adverse	Not Significant
Breeding Birds	Localised disturbance from night time illumination in winter months.	Minor adverse	None	Minor adverse	Not Significant
	Birds will adapt to localised construction noise.	Minor adverse	None	Minor adverse	Not Significant
Bats	Temporary removal of habitats - severance of connectivity and fragmentation.	Moderate adverse	Temporarily removed habitats will be reinstated.	Minor adverse	Not Significant
Otter	There is the potential harm or kill individual otters during construction within 10 m of Watercourses 27, 28 and 29.	Moderate adverse	A pre-construction check for otter holts/couches and activity of will be undertaken where construction is present within 100 m of watercourses as identified as suitable for supporting the species during the 2017 field surveys. Habitat management will be	Minor adverse	Not Significant

Receptor	Description of Effect	Classification of effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
			undertaken to help reduce the quality of the habitats for holt/couch creation for the period leading up to and for the duration of construction in that area. Additional mitigation may be required as a result of the survey.		

Table 8.15: Ecology summary of effects arising during operational phase

Receptor	Description of Effect	Classification of Effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
Power Generation Plant					
Invertebrates	Effects from operation lighting.	Minor adverse	None	Minor adverse	Not Significant
Reptiles	Risk of direct mortality from the use of the Access Road by operational traffic.	Minor adverse	None	Minor adverse	Not Significant
Bats	Noise disturbance on commuting and foraging bats.	Minor adverse	None	Minor adverse	Not Significant
	Disturbance from lighting emitted from the Power Generation Plant. Embedded mitigation will limit light spill onto ecologically sensitive	Minor adverse	The lighting should utilise warm light luminaire such as yellow or amber LED. White LED lamps have a broad spectrum of	Minor adverse	Not Significant

Receptor	Description of Effect	Classification of Effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
	features.		light with whilst yellow and amber LED lamps each have a specific, narrower spectrum and have peak wavelengths between 590 and 660 nm, which is less attractive to invertebrates. This in turn will reduce the number of bats that will be attracted to feed and be open to predation through increased visibility.		

a) Project 'inter effects'

8.9.2 The predicted effects of the Project upon receptors to air quality are limited to those assets listed in Table 8-17 and Table 8-18, and as such no significant impacts are predicted from the Project.

8.10 Assessment of Effects on Natural Features (APFP Regulations 2009)

8.10.1 Regulation 5(2)(l) of the Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 requires DCO applicants to provide, where applicable:

a plan with accompanying information identifying—

- *any statutory or non-statutory sites or features of nature conservation*
- *such as sites of geological or landscape importance;*
- *habitats of protected species, important habitats or other diversity features; and*
- *water bodies in a river basin management plan.*

together with an assessment of any effects on such sites, features, habitats or bodies likely to be caused by the proposed development.

8.10.2 Statutory and non-statutory designated sites of nature conservation importance are shown in Figure 8.2; the Figures also show habitats of protected species, important habitats and other diversity features.

8.10.3 Relevant water bodies are identified in Figure 9.5.

8.10.4 Sections 8.7 to 8.9 of this chapter (together with Appendices 8.1 to 8.19) assess any effects of the Project on the sites, features and habitats mentioned in regulation 5(2)(l) and consider whether or not they are 'significant' for EIA purposes.

8.10.5 An assessment of the effects on relevant water bodies is provided in **Chapter 9: Water Resources and Flood Risk**.

8.11 Cumulative Effects

a) Assessment of Potential Cumulative Effects – Construction and Demolition

i. Description of baseline where cumulative impacts expected

8.11.1 The assessment of residual effects identified that the implementation of the Project would have no significant effects once mitigation measures have been fully implemented. The assessment of cumulative effects relies upon there being a perceptible effect as a result of the project being considered in order for this to be significant in combination with other projects. It is therefore considered that there is no potential for cumulative impacts on ecological receptors as a result of operation of the Project in combination with the identified other projects.

8.11.2 No further mitigation will be required.

b) Assessment of Potential Cumulative Effects – Operation

i. Description of baseline where cumulative effects expected

8.11.3 It is considered that there is no potential for cumulative impacts on ecological receptors as a result of operation of the Project in combination with the identified other schemes as all residual effects were considered not to be significant.

8.11.4 No further mitigation will be required.

8.12 Conclusions and Remaining Surveys

8.12.1 This chapter has identified ecological designated sites, habitats, species or ecosystems which may be affected by the Project and assessed the likelihood of significant effects.

8.12.2 No residual significant effects have been identified for each component of the Project, or the Project as whole due to the embedded mitigation inherent within the design but also the application of additional mitigation where required.

8.12.3 The following surveys are ongoing and will be undertaken in 2018:

- Hedgerow survey in April 2018;
- Ongoing bat activity surveys in April and May 2018;
- Bat emergence and re-entry surveys on Buildings 7 and 8 in May, June & July 2018; and
- Breeding bird survey in April and May 2018.

8.12.4 Where possible the survey results are provided in this chapter, or as supplementary information to follow soon after submission. Any delayed results are not expected to materially change the impact assessment results. It is also intended to continue liaison with CCS and NRW regarding the ecological mitigation required for reptiles and other species present onsite.

8.13 References

Ref. 8.1 Department of Energy and Climate Change (July 2011) Overarching National Policy Statement for Energy (EN-1) - https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/37046/1938-overarching-nps-for-energy-en1.pdf

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Ref. 8.5 AECOM (2018). Abergelli Power Station Environmental Statement Abergelli Power Limited.

Ref. 8.6 Joint Nature Conservation Committee (2010 Ed.). Handbook for Phase 1 Habitat Survey – A Technique for Environmental Audit. JNCC. Peterborough

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Ref. 8.9 Gent, T. and Gibson, S. (2003). Herpetofauna Workers' Manual. JNCC, Peterborough.

Ref. 8.10 Hundt, L. (2012) Bat Surveys: Good Practice Guidelines, 2nd edition, Bat Conservation Trust.

Ref. 8.11 Bright, P., Morris, P. and Mitchell-Jones, A. (2006). Dormouse Conservation Handbook Second Edition. English Nature, Peterborough.

Ref. 8.12 Chanin P (2003). Monitoring the Otter Lutra lutra. Conserving Natura 2000 Rivers Monitoring Series No. 10, English Nature, Peterborough.

Ref. 8.13 Dean, M.,Strachan, R., Gow, D. and Andres, R. (2016). The Water Vole Mitigation Handbook (The Mammal Society Mitigation Guidance Series). Eds Fiona Mathews and Paul Chanin. The Mammal Society, London.

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Ref. 8.15 Common Bird Census (CBC) (Marchant, 1983; Bibby et al. 1992.

Ref. 8.16 IAQM (2012). Guidance on Air Quality Monitoring in the Vicinity of Demolition and Construction Sites. IAQM, London.

Ref. 8.17 DMRB (2007). Design Manual for Roads and Bridges, Volume 11 Environmental Assessment, Section 3 Environmental Assessment Techniques, Part 1 HA 207/07, Air Quality (May 2007).

Ref. 8.18 Institution of Lighting Professionals' Guidance Notes for the Reduction of Obstructive Light (2011)

Ref. 8.19 AECOM (2017). Abergelli Power Project No Significant Effects Report.

Ref. 8.20 Bunkley, J.P., McClure, C.J.W., Kleist, N.J., Francis, C.D. and Barber, J.R. (2015). Anthropogenic noise alters bat activity levels and echolocation calls. Global Ecology and Conservation [online]. Available at: https://www.sciencedirect.com/science/article/pii/S235198941400064X Accessed 1 March 2018.

Ref. 8.21 Luo, J., Goerlitz, .H.R., Brumm, H. and Wiegrebe, L. (2015) Linking the sender to the receiver: vocal adjustment by bats to maintain signal detection in noise. Scientific Reports [online]. Available at: http://www.nature.com/articles/srep18556 Accessed 01 March 2018.

Ref. 8.22 C J Wilson and R G Byrnes (1996). The Management of Problems Involving Badgers (*Meles meles*). Protection of Badgers Act 1992 licensing cases dealt with on behalf of the Ministry of Agriculture, Fisheries and Food in England from 1992 to 1996. A report by the Farming and Rural Conservation Agency on behalf of the Ministry of Agriculture, Fisheries and Food.

Ref. 8.23 Bruce-White, C. and Shardlow, M. (2011). A Review of the Impact of Artificial Light on Invertebrates; Buglife – The Invertebrate Conservation Trust

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Chapter 9

Water Quality and Resources

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TABLES

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APPENDICES

9. Water Quality and Resources

9.1 Introduction

9.1.1 This chapter provides an assessment of the likely significant effects on water quality, water resources and flood risk arising from construction, operation and decommissioning of the Project. Maintenance is included within the operational assessment of the Project.

9.1.2 A detailed description of the Project Site and the Project is provided in **Chapter 3: Project and Site Description**. A glossary of terms and list of abbreviations used in this chapter is provided in **Document Reference 1.4.**

9.1.3 This chapter is supported by the assessment demonstrated in Appendix 9.1: Flood Consequence Assessment (FCA), and a Water Framework Directive (WFD) Screening Assessment provided in Appendix 9.2. Both the FCA and WFD Screening Assessment should be read alongside this chapter. Assessments of likely significant effects on hydrogeology are presented in **Chapter 10: Geology, Ground Conditions and Hydrogeology**.

a) Objectives of the assessment

9.1.4 The objectives of the assessment were to:

- Assess the activities to be carried out and their associated potential impacts likely to arise throughout the different phases of the Project which pose a risk to all water environmental receptors within the Project Site and surroundings;
- To provide any additional mitigation as required to prevent, reduce and offset any significant adverse effects to water quality and resources likely to be affected by the Project;
- Detail the residual effects after implementation of the mitigation;
- Detail cumulative effects of the Project and nearby projects;
- To ensure the Project complies with all local, national and international regulatory and legislative requirements; and
- To address the issues and concerns raised in the Scoping Opinion (Appendix 4.2) by the SoS in relation to Water Quality and Resources following an initial consultation in 2014.

9.2 Changes since the 2014 PEIR

9.2.1 There have been changes to the Project design as a result of design evolution and consultation as detailed in **Chapter 3: Project and Site Description**. To aid the reader, Table 9-1 below outlines the changes to this assessment compared with the 2014 PEIR. Note, there are no design changes since 2018 that has altered this assessment.

Table 9-1: Summary of changes since the 2014 PEIR to the water quality and resources assessment

Section	Changes since the 2014 PEIR	Section Reference
Legislation and Policy	Regulation amendment - The Water Environment (Water Framework Directive) (England and Wales) (Amendment) Regulations 2016 (Ref. 9-1) which came into force from 3 March 2016.	Section 9.3.6
	Introduction of new regulation - The Water Pollution Prevention - Oil Storage Standards (Water Resources (Control of Pollution) (Oil Storage) (Wales) Regulations 2016 (Ref. 9-2)	Surface Water Management Plan (Appendix 3.2)
Baseline	Additional baseline data has become available since the 2014 PEIR was prepared.	Updated baseline data for 2014, 2015 and 2016 are presented in Section 9.5
	Updated baseline data for private groundwater supply boreholes.	WFD Screening Assessment (Appendix 9.2)
Project Design	Water supply option to the Project has been revised. Water will be delivered via tanker.	**Chapter 3: Project Site and Description**
	Drainage strategy has been revised to suit the new design.	**Chapter 3: Project Site and Description** & Appendix E in Appendix 9.1 - Outline Drainage Strategy
	Embedded designs to mitigate potential, water quality and flood risk impacts.	**Chapter 3: Project and Site Description** & Appendix E in Appendix 9.1 - Outline Drainage Strategy
	Removal of all operational waste water from the Project Site.	**Chapter 3: Project Site and Description** & Appendix E in Appendix 9.1 - Outline Drainage Strategy
	Following new Climate Change Allowances in 2016 - climate change allowances agreed to be 1% AEP + 20% for the attenuation volume calculations	Flood Consequence Assessment (Appendix 9.1)
Significance of Effect	Update of new receptors, update to existing operational / planned / approved projects for the potential cumulative impact in Section 9.11	Summary of Receptors in Table 9-8 and Cumulative Effects are Section 9-11

9.3 Legislation, policy and guidance

9.3.1 This section identifies and describes legislation, policy and guidance of relevance to the assessment of the potential water quality, water resources and flood risk impacts associated with the Project.

9.3.2 Legislation and policy has been considered on an international, national, regional and local level. The following is considered to be relevant to the water quality, water resources and flood risk assessment as it has influenced the sensitivity of receptors and requirements for mitigation or the scope and/or methodology of the Environmental Impact Assessment (EIA).

a) International

i. Water Framework Directive (WFD) (2000/60/EC) (European Union, 2000)

9.3.3 The Water Framework Directive (WFD) (2000/60/EC) (Ref. 9-3) together with its two daughter directives, being the Groundwater Directive (GWD) (2006/118/EC) (Ref. 9-4) and the Priority Substances Directive (2008/105/EC) (Ref. 9-5), and the EC Floods Directive (2007/60/EC) (Ref. 9-6) set out by the European Union are key international legislations that affect the Project within the context of water quality and resources. These directives together provide consensus measures on which surface water and groundwater bodies are protected.

9.3.4 The WFD also establishes a legal framework to protect and restore clean water status (i.e. “good” in terms of ecological and chemical quality and water quantity, as appropriate) across Europe and to ensure its long-term, sustainable use. The WFD is a significant piece of EU water legislation, with the overarching objective of enabling all water bodies in Europe to attain ‘Good’ or ‘High’ ecological status by 2015.

9.3.5 The WFD directive establishes an innovative approach for water management based on river basins, the natural geographical and hydrological units and sets specific deadlines for Member States to protect aquatic ecosystems. The Directive addresses inland surface waters, transitional waters, coastal waters and groundwater. It establishes several principles for water management, including public participation in planning and the integration of economic approaches, including the recovery of the cost of water services.

9.3.6 The WFD is implemented in England and Wales by “The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017” (Ref. 9-7). The Natural Resources Wales (NRW) is the competent authority in Wales responsible for delivering the objectives of the WFD. River Basin Management Plans (RBMP) specifically set out measures to ensure that water bodies in Wales achieve ‘Good’ ecological status.

b) National

9.3.7 The national legislations relevant to the Project in terms of water quality and water resources are summarised below:

i. The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017

9.3.8 The Water Framework Directive requires that Member States continue to provide shellfish water protected areas with at least the same protection as under the

repealed Shellfish Waters Directive. The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 were laid before the National Assembly for Wales on 16 March 2017. The regulations came into force from 10 April 2017.

9.3.9 The Regulations ensure that objectives are set for improving or protecting the water quality of shellfish waters and that these are monitored. Information about these areas must also be included in the river basin management plans.

9.3.10 The content of the list of shellfish water protected areas in Wales has not changed since 2013.

ii. Flood and Water Management Act 2010

9.3.11 The Act (Ref. 9-8) designates City and County Swansea Council (CCS) as the Lead Local Flood Authority (LLFA), with the responsibility to lead and co-ordinate local flood risk management in the area. It also requires a Sustainable Urban Drainage System (SuDS) Approving Body (SAB) to be established within the LLFA. This responsibility to promote, approve and adopt sustainable drainage systems in new and re-developments can be delegated but the legal responsibility for drainage remains with CCS as the LLFA. SAB must approve drainage systems for the new and re-developed site in their area before construction can begin. The proposed drainage system must also meet National Standards for Sustainable Drainage (Ref. 9-9).

iii. Flood Risk Regulations 2009

9.3.12 The Flood Risk Regulations (Ref. 9-10) require NRW and LLFA to produce a Preliminary Flood Risk Assessment, Flood Hazard Maps, Flood Risk Maps and Flood Risk Management Plans for any areas at significant risk.

iv. Environmental Permitting (England and Wales) Regulations 2016

9.3.13 The Permitting regulations (Ref. 9-11) require operators to obtain permits for some facilities regarding water resources. The permits are granted by NRW, who control permitting water discharge and groundwater activities. The 2016 update requires permits to be obtained for flood risk activities, including work on or near a main river and in a flood plain.

v. Well-being of Future Generations (Wales) Act 2015

9.3.14 The Act (Ref. 9-12) requires public bodies to undertake their duties and decision making in a sustainable way to help secure Wales' long term well-being, so that it benefits from a prosperous economy, a healthy and resilient environment and vibrant, cohesive communities. The Act includes the requirement for decision making to take account of long term implications, such as climate change.

vi. Environment (Wales) Act 2016

9.3.15 The Act (Ref. 9-13) aims to enable Wales' natural resources to be managed in a more proactive, sustainable and joined up way and to help tackle climate change.

c) National Policy

i. Overarching National Policy Statement for Energy (NPS EN – 1)

9.3.16 According to the policy (Ref. 9-14), an assessment of the existing baseline conditions regarding water quality, water resources and physical characteristics of the water environment is required where a proposed project is likely to have effects on the water environment.

9.3.17 The NPS EN – 1 also sets the requirement for additional pollution control measures that must be considered for all activities that discharge to the water environment and recommends that the SoS gives increased weight in its decision making to impacts on the water environment that would have an adverse effect on the achievement of the objectives of the WFD.

ii. National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines (NPS EN – 4)

9.3.18 The NPS EN-4 Part 2 Section 2.22.2 (Ref. 9-15) recognises that "constructing pipelines creates corridors of surface clearance and excavation that can potentially affect watercourses, aquifers, water abstraction and discharge points, areas prone to flooding and ecological receptors. Pipeline impacts could include inadequate or excessive drainage, interference with groundwater flow pathways, mobilisation of contaminants already in the ground, the introduction of new pollutants, flooding, disturbance to water ecology, pollution due to silt from construction / demolition and disturbance to species and their habitats".

9.3.19 The NPS EN-4 states that where the project is likely to have effects on water resources or water quality, an assessment of the impacts should be provided in line with Section 5.15 of EN-1. The SoS should be satisfied that the impacts on water quality and resources are acceptable in accordance with Section 5.15 of EN-1.

iii. National Policy Statement for Electricity Networks Infrastructure (NPS EN-5)

9.3.20 NPS EN-5 (Ref. 9-16) requires consideration of adaption to climate change particularly from the increased risk of flooding to the resilience of some of the sites infrastructure and should be covered in the FCA.

iv. Planning Policy Wales (Welsh Government, 2016)

9.3.21 The policy (Ref. 9-17) is supplemented by TAN15 and incorporates sustainable development into the planning system which can be adhered to. It requires every local planning authority to have produced a Local Development Plan (LDP) superseding the Unitary Development Plan (UDP).

v. TAN15: Development and Flood Risk (Welsh Government, 2004)

9.3.22 Technical Advice Note 15 (TAN15) (Ref. 9-18) provides the framework for guiding planning decisions to assess and manage flood risk impacts for new developments. The aim is to, for preference, direct new developments away from high risk of flooding areas. If using a high risk area is unavoidable, the development must be

justified on sustainability grounds and that the consequences of the flooding are acceptable.

9.3.23 The development advice maps (DAM) (Ref. 9-19) are the information considered most suitable to determine flood risk zones and when flood risk issues must be taken into consideration in planning future development in that area.

vi. Recommended non-statutory standards for sustainable drainage (SuDS) in Wales (Welsh Government, 2017)

9.3.24 This SuDS approach (Ref. 9-20) aims at reducing the volume of water contaminated by sewerage and needing to be pumped for treatment. This would allow new development to use the free capacity in the sewerage network to remove the need to install new infrastructure and reducing the risk of flooding.

vii. Water Strategy for Wales (Welsh Government, 2015)

9.3.25 The Water Strategy (Ref. 9-21) aims to improve natural resource management of water systems. It aims to improve the resilience of the whole water systems and therefore reduce costs to consumers and businesses, including water companies.

d) Regional

i. Western Wales River Basin Management Plan (RBMP) (NRW, 2015)

9.3.26 The purpose of RBMP (Ref. 9-22) is to protect and improve the water environment in the Western Wales River Basin District (RBD). The plan includes; classification of water bodies; summary of Programme of Measures to achieve statutory objectives and statutory objectives for water bodies.

e) Local

i. City and County of Swansea Council Local Development Plan (2017)

9.3.27 This adopts a sustainable approach to flood risk by avoiding vulnerable development occurring within flood hazard areas. Policy RP4 Avoidance of Flood Risk (Ref. 9-23) states that development will not be permitted if it causes an increase to flooding on or off site.

ii. City and County of Swansea Council Unitary Development Plan (2008)

9.3.28 Policy EV35: Surface water run-off, and Policy EV36: Development and Flood Risk, are the relevant policies in CCS Unitary Development Plan (Ref. 9-24). Policy EV35 affects developments that will lead to additional surface water run-off or cause a reduction of the quality of surface water run-off, and encourages SuDS implementation wherever practical to counteract this. Policy EV36 only allows new developments within flood risk areas if developers can justify the location by proving the flooding consequences associated with the development are acceptable.

iii. The City and County of Swansea Council Strategic Flood Consequence Assessment (SFCA) Stage 2 (2012)

9.3.29 Stage 1 SFCA (Ref. 9-25) is a desk based study of flood risk, and Stage 2 (Ref. 9-26) is a more detailed assessment of flood risks. This determined that the main flood risk to the area is from fluvial and tidal water sources, with surface water also occurring and groundwater risk considered minimal. A Stage 3 SFCA was not required as Stage 1 and 2 satisfied the requirements of TAN15 for the potential development.

iv. The City and County of Swansea Flood Risk Management Plan (FRMP) (2015)

9.3.30 The FRMP (Ref. 9-27) contains the overview of the flood risk within the CCS area and the objective to reduce flood risk in significant flood risk areas for six years to 2021. The plan covers flooding from surface water, groundwater and ordinary watercourse. NRW are responsible for flooding from main rivers and reservoirs.

v. The City and County of Swansea Site Waste Management Plan (SWMP) (2015)

9.3.31 The SWMP details how resources will be managed and how waste will be minimised and reduced, re-used and recycled wherever possible. This will include guidelines such as to keep waste segregated as it's generated to save time and money.

vi. The City and County of Swansea Local Flood Risk Management Strategy (LFRMS) (2013)

9.3.32 Under the LFRMS (Ref. 9-28), flood risk from surface run-off, groundwater and ordinary watercourses have been considered. The LFRMS is the method through which the LLFA leads and co-ordinates flood risk management on a day to day basis. Local strategies must include objectives and methods for managing local flood risk, as well as timescales and cost of implementation.

9.4 Methodology

a) Scope of the assessment

9.4.1 The scope of this assessment has been determined through a formal EIA scoping process undertaken with the Planning Inspectorate (PINS) on behalf of the Secretary of State (SoS) and subsequent consultation with key consultees, including NRW and CCS. Comments raised on the EIA Scoping Report by NRW in their letter dated 14 November 2014 have been taken into account in the development of the assessment methodology and these are detailed where relevant in this chapter. Responses to the comments raised in the EIA Scoping Opinion, NRW and CCS can be found in Table 9-2.

i. Water Quality

9.4.2 The scope of the water quality assessment has been undertaken in accordance with the relevant applicable regulations as outlined in Section 9.3 above.

9.4.3 The assessment consisted of a desk-based study to establish the baseline conditions of the water environment within the Project Site and surroundings, informed by the literature and internet-based information sources and supplemented by responses received via direct consultation with relevant regulatory authorities and stakeholders.

9.4.4 The potential impacts on the water environment during the construction, operational and decommissioning phases of the Project have been identified and assessed, taking into account the embedded design mitigations as contained in **Chapter 3: Project and Site Description** and the comments raised in the Scoping Opinion Report by the SoS (Appendix 4.2).

ii. Flooding

9.4.5 Potential effects from the development have been assessed with reference to the Highway Agency's Design Manual for Roads and Bridges (DMRB, HD/45/09) (Ref. 9-29) in relation to the water environment. Although primarily developed for the assessment of water quality effects, the method can also be applied to drainage and flooding effects and provides a robust and accepted method for assessing the significance of effects

9.4.6 This chapter has also followed guidance set out in NPS EN-1 and TAN15: Development and Flood Risk. Consultation with NRW, and with the LLFA, has also been undertaken for the preparation of the FCA, which has informed this assessment, as noted in Section 9.4b. The FCA (Appendix 9.1) supporting this ES, considers the impact of the Project on flooding and drainage.

9.4.7 Sustainable disposal of surface water through SuDS design has been proposed wherever possible.

9.4.8 Appropriate methods for the construction of the Gas Connection and Electrical Connection at water crossings to prevent adverse effects on drainage and flooding have been considered.

b) Consultation

9.4.9 The scope of the assessment has also been informed by ongoing consultation with statutory consultees throughout the design and assessment process, including past and recent email communications with the SoS, and a meeting with NRW and CCS. A summary of the comments raised and responses are detailed in Table 9-2.

Table 9-2: Summary of consultation responses that have informed the scope and methodology of the water quality and resources assessment

Consultee	Date	Comment	AECOM Response
Secretary of State (SoS) (Scoping Opinion, para 2.45)	August 2014	The Scoping Report did not detail whether any areas of the site are at risk from flooding. EA data indicates that an area to the south west of the application site is within EA Flood Zones 2/3. The SoS notes that the ES is to contain an FCA. This document should include a description of which areas of the site are at risk from flooding and the exact locations of all watercourses on site, including springs, streams and drainage ditches.	The sites at risk from flooding and the locations of watercourses on site are addressed in full within Section 6 and Appendix D of the FCA (Appendix 9.1)
SoS (Scoping Opinion, para 3.11)	August 2014	The SoS agrees to the proposal to scope out WFD Screening Assessment subject to the agreement of NRW	WFD Screening Assessment has been completed (Appendix 9.2)
SoS (Scoping Opinion, para 3.45)	August 2014	The SoS notes the comments of NRW that the assessment should include consideration of surface water drainage impacts and options for improving site surface water drainage to prevent localised flooding during extreme rainfall events.	The prevention of localised flooding during extreme rainfall events is addressed in full within the FCA (Appendix 9.1) and Outline Surface Water Management Plan which also considers the Outline Drainage strategy (Appendix E of FCA provided in Appendix 9.1).
SoS (Scoping Opinion, para 3.46)	August 2014	The SoS recommends that the applicant considers temporary attenuation ponds to allow adequate settlement of site generated run-off during the construction and decommissioning phases of the development. The SoS draws the attention of the applicant to NRW's comments that silt fencing, scour protection and sediments alone have been proven ineffective in this catchment due to its flashy nature.	The settlement of site generated run-off is addressed in the Outline Drainage Strategy (Appendix E of FCA provided in Appendix 9.1) and within Sections 9.6 and 9.7 of this chapter and included in the Outline Surface Water Management Plan in Appendix 3.2.
SoS	August	The SoS recommends that the applicant ensures that it	Assessment in the FCA (Appendix 9.1) and

Consultee	Date	Comment	AECOM Response
(Scoping Opinion, para 3.47)	2014	can be demonstrated that the surface water disposal scheme would cause no harm to local watercourses upon discharge.	Sections 9.6 and 9.7 of this report confirms there will be no temporary or permanent significant effects on local watercourses. The attenuation ponds would allow for sampling to prove quality. An Outline Surface Water Management Plan is presented in Appendix 3.2.
SoS (Scoping Opinion, para 3.49)	August 2014	The SoS notes the concerns of NRW regarding how sewage and waste waters would be managed at the site, the SoS recommends that details of proposed discharges are provided within the ES.	Included in Sections 9.7 and 9.8 of this chapter and the Outline Drainage Strategy (Appendix E of FCA provided in Appendix 9.1). The sewage and waste waters will be discharged on site to either a package sewage treatment plant or septic tank.
SoS (Scoping Opinion, para 3.53)	August 2014	The SoS notes that NRW would set limits on the quantity of water that is discharged from the Power Generation Plant under an Environmental Permit.	The limits on the quantity of water that is discharged is discussed in the FCA in Appendix 9.1 and Sections 9.6 and 9.7 of this chapter.
SoS (Scoping Opinion, para 3.54)	August 2014	The SoS notes the concerns of NRW regarding cooling water, it should be stated within the ES whether any cooling water would be required and if so where it would be derived from and discharged to.	Based on the Project's Design Concept (Ref. 9 – 22), water cooling is not required. Domestic and demineralised water will be delivered to site via tanker. No discharge of process water to nearby water receptors is envisaged as all process water will be taken off-site via tanker to appropriate wastewater treatment facility by specialist contractors.
SoS (Scoping Opinion, para 3.55)	August 2014	The SoS notes the concern of Dwr Cymru (Welsh Water) regarding the potential impact of the development on water quality within the Lower Lliw Reservoir. It is recommended that the applicant assesses potential impacts on the reservoir including	The potential impacts on the reservoir have been assessed in Section 9.6 of this chapter.

Consultee	Date	Comment	AECOM Response
		potential impacts from deposition and affected rainfall.	
SoS (Scoping Opinion, para 3.56)	August 2014	The SoS recommends that the applicant consults Dwr Cymru (Welsh Water) regarding the 48" strategic water main that crosses the application site.	The Water Main has been considered in the indicative site layout plans (Figure, C1, Appendix C of FCA provided in Appendix 9.1) and through ongoing consultation with Dwr Cymru (Welsh Water).
SoS (Scoping Opinion, para 3.56)	August 2014	The SoS raised comments regarding a potential Landfill at the Project Site which may lead to re-mobilisation of contaminated material	Landfill leading to remobilisation of contaminated material has been considered in the embedded mitigation (Section 9.6) and will be considered further in the Outline CEMP (Appendix 3.1) for the Project.
NRW (Annex 1 Para E1.7)	14 November 2014	NRW raised comments regarding any process wastewater composition (i.e. including the chemical composition and temperature) to be generated at the Project Site and the potential impacts on receiving water receptor(s)	Wastewater to be generated from the Project Site has been considered in the embedded mitigation (**Chapter 3: Project and Site Description**). No discharge of process water to nearby water receptors is planned as all process wastewater will be taken off-site via a tanker to an appropriate wastewater treatment facility by specialist contractors.
NRW (para 6 page 6	14 November 2014	NRW requested that the exact location of ordinary water courses within the Project Site be identified and assessed for any potential impacts.	The location of ordinary water courses and any potential impacts has been considered in the in the embedded mitigation (**Chapter 3: Project and Site Description**) the revised Outline Drainage Strategy (Appendix E of FCA provided in Appendix 9.1) and discussed in the FCA in Appendix 9.1 and the WFD assessment
NRW	14 November 2014	NRW raised concerns regarding contaminated excavation material and hazardous wastes management	Contaminated material and hazardous wastes management has been considered in the embedded mitigation (**Chapter 3: Project and**

Consultee	Date	Comment	AECOM Response
			Site Description) and will be considered further in the Outline CEMP (Appendix 3.1) for the Project.
NRW	14 November 2014	NRW concerns regarding the Peat Management Plan	The Peat Management Plan has been proposed in the embedded mitigation (**Chapter 3: Project and Site Description**) and will be considered further in the Outline CEMP (Appendix 3.1) for the Project
NRW	14 November 2014	NRW concerns regarding flood risk, water quality and resources – potential impacts on ordinary water courses crossing the Project Site and running adjacent to the Main River Llan	The impact on ordinary water courses has been considered in the embedded mitigation (**Chapter 3: Project and Site Description**), the revised Outline Drainage Strategy (Appendix E of FCA provided in Appendix 9.1) and discussed in the FCA in Appendix 9.1 and the WFD Screening Assessment (Appendix 9.2) Prior consent will be sort from NRW for any works likely to affect the Main River (i.e. within 7 m from the Main River Llan)
NRW	14 November 2014	NRW concerns regarding water quality and sediment loading on the Llan and other watercourses in proximity with the Project site	Water quality and sediment loading has been considered in the embedded mitigation (**Chapter 3: Project and Site Description**).
NRW	14 November 2014	NRW concerns regarding temperature and chemical composition of cooling/process waters to be discharge to watercourses	Concerns regarding temperature have been considered in the embedded mitigation (**Chapter 3: Project and Site Description**).
NRW	14 November 2014	NRW request for a WFD Screening Assessment be undertaken	This has been addressed by the completion of a WFD Screening Assessment as provided in Appendix 9.2
NRW	14 November	NRW concerns regarding potential impacts on groundwater from past mineworks/mine adit as a result	The impacts on groundwater from past mineworks has been considered in the

Consultee	Date	Comment	AECOM Response
	2014	of construction activities	embedded mitigation (**Chapter 3: Project and Site Description**) and will be considered further in the Outline CEMP (Appendix 3.1) for the Project
NRW	14 November 2014	NRW concerns regarding the sediment filled effluent water discharge to surface and groundwater	The concerns regarding sediment filled effluent water discharge has been considered in in the embedded mitigation (**Chapter 3: Project and Site Description**) and will be considered further in the Outline CEMP (Appendix 3.1) for the Project
NRW	14 November 2014	NRW concerns regarding potential Groundwater/Surface water abstraction – requirement for EPR Permit if water used for dust control is to be sourced from the Project Site	The potential Groundwater/Surface water abstraction has been considered in the in the embedded mitigation (**Chapter 3: Project and Site Description**) and will be considered further in the Outline CEMP (Appendix 3.1) for the Project
NRW	14 November 2014	NRW concerns regarding dewatering during construction and the associated potential impacts on the water environment – required for EPR permit	Dewatering has been considered in the in the embedded mitigation (**Chapter 3: Project and Site Description**) and will be considered further in the Outline CEMP (Appendix 3.1) for the Project
NRW	14 November 2014	NRW concerns regarding the potential landfill at the Project Site – requirement for the Scope of a Contaminated Land Risk Assessment be discussed with the Local Authority.	The potential landfill has been considered in the in the embedded mitigation (**Chapter 3: Project and Site Description**) and will be considered further in the Outline CEMP (Appendix 3.1) for the Project
NRW	14 November 2014	NRW concerns regarding the need for a cumulative assessment be done in relation to other planned and existing projects	The need for cumulative assessment has been considered in the in the embedded mitigation (**Chapter 3: Project and Site Description**) and

Consultee	Date	Comment	AECOM Response
			will be considered further in the Outline CEMP (Appendix 3.1) for the Project
CCS	12 October 2017	Identified approach for analysing flood risk from ordinary watercourses on site based upon a desk based study rather than a modelling approach. Volumes and flows at key locations can be calculated based upon the latest hydrological methods. Climate Change Allowances were agreed to be 1% AEP +20% for the attenuation volume calculations on site. Short length culvert beneath the proposed road is acceptable. 7 m easement should be adhered to for ordinary watercourses.	This comment regarding analysing flood risk is addressed in full within the FCA (Appendix 9.1)
NRW	18 October 2017	Flood data provided	Information regarding flood data is used to complete the FCA (Appendix 9.1)
NRW	19 October 2017	Confirmation that NRW have a 1D HEC-RAS model for Afon Llan to the south of the Project Site.	NRW have advised that this model is not suitable for use within an FCA so has not been included
NRW	7 November 2017	NRW will only comment on development within Flood Zone C, and are happy with the assessment approach providing there is no land raising or development within the C2 Flood Outline.	NRW do not consider an FCA required for their remit as the development proposal does not fall within flood zones C1 and C2. Blockage scenarios will fall under the CCS remit.
NRW	7 November 2017	Response by NRW to proposed methodology/approach to be adopted for the WFD assessment. Provision of baseline data for WFD water bodies	In accordance with the methodology agreed with NRW, a preliminary WFD assessment has been prepared to assess compliance.
NRW	09 October 2017	Data provided by the NRW data distribution team	Data has been used to inform the WFD assessment
CCS	09 October 2017	Data provided by the CCS Environment team	Data has been used to inform the WFD assessment

Consultee	Date	Comment	AECOM Response
CCS	13 November 2017	Provided and confirmed opinions on findings from site visit. Key points include given the size of the local watercourses and steep catchment, there is low risk of flooding from ordinary watercourses. Diversion of the ordinary watercourse through Generating Equipment Site is acceptable because the size of the water course is small. CCS agrees with views in principle.	Agreed points from site visit. Land Drainage Consent is required for any field drains diversion.
CCS	27 November 2017	Discussion and agreement of approach to assessing the flood risk from ordinary watercourse. CCS understands the limitations of the UFMfSW and accepts that the flood risk to the site is likely to be more from overland flow than fluvial sources. Therefore maintenance of flow routes is important to reduce this flood risk and any downstream impacts. The overland flow path on the eastern boundary of the Generating Equipment Site should be kept clear and formalised to encourage water to flow downslope, away from the development and nearby Solar Farm and towards the ecological mitigation area to the south. The 7 m easement could be relaxed provided some access is maintained. Overland flow routes should be formalised along the eastern edge of the site and kept clear. Easement of these routes is not necessary.	This comment is included for information within the FCA (Appendix 9.1)
CCS	21 February 2018	In regards to run-off rates, the approach used is acceptable i.e. IOH124, but when it comes to assessment of the chosen system we would be looking for FEH2013 rainfall parameters to be used in preference to FSR or earlier versions of FEH in line with the latest NRW guidance from 2016.	The run off rate calculations have been updated using the FEH2013 rainfall parameters within the drainage strategy, Appendix E (Outline Drainage Strategy) provided in Appendix E of FCA provided in Appendix 9.1).

Consultee	Date	Comment	AECOM Response
NRW	15th February 2018	NRW noted the submission of the Water Framework Directive (WFD) screening assessment and agreed with the conclusion that the Project will not have a significant adverse effect on the River Llan waterbody.	Noted
NRW	15th February 2018	NRW noted that the majority of the red line boundary lies within Zone B of the TAN15 DAM and that there is no development within the C2 zone associated with the River Llan. No other comments on the FCA.	APL confirms that no development, other than ecological mitigation will take place in this small area of C2 Zone. No land raising is proposed.

c) Study area

9.4.10 The study area adopted with respect to the water quality and water resources extends beyond the Project Site Boundary as provided in Figure 9.1. The study area therefore includes the area within the Project Site Boundary and a potential zone of influence (ZoI) which is defined as a distance over which significant effects on important water receptors/features can reasonably have the potential to occur. In this case, from the perspective of water receptors/features, this is defined as a 1 km buffer zone of influence (ZoI) around the Project Site Boundary (Figure 1.1 of Appendix 9.2).

9.4.11 The 1 km buffer ZoI has been determined considering a number of factors, including the number of water receptors likely to be affected by the Project, taking into account the nature of the Project, adopted assessment methodology as described in **Chapter 4: Approach to Environmental Impact Assessment,** the embedded design mitigation measures, the Outline CEMP, outline drainage strategy (Appendix E of the FCA provided in Appendix 9.1) and the proximity of each identified receptor to the Project Site.

d) Sensitivity and value of resources

9.4.12 The sensitivity of each water feature/receptor identified with respect to the water quality and water resources within the study area has been determined by the importance of the affected features/receptors in the study area.

9.4.13 A list of the main water features/receptors identified and considered within the study area is given below. The list takes into account the site's characteristics, background project documents, relevant reference documents and professional judgement.

- WFD classified water bodies ('Main Rivers');
- Ordinary water bodies including springs, ponds, reservoirs, lakes and rivulets;
- Groundwater bodies and aquifer(s);
- Licensed groundwater and surface water abstractions;
- Flood risk zones; and
- Water dependent conservation areas and other key environmental receptors such as sites of importance for nature conservation (SINC), ancient Woodlands, SSSI (Figure 9.2).

9.4.14 The criteria used in assessing the value and sensitivity of key water features/receptors within the study area are set out in Table 9-3.

Table 9-3: Determining Water Receptor Sensitivity and Value

Value/ sensitivity	Guidelines	Relevant Examples Used to Assess Sensitivity
Very High	The receptor has little or no ability to absorb change without fundamentally altering its present character, is of very high environmental value, or of international importance. Attribute has high quality and rarity on regional or national scale.	Water body of very good chemical or biological quality, i.e. Water Framework Directive (WFD) Class 'High'. Site protected/designed under EU or UK habitat legislation (Special Areas of Conservation (SAC), Special Protection Area (SPA), Site of Special Scientific Interests (SSSI), Water Protection Zone (WPZ), Ramsar site, species protected by EU legislation.). EC designated Salmonid fishery. Principal aquifer providing a regionally important groundwater resource or supporting a site protected under EC and UK habitat legislation. Source Protection Zone (SPZ) 1. A source used for public or local potable water supply. Water body of high amenity value, including areas of bathing and where water immersion sports are regularly practised. Floodplain or defence protecting >100 residential properties from flooding. Areas which include essential infrastructure or must be operational during a flood, including emergency services. Development Advice Map Zone C2 (Areas of the floodplain without significant flood defence infrastructure.)
High	The receptor has low ability to absorb change without fundamentally altering its present character, is of high environmental value, or of national importance. Attribute has a high quality and rarity on local scale.	Water body of good chemical and biological quality, i.e. WFD Class 'Good'. Species protected under UK legislation. EC designated Cyprinid fishery. Principal aquifer providing locally important resource or supporting river ecosystem. SPZ 2 or 3. A source used for non-potable water supply. Water body of a moderate amenity value including public parks, boating, non-contact water sports, popular footpaths adjacent to watercourses, or watercourses running through housing developments/town centres. Floodplain or defence protecting between 1 and 100 properties or industrial premises from flooding. Areas which are highly vulnerable to flooding, including power stations, residential units, educational facilities and waste management sites. Development Advice Map Zone C1 (Areas of the floodplain which are developed and served by significant infrastructure, including flood defences).

Value/ sensitivity	Guidelines	Relevant Examples Used to Assess Sensitivity
		High risk of surface water flooding (chance of flooding of greater than 1 in 30 (3.3% AEP)).
Medium	The receptor has moderate capacity to absorb change without significantly altering its present character, has some environmental value, or is of regional importance. Attribute has a medium quality and rarity on local scale.	Water body of fair chemical or biological quality, i.e. WFD Class 'Moderate'. Aquifer providing water for agricultural or industrial use with limited connection to surface water. Water body of particular local social/cultural/educational interest. Water body of low amenity value with only casual access, e.g. along a road or bridge in a rural area. Floodplain or defences protecting <10 industrial properties from flooding. Areas which are less vulnerable to flooding, including retail, commercial, general industry, transport and utilities infrastructure. Development Advice Map Zone C (Based on Environment Agency extreme flood outline, equal to or greater than 0.1% AEP (river, tidal or coastal). Medium risk of surface water flooding (chance of flooding between 1 in 100 (1% AEP) and 1 in 30 (3.3% AEP)).
Low	The receptor is tolerant of change without detriment to its character, is of low environmental value, or local importance. Attribute has a low quality and rarity on local scale.	Water of poor or bad chemical or biological quality, i.e. WFD Class 'Poor'. Low sensitivity aquatic ecosystem. Non-Aquifer. Water body of no amenity value, seldom used for amenity purposes, in a remote or inaccessible area. Floodplains with low probability of flooding residential and industrial properties Areas that are water tolerant, including flood control infrastructure, boatyards and marinas. Development Advice Map Zone B (Areas known to have been flooded in the past evidenced by sedimentary deposits). Low risk of surface water flooding (chance of flooding is between 1 in 1000 (0.1% AEP) and 1 in 100 (1% AEP)).
Negligible	The receptor is resistant to change and is of little environmental value. Attribute is of negligible quality and rarity.	The receptor is resistant to change and is of little environmental value. Very low risk of surface water flooding (chance of flooding is less than 1 in 1000 (0.1% AEP). Outside Development Advice Map flood risk zones.

e) Magnitude of impact

9.4.15 The definitions of the magnitude of potential impact and examples are set out in Table 9-4, based on HD/45/09 Table A4.4 (DMRB) and professional judgement based on the vulnerability of the affected area.

Table 9-4: Determining the Magnitude of Impact on Water Receptors within the Study Area

Magnitude	Guidelines	Relevant Examples Used to Assess Magnitude
High	Total loss or major alteration to key elements/features of the baseline conditions such that post development of the character/composition of the baseline conditions will be fundamentally changed.	Results in loss of attribute and/or quality and integrity of the attribute Deterioration in element of WFD. Increase in peak flood level (1% AEP) >100 mm (Hydrological Assessment of Design Floods and Hydraulic Assessment, Methods E and F, Annex I) Increased flood risk to essential infrastructure, highly vulnerable developments
Medium	Loss or alteration to one or more key elements/features of the baseline conditions such that post development of the character/composition of the baseline conditions will be materially changed.	Results in effect on integrity of attribute, or loss of part of attribute Increase in peak flood level (1% AEP) >50 mm. Loss of flood storage and increased flood risk to less vulnerable developments.
Low	Minor shift away from baseline conditions. Changes arising from the alteration will be detectable but not material; the underlying character/composition of the baseline conditions will be similar to the pre-development situation.	Results in some measurable change in attributes quality of vulnerability Loss of flood storage and increased flood risk to water tolerant development or impact which does not affect existing or any possible future developments
Negligible	Very little change from baseline conditions. Change is barely distinguishable, approximating to a “no change” situation.	Results in effect on attribute, but of insufficient magnitude to affect the use or integrity Negligible change in peak flood level (1% AEP) <10 mm Negligible change to flood risk / storage

f) Significance of effect and definitions

9.4.16 The significance of the potential effects of the Project on the water environment is defined by the sensitivity of and the magnitude of the impact on the receptors/features within the study area.

9.4.17 Based on the receptor sensitivity and the magnitude of impact on the water environment, the definition of the significance of effect on the water features receptors are set out in Table 9-5.

Table 9-5: Classification of Effects

Magnitude	Value and Sensitivity of Receptor				
	Very High	**High**	**Medium**	**Low**	**Negligible**
High	Major	Major	Moderate	Moderate	Minor
Medium	Major	Moderate	Moderate	Minor	Negligible
Low	Moderate	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Minor	Negligible	Negligible	Negligible

9.4.18 Following the classification of an effect as detailed in Table 9-5, a clear statement is made as to whether the effect is ‘significant’ or ‘not significant’.

9.4.19 Effects predicted to be **Minor** or **Negligible** are considered to be manageable and are therefore ‘Not Significant’ and effects assessed as **Moderate** or **Major** are considered to be 'Significant'.

9.5 Baseline Environment

9.5.1 This section describes the baseline environmental characteristics for the Project Site and surroundings with specific reference to the water quality and water resources within the study area.

9.5.2 In order to assess the potential impacts and effects of the Project, the baseline environmental conditions and relevant water features/receptors that currently exist in the study area have been determined from a number of sources including the following:

- British Geological Survey (BGS) 1:50,000 Series Geological Maps Sheet 247 Swansea (England and Wales);
- Information from Natural Resources Wales (NRW) website and consultation;
- Information from City Council of Swansea (CCS) website and consultation;
- Information from Ordnance Survey Map covering the study area;
- Report of the Western Wales River Basin Management Plan (RBMP)
- Relevant European Union (EU) legislation – Status report of WFD designated water bodies identified within the study area;
- Observations made during a site visit on 8 November 2017; and
- Envirocheck report, Landmark (2017) (Appendix 10.1).

9.5.3 Taking into account the defined study area as described in Section 9.4(c), the value and sensitivity of the main environmental receptors and resources identified within the study area is summarised in Table 9-11 (water quality) and Table 9-12 (flood risk and surface water drainage).

9.5.4 The criteria used in determining the sensitivity and value, significance of the magnitude and effects impact on the water environment baseline conditions are set out in Section 9.4 of this ES.

a) Topography and land use

9.5.5 The topography of the study area is reasonably elevated and steeply sloping. Ground levels across the Project Site vary from approximately 146 m AOD in the north with ground levels at the Generating Equipment Site reaching an elevation of about 90 m AOD before generally falling in a southerly and south easterly direction to an elevation of approximately 80 m AOD along the Afon Llan River and its tributaries. Felindre Gas Compressor Station located immediately to the north of the Access Road is constructed on raised ground at a level of approximately 87 m AOD. This is approximately 5-8 m above the flood plain of the field drainage and ordinary watercourse to the south of the Access Road, which drains to the Afon Llan.

9.5.6 The land within the Project Site is currently used for sheep and horse grazing with existing development consisting of farm buildings and access roads. The area surrounding the Project Site is, at present, predominantly rural, although there is Felindre Park and Share to the south and a substantial amount of utility infrastructure in the area, some of which cross the Project Site. There are a number of solar farms in fields neighbouring the Site. Some springs and drainage channels/ditches within the Project Site drain the land and discharge into the Afon Llan River. The current land uses are considered “Less vulnerable” to flooding according to the TAN15 classifications.

b) Ground conditions and hydrogeology

9.5.7 A full description of ground conditions and hydrogeology of the Project Site is provided in **Chapter 10: Geology, Ground Conditions and Hydrogeology**. A summary is provided here to understand the possible linkages with surface water features and groundwater resources explicitly used for private groundwater supply within the study area.

9.5.8 The British Geological Survey (BGS), online mapping data, provides details of both the regional and local geology of the study area. The data indicates that the Project Site is underlain by bedrock of the Grovesend Formation, comprising mudstone, siltstone and sandstone (Figure 9.3). Superficial deposits across the Project Site are quite variable. However, they primarily comprise till and glaciofluvial deposits (sands and gravels) with a smaller area of peat, to the west of the north-western corner of the Project Site (Figure 9.4). The thickness of the superficial deposits beneath the Project Site is currently unknown. Groundwater occurs in both the superficial and bedrock beneath the study area.

9.5.9 NRW has designated the bedrock geology beneath the Project Site and the study area as a Secondary A aquifer with the superficial deposits designated a mixture of Secondary A aquifer and unproductive strata. Secondary A aquifers are permeable layers capable of supporting water supplies at a local rather than strategic scale and, in some cases, can form a vital source of base flow to rivers. Unproductive strata are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow. Soils in the study area are variable, designated to have high, intermediate and low leachate potential.

9.5.10 Groundwater movement within the underlying geology is likely to be limited considering the aquifer designations as discussed above. Although the Project Site is elevated, shallow or perched groundwater within the superficial deposits is expected to be reasonably close to the surface and in hydraulic connectivity with the surface watercourses present within the Project Site and immediate surroundings. From the site visit in November 2017, it was noted that infiltration is likely to be limited on the Generating Equipment Site where collections of surface water and saturated ground were observed throughout the locality. The timing of the visit did not follow a particularly wet period of weather.

9.5.11 The objectives of the WFD have been used to assess the groundwater quality in the study area. The Carmarthen Carboniferous Coal Measures (Waterbody ID GB41002G200600) and Swansea Carboniferous Coal Measures (Waterbody ID GB410002G201000) are two WFD groundwater bodies within the study area (Figure 9.5). Information on their status regarding water quality is available from NRW Rivers and Waterbodies website (accessed October 2017). According to NRW website, the current quantitative water quality for both the Carmarthen and Swansea water bodies is good and predicted to remain so beyond 2015, based on the most recent available data from 2015.

9.5.12 However, the overall 2015 Cycle 2 Status and current chemical quality for both Carmarthen Carboniferous Coal Measures and Swansea Carboniferous Coal Measures groundwater bodies are reported to be poor and are expected to remain so beyond 2015. There are no identified designated groundwater SPZs or drinking water Safeguard Zones with regards to agricultural activities within 1 km of the Project Site. Furthermore, information on the status of the Carmarthen and Swansea Carboniferous WFD groundwater bodies shows that they are not targeted for improvement within the Western Wales River Basin Management Plan (RBMP).

9.5.13 The Landmark Envirocheck report (Appendix 10.1) has identified no groundwater abstraction licences associated with the Project Site. The Landmark report identified only one licence located within 100 m of the Project Site, recorded 56 m to the north-east for a well at Abergelli Farm, licence number 22/59/4/0027 dated February 1993, for general farming and domestic use. Recent date (received on 9 October 2017) on private groundwater and abstraction licences received from CCS and NRW respectively did not identify this licence or any other licences within the 4 km of the Project Site.

c) Contaminated land

9.5.14 A detailed assessment of the potential for contaminated land is included in **Chapter 10: Geology, Ground Conditions and Hydrogeology**. A summary of the possible risks to surface water features and the groundwater bodies and aquifer is provided below.

9.5.15 No intrusive site investigation has been completed to inform this assessment. However, as the majority of the Project Site is undeveloped, it is unlikely to have experienced significant potentially contaminative activities. Figure 9.6 shows current or historical potential pollution point/aerial sources within 1 km of the Project Site. It also includes historic landfill and industrial land use activities that have a higher potential for ground contamination such as the disused (inert) landfill site located approximately 100 m west of the Gas Connection, a coal mine north of Abergelli Farm and the Substation towards the south west of the Project Site.

9.5.16 The Project Site is overlying mine workings. An assessment of the workings, adits and mine entries is discussed in **Chapter 10: Geology, Ground Conditions and Hydrogeology**. A comprehensive ground investigation will be undertaken as part of embedded mitigation, prior to construction, and will provide more detail of ground conditions.

9.5.17 A mine spoil dump covered approximately three-quarters of the landfill area from the former Abergelli Colliery (Figure 9.6). This mine waste largely was removed leaving a layer of well compacted mine waste over the majority of the landfill area. Part of the ground that was covered by mine spoil was formerly used for drying out of water treatment sludge (aluminium sulphate) though this ceased when the landfill became operational. No further information regarding potential impacts to the water environment from this operation is known.

d) Surface water and groundwater features

9.5.18 There are both designated "ordinary" and "main" surface water bodies within the study area (Figures B2 and B3, Appendix B of FCA provided in Appendix 9.1). Within the Project Site, there are springs and spring-drainage rivulets and drainage ditches that drain the Project Site into the Afon Llan River. The Afon Llan River and its tributaries are the closest surface water features in the vicinity of the Project Site considered in the assessment. The Afon Llan River catchment includes all of the Project Site. The Loughor Estuary, alongside other ecological statutory designated sites more distant from the Project Site downstream of the Project Site, are also discussed.

9.5.19 There are three WFD classified surface water bodies (Figure 9.1) within the study area: the Afon Llan (Water body ID GB110058032070 to the south of the Project Site), the Afon Lliw (Water body ID GB110059032100 to the north of the Project Site) and the Loughor Estuary (Burry Inlet Inner) (Water body ID GB531005913500 located approximately 7 km south of the Project Site) into which these water bodies discharges.

9.5.20 The Afon Llan River is the closest WFD designated surface watercourse that traverses the immediate vicinity of the Project Site. It flows in a south-westerly direction and is designated as a Main River by Natural Resources Wales (NRW). The Afon Llan borders the southern boundary of the Project Site. The Afon Llan links with the Afon Lliw and the River Loughor, which discharges into Carmarthen Bay. The Power Generation Plant is located approximately 400 m from the Afon Llan watercourse. The rivers will not be directly altered by the Project.

9.5.21 There is one WFD groundwater body (Table 9-10) (i.e. the Carmarthen Carboniferous Coal Measures Water body ID GB41002G200600) in the vicinity of the Project Site. This WFD water body is not targeted for improvements within the Western Wales RBMP.

9.5.22 Information about the current and predicted status of the Afon Llan River and the other designated WFD water bodies within the study area are available from NRW Cycle 2 River and Waterbodies websites[1] (accessed May 2017) and is summarised in Table 9-8. Details of groundwater bodies are provided in Table 9-10.

Table 9-6: Surface water bodies WFD Cycle 2 status WFD status of Afon Llan, Afon Lliw and Loughor Estuary

Status			
Water Body	**Afon Llan**	**Afon Lliw**	**Loughor Estuary (Burry Inlet Inner)**
Overall Status	Good	Moderate	Poor
Chemical Status	Good	Fail	Good
Ecological Status	Good	Good	Poor
Driving Ecological Quality Elements	Fish, Invertebrates, Macrophytes and Phytobenthos Combined	Fish, invertebrates	Phytoplankton blooms
Mitigation Measures by NRW	Not yet applied	Not yet applied	Not yet applied
Typology	Low, Small, Siliceous	Low, Small, Siliceous	Mixed, Macro, Extensive

Table 9-7: Groundwater body WFD Cycle 2 status

Status	
Water Body	**Carmarthen Carboniferous Coal Measures**
Overall 2015 Cycle 2 Status	Poor

[1] https://nrw.maps.arcgis.com/apps/wegappviewer/index.html?id=2176397a06d64731af8b21fd69a143f6

Status	
Water Body	**Carmarthen Carboniferous Coal Measures**
2015 Cycle 2 Quantitative Status	Good
2015 Cycle 2 Chemical Status	Poor

9.5.23 The Afon Lliw is located approximately 1.3 km north of the Project Site and has been assessed under the WFD as shown in Table 9-9.

9.5.24 There are other smaller watercourses in the vicinity of the Project Site that drain to the Afon Llan, along with some springs and small ponds. These have not been individually assessed previously under the WFD. The selection of waterbodies to be evaluated in 2015 was based on the judgment of NRW considering the catchment size, available data and overall significance. It is thought that these waterbodies were not previously assessed partly due to lack of data and because their small size means their overall importance to the river basin district is reduced.

9.5.25 The largest ordinary watercourse traversing the eastern perimeter of the Project Site has been observed to be 2.0-2.5 m wide at the bank and 1 m deep. Some ordinary watercourses will be directly altered by the Project (Figures 2.4-2.6, Appendix E of FCA (Outline Drainage Strategy) provided in Appendix 9.1).

9.5.26 Both the Afon Llan and Afon Lliw discharge to the Loughor Estuary west of Swansea, approximately 7 km from the Project Site. The Project Site lies outside of the Afon Lliw topographic catchment and therefore it is expected that any direct hydraulic connectivity will be limited. The Afon Llan does, however, join with the Afon Lliw approximately 9 km downstream of the Project Site. There may also be some potential for the cross-transfer of shallow groundwater flows between the two catchments. The Loughor Estuary has been assessed under the WFD as shown in Table 9-9. NRW has identified that the Loughor Estuary contains designated Shellfisheries.

9.5.27 No surface water abstraction points have been identified within the Project Site. The closest surface water abstractions, assumed to be from a tributary of the Afon Llan, have been identified approximately 1.6 km northeast and upstream of the Project Site. Accordingly, no impact to this receptor is envisaged and it is not considered further in this assessment.

9.5.28 There are a number of small drainage ditches and land drains which cross the Project Site and output into the ordinary watercourses and then the Afon Llan. There are also springs with associated streams which discharge into the Afon Llan throughout the Project Site.

9.5.29 There are two heavily vegetated ponds located within the Generating Equipment Site. These are of unverified extent owing to vegetation cover but are thought to have a radius of approximately 5 m.

e) Flood risk

9.5.30 There are no flood defence structures in the study area.

9.5.31 The Lle Geo-Portal Development Advice Map (DAM) (Ref 9-25) determines that a relatively small area in the Project Site, south of the Generating Equipment lie within DAM Zone C2 (areas of the floodplain without significant defence infrastructure). Small areas along the eastern edge of the Project Site Boundary, east and south of the Generating Equipment Site lie within DAM Zone B (areas known to have flooded in the past). The remainder of the Project Site is outside the DAM Zones and considered to be at very low risk of flooding i.e. DAM Zone A. Figure D1 in Appendix 9.1 displays the flood zones and Project Site Boundary.

9.5.32 During the site visit, the area between the Felindre Gas Compressor Station and the Generating Equipment Site was notably saturated. It is assumed that this area and the lower lying area to the south may be susceptible to groundwater or surface water flooding. This is consistent with BGS groundwater flooding susceptibility mapping showing the south area of Project Site as potential groundwater flooding at surface, while the rest of the Project Site lies in limited potential or potential for flooding properties below ground level. **Chapter 10: Geology, Ground Conditions and Hydrogeology** describes additional information on the Landmark Envirocheck Report (2017).

9.5.33 The literature review has not identified any historic incidents of flooding affecting the Project Site from any source. The references considered are in the References section (Section 9.12).

9.5.34 The CCS PFRA (2011), Level 1 (2010) and Level 2 (2012) SFCA's do not report any recorded flood events from groundwater sources within the CCS region. The FRMP (2015) indicates that there is a low risk of groundwater flooding across the CCS region.

9.5.35 NRW online maps show that reservoir flooding is not predicted to affect the Project Site. This is relevant with respect to the upstream Lliw Reservoir.

9.5.36 The existing Water Main that crosses the Project Site in a northwest to southeast orientation could present a flood risk if inadvertently damaged or leaking. Previous consultation on the Project with Welsh Water ascertained that flow rates in the pipe are approximately 1.2.-1.7 m^3/s. The flood risk from this source if it were to leak is considered to be very low.

f) Artificial water features

9.5.37 Situated north of the Project Site is Felindre Water Treatment Works with a covered reservoir. There is a Water Main connected to Felindre water treatment works via a 1.68 m diameter pipe which follows a south-east to north-west direction across the Generating Equipment Site and along the line of an existing access track. The treated water is supplied to Swansea, Llanelli and Bridgend areas.

9.5.38 The Lower Lliw Reservoir is also situated north and upstream of the Site, approximately 1.1 km away. It is part of the water supply infrastructure in the adjacent Lliw catchment.

g) Ecological designations

9.5.39 A detailed description of ecological designations within the study area is provided in **Chapter 8: Ecology** and illustrated in Figures 8.1 and Figure 8.2. A summary of features relevant to the assessment of impacts on the water environment is provided below.

9.5.40 The Loughor Estuary is located approximately 7 km west of the Project Site and receives water from the Afon Llan and Afon Lliw. It is designated as an SSSI with the Burry Inlet further downstream also a designated Ramsar site. Both form part of the Carmarthen Bay SAC.

9.5.41 Two SSSI sites (Figure 9.2) located closer to and potentially in hydraulic connectivity with the Project Site are:

- Nant y Crimp SSSI, located approximately 2.2 km west which is designated for its wet pastures, grassland/woodland habitat and marsh fritillary butterfly. The Project Site is not located within the catchment of the Nant y Crimp and therefore any hydraulic connectivity with the Project Site would be limited to potential groundwater flows; and
- Penllergaer railway cutting SSSI, approximately 3 km to the south-west which is designated for geological interest. An unnamed tributary of the Afon Llan flows through the Penllergaer SSSI. Geological designations are not relevant to this assessment as there will not be any effects of the Project on the geological conditions from the perspective of water quality and resources.

9.5.42 Effects on the SSSIs are addressed in **Chapter 8: Ecology**.

9.5.43 There are SINCs situated within and surrounding the Project Site (Figure 9.2). Three are considered relevant to this assessment: the Lletty-Morfil SINC, which is partly within the Project Site and is designated for purple moor grass and rush pasture and scrub habitats; and the Waun Garn Wen and Rhos Fawr SINCs adjacent to the Project Site, which are also designated for purple moor grass and rush pasture, wet woodland, scrub and watercourse habitats. The SINCs may, therefore, have some sensitivity to changes in water table and water quality. The area of peat adjacent to the north-west corner of the Project Site extends into the Waun Garn Wen SINC.

h) Drainage

9.5.44 Most of the Project Site is undeveloped and surface water run-off flows overland and through field drains discharging into the Afon Llan. These field drains and drainage ditches can be seen to cross the Project Site and flow to the ordinary watercourses. The largest ordinary watercourse flows south along the east perimeter of the Project Site before discharging to the Afon Llan.

9.5.45 It has been identified that there are no foul sewers within the Project Site, and therefore assumed that the foul effluent from the nearby farm and residential properties discharge to cess pits and septic tanks.

i) Summary of Receptors

9.5.46 Based on the information reviewed for this ES, the water quality and resources and flood receptors/features with the potential to be affected by the Project have been identified.

9.5.47 Table 9-8 summarises the key receptors and classifies their importance. This has been undertaken using professional judgement and with reference to the baseline information and the policy guidance noted in Section 9.3. The identified receptors are assessed to have a hydrological or hydraulic connection to the Project Site. The Lower Lliw reservoir and Afon Lliw are upgradient and not in direct hydraulic continuity so are excluded from further assessment. Receptors are located in Figure 9.2.

Table 9-8: Summary of Relevant Water Quality and Resources and Flood Receptors/Features

Receptor	Key Attributes Defining Importance	Sensitivity
Afon Llan	Water Quality and Resources - WFD Class Moderate.	Medium
	Flood Risk - DAM Zone C2. However, the floodplain protects between 1 and 100 properties from flooding, so sensitivity lowered from Very High.	High
Overland flow routes	Water Quality and Resources – n/a	n/a
	Flood Risk - Proximity of Generating Equipment Site to flow route and high risk of surface water flooding (greater than 1 in 30 (3.3% AEP).	High
Water Main	Water Quality and Resources – n/a	n/a
	Flood Risk - Supply of potable water from Lower Lliw Reservoir and passes through Project Site. Despite being at very low risk of fluvial and/or surface water flooding, asset importance is defined as floodplains with low probability of flooding residential and industrial properties.	Low
Tributary of the Afon Llan crossing the Generating Equipment Site, (Ordinary Watercourses and Drainage	Water Quality and Resources Assessed to be of fair ecological quality.	Medium
	Flood Risk - DAM Zone B, despite some ordinary watercourses and drainage	

Receptor	Key Attributes Defining Importance	Sensitivity
Channels)	channels considered to be very low risk.	Low
Tributary of the Afon Llan immediately east of Generating Equipment Site	Water Quality and Resources Assessed to be of fair ecological quality. Flood Risk - DAM Zone B, despite some ordinary watercourses and drainage channels considered to be very low risk.	Medium Low
Tributaries of the Afon Llan crossing/adjacent to the Access Road west of the Project Site	Water Quality and Resources Assessed to be of fair ecological quality. Flood Risk - DAM Zone B, despite some ordinary watercourses and drainage channels considered to be very low risk.	Medium Low
Ponds within the Generating Equipment Site	Water Quality and Resources Assessed to be of fair ecological quality. Flood Risk - DAM Zone B, despite some ordinary watercourses and drainage channels considered to be very low risk.	Medium Low
Groundwater bodies and aquifers	Water Quality and Resources - Secondary A aquifer providing water for agricultural and domestic use. Flood Risk – n/a	Medium n/a

Receptor	Key Attributes Defining Importance	Sensitivity
Loughor Estuary/Burry Inlet	Water Quality and Resources - SAC, SSSI designations.	Medium
	Flood Risk – DAM Zone B, despite some ordinary watercourses and drainage channels considered to be very low risk	Low
Nant y Crimp SSSI	Water Quality and Resources – SSSI designations.	Medium
	Flood Risk – DAM Zone B, despite some ordinary watercourses and drainage channels considered to be very low risk.	Low
Lletty-Morfil SINC	Water Quality and Resources – SINC designations.	Medium
	Flood Risk – DAM Zone B, despite some ordinary watercourses and drainage channels considered to be very low risk.	Low
Waun Garn Wen SINC	Water Quality and Resources – SINC designations.	Medium
	Flood Risk – DAM Zone B, despite some ordinary watercourses and drainage channels considered to be very low risk.	Low

Receptor	Key Attributes Defining Importance	Sensitivity
Rhos Fawr SINC	Water Quality and Resources – SINC designations.	Medium
	Flood Risk – DAM Zone B, despite some ordinary watercourses and drainage channels considered to be very low risk.	Low
Other non-specific locations within study area	Water Quality and Resources – no environmental designation.	Negligible
	Flood Risk - Very low risk of surface water flooding (chance of flooding is less than 1 in 1000 (0.1% AEP). Outside Development Advice Map flood risk zones.	Negligible

9.6 Embedded Mitigation

9.6.1 As detailed in **Chapter 3: Project Site and Description**, a number of embedded mitigation measures have been identified through the iterative EIA process and have been incorporated into the design and construction planning of the Project.

9.6.2 As these mitigation measures have been embedded into the design, are legal requirements or are standard practices that will be implemented, the assessment of likely significant effects assumes that they are in place.

9.7 Assessment of Effects

9.7.1 This section presents the findings of the water quality and resources impact assessment and flood risk impact assessment during the construction, operation and decommissioning phases of the Project.

9.7.2 This section identifies any likely significant effects that are likely to occur and the additional mitigation and monitoring measures that are proposed to reduce or eliminate the identified significant effects.

j) Construction effects – Power Generation Plant

i. Water Quality and Resources

9.7.3 This section considers the potential impacts and effects that construction works for the Project pose to water quality and resources. A description of the anticipated scope of the construction works required is included in **Chapter 3: Project Site and Description**.

9.7.4 The principal risks of the construction works to water quality and resources therefore comprise:

- Pollution impacts on surface watercourses and groundwater associated with:
  - increased sediment loads in site runoff containing elevated suspended sediment levels disturbed during site clearance;
  - the release of hydrocarbons and oils due to a large number of vehicles accessing the site, leakages from temporary oil/fuel storage tanks and accidental spillages; and
  - accidental leaks of hazardous materials, such as concrete and cement products, which can be contained in uncontrolled wash-down water and surface water runoff;
  - dewatering of excavations and the discharge of potentially polluted/high sediment loading water to the water receptors; and
  - pollution from dust and debris.

9.7.5 Measures to address the above have been identified and, where appropriate, are included in the embedded mitigation given in **Chapter 3: Project and Site Description** and in the Outline CEMP (Appendix 3.1).

Increased pollution and sediment load

9.7.6 The magnitude of potential impacts to surface water receptors will be most significant when working in areas adjacent to a water body or drainage channel. If they occur, the impacts will be direct and temporary - water quality within the affected water body is expected to improve over time as sediments settle or are trapped by vegetation and pollutants such as hydrocarbons, oils and other hazardous products are dispersed, diluted and treated by natural processes.

9.7.7 Surface water runoff from the Project Site will be conveyed to the tributaries of the Afon Llan River, east of the Project Site. This tributary to the Afon Llan is a designated ordinary watercourse with a **Medium** sensitivity. Consequently, the magnitude of any potential impacts to this water receptor during the construction phase of the Project will be **Negligible**. Accordingly, the significance of effects is assessed to be **Negligible** and no additional mitigation is required.

9.7.8 There is potential for hydraulic connectivity (most likely through shallow groundwater) and therefore for runoff to migrate to the Lletty-Morfil, Waun Garn Wen and Rhos Fawr SINCs located within the Project Site at approximately 200 m and 300 m from the Power Generation Plant (Figure 9.2). Given the approximate distances and locations of these features, their **Medium** sensitivity and the inferred groundwater flow direction (Figure 9.2), the magnitude of potential impacts on these receptors is assessed as **Negligible**. Hence the significance of any effects will be **Negligible** and no additional mitigation is required.

9.7.9 Surface water runoff from the Project Site may infiltrate and migrate further afield via groundwater. The primary groundwater flow direction is assessed to be towards the Afon Llan (Figure 9.3) but will be confirmed through future geotechnical/ground investigations at the Project Site post DCO Application. The groundwater aquifer beneath the Project Site is a WFD designated water body (i.e. Carmarthen Carboniferous Coal Measures groundwater body) (Figure 9.5) of medium sensititivity. Taking into account its current and forecasted WFD water quality status which is expected to remain poor, its dilution and dispersion potential, it is envisaged that infiltration of surface runoff will not significantly impact the flow or quality of groundwater. The receptor sensitivity is **Medium**, the magnitude of potential impact on groundwater arising from pollution by surface water runoff is considered to be **Negligible** so the significance of effects is assessed to be **Negligible** and no mitigation is required. Potential impacts to groundwater resources are discussed in **Chapter 10: Geology, Ground Conditions** and Hydrogeology.

9.7.10 Runoff from the Generating Equipment Site will contribute only a small proportion of flow in the Afon Llan. The Afon Llan is hydrologically connected with the Loughor Estuary which is also a WFD designated surface water body of **High** sensitivity located about 7 km south of the Project Site. In the event that surface water runoff is accidentally polluted, before it is discharged from the Project Site into the Afon Llan River, it will have to travel several kilometres before reaching the Loughor Estuary (SAC, SSSI). As such, any pollutants would have settled, dispersed, diluted

and be treated by natural processes thereby limiting any subsequent impact to the Loughor Estuary. The sensitivity of the Loughor Estuary is **High**, the magnitude of potential pollution impacts will be **Negligible,** hence the significance of effect has been assessed as **Minor** and no additional mitigation is required.

9.7.11 The two existing ponds within the Generating Equipment Site will be lost as a result of the Project – Pond 16 and Pond 22. Pond 16 is temporal and Pond 22 holds water year round as located in **Appendix A8.4, Figure 1.** Based on this, from a water quality and resources perspective, the potential pollution and sediment loading impacts on these ponds is scoped out of the assessment.

9.7.12 Potential impacts and effects associated with ground instability and piling works are discussed in **Chapter 10: Geology, Ground Conditions and Hydrogeology**.

Dewatering discharges

9.7.13 Dewatering of site excavations may be required for piling or construction of foundations within the Generating Equipment Site. As described previously, given the current and historic land uses, ground contamination is unlikely to pose a significant groundwater quality risk as a result of mobilisation of existing contaminants. Therefore dewatering of excavations is unlikely to introduce polluted water to the water environment. Water removed during dewatering activities may contain elevated suspended solids and will be subject to appropriate mitigation (e.g. settlement ponds) before discharge to the water environment off-site.

9.7.14 As noted above, water from dewatering activities will be discharged a treatment process (e.g. settlement ponds/oil removal system) and this will likely be discharged directly into the tributary to the Afon Llan east of the Project Site. This tributary is not a WFD designated water body but an ordinary water body of **Medium** sensitivity. The magnitude of potential impacts from dewatering discharges on this tributary to the Afon Llan during construction is considered to be **Low**. Accordingly, the significance of potential effects is assessed as **Minor** and no additional mitigation is required.

Sediment filled and turbid surface water resulting from dust and debris

9.7.15 Construction activities have the potential to release debris and dust that may be blown into adjacent surface water features. Increased dust levels in surface water bodies may reduce the levels of light reaching aquatic plant and animal species and cover sensitive habitats on the floor of the streams and ponds. Debris blown into water bodies can decrease the aesthetic quality of the water body. Impacts will be direct and temporary.

9.7.16 The Project does not involve any demolition activities therefore high levels of dust and debris are unlikely particularly with the implementation of the dust control measures incorporated into the Outline CEMP (Appendix 3.1).

9.7.17 The ordinary surface water bodies (i.e the watercourses close to and within the Generating Equipment Site) including the tributary to the Afon Llan east of the the

Project Site are potential surface water receptors that could be impacted by dust and debris during construction. These will be directly affected by physical works however the embedded mitigation measures in the Outline CEMP (Appendix 3.1) will control potential pollution impacts. The sensitivity of the receptors is **Medium**, the magnitude of impacts associated with dust generation and debris has been assessed as **Negligible**. Accordingly, the significance of effects is assessed to be **Negligible** no additional mitigation is required.

9.7.18 It is envisaged that the embedded mitigation measures will help control dust and debris related impacts such that they do not affect waterbodies and SINCs at a distance from the Power Generation Plant. The sensitivity of the ordinary waterbodies and SINCs within the Project Site is **Medium**. In the event of any accidental escape of dust and debris into any of the ordinary surface water receptors (e.g. ponds, rivulets and ditches) within and nearby watercourses (e.g. the tributary to the Afon Llan) to the Project Site the magnitude of impact will be **Negligible**. Accordingly, the significance of effect at any of these ordinary water receptors (i.e. the tributary to the Afon Llan, ponds, rivulets and ditches) is assessed as **Negligible** and no additional mitigation is required.

9.7.19 The magnitude of the potential impacts likely to arise during the construction works on the identified water receptors at the Power Generation Plant are considered to be negligible. Accordingly the effect significance on the water receptors within the Project Site and study area is assessed as minor or negligible and **Not significant**.

ii. Flooding

9.7.20 This section considers the potential impacts and effect that construction works for the Power Generation Plant may have on flood risk and drainage. A description of the anticipated scope of construction works required is included in **Chapter 3: Project and Site Description.** The construction phase is expected to take approximately 22 months.

9.7.21 The potential flood risks include:

- Damage to Water Main;
- Water Main temporary bridge; and
- Maintenance Compound and construction car parking within temporary Laydown Area.

Damage to Water main

9.7.22 A 1.68 m diameter Water Main, the Felindre-Margam trunk main, traverses the Generating Equipment Site, and is a key part of the main water supply infrastructure in the area. The exact location and depth of the Water Main will be determined during site investigations (currently scheduled to be completed in January 2018), liaison with Dwr Cymru Welsh Water and a precautionary safeguarded area of 30 m has been allowed for either side of the assumed location of the Water Main during construction to avoid the chance of striking the Water Main. Following survey and discussion of construction methodology with Dwr Cymru Welsh Water it may be possible to reduce the safeguarded area.

9.7.23 Within the Water Main easement area, the existing ground level has been retained. In the very unlikely event of an accidental rupture, any resultant outflow is likely to pass through the Project Site but is unlikely to impact the elevated Generating Equipment Site. The predicted flow volumes and land levels are such that the adjacent ordinary watercourses, either side of the main, and the receiving Afon Llan should accommodate the temporary increase in overland flow until the fracture is repaired or flow is halted, avoiding an effect on third parties. Therefore, based on the sensitivity of the receptor being **Low**, and a **Low** magnitude impact as a result of embedded mitigation and accounting for the unlikely event of an accident, the significance of effect via safeguarding is predicted to be **Negligible**, and therefore not significant.

Water Main Temporary Bridge

9.7.24 The Water Main will be crossed by a temporary bridge designed for construction loads from the Access Road to Generating Equipment Site. Welsh Water will be consulted during detailed design to include the required protective measures to the crossing to preserve the Water Main's integrity. There will also be a specialist engineering consultant on site during the bridge's construction to ensure the safe crossing of heavy loads in the construction period, some in excess of 300 tons, over the Water Main. Historic Welsh Water consultation has preferred a Bailey bridge solution, previously used to cross the same Water Main, which will be discussed further. Any crossing solution will be subject to Welsh Water agreement. With a receptor sensitivity of **Low** and a predicted impact magnitude of **Negligible** owing to appropriate loading mitigation, the effect significance predicted to be **Negligible**, and therefore not significant.

Maintenance Compound and construction car parking within the temporary Laydown Area

9.7.25 The temporary Laydown Area will provide storage space for materials, plant and equipment. It will also comprise accommodation and welfare facilities for construction staff as well as parking. The location of the Laydown Area is currently greenfield. The construction of the Laydown Area will involve vegetation clearance and laying down of granular material which, subject to infiltration tests, should permit surface water to drain to ground at a rate close to the existing conditions. The granular area amounts to 2.8 ha. The footprints of the construction compound building facilities will result in some, temporary, loss of surface draining area; however, this amounts to a negligible portion of the Laydown Area.

9.7.26 The temporary, low permeability of the surface during construction from building facilities and changes in runoff have not been considered in calculations for permanent construction runoff. Therefore, this has not been allowed for in the compensatory attenuation pond, proposed for the south eastern corner of the Generating Equipment Site. However, there is provision for consideration of temporary runoff in the Outline CEMP (Appendix 3.1). The temporary Laydown Area will be returned to its original pre-construction composition (grassland) following construction. Based on the sensitivity of the receptor (other non-specific locations within study area) being **Negligible** because of the very low flood risk,

and the **Negligible** magnitude of the impact through embedded mitigation of predominantly gravel surfacing. The significance of the temporary effect is considered to be **Negligible**.

9.7.27 The size of the temporary Laydown Area car park is 0.3 ha and is additional to the 2.8 ha referred to above for the remainder of the Laydown Area i.e. it is approximately 10% of the total Laydown Area. The surface of the car parking area is assumed to be constructed using a gravel / granular surface finish, under the 'General Site Area' runoff designation of the Outline Drainage Strategy (Appendix E of FCA provided in Appendix 9.1). This should, subject to infiltration tests, permit surface water to drain to ground at a rate close to existing conditions. Based on the sensitivity of the receptor (other non-specific locations within study area) being **Negligible** because of the very low flood risk, and the **Negligible** magnitude of the impact through embedded mitigation, the significance of the permanent effect is considered to be **Negligible**.

k) Construction effects - Gas Connection

i. Water Quality and Resources

9.7.28 The potential impacts associated with the activities and the water receptors likely to be impacted during the construction phase are the same as those identified for the Power Generation Plant. From water quality and resources perspective, it is envisaged that the Gas Pipeline will not give rise to an increase in impermeable area within the Project Site and impact upon the surface water run-off regime for the Gas Connection. Consequently, given the nature of the works and the size of the area required for the Gas Connection construction works, the overall effects of the potential impacts associated with the construction activities at the Gas Connection areas are considered to be similar or less than the impacts determined at the Power Generation Plant and as detailed above.

9.7.29 Accordingly, given that the water receptors and their sensitivities remains the same, the magnitude of the potential water quality impacts likely to arise during the construction works at the Gas Connection point is considered to be **Negligible** and the overall significance of effects on the range of sensitivity water receptors as a result of the construction activities is therefore considered to range from **minor to Negligible** and therefore **Not significant** with no further mitigation required.

ii. Flooding

9.7.30 No Gas Connection effects for flooding have been identified during the construction phase.

l) Construction effects – Electrical Connection

i. Water Quality and Resources

9.7.31 A detailed description of the construction activities for the Electrical Connection is provided in **Chapter 3: Project and Site Description**. In summary, the majority of the Electrical Connection route runs along side the new section of the Access Road

9.7.32 The potential impacts associated with the activities and the water receptors likely to be impacted during this construction phase are likely to be similar to those identified for the Power Generation Plant. Consequently, given the nature of the works and the size of the area required for the Electrical Connection construction works, the overall effects of the potential impacts associated with the construction activities at the Electrical Connection are considered to be similar, but slightly less than the impacts determined at the Power Generation Plant as detailed above.

9.7.33 Taking into account the medium sensitivity of the groundwater body beneath the Project Site and the current and forecasted WFD status (i.e. poor water quality) for the groundwater body, the **Magnitude** of potential impacts likely to arise from the installation of the Electrical Connection is considered to be **Negligible**. Hence the significance of effect is assessed as **Negligible**.

9.7.34 Additionally, given that the water receptors and their sensitivities remain the same, the overall **Magnitude** of the potential water quality impacts likely to arise during the construction of the Electrical Connection is considered to be **Negligible** and the overall significance of effects on the range of sensitivity water receptors as a result of the construction activities is therefore considered to range from **Minor to Negligible** and therefore **Not significant** with no further mitigation required.

ii. Flooding

9.7.35 No Electrical Connection effects for flooding have been identified during the construction phase.

m) Operational Effects – Power Generation Plant

9.7.36 A full description of the operational phase of the Project is included in **Chapter 3: Project and Site Description.**

i. Water Quality and Resources

9.7.37 The main activities with the potential to affect the water environment have been identified as follows:

- Potable water use for staff welfare and discharge of grey water/sewage (i.e. treated foul wastewater discharges);
- Water for emergency use (e.g. fire control) (water discharges);
- Storage and use of fuels or other chemicals on-site; and
- Vehicle movement to and around the Project Site.

9.7.38 The key risks to the water environment during the operational phase include:

- Pollution from oil (lubrication etc.) and fuels leakage from storage facilities or resulting from accidental spillages during delivery which may be carried by surface water runoff discharging to the water environment through the proposed surface water drainage system; and
- Water quality impacts associated with treated wastewater discharges.

Pollution

9.7.39 Within the drainage strategy (Appendix E of Appendix 9.1) it is proposed that surface water runoff from the Power Generation Plant will be discharged either via infiltration (where ground conditions allow) or to the local watercourses on and around the Power Generation Plant which eventually drain to the Afon Llan. It is expected that the Power Generation Plant drainage will include a combination of piped and SuDS systems, including oil interceptors, trapped gullies/filter drains, attenuation ponds and swales providing appropriate water quality treatment stages in line with current guidance to reduce the risk of surface water and groundwater contamination.

9.7.40 The tributary to the Afon Llan east of the Project Site will be the receiving surface water body for discharges from the Project Site. The sensitivity of this water body is **Medium**. Taking into account the embedded mitigation measures, the **Magnitude** of potential impacts from pollution during the operational phase is considered to be **Negligible**. Accordingly, the significance of effects is therefore assessed to be **Negligible**.

9.7.41 The potential water quality related pollutants likely to arise from the Project Site during operation are expected to be hydrocarbon-related, mainly from fuel, oil and lubricant stored at the Project Site. Where pollution occurs due to a breach of the embedded mitigation measures, impacts arising from leachate from the attenuation pond or accidental hydrocarbon spillage, for example, there is the potential for infiltration to groundwater to occur. However, the impacts will likely be localised. The sensitivity of the groundwater beneath the Project Site is **Medium**. Taking into account natural attenuation, the quantity of hydrocarbon likely to be stored at the Project Site at a given time as well as the dilution potential of the groundwater, the magnitude of potential impacts arising from pollution is **Negligible**. Accordingly, the significance of effects is assessed to be **Negligible** and no additional mitigation is required.

Water quality impacts associated with treated wastewater discharges

9.7.42 The quantity of foul effluent generated on site is expected to be small due to the limited number of workers on site at any one time during regular operational hours. Connection to a public sewer is not deemed feasible. The drainage strategy has considered the use of either septic tanks within the site or a package sewage treatment plants for foul effluent. However, package treatment plants are the preferred option, subject to detailed design following completion of ground investigations. The choice of one or other of these disposal methods is not considered to have a material effect on the impact assessment. Due to the small quantity of foul water generated during operations, it is anticipated that treated water can be discharged via infiltration (soakaway) on site. The foul water drainage system will be positioned to minimise the risk of inundation by floodwaters. Where there is an inadequate unsaturated zone beneath the site, the option of discharging to local watercourses will be adopted. Any discharges will be subject to the

Environmental Permitting Regulations and will need to meet quality criteria set by NRW.

9.7.43 The sensitivity of the surface water and/or groundwater receptors (i.e. the tributary to the east of the Afon Llan and/or Carmarthen Carboniferous Coal Measures groundwater body beneath the Project Site) likely to receive foul effluent from the Project Site is **Medium.** Taking into account the quantity of treated foul waste/wastewater likely to be generated from the packaged sewage treatment plant and dilution properties of these receiving receptors, the magnitude of pollution impacts from discharges is considered to be **Negligible**. Hence, the significance of effect is considered to be **Negligible** and not significant.

9.7.44 It envisaged that temporary toilets with appropriate foul waste facility will be in place during maintenance operation and all foul waste generated during this period will be taken off-site for disposal at appropriate facilities by specialist contractors. Accordingly, no impact on water receptors is expected and no further mitigation is required.

ii. Flooding

9.7.45 Potential impacts and effects on flood risk and surface water drainage during operation are detailed in this section.

Surface water runoff from impermeable areas

9.7.46 There will be a change in the existing surface water drainage behaviour and storage capacity as a result of the development. This will result in a reduction in infiltration rates compared to existing conditions. To compensate for this impact, an attenuation pond is proposed for the south eastern corner of the Generating Equipment Site. The purpose of the attenuation pond is to attenuate surface water runoff in order to maintain the equivalent greenfield runoff. Additional information regarding the attenuation pond is in FCA Section 8.4. The discharge will enter the ordinary watercourse immediately to the east of the Generating Equipment Site via a drainage swale, subject to the agreement of CCS. An emergency overflow will be provided to the attenuation pond to prevent the site becoming inundated in the event of an extreme rainfall event.

9.7.47 The sensitivity of the receptor (Generating Equipment Site) is considered to be **High** as a result of the Generating Equipment Site coinciding with an area of high risk of surface water, and historic (Dam Zone B), flooding. The magnitude of the impact is considered to be **Negligible** through the embedded attenuation mitigation. The significance of the permanent effect is therefore considered to be **Minor** and **Not significant**.

9.7.48 For the Access Road, and internal roads, it is proposed that roadside swales or infiltration drains will be used to remove and convey surface water from the road surface. Alternatively, where there are space constraints, the new site roads will be kerbed and drain via road gullies with pollution control measures. It is proposed that roadside swales will discharge to the nearest local watercourse, attenuated the

existing greenfield runoff rate. The sensitivity of the Access Road as a flood risk receptor is considered to be **Negligible** since the Access Road is in a very low flood risk area. The magnitude of the impact is considered to be **Low** through embedded mitigation. The significance of the permanent effect is therefore considered to be **Negligible**, and **Not significant**.

Drainage System Modifications (diversions of ditches for cut offs including Gas Connection diversion, swales)

9.7.49 The existing site benefits from a combination of ordinary watercourses and drainage ditches that drain surface water towards the Afon Llan main river. The presence of the development may impede existing surface water flow paths. Cut off drainage ditches will be placed around the uphill site perimeter of the Generating Equipment Site. The new drainage ditches will be designed to divert existing surface water runoff around the Project Site and downstream to re-join the existing drainage ditches and local watercourses. They will also be designed to avoid any loss of existing conveyance capacity. The sensitivity of the Generating Equipment Site as a flood risk receptor is considered to be **High** as a result of the Generating Equipment Site coinciding with an area of high risk of surface water and historic (Dam Zone B), flooding. The magnitude of the impact is considered to be **Negligible** through the embedded drainage diversion mitigation. The significance of the permanent effect is therefore considered to be **Minor** and **Not significant**.

9.7.50 The new Access Road may also impede existing surface water drainage channels and overland flow routes. Therefore, existing field drainage that coincides with the new Access Road will be culverted or bridged for a short length to allow flow up to the 1 in 100 year return period. This is required in the area to the south of the Felindre Gas Compressor Station, where the new Access Road extends from the existing access road, and swings east and northeast towards the Generating Equipment Site. The sensitivity of the Access Road as a flood risk receptor is considered to be **Negligible** since the Access Road is in a very low flood risk area. The magnitude of the impact is considered to be **Low**. The significance of the permanent effect is therefore considered to be **Negligible,** and **Not significant**.

Water Main Permanent Bridge

9.7.51 The Water Main will be crossed by a single, permanent access bridge replacing the temporary one for construction to allow access from the new Access Road and Laydown Area. This section of road will be built on an embankment above the easement or on a suspended bridge structure. The embankment would include open pipes to allow surface water run-off from the north to drain through and the suspended bridge option allows surface water to flow unhindered underneath without being impeded. It is considered that the sensitivity of the bridge to flood risk is **Low** because the crossing is in an area of low risk of surface water flooding. The predicted magnitude of the impact is **Negligible** through the implementation of embedded mitigation to avoid flow impedance. The significance of the permanent effect is therefore considered to be **Negligible** and **Not significant**.

Impedance and storage of overland flow route

9.7.52 There is an existing overland flow route that crosses the eastern boundary of the Generating Equipment Site, which also flanks an ordinary watercourse immediately east. This route, according to NRW surface water maps is considered to be 'medium to high' risk of surface water flooding. Part of this overland flow route could enter the Generating Equipment Site because of the raised topography of the land surrounding the northern tip of the Project Site. To mitigate this potential impact, localised land reprofiling and appropriate orientation of the uphill perimeter ditch is planned. In the event that some flow does enter the site, the onsite drainage and surface water attenuation storage in the south eastern corner has been designed to accommodate it.

9.7.53 There is land raising at the Generating Equipment Site, which could impede the existing overland flow route to be diverted along the eastern boundary of the Project Site. CCS have noted the need to retain access to this overland flow path along the eastern boundary of the Generating Equipment Site. This means it should be kept clear and formalised to encourage water downslope and away from the development towards the Ecological Mitigation Area to the south. By taking these steps, it would provide the access easement required by CCS for maintenance access to the watercourse. This would need to be subject to an agreement between APL and CCS, but legislation permits access by CCS for up to 7 m either side of the ordinary watercourse.

9.7.54 The sensitivity of the Generating Equipment Site receptor as a flood risk receptor is considered to be **High** as a result of the Project Site coinciding with an area of high risk of surface water, and historic (DAM Zone B) flooding. The magnitude of the impact is considered to be **Negligible** through the embedded mitigation to accommodate and retain the overland flow path. The significance of the permanent effect is therefore considered to be **Minor.**

n) Operational effects - Gas Connection

i. Water Quality and Resources

9.7.55 A detailed description of the activities at the Gas Connection point during this phase is provided in **Chapter 3: Project and Site Description**. From a water quality and resources point of view, no impact is expected to arise from the Gas Connection during the operational phase of the Project. The effects are not material during the operation of the Project and have been scoped out of the assessment. No mitigation is therefore required.

ii. Flooding

9.7.56 The only permanent structure constructed for the Gas Connection is the Above Ground Installation (AGI) at the connection to the National Gas Transmission System (Figure 3.4), which will change the infiltration capacity of the ground.

9.7.57 The installation will have exposed plant on reinforced foundations with gravel surfacing in between. The detailed layout will be determined in the next design

phase. It is anticipated that, like the main Generating Equipment Site, infrastructure will be identified to appropriately attenuate surface water runoff in order to maintain the equivalent greenfield runoff. The total size of the AGI, including access spur road is approximately 0.3 ha. The sensitivity of the AGI as a flood risk receptor is considered to be **Negligible** as a result of the AGI being located in an area of very low surface water risk. The magnitude of the impact is considered to be **Negligible** through the embedded attenuation mitigation. The significance of the permanent effect is therefore considered to be **Negligible** and **Not significant**.

o) Operational effects – Electrical Connection

i. Water Quality and Resources

9.7.58 Detailed description of the activities at the Electrical Connection during the operational phase is provided in **Chapter 3: Project and Site Description**. For water quality and resources, no impact is expected to arise from the Electrical Connection location during the operational phase of the Project. The effects are not material during the operation of the Electrical Connection and have therefore been scoped out of the assessment. No mitigation is therefore required.

ii. Flooding

9.7.59 For flooding, no impact is expected to arise from the Electrical Connection during the operational phase of the Electrical Connection. The effects are not material during the operation of the Electrical Connection and have therefore been scoped out of the assessment. No mitigation is therefore required.

p) Decommissioning effects – Power Generation Plant

i. Water Quality and Resources

9.7.60 The assessment has considered the effects of decommissioning the Power Generation Plant after 25 years. At that time, the Generating Equipment would be removed and the Generating Equipment Site re-instated to a similar condition as before construction. The decommissioning phase would be likely to be of a similar duration to construction i.e. 22 months. Based on the principle of the construction effects being wholly reversed, the assessment considers that decommissioning will not result in any change to the effects identified for construction and operation. The significance of effects would be **Negligible** and no further mitigation is required.

ii. Flooding

9.7.61 Reinstatement of the Power Generation Plant to the existing characteristics would bring back the drainage benefits of the existing ‘greenfield’ characteristics. The significance of effects would be **Negligible** and no further mitigation is required.

q) Decommissioning effects – Gas Connection

9.7.62 The assessment has also considered the effects of decommissioning the Gas Connection after 25 years. It is probable that the Gas Connection may be left in situ as this is likely to cause less environmental effects than removal.

9.7.63 Assuming the Gas Pipeline is left in situ, no impact from the Gas Connection on water quality and resources and flooding is expected during the decommissioning phase of the Project and no additional mitigation is required.

r) Decommissioning effects – Electrical Connection

9.7.64 As for the Gas Connection, no impact from the Electrical Connection on water quality and resources and flooding is expected during this phase of the Project. Accordingly no additional mitigation is required.

9.8 Water Framework Directive Assessment

9.8.1 This section provides a summary of the Water Framework Directive Assessment (WFD) of the WFD water bodies likely to be impacted by the Project. A separate assessment to the EIA required to satisfy the objectives of the WFD is provided in Appendix 9.2 and should be read along this section of the ES.

9.8.2 It is envisaged that the construction works will require diversion of existing ordinary watercourses (i.e. watercourses that are not WFD designated water bodies, but are tributaries to WFD designated water bodies) currently crossing the Generating Equipment Site to instead run around the perimeter of the Generating Equipment Site. This diversion is expected not to significantly affect the general drainage paths, flow regime or connectivity of watercourses in the area. It is also anticipated that bankside vegetation lost on the Generating Equipment Site will be returned along the route of the new watercourses. There may be some short-term loss of habitat while vegetation establishes, however, no reduction is expected in the longer term.

9.8.3 The Project will involve culverting of ordinary watercourses (i.e. watercourses that are not WFD designated water bodies) where these are crossed by the Access Road. In accordance with the embedded design mitigation the crossings will be designed so as not to restrict flood flows, to maintain a natural bed through the structure, and where necessary to include specific measures to maintain species connectivity through the structure such as otter ledges. There will be some permanent loss of bankside habitat at the culverts. However, this will be for short lengths only and is therefore not expected to affect the integrity of the aquatic ecosystems significantly.

9.8.4 There is an existing pond on the Power Generation Plant which holds water all year round and supports aquatic ecology and ecological habitat which is to be removed. The embedded mitigation provides for a permanent attenuation pond for the Project, which will be sited close to this location, including suitable habitat insofar as this does not compromise the storage volume. Consequently, no significant permanent loss of habitat is, therefore, envisaged with these mitigation measures implemented.

9.8.5 The Project will incorporate appropriate SuDS and proprietary products as part of both its embedded and additional mitigation to provide adequate water treatment before discharging from the Project Site to any nearby ordinary (i.e. tributaries to

WFD designated) water bodies or main (WFD designated) water bodies in accordance with current guidance. It is predicted that even with these mitigation measures in place, slight changes in the water quality of the receiving water bodies may occur. However, due to dispersion and dilution, changes that will cause a fall in one class of any relevant element of the WFD water quality elements is unlikely. Consequently, while the Project may create a slight change in the water quality of WFD surface and groundwater bodies nearby, this will not threaten the current status of the water bodies and therefore does not pose a risk to achieving the objectives of the WFD.

9.8.6 Risks during construction will be temporary and will not cause any long term effects beyond the construction phase. The construction works will therefore not pose a risk to achieving the objectives of the WFD.

9.9 Mitigation and Monitoring

9.9.1 As a general rule, additional mitigation measures are proposed where a significant effect is predicted to occur. Embedded mitigation measures, which have been incorporated within the design of the Project or are standard practice measures that have been committed to are summarised in the Outline CEMP in Appendix 3.1 and the Landscape and Ecology Mitigation Plan in Appendix 3.3.

9.9.2 It is considered that no additional mitigation is required, to supplement the identified embedded mitigation effects. The implemented embedded mitigation should result in minor or less significant risks from the operation of the Project.

9.9.3 No monitoring is proposed to supplement and verify the embedded mitigation proposed, which will be delivered via the Outline CEMP (Appendix 3.1).

9.10 Residual Effects

9.10.1 The following tables present a summary of the Water Quality and Resources and Flooding assessment. They identify the receptors likely to be impacted, the level of effect and, where the effect is deemed to be significant, the tables include the mitigation proposed and the resulting residual effect.

Table 9-9: Water Quality and Resources – Overall Summary of Water Quality Effects and Flooding Arising During Construction and Decommissioning Phase

Receptor	Description of Effect	Classification of Effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
Power Generation Plant - Water Quality and Resources					
Tributaries of Afon Llan crossing the Power Generation Plant, immediately east of site and adjacent to the Access Road west of the Project Site	Increased pollutant and sediment loads	Negligible	Not required	Negligible	Not Significant
	Pollution from dust and debris	Negligible	Not required	Negligible	Not Significant
	Pollution from dewatering discharge	Minor	Not required	Minor	Not Significant
Lletty-Morfil SINC, Waun Garn Wen SINC (including areas of peat) and Rhos Fawr SINC	Increased pollutant and sediment loads	Negligible	Not required	Negligible	Not Significant
	Pollution from dust and debris	Negligible	Not required	Negligible	Not Significant
Groundwater body and aquifers	Infiltration of pollutants	Negligible	Not required	Negligible	Not Significant
Loughor Estuary	Increased pollutant and sediment load	Minor	Not required	Minor	Not Significant
Nant y Crimp SSSI	Increased pollutants	Negligible	Not required	Negligible	Not Significant
Power Generation Plant - Flooding					
Water Main	Flood Risk (main fracture)	Negligible	Not required	Negligible	Not Significant
Water Main	Temporary Bridge (bridge failure)	Negligible	Not required	Negligible	Not Significant
Other non-specific locations within study area	Change in surface water runoff caused by	Negligible	Not required	Negligible	Not Significant

Receptor	Description of Effect	Classification of Effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
	maintenance compound				
Other non-specific locations within study area	Surface water runoff from impermeable areas (Temporary Laydown Area)	Negligible	Not required	Negligible	Not Significant
Gas Connection – Water Quality and Resources					
Tributaries of Afon Llan crossing the Project Site and likely to be traversed by the Gas Connection and Gas Pipeline	Increased pollutant and sediment loads	Negligible	Not required	Negligible	Not Significant
	Pollution from dust and debris	Negligible	Not required	Negligible	Not Significant
	Pollution from dewatering discharge	Negligible	Not required	Negligible	Not Significant
Lletty-Morfil SINC, Waun Garn Wen SINC (including areas of peat) and Rhos Fawr SINC	Increased pollutant and sediment loads	Negligible	Not required	Negligible	Not Significant
	Pollution from dust and debris	Negligible	Not required	Negligible	Not Significant
Groundwater body and aquifers	Infiltration of pollutants	Negligible	Not required	Negligible	Not Significant
Loughor Estuary	Increased pollutant and sediment load	Minor	Not required	Minor	Not Significant
Nant y Crimp SSSI	Increased pollutants	Negligible	Not required	Negligible	Not Significant
Electrical Connection – Water Quality and Resources					
Tributaries of Afon Llan crossing the Project Site and likely to be traversed by the Electrical Connection and cable route	Increased pollutant and sediment loads	Negligible	Not required	Negligible	Not Significant
	Pollution from dust and	Negligible	Not required	Negligible	Not Significant

Receptor	Description of Effect	Classification of Effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
and adjacent to the Access Road west of the Project Site	debris				
	Pollution from dewatering discharge	Negligible	Not required	Negligible	Not Significant
Lletty-Morfil SINC, Waun Garn Wen SINC (including areas of peat) and Rhos Fawr SINC	Increased pollutant and sediment loads	Negligible	Not required	Negligible	Not Significant
	Pollution from dust and debris	Negligible	Not required	Negligible	Not Significant
Groundwater body and aquifers	Infiltration of pollutants	Negligible	Not required	Negligible	Not Significant
	Contamination from drilling	Negligible	Not required	Negligible	Not Significant
Loughor Estuary	Increased pollutant and sediment load	Minor	Not required	Minor	Not Significant
Nant y Crimp SSSI	Increased pollutants	Negligible	Not required	Negligible	Not Significant

Table 9-10: Water Quality and Resources - Summary of Water Quality Effects and Flooding Arising During Operation Phase

Receptor	Description of Effect	Classification of Effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
Power Generation Plant – Water Quality and Resources					
Tributaries of Afon Llan crossing the site, immediately east of site and adjacent to the Access Road west of the site	Pollution	Negligible	Not required	Negligible	Not Significant
	Discharge of treated wastewater	Negligible	Not required	Negligible	Not Significant
Groundwater body and aquifers	Infiltration of pollutants	Negligible	Not required	Negligible	Not Significant
	Discharge of treated wastewater	Negligible	Not required	Negligible	Not Significant
Power Generation Plant - Flooding					
Afon Llan and overland flow routes	Surface water runoff from impermeable areas (Generating Equipment Site)	Minor	Not required	Minor	Not Significant
Overland flow routes	Drainage system modifications (Generating Equipment Site)	Minor	Not required	Negligible	Not Significant
Tributary of the Afon Llan crossing the Generating Equipment Site, (Ordinary Watercourses and Drainage Channels)	Impedance and storage of flow	Minor	Not required	Minor	Not Significant
Maintenance Area	Surface water runoff from	Negligible	Not required	Negligible	Not Significant

Receptor	Description of Effect	Classification of Effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
	impermeable areas				
Other non-specific locations within study area	Surface water runoff from impermeable areas (Access Road)	Negligible	Not required	Negligible	Not Significant
Tributaries of the Afon Llan crossing/adjacent to the Access Road west of the Project Site	Drainage system modifications (Access Road)	Negligible	Not required	Negligible	Not Significant
Water Main	Permanent Bridge (flow conveyance)	Negligible	Not required	Negligible	Not Significant

a) Project "in combination" Effects

9.10.2 From the perspective of both water quality and flood risk, there are no significant effects likely to arise from any elements of the Project during the different phases of the Project Life. Therefore, overall, it has been considered that there is no significant effect predicted for the Project.

9.11 Cumulative Effects

a) Assessment of Potential Cumulative Effects – Construction and Decommissioning

9.11.1 It has been demonstrated that the likely effects of the Project are at worse Negligible/Minor and there are no likely significant effects on Water Quality and Resources and Flooding.

9.11.2 Given that the effects of the Project are Negligible/Minor, this will not have any likely additive effects to any other projects of those listed in Table 4-6 or those within the ZoI of the Project Site during construction or decommissioning and therefore no significant cumulative effects are predicted.

b) Assessment of Potential Cumulative Effects – Operation

9.11.3 It has been demonstrated that the likely effects of the Project are at worse Negligible/Minor and there are no likely significant effects on Water Quality and Resources and Flooding.

9.11.4 Given that the effects of the Project are Negligible/Minor, this will not have any likely additive effects to any other projects of those listed in Table 4-6 or those within the zone of influence of the Project Site during operation and therefore no significant cumulative effects are predicted.

9.12 References

Ref. 9-1 The Water Environment (Water Framework Directive) (England and Wales) (Amendment) Regulations 2016.

Ref. 9-2 The Water Pollution Prevention - Oil Storage Standards (Water Resources (Control of Pollution) (Oil Storage) (Wales) Regulations 2016

Ref. 9-3 European Commission. Water Framework Directive (WFD), 2000/60/EC. October 2000.

Ref. 9-4 European Commission. Groundwater Directive (GWD), 2006/118/EC. December 2006.

Ref. 9-5 European Commission. Priority Substances Directive, 2008/105/EC. December 2008

Ref. 9-6 European Commission. Floods Directive, 2007/60/EC. October 2007.

Ref. 9-7 The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017.

Ref. 9-8 Department for Environment, Food & Rural Affairs. Flood and Water Management Act 2010.

Ref. 9-9 National Standards for Sustainable Drainage.

Ref. 9-10 Department for Environment, Food & Rural Affairs. Flood Risk Regulations 2009.

Ref. 9-11 The Environmental Permitting (England and Wales) Regulations 2016.

Ref. 9-12 Welsh Government. Well-being of Future Generations (Wales) Act 2015.

Ref. 9-13 National Assembly of Wales. Environment (Wales) Act 2016.

Ref. 9-14 Department of Energy & Climate Change. Overarching National Policy Statements for Energy (EN-1) July 2011.

Ref. 9-15 Department of Energy and Climate Change. National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4). July 2011.

Ref. 9-16 Department of Energy & Climate Change. National Policy Statement for Electricity Networks Infrastructure (EN-5) July 2011.

Ref. 9-17 Welsh Government. Planning Policy Wales. Cardiff, Edition 9, November 2016.

Ref. 9-18 Welsh Assembly Government. Technical Advice Note 15: Development and Flood Risk. Cardiff, 2004.

Ref. 9-19 Lle Geo-Portal. Development Advice Map. 2017. (Online) Available from: http://lle.gov.wales/map#m=-3.159,51.47832,8&b=europa&l=328h;329h;330; (Accessed November 2017)

Ref. 9-20 Welsh Government. Recommended non-statutory standards for sustainable drainage (SuDS) in Wales – designing, constructing, operating and maintaining surface water drainage systems. Cardiff, 2017.

Ref. 9-21 Welsh Government. Water Strategy for Wales. Cardiff, 2015.

Ref. 9-22 Natural Resources Wales. Western Wales River Basin Management Plan 2015-2021 Summary. Cardiff, December 2015.

Ref. 9-23 City and County of Swansea. Local Development Plan (unadopted; submitted for examination July 2017). Swansea, 2017.

Ref. 9-24 City and County of Swansea. Unitary Development Plan. November 2008.

Ref. 9-25 Scott Wilson. City & County of Swansea Council – Stage 1 Strategic Flood Consequence Assessment. September 2010.

Ref. 9-26 URS. City and County of Swansea – Strategic Flood Consequence Assessment - Stage 2. Plymouth, October 2012.

Ref. 9-27 City and County of Swansea. Flood Risk Management Plan 2015. Swansea, 2015.

Ref. 9-28 City and County of Swansea. Local Flood Risk Management Strategy. Swansea, 2013.

Ref. 9-29 Highway Agency. Design Manual for Roads and Bridges (DMRB, HD/45/09). Chapter 11, November 2009.

Chapter 10

Geology, Ground Conditions, and Hydrogeology

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10. Geology, Ground Conditions and Hydrogeology

10.1 Introduction

10.1.1 This chapter provides an assessment of the geology and ground condition effects arising from construction, operation and decommissioning of the Project. Maintenance is included within the operational assessment of the Project.

10.1.2 A detailed description of the Project Site and the Project is provided **in Chapter 3: Project and Site Description**. A glossary of terms and list of abbreviations used in this chapter is provided in **Document Reference 1.4.**

10.1.3 This chapter also provides details of the geological conditions and the presence of potentially contaminated land and hazardous materials. The effects of the Project on the ground conditions and of constraints posed by the existing ground conditions on the Project are considered for the construction, operational and decommissioning phases of the Project. Where appropriate, mitigation measures are presented to minimise the effects of actual or predicted adverse effects.

10.1.4 Data used within this chapter includes that presented within the Preliminary Geo-environmental Risk Assessment (Appendix. 10.1).

a) Objectives of the assessment

10.1.5 The objectives of the assessment were to describe:

- The legislation, policy and guidance which have been taken into account in the assessment;
- The assessment methodology, including the consultation outcomes which have informed the assessment;
- Baseline conditions currently existing at the Project Site and in the surrounding study area;
- The likely significant effects of the Project (including the embedded mitigation and avoidance measures) during the construction, operation and decommissioning phases;
- The additional mitigation required to prevent, reduce or offset any significant adverse effects; and,
- The likely residual effects and cumulative effects after these measures have been employed.

10.2 Changes since the 2014 PEIR

10.2.1 There have been changes to the design as a result of design evolution and consultation as detailed in **Chapter 3: Project and Site Description**. To aid the reader, Table 10-1 outlines the changes to this assessment compared with the 2014 PEIR.

Table 10-1: A Summary of Changes since the 2014 PEIR to the Geology, Ground Conditions and Hydrogeology Assessment

Section	Changes since the 2014 PEIR	Section Reference
Methodology	Greater detail regarding the sensitivity and magnitude has been incorporated into the text	Section 10.4
Baseline	An updated Envirocheck Report has been used to allow that the most up to date information to be used in the assessment	Section 10.5
Assessment of Effects	More extensive embedded mitigation measures have been incorporated into the design have reduced the presence of significant effects.	Section 10.7

10.3 Legislation, policy and guidance

10.3.1 Legislation and policy has been considered on an international, national, regional and local level. The following is considered to be relevant to the geology, ground conditions and hydrogeology effects assessment as it has influenced the sensitivity of receptors and requirements for mitigation or the scope and/or methodology of the EIA.

a) International and EU

- Directive 2010/75/EU on 24th November 2010 on industrial emissions (integrated pollution prevention and control), the Industrial Emissions Directive (IED) (Ref. 10.2). The IED is implemented in Wales by the Environmental Permitting (England and Wales) Regulations 2016;
- Water Framework Directive (WFD) 2000/60/EC aims to ensure that all surface water and groundwater reaches 'good' status (in terms of ecological and chemical quality and water quantity as appropriate), promotes sustainable water use, reduce pollution and contribute to the mitigation of flood and droughts (Ref. 10.3). The WFD is implemented in Wales by the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017;
- Groundwater Directive 2006/118/EC aims to set groundwater quality standards and introduce measures to prevent or limit pollutants entering groundwater, including those listed within the 'List of Priority substances' (Ref. 10.4); and
- Seventh Environmental Action Programme came into force on 17th January 2014 to ensure land is managed more sustainably in the European Union (EU), that soil is adequately protected and that the remediation of contaminated sites is well underway (Ref. 10.5). It also commits the EU and its Member States to increasing efforts to reduce soil erosion, increase soil organic matter and to remediate contaminated sites.

b) National Legislation

i. Environmental Protection Act

10.3.2 The contaminated land regime in Part 2A of the Environment Protection Act (EPA) 1990 (Ref. 10.9) was introduced to specifically address the historical legacy of land contamination. Part 2A of the Environmental Protection Act 1990 has introduced the following statutory definition for "contaminated land":

> "*any land which appears to the local authority in whose area it is situated to be in such a condition by reason of substances in, on, or under the land, that:*
>
> *Significant harm is being caused or there is significant possibility of such harm being caused; or*
>
> *Significant pollution of controlled waters is being caused, or there is a significant possibility of such pollution being caused*."

10.3.3 Part 2A provides a means of dealing with unacceptable risks posed by land contamination to human health and the environment. Enforcing authorities are required to identify and deal with such land but Part 2A is only to be used by the Enforcing Authority where no appropriate alternative solution exists.

10.3.4 The term 'contaminant linkage' indicates that all three elements (i.e. contaminant / pathway / receptor) have been identified. The land can only be determined as Contaminated Land if there is a contaminant linkage and the contamination meets the criteria, outlined above.

c) National Policy

ii. Overarching National Policy Statement for Energy (NPS EN-1)

10.3.5 The relevant assessment principles in terms of generic impacts ('Biodiversity and Geological Conservation' and 'Land Use including Open Space, Green Infrastructure and Green Belt' and 'Waste Management') from Part 5 of NPS EN-1 (Generic Impacts) are set out below (Ref. 10.6).

10.3.6 Paragraphs 5.10.8 to 5.10.9 of NPS EN1 state "Applicants should seek to minimise impacts on the best and most versatile agricultural land (defined as Grades 1, 2 and 3a of the Agricultural Land Classification) and preferably use land in areas of poorer quality (Grades 3b, 4 and 5) except where this would be inconsistent with other sustainability considerations. Applicants should also identify any effects and seek to minimise impacts on soil quality taking into account any mitigation measures proposed. For developments on previously developed land, applicants should ensure that they have considered the risk posed by land contamination.

10.3.7 Applicants should safeguard any mineral resources on the proposed site as far as possible, taking into account the long-term potential of the land use after any future decommissioning has taken place".

iii. National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines (NPS EN-4)

10.3.8 Sections 2.20 - 2.23 of NPS EN-4 (Ref. 10.7) set out additional policy for assessing the potential impacts of gas and oil pipelines, relating to: noise and vibration; biodiversity, landscape and visual; water quality and resources; and soil and geology.

10.3.9 Paragraph 2.23.1 of EN-4 states that, 'it will be important for applicants to understand the soil types and the nature of the underlying strata.' Accordingly, applicants should consult with the relevant statutory consultees at an early stage regarding the potential impact of gas pipelines on soil and geology (paragraph 2.23.4). Paragraph 2.23.2 states that applicants should assess the stability of the ground conditions associated with the pipeline route, including considering the options for installing the pipeline.

iv. National Policy Statement for Electricity Networks Infrastructure (NPS EN-5)

10.3.10 NPS EN-5 (Ref. 10.8) includes limited information regarding impacts on geology, although Paragraph 2.8.9 recognises that an underground line is likely to have more potential impacts on geology and soils than an overhead line.

v. Environment Agency Guidance

10.3.11 In April 2013, National Resources Wales (NRW) was formed from a merger of Environment Agency Wales, the Countryside Council for Wales and the Forestry Commission Wales and undertakes the environmental regulatory duties in Wales. However Environmental Agency guidance documents continue to be used as representing "best practice" in the field of land contamination.

10.3.12 The Environment Agency's Model Procedures for the Management of Land Contamination (also known as Contaminated Land Report 11 (CLR11)) (Ref. 10.10), form the core reference guidance across the range of land contamination-related regulatory regimes in the UK and are integral to most projects dealing with land contamination. The report provides a road map/ flowcharts for structured decision making required for the management of land affected by contamination. CLR11 consolidates the general approach for the assessment of land contamination that was introduced with the CLR in 2000. CLR11 is based on a phased, risk-based approach using the 'source/ contaminant – pathway – receptor' concept as the key part of a Conceptual Site Model (CSM). A contaminant linkage is said to exist when all three components of the model can be identified on a site. A contaminant is a substance which is in, on or under the land and which has the potential to cause harm or to cause pollution of the water environment. A receptor is either a living organism, a group of living organisms, an ecological system or a piece of property which is being, or could be, harmed, by a contaminant; or a water environment which is being, or could be, polluted by a contaminant. A pathway is one or more routes or means by, or through, which a receptor is being exposed to, or affected by, a contaminant, or could be so exposed or affected.

10.3.13 The Environment Agency's Guiding Principles for Land Contamination (GPLC) (Ref. 10.11), provide a simplified overview of the approach laid out in CLR11 for

site/ problem holders and their professional advisors/ consultants. The aim of the GPLC is to clarify roles and responsibilities, encourage good practice and comply with or avoid the need for regulation and to provide a link to relevant advice in other guidance documents.

10.3.14 NRW have adopted the Environment Agency's approach to protecting groundwater. The Environment Agency's approach to groundwater protection document (Ref 10.12) details position statements that describe the Environment Agency's approach to managing and protecting groundwater. The position statements set a framework which assist the Environment Agency is making decisions on groundwater management, including a position statement on mining induced pollution

10.3.15 The following CIRIA Guidance documents are relevant:

- Control of water pollution from construction sites (C532) (Ref. 10.13);
- The SuDS (Sustainable Urban Drainage Systems) manual 2015 (C753) (Ref. 10.14), and the SuDS manual 2007 (C697) (Ref. 10.15);
- Environmental good practice on site guide (C741) (Ref. 10.16);
- Assessing risks posed by hazardous ground gases to buildings (C665) (Ref. 10.17); and
- Contaminated land risk assessment - a guide to good practice (C552) (Ref. 10.18).

vi. Planning Policy Wales

10.3.16 Section 4.10 of PPW (Ref. 10.19) discusses the requirement for conserving the best, most versatile agricultural land, as a finite resource for the future. "*Land of grades 1, 2, and 3a should only be developed if there is an overriding need for the development, and either previously developed land or land in lower agricultural grades is unavailable, or available lower grade land has an environmental value recognised by a landscape, wildlife, historic or archaeological designation which outweighs the agricultural considerations*."

10.3.17 Section 13.5, discusses dealing with unstable and contaminated land, and how "the planning system should guide development to lessen the risk from natural or human made hazards, including risk from land instability and land contamination."

10.3.18 Section 13.7 discusses development management and contaminated land, outlining what planning decisions need to take into account, "*evidence of a detailed investigation and risk assessment prior to the determination of the application to enable beneficial use of the land*."

10.3.19 Section 13.9 outlines development management policies for unstable land. "Planning decisions need to take into account the potential hazard that instability could create, and the results of a specialist investigation and assessment to determine the stability of the ground."

vii. Technical Advice Note (TAN) 5: Nature Conservation and Planning

10.3.20 TAN 5 (Ref. 10.20) provides "advice about how the land use planning system should contribute to protecting and enhancing biodiversity and geological conservation".

d) Local

10.3.21 The Project Site is located on land identified as 'Coal' resource, as illustrated on the City and County of Swansea (CCS) Unitary Development Plan (UDP) Proposals Map, where UDP Policy R2 applies (Ref. 10.21). Policy R2 states that development proposals that would affect the working of known potential resources will have to be accompanied by a full assessment of the potential resource and the impact of the proposal in terms of sterilising the resource.

10.3.22 An area of the Gas Connection within the Project Site is located on land identified as 'Sand and Aggregates' resource, as illustrated on the UDP Proposals Map, where UDP Policy R4 applies. Policy R4 states that development proposals that would affect the working of known potential mineral resources will have to be accompanied by a full assessment of the potential mineral resource and the impact of the proposal in terms of sterilising the resource. These areas are shown on Figure 10-1.

10.3.23 Policy 1 of the UDP states that the County's environment will be protected from materially harmful development and where possible enhanced. Development that would result in adverse environmental effects will not be permitted, particularly in respect of:

- Air, noise or light pollution;
- Flood risk;
- The quality and quantity of water resources;
- Land contamination; and
- Land instability or subsidence.

10.3.24 CCS also has a Deposit Local Development Plan (LDP) which is supported by evidence presented in a number of Topic Papers. The Topic Paper which supports minerals (Ref. 10.22) indicates that the Welsh Government commissioned the British Geological Survey (BGS) to prepare Mineral Resource Maps for Wales (Ref. 10.23). This map indicates that the Project Site is located on secondary shallow coal resources overlain by glacigenic superficial deposits and peat.

10.4 Methodology

a) Scope of the assessment

10.4.1 The scope of this assessment has been determined through a formal EIA scoping process undertaken with the Secretary of State (SoS). Comments raised on the Scoping Report (Appendix 4.1) have been taken into account in the development of the assessment methodology and these are detailed where relevant in this chapter.

b) Consultation

10.4.2 The scope of the assessment has also been informed by ongoing consultation with statutory consultees throughout the design and assessment process, including the SoS, CCS, NRW, Public Health England, Coal Authority and local residents.

10.4.3 A summary of the comments raised and responses are detailed in Table 10-2.

Table 10-2: Summary of Consultation Responses

Consultee	Date	Comment	Response
Secretary of State (SoS) (Scoping Opinion, para.3.60 Ref. 10.22)	-	The SoS welcomes that the foundations of the development will be designed so as not to present a preferential pathway for contaminant migration if present at the project site. The SoS notes that this consideration should be extended to other works forming part of the development, including underground gas and electricity connections.	Noted.
SoS (Scoping Opinion, para.3.61)	-	The SoS draws the attention of the applicant to the comments of the Coal Authority indicating that the site is in a Development High Risk Area, as the site has been subject to past coal mining activity and is located within an area of surface coal resource.	A Coal Authority Report (see Appendix 10.4) has been obtained along with mine abandonment plans (see Figure 10.3).
SoS (Scoping Opinion, para.3.62)	-	The SoS recommends that the applicant takes into consideration the location and stability of abandoned mine entries, the extent and stability of shallow mine workings, outcropping coal seams, unrecorded mine workings, hydrogeology, mine water and mine gas.	A Coal Authority Report has been obtained along with mine abandonment plans which indicate the whole of the Project Site is overlying mine workings. Findings summarised in this chapter. However the depth to which the workings extend is unknown. This will be investigated as part of the future ground investigation works and reported in a mining risk assessment report, in which remedial recommendations for stabilising the mine workings will be identified as required. The assessment assumes as a worst case that piling will be required for stabilisation.
SoS (Scoping Opinion, para.3.63)	-	The SoS recommends that the applicant considers, if surface coal resources are present, whether prior extraction of the mineral resource is practical and viable. The applicant should also consider	A Coal Authority Report has been obtained. Findings summarised in Chapter 10 of this ES (paras 10.4.16

Consultee	Date	Comment	Response
		whether Coal Authority permission is required to intersect, enter, or disturb any coal or coal workings during site investigation or development work.	to 10.4.20). There are no surface coal resources present. Coal Authority Permit is required.
NRW	22nd July 2014	Site survey work undertaken should take into account current environmental permitting and likely future requirements under the Industrial Emissions Directive (IED) to undertake intrusive works to gather baseline contamination data as part of the environmental permitting process.	Completion of all necessary ground investigation and risk assessments is identified in **Chapter 3: Project as Site Description** of this ES as embedded mitigation and will be required as part of a DCO Requirement.
NRW	-	Requires information for the landfill, abstraction wells, discharge consents, and pollution controls or incidents. Ground instability should be assessed and the applicant should be satisfied that piling operations and any vibration associated with the construction process will not disturb the Water Mains that traverses the Project Site, historic mine workings, adits, or groundwater. Both landfills within the Project Site now fall outside NRW's regulation. A contaminated land risk assessment should be undertaken.	A Preliminary Geo-Environmental Risk Assessment (PRA) Report has been completed (Appendix 10.1) which presents the documentation and drawings provided by NRW relating to the landfill and landfill extension within the vicinity of the Project Site. This information will be used to design the ground investigation.
Public Health England (PHE)	23rd July 2014	PHE would expect the promoter to provide details of any hazardous contamination present on site (including ground gas) as part of the site condition report.	Ground investigation works will be undertaken and to intersect mine workings/coal seams to provide ground gas monitoring and assessment. Ground gas and detail of hazardous contamination will be included in a Site Condition Report A Coal Authority permit will be required.
City and County of Swansea Council	-	The ES referred to a historic land use as an inert landfill and the results of the 'comprehensive ground investigation work' should be supplied to the LA. Take into consideration / protection of groundwater as there are private water abstractions in the area.	A ground investigation will be required prior to development and the report will be submitted to and approved by CCS prior to

Consultee	Date	Comment	Response
(CCS)			commencement of development works. It is expected that this will be required to discharge the relevant DCO Requirement. Details of private abstractions have been requested from CCS (para 10.5.30). Clean drilling techniques will be used during the ground investigation to protect private groundwater abstractions.
Coal Authority (CA)	-	CA requested Coal Authority report and mine entry information. Followed up by requesting mine abandonment plans.	The Coal Authority provided all information requested. A permit / licence will be required for any ground investigation activities that penetrate the coal measures strata. If coal seams / workings are not encountered during the ground investigation, the Coal Authority may not require a permit to be issued for the construction works if they are not going to be penetrated.
NRW	14th Nov 2014	We note that there have previously been two landfills within the planning development boundary and that both sites now fall outside our regulation. A contaminated land risk assessment should be undertaken as part of the ES. You are advised to contact the local authority to agree the scope of the assessment as they are the lead authority for land quality.	A preliminary contaminated land risk assessment has been completed (Appendix 10.1). This report recommended that a ground investigation is undertaken to input into the design of the Project. The site investigation will form part of the embedded mitigation measures (See Section 10.6)
NRW	18th March	The landfills listed in close proximity to the application site boundary have ceased to have a permit with NRW or Environment Agency	None. Data regarding the landfills is provided in the Envirocheck Report

Consultee	Date	Comment	Response
	2015	Wales. We believe that they are likely to have been surrendered. We advise that you contact the City and County of Swansea as the lead regulator for land quality under the Contaminated Land Regulations as they may hold further information on this matter.	(Appendix 10.2)
NRW	2018	Recommendation that information on the location and extent of peat is provided upfront as part of the DCO submission. A peat survey should comply of a minimum of 1 peat probe per hectare of development area, and 1 peat core per 10 peat probes. This will show the distribution of peat across the development area so that the main areas of deep peat can be avoided by infrastructure, and therefore inform the subsequent PMP.	An additional desk study of peat resources including NATMAP Soilscapes dataset (Cranfield University) and soil maps has been undertaken in order to better understand the location and spatial extent of the peat deposits. The desk study did not reveal any more detail than what was presented in the 2018 PEIR. A peat survey will therefore be undertaken post-consent as part of the overall site investigation and in line with these recommendations. If peat is discovered to a significant depth, a Peat Management Plan will be produced (if required) and agreed with CCS and NRW.

c) Study area

10.4.4 An approximate 1 km search buffer has been used from the Project Site for purposes of relevant environmental data searches and a historical mapping review. This study area has been chosen for the assessment based on professional judgement as it is considered to incorporate all potential receptors that could be impacted by geology, ground conditions and hydrogeology relating to the Project (i.e. sensitive environments, surface water and groundwater resources, etc.) and activities that may impact on the Project (i.e. historical development in the surrounding area, potentially contaminative permitted activities, waste operations, etc.).

d) Sensitivity

10.4.5 The criteria used to assess the sensitivity of contaminated land receptors are presented in Table 10-43. This table is specifically for assessing the sensitivity of geology, ground conditions and hydrogeology receptors and complements the generic tables presented in **Chapter 4: Approach to Environmental Impact Assessment**.

Table 10-3: Sensitivity of Geology, Ground Conditions and Hydrogeology Receptors

Sensitivity of Receptors	Example Receptor Definition
High	Feature of international importance, for example a Special Area of Conservation (SAC). Critical social or economic uses such as for water supply, navigation or mineral extraction. Groundwater is a valuable resource because of its high quality and yield; is designated as a Principal Aquifer and/ or is known to be extensively exploited for water supply. Potable water supply source in close proximity. Site within a SPZ. Alternatively, groundwater is critical to designated sites of nature conservation.
Medium	Feature of national importance, for example a Special Area of Conservation (SSSI). High classification for water quality (i.e. A1 Excellent or A2 Good) or sensitive habitats of national importance. Groundwater is a locally valuable resource because of its moderate quality and/or yield is designated as a Secondary Aquifer and/or is known to be locally exploited for non-potable water supply.
Low	Feature of regional or local importance. Moderate water quality (i.e. B Moderate). Sensitive habitats of regional importance. Limited social or economic uses. Groundwater of limited value because its quality does not allow potable or other quality sensitive uses. Exploitation of local groundwater is not extensive and/or local areas of nature conservation known to be sensitive to groundwater impacts.
Negligible	Heavily modified with poor water quality (i.e. C Poor and D seriously

Sensitivity of Receptors	Example Receptor Definition
	Polluted). Minimal economic or social uses. Poor groundwater quality and/or very low permeability make exploitation unfeasible. Changes to groundwater flow or quality not expected to impact on local ecology. Associated habitats less than local importance.

e) Magnitude

10.4.6 The criteria used to assess the magnitude of effects are presented in Table 10-44. This table is specifically for assessing the magnitude of potential effects on geology, ground conditions and hydrogeology and complement the generic tables presented in **Chapter 4: Approach to Environmental Impact Assessment**.

Table 10-4: Geology, Ground Conditions and Hydrogeology Magnitude Assessment Criteria

Magnitude	Description
High	Short term acute effect on human health affecting both Site users and users of sites in the vicinity, arising from contamination on the Application Site, or Chronic damage to human health affecting users of both the site and other sites in the vicinity arising from contamination on the Application Site. Persistent or extensive effects on water quality, closure of an abstraction, major damage to agriculture. Persistent or extensive effects to ecosystems. Catastrophic damage to buildings or property on or in the vicinity of the Application Site arising from contamination on the Application Site.
Moderate	Chronic damage to human health of users of the Application Site. Significant effect on water quality e.g. notification required to abstractors, significant damage to agriculture, reduction in amenity value. Significant damage to aquatic or other ecosystems, which may result in a substantial adverse change in its functioning or harm to a species of special interest that may endanger the long-term maintenance of the population. Significant damage to crops, buildings or property.
Low	Non-permanent effects to human health e.g. short term intermittent nuisance such as odours not hazardous to human health. Minor or short-lived damage to water quality or ecosystems, which is unlikely to result in a substantial adverse change in its functioning or harm to a species of special interest. Minor damage to crops, buildings or property.
Negligible	No observed effect on human health. Poor vegetation growth, choice of landscaping species restricted. Repairable effects of damage to buildings, structure and services e.g. staining or discoloration of building materials. No observed effects on water quality or ecosystems.

f) Effect definitions

10.4.7 Table 10-5 details the matrix used for the classification of effects whilst Table 10-6 sets out the generic significance criteria definitions.

Table 10-5: Classification of Effects

Magnitude	Value and sensitivity of receptor			
	High	**Medium**	**Low**	**Negligible**
High	Major	Major	Moderate	Moderate
Medium	Major	Moderate	Moderate	Minor
Low	Moderate	Moderate	Minor	Negligible
Negligible	Minor	Minor	Negligible	Negligible

10.4.8 Following the classification of an effect as detailed in Table 10.6, a clear statement is made as to whether the effect is 'significant' or 'not significant'. As a general rule, major and moderate effects are considered to be significant and minor and negligible effects are considered to be not significant. However, professional judgement is also applied where appropriate.

Table 10-6: Significance Criteria Definitions

Significance of Effect	Description
Major	Effects, both adverse and beneficial, which are likely to be important considerations at a national to regional level because they contribute to achieving national/regional objectives, or, which are likely to result in exceedance of statutory objectives and/or breaches of legislation.
Moderate	Effects that are likely to be important considerations at a regional and local level.
Minor	Effects that could be important considerations at a local level.
Negligible	An effect that is likely to have a negligible or neutral influence, irrespective of other effects.

10.5 Baseline Environment

10.5.1 This section describes the baseline environmental characteristics for the Project Site and surrounding areas with specific reference to geology, ground conditions and hydrogeology.

10.5.2 This assessment has been undertaken using desk based information currently available including the Landmark Envirocheck Report (dated October 2017 and presented in Appendix 10.2) and the Preliminary Geo-Environmental Risk Assessment for Abergelli Power Project (Appendix 10.1), and a site walkover undertaken in July 2014.

10.5.3 The ground conditions have not yet been assessed via an intrusive ground investigation. The results of the site investigation works must be reported to CCS/NRW as secured by the DCO Requirements.

a) Current and Surrounding Land-use

10.5.4 The land-use is predominantly agricultural, used for sheep and horse grazing bounded by drainage ditches, fencing and hedgerows. There are no residential buildings within the Project Site.

10.5.5 A detailed description is presented in **Chapter 3: Project and Site Description**, Section 3.3.

b) Geological information

10.5.6 The baseline geology, ground conditions and hydrogeology data of the Project Site has been gathered from the following sources:

- Landmark Information Group Envirocheck Report. Presented in Appendix 10.2;
- British Geological Survey (BGS) Borehole Log SN65200160 Aber-gelli-fach Farm - Dated 7 October 1991. Presented in Appendix 10.3;
- Preliminary Geo-Environmental Risk Assessment from Abergelli Power Project (Ref. 10.1); and
- BGS. Digital Geological map of Great Britain at 1:50,000 scale (Ref. 10.25).

i. Made Ground

10.5.7 There is no Made Ground indicated within the Project Site, based on published BGS records. Made Ground is only considered to be likely to be present an areas associated with previous development such as the landfill and colliery. It may also be present if the landowner undertook land levelling. If any Made Ground is present within the Project Site, its composition and provenance would be unknown.

ii. Superficial Geology

10.5.8 There are four types of superficial deposits identified across the Project Site comprising: glacial diamicton till, glaciofluvial deposits of sand and gravel, alluvium deposits of clay, silt, sand and gravel and quaternary peat.

10.5.9 The glaciofluvial deposits are located along the Access Road, and areas to the north of the Laydown Area, while till is present on the Access Road, across the Laydown Site, in the western portion of the Generating Equipment Site and the mid-section of the Gas Connection. Alluvium deposits are located across the Ecological Mitigation Site and along the eastern boundary of the Generating Equipment Site while peat is present in the north east of the Generating Equipment Site and to the north west of Abergelli Farm.

10.5.10 The BGS indicates that there are three boreholes located in the Project Site, however only one is available to view online and presented in Appendix 10.3. The borehole log is located east of Abergelli Farm in an area mapped as being underlain by Devensian glaciofluvial deposits of sand and gravel.

10.5.11 The borehole log indicates superficial deposits comprising yellow brown sandy gravelly clay down to 6.4 metres below ground level (mbgl), overlying grey brown clayey gravelly sand, clayey sand and sandy clay down to 15.8 mbgl considered to be representative of glaciofluvial deposits. These are underlain by firm yellow clay becoming stiff grey gravelly clay described in the log as possible boulder clay which is likely to be glacial till; proven to a maximum depth of 16.8 mbgl. Traces of coal were identified at 10.7 mbgl within the clayey sand.

iii. Bedrock Geology

10.5.12 The bedrock geology underlying the Project Site consists of the Grovesend Formation of the South Wales Upper Coal Measures Formation, comprising argillaceous mudstones and siltstones, with well-developed coals, and minor lithic sandstones. The BGS (Ref. 10.26) indicates that the Grovesend Formation is the youngest unit found in the South Wales coalfield.

10.5.13 The north eastern corner of the 1 km search buffer surrounding the Project Site is underlain by the Swansea Member, comprising green-grey Pennant Sandstone, with thin mudstone/siltstone and seatearth interbeds and (mainly thin) coals. This geological formation is overlain conformably by the Grovesend Formation.

10.5.14 The geological map (Appendix 10.2) indicates the presence of one fault crossing the Project Site running north west to south east through the Access Road. There are numerous other faults identified within the 1 m search buffer around the Project Site predominantly running from north-west to south east.

10.5.15 The Preliminary Geo-Environmental Risk Assessment (Ref.10.1) indicates that there was a 'Slant' (inclined shaft or level) identified at Abergelli Colliery, which provided access to both the Graigola and Swansea Four Feet coal seams.

c) Soils and Agriculture

10.5.16 The soil and agriculture land classifications are discussed in the Preliminary Geo-Environmental Risk Assessment (Ref. 10.1) and confirmed by NATMAP Soilscapes indicate the following:

- There are two different soil classification areas across the Project Site. The predominant soil classification is described as "slowly permeable, wet, very acidic upland soils with a peaty surface". The soils are described as "low fertility" and land cover is described as "moorland rough grazing and forestry". The precipitation "drains to the stream network". Overgrazing of this soil could lead to accelerated run-off and soil erosion.
- Through the centre and north eastern section of the Project Site, the soils are described as "freely draining, slightly acid loamy soils". The soils are of "low fertility", with "arable and grassland" land cover and precipitation "drains to local groundwater and rivers". There is potential for groundwater contamination with these soils, comprising nitrate, siltation and nutrient enrichment of streams from soil erosion.
- The agricultural land classification for the land within and surrounding the Project Site is Grade 4 ("poor quality agricultural land") "with severe limitations

which significantly restricts the range of crops and/or level of yields, mainly suited to grass with occasional arable crops".

- The Project Site is known to be utilised as improved grazing for sheep and horses, with small areas of marshy grassland and woodland copses interspersing the improved grassland to the north and east.

d) Ground Workings and Mineral Resources

10.5.17 The Envirocheck (Appendix 10.2) does not indicate the presence of any historical ground workings on the Project Site, however within the 1 km search buffer there are ten records of historical ground working features. These have all ceased production and are listed in Table 10-7. These comprise nine opencast mines producing sandstones and sands and gravel and one underground mine producing coal.

Table 10-7: Recorded Opencast and Underground Mines

Site Name	Distance and direction	Type of site	Status	Geology and Commodity
Aber-Gelli-Fach Gravel Pit	161 m NE	Opencast	Ceased	Glaciofluvial Deposits - sand and gravel
Bryn-Whilach Plantation Gravel Pit	456 m SE	Opencast	Ceased	Till - sand and gravel
Waen Ffyrdd Plantation Sand Pit	474 m W	Opencast	Ceased	Glaciofluvial Deposits - sand
Gelli-Gron	621 m NE	Opencast	Ceased	Swansea Member - sandstone
Llidiard -Y-Cleders	648 m NW	Opencast	Ceased	Grovesend Formation - sandstone
Bryn-Whilach	676 m SE	Underground	Ceased	Grovesend Formation - deep coal
Nant-Y-Ganol Wood Sand Pit	800 m S	Opencast	Ceased	Till - sand
Waterworks Cottage	893 m N	Opencast	Ceased	Swansea Member - sandstone
Gelli-Feddan	956 m N	Opencast	Ceased	Grovesend Formation - sandstone
Pen-Y-Fedw-Isaf	976 m W	Opencast	Ceased	Swansea Member - sandstone

10.5.18 The Coal Authority Mining Report (Appendix 10.4) identified Abergelli Colliery located adjacent to the Project Site approximately 500 m north of Abergelli Farm. A coal pit, shaft, colliery, and mine spoil heap have all been identified on historical mapping at locations extending to between 480 m and 1 km from the Project Site Boundary (i.e. outside the boundaries of the Project Site).

10.5.19 The Coal Authority Mining Report (dated 30 July 2014) indicated that the Project Site is in the "likely zone of influence from workings in three seams of coal, at shallow to a depth of 380 m". Figure 10.2 presents the mine workings from the mine abandonment plan across the Project Site. This plan shows that the entire Project Site is influenced by mine workings.

10.5.20 As illustrated in Figure 10.2, there is one mine and one shaft entry located within or close to the Project Site. The mine entry is located outwith the Project Site Boundary, in the vicinity of Abergelli Colliery (north of Abergelli Farm). The mine shaft is located south of the Substation at (NGR 264970, 200800) within the Project Site Boundary. There is no record of any treatment to the mine/shaft entries. These mine/shaft entries are shown on Figure 10.3. A site visit undertaken on the 12th March 2018 has confirmed that the shaft has been back filled and no open void was visible.

10.5.21 The Coal Authority indicates that reserves of coal exist and could be worked in the future. However, the Project Site is currently not in an area for which the Coal Authority is determining to grant a licence to remove coal using underground methods, where a licence has been granted or in an area that is likely to be affected at the surface from any planned future underground workings.

10.5.22 The Coal Authority report states that the Project Site is not within the boundary of an opencast site from which coal has been removed by opencast methods, and does not lie within 200 m of a boundary of an opencast site. It also states that the Project Site is not within 800 m of the boundary of an opencast site for which the Coal Authority are determining whether to grant a licence to remove coal by opencast methods, or for which a licence to remove coal has been granted.

e) Ground Stability/Subsidence

10.5.23 The Coal Authority Mining Report indicates that no notice of the risk of the land being affected by subsidence has been given under Section 46 of the Coal Mining Subsidence Act 1991.

10.5.24 Abergelli Farm has been subject to remedial works, by or on behalf of the Coal Authority under its emergency surface hazard call out procedures. No further information was provided, however two damage notices or claims for alleged subsidence damage were made in June 1995 and November 1996 both of which were rejected.

10.5.25 Geological hazards across the Project Site have been identified in the Landmark Envirocheck Report; these are detailed in Table 10-8.

Table 10-8: Geological Hazards

Geological Hazard		Hazard Potential:
Stability Hazards	Collapsible Ground	No hazard to very low
	Compressible Ground	No hazard to high
	Ground Dissolution	No hazard
	Landslide Ground	Very low to low

Geological Hazard		Hazard Potential:
	Running Sand Ground	No hazard to low
	Shrinking or Swelling Clay Ground	No hazard to very low
Radon Affected Areas	Lower probability radon area (less than 1% of homes are estimated to be at or above the Action Level).	
Radon Protection Measures	No radon protective measures are necessary in the construction of new dwellings or extensions	

10.5.26 The high compressible ground hazard is assumed to be associated with the peat located in the north east of the Generating Equipment Site and to the north west of Abergelli Farm. The presence of peat and nature of its compressibility will be determined during the post consent ground investigation.

10.5.27 Consideration of this hazard will be made in the design of any ground works (including ground investigation, earthworks, de-watering) and foundation design. There is an impact associated with any measure selected to mitigate the risk of settlement of compressible peat deposits (if present). The final design will incorporate suitable mitigation on the basis of the ground investigation findings to minimise the interaction of the Project with the peat / disturbance of the peat as a result of the Project. In the event that there will be some disturbance of peat, part of the embedded mitigation is to undertake a peat survey, including probing of the peat to determine the thickness and extent of the deposits, and the production of a Peat Management Plan, which will detail how to handle the peat properly and maximise on-site reuse of any excavated peat The peat survey methodology and Peat Management Plan (if a reasonable amount of peat is found) will be prepared in consultation with and approved by CCS and NRW prior to construction. Both the methodology and the management plan will be secured via a DCO Requirement.

f) Hydrogeology

10.5.28 The superficial glaciofluvial deposits and the bedrock geology are both classified as Secondary A Aquifers. Secondary A Aquifers are defined as '*permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers*.'

10.5.29 The superficial glacial till deposits are classed as Unproductive Strata, defined as 'rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow'.

10.5.30 The Landmark Envirocheck report has identified no groundwater abstraction licences associated with the Project Site. There is only one licence located within 100 m of the Project Site, recorded 56 m to the north-east for a well at Abergelli Farm, licence number 22/59/4/0027 dated February 1993, for general farming and domestic use. There are a further seven licensed groundwater abstractions within 1 km of the site all for general farming and domestic use and a further 21 within 2 km of the Project Site. Swansea Council has also identified a number of private water supplies located in close proximity to the Project Site. Further detail relating to

water abstractions including the potential presence of unlicensed private water supplies is included in **Chapter 9: Water Quality and Resources**.

10.5.31 The Project Site does not lie within a groundwater Source Protection Zone (SPZ).

10.5.32 The Landmark Envirocheck identifies the groundwater vulnerability classification of the soils beneath the Project Site and surrounding area. These vary between Low (L) to High (H) Leaching Potentials (classifications of L, H1, H3, I1 and U). These classifications are described as follows:

- L: Soils in which pollutants are unlikely to penetrate the soil layer because water movement is largely horizontal or they have large ability to attenuate diffuse pollutants. Lateral flow from these soils contributes to groundwater recharge elsewhere in the catchment.
- H1: Soils which readily transmit liquid discharges because they are either shallow or susceptible to rapid by-pass flow directly to rock, gravel or groundwater.
- H3: Coarse textured or moderately shallow soils which readily transmit non-absorbed pollutants and liquid discharges but which have some ability to attenuate absorbed pollutants because of their large clay or organic matter contents.
- I1: Soils which can possibly transmit a wide range of pollutants.
- U: Soil information for restored mineral workings and urban areas is based on fewer observations than elsewhere. A worst case vulnerability classification (H) assumed, until proved otherwise.

10.5.33 The Envirocheck Report identifies areas prone to flooding associated by the Afon Llan in the south of the Project Site in the Ecological Mitigation Area. NRW website (Ref. 10.27) indicates a medium chance of flooding from rivers or the sea with a chance of flooding of between 1 in 100 (1%) and 1 in 30 (3.3%).

10.5.34 The Envirocheck Report indicates the presence of two discharge consents to groundwater on the Project Site, however these have both been surrendered. Both were held by the Felindre Gas Compressor Station, one for discharging sewage to an unnamed land drain, effective between 2007 and 2010; and one for trade discharges (site drainage) to the Afon Llan, effective from 2006 until it was surrendered in 2011. There are a further three discharge consents within 250 m of the Project Site, all of which have expired.

10.5.35 There have been no Pollution Incidents to Controlled Waters recorded on the Project Site by the Envirocheck Report. There have been three between 250 m and 500 m of the Project Site, which were classed as Category 3 minor incidents and a further eight incidents between 500 km and 1 km of the Project Site. These were classed between Category 1 major incident and Category 3 minor incidents.

g) Soil Chemistry

10.5.36 The Envirocheck Report has identified the estimated background soil chemistry (for selected key elements) across the Project Site. They are summarised as:

- Arsenic: 25 – 35 mg/kg,
- Cadmium: <1.8 – 3.0 mg/kg,
- Chromium: 60 – 90 mg/kg
- Nickel: 15 – 45 mg/kg; and
- Lead: <100 mg/kg.

h) Groundwater Quality

10.5.37 Groundwater quality in the study area has been assessed against the objectives of the Water Framework Directive (WFD). Details are presented in **Chapter 9: Water Quality and Resources**.

i) Landfill

10.5.38 The Envirocheck Report indicates that there are no landfill sites located within the Project Site Boundary.

10.5.39 The closest landfill sites to the Project Site is one registered landfill and an adjacent historic “Landfill Extension” located at Abergelli Fach Farm located between 92 m and 121 m north east of the Project Site. The current status of the registered landfill is ‘closed’ and it was only able to accept non-biodegradable wastes. The total void space was calculated at 75,000 m^3 with a total tonnage of 142,500 t.

10.5.40 The Landfill Extension is reported to have accepted inert waste. The planning application for this extension was granted in 1997. NRW provided the Working Plan and associated drawings for the landfill which were dated March 1994. The total void space was calculated at 99,898 m^3, with a total tonnage of 179,816 t. The Working Plan described the land as low lying, and poorly drained. Approximately three quarters of the landfill area was covered by a mine soil dump from Abergelli Colliery. This mine waste was removed leaving a layer of well compacted mine waste over the majority of the landfill area. The area of ground that was covered by the mine spoil was used for drying out of water treatment sludge (aluminium sulphate) though ceased when the landfill became operational. No further information on this operation is known.

10.5.41 Swansea City Waste Disposal Company Ltd gained planning permission for ‘excavation and removal of inert material from landfill site and restoration’ at Abergelli Farm in February 2003 (CCS Ref: 2002/0312). This consent was subsequently amended, extending the permission to allow the excavation and removal of inert material until 31st December 2010 (2007/0907). The site has now been fully restored.

10.5.42 There are also an additional three historical landfills within 400 m of the Project Site, all located between 294 m and 402 m south-east of the Project Site. The first is located 294 m east of the Project Site at Gorswen Farm and accepted unspecified waste between 1971 and 1972. The second landfill was licenced to British Steel and located 309 m south-east. It was active between 1980 and 1994 and received deposited waste included industrial and household waste. The third landfill is located 402 m south-east and was active been 1955 and 1970 receiving deposited waste included inert, industrial and special waste.

j) Recorded Animal Burial Grounds

10.5.43 Information obtained from CCS indicates there was no local cull of animals in Swansea, Neath Port Talbot or Carmarthenshire during the Foot and Mouth outbreak in 2001. No mass burial of animals have been recorded at the Project Site.

k) Historical Land Use

10.5.44 Historical maps have been provided in the Landmark Envirocheck Report, presented in Appendix 10.2. The historical development of the Project Site is summarised in Table 10-9.

Table 10-9: Historical Development

Dates / Sources	On Project Site	Off Project Site
1877 1:2,500 1884 1:10,560	The Project Site is predominantly agricultural fields and tracks, with areas of woodland and marshland.	The land is predominantly agricultural. A lime kiln is identified approx. 325 m south east of the Project Site; west of the Maes-eglwys development. There are a number of buildings associated with Abergelli Fach to the east of the Project Site, Abergelli Fawr to the west of the Site and Bryn Mawr along the north western corner of the Project Site. Bryn-whilach Pit is identified approx. 775 m south of the Site.
1890 1:10,560 1898 – 1899 1:2,500	The woodland in the south west of the Project Site has now been identified as Abergelli Fach Plantation and Lletty-Morfil Plantation.	A gravel pit is identified to the west of Abergelli Fach approx. 250 m west of the Site. An old gravel pit is identified approx. 425 m to the south of the Project Site that was not previously identified in Bryn-whilach Plantation.
1921 1:10,560 1917-1918 1:2,500	Rises and streams are now indicated on the map.	Two old quarries have been identified. One approximately 1 km west and one approximately 650 m north west of the Project Site. A tank is identified next to a spring 250 m west of the Project Site, north of Abergelli Fach Plantation. The gravel pit located to the west of the Site is now identified as ‘old’. The limekiln previously identified west of Maes-eglwys is now labelled as ‘Old Limekiln’. Bryn-whilach Pit is identified approx. 775 m south of the Site is now labelled as ‘Old Coal Pit’.
1935-1936 1:10,560 1935 1:2,500	No significant changes.	Abergelli Colliery, associated buildings, engine houses, railway sidings, slant (loading bay) and tank are identified on the map, north of Abergelli Fach and adjacent to the Site Boundary. The gravel pit to the west of Abergelli Fach is no longer labelled. The gravel pit located to the south of the Site is no longer shown. The two old quarries to the northwest and west of the Site are no longer shown.

Dates / Sources	On Project Site	Off Project Site
1951 1:10,560	No significant changes.	The buildings associated with Abergelli Colliery have changed slightly but still appear to be operational
1964 1:10,560 1961 1:2,500	No significant changes.	The colliery is now identified as disused. A spoil heap/tip adjacent to the colliery is identified to the north west of the mine with a routeway into the centre of the tip. Railway sidings tracks run through the colliery and ends at the edge of the spoil heap/tip. The tank next to Abergelli Plantation is no longer identified. A large Works building is located 650 m south of an access road.
1976 1:10,000 1973-1975 1:2,500	Electricity pylons are identified across the Project Site, towards the central section of the Project Site, running in a north-east to south-west direction.	The majority of the buildings associated with Abergelli Colliery no longer remain. The tip to the south of the Project Site has extended to the north east and is now labelled 'tip'. The Substation is presented adjacent to the south of access road. Associated pylons run south towards the tip and also north and east.
1986 1:2,500	No significant changes.	A gas valve compound is shown adjacent to the north western Project Site Boundary. Beyond the gas valve compound are covered reservoirs and associated water treatment works.
1990 1:2,00	No significant changes.	The spoil heap/tip/landfill adjacent to the former Abergelli colliery is no longer present on the map.
1991 1:10,000 1992 1:2,500 1999 Google Earth Pro imagery	Two ponds are labelled in the proposed area of the Generating Power Plant. [HOLD3] The Substation is present in the south western corner of the Project Site, adjacent to Lletty-Morfil Plantation.	A large warehouse building is now present in the area adjacent to the former Abergelli Colliery (which is no longer labelled). From the earliest imagery available on Google Earth Pro the landfill adjacent the former Abergelli colliery appears to be backfilled and the slope graded. The majority of the landfill extension to the south of the Project Site is vegetated. Abergelli Fach is now labelled as Abergelli Farm and looks to have been redeveloped. Abergelli Fawr to the east of the Project Site is now labelled as ruins. The Works building to the south of the Project Site is now labelled as Velindre Works. A tip is located approximately 300 m to the south of the Project Site

Dates / Sources	On Project Site	Off Project Site
1999 1:10,000	No significant changes.	Velindre Works to the south of the Project Site is no longer present.
2000 Aerial photography	No significant changes.	The tip located to the south of the Project Site appears to be vegetated.
2002 1:10,000 2002 Google Earth Pro imagery	No significant changes.	Two buildings associated with the former colliery remain along with a large warehouse. The tip to the south of the Project Site is becoming vegetated. The northern part of the landfill extension looks to be currently worked.
2006 1:10,000	No significant changes.	An area to the west of Abergelli Farm is cleared of vegetation. Part of the former tip to the north of the former Abergelli Colliery has been redeveloped into an area of hardstanding. The tip located approximately 300 m to the south of the Project Site is no longer present.
2008 Google Earth Pro imagery	No significant changes.	The gas compression station located immediately adjacent to the north of the access road is being developed. A large tract of land leading north from the station is cleared of vegetation to allow for the pipelines to be buried. The area of ground west of Abergelli Farm which was cleared in 2006 now has a number of small buildings present.
2010 Google Earth Pro imagery	No significant changes.	There is a new access road serving the gas compression station development running along the northern boundary of the tip to the south of the Site. Two new residential dwellings have been built on the open ground to the west of Abergelli Farm.
2013 Google Earth Pro imagery	No significant changes.	The access road serving the Felindre Gas Compressor Station development is no longer present.
2015 Google Earth Pro imagery	No significant changes.	A new area of hardstanding has been developed on the landfill site adjacent to the former Abergelli Colliery. Two solar parks have been developed; Rhyd-y-pandy solar park to the east of the Project Site and Abergelli Farm to the west of the Site.

l) Sensitive Land Uses

10.5.45 There are four areas of ancient woodland on the Project Site. One area of ancient woodland is located close to the Generating Equipment Site and other three surround the Substation and Felindre Gas Compressor Station. More information on the ancient woodland is provided in **Chapter 8: Ecology**.

m) Potentially Contaminative Land Uses

10.5.46 Table 10-10 lists land uses identified which have the potential to cause contamination on the Project Site and within 250 m of the Project Site Boundary. Land uses further than 250 m from the Project Site Boundary are not considered as they are unlikely to affect the Project Site. The table also details contaminant groups potentially present as a result of these land uses.

Table 10-10: Land Uses and Potentially Present Contaminant Groups

Process / Land use	Location	Contaminant Groups Potentially Present
Abergelli Colliery with associated engine houses, tanks, conveyor belt and spoil heap	Off-Site: North of Abergelli Fach (Farm) immediately west of the Project Site.	Metals and metalloids, phenols, sulphates, asbestos, total petroleum hydrocarbons (TPH) and polycyclic aromatic hydrocarbons (PAHs). Ground gas including coal bed methane.
Railway sidings associated with Abergelli Colliery	Off-Site: North of Abergelli Fach (Farm) immediately west of the Project Site.	Hydrocarbons including lubricating oils/fuel, PCBs, PAHs, ethylene glycol, heavy metals, asbestos, combustion ash, herbicides, creosote, sulphate.
Drying out of water treatment sludges	Off-Site: Abergelli Colliery and location of landfill extension (~120 m west of Project Site).	Aluminium sulphate and heavy metals
Historic Landfill and Landfill Extension	Off-Site: North west and west of Abergelli Colliery (north of Abergelli Fach) ~100 m west of the Project Site at its closest point.	Heavy metals, hydrocarbons, asbestos and other unknown contaminants associated with the waste (reported to be non-biodegradable wastes). Mining wastes including mine tailings/spoil potentially containing high concentrations of arsenic, copper and other metals, phenols, sulphates, asbestos, TPH and PAHs. Gases such as carbon dioxide, methane and hydrogen sulphide generated from fill materials of unknown constituents.

Process / Land use	Location	Contaminant Groups Potentially Present
Felindre Gas Compressor Station, the Substation and electricity pylons	Off-Site: West of the Project Site, located north and south of the Access Road. Sites operated by National Grid Gas Plc. Electricity pylons located across the Project Site	Polychlorinated biphenyls (PCB's), other transformer oils and solvents
Agricultural land	On-Site: Across the majority of the Project Site including plantations to the south of the Project Site.	Fertilisers, pesticides, herbicides, fuel and oil hydrocarbons associated with machinery, organic and biological contaminants.

n) Sources of Contamination

10.5.47 It is considered that the most likely sources of contamination for the Project Site are:

- Contamination associated with the off-site historic landfill and landfill extension including aluminium sulphate sludge; and
- Contamination from agricultural land use.

o) Preliminary Conceptual Site Model (CMS)

10.5.48 On the basis of the information summarised above, a preliminary CSM has been developed for the Project Site. The CSM identifies potential contaminants, receptors (both on and off-site) and exposure pathways that may be present. The identification of such potential "pollutant linkages" is a key aspect of the evaluation of potentially contaminated land. Potential "pollutant linkages" associated with the Project Site are detailed within Table 10-11.

10.5.49 It should be noted that the identification of potential "pollutant linkages" does not indicate that they are significant in any way or that the Project Site is unsuitable for its current/proposed use. It does, however, act as a way of focusing future data collection at the Project Site and identifying any key potential risks associated with the Project Site.

10.5.50 The model is based on a desk study and a walkover undertaken in 2014 and will be confirmed through intrusive investigation prior to detailed design and as per a DCO Requirement.

Table 10-11: Preliminary Conceptual Site Model

Source	Pathway	Receptor	Risk	Risk Description
Off-Site: Waste within the historic landfill and landfill extension (including the process of drying out water treatment sludge)	Direct contact with shallow groundwater impacted with landfill leachates.	Construction Workers	Low	The majority of the development area will comprise hardstanding; therefore the risk of exposure is negligible. Regular contact with this potential contaminative source is unlikely. The presence of vegetation across the majority of the Project Site limits exposure via the direct contact pathway.
Landfill gas generation	Inhalation of soil vapours outdoors	Construction Workers	Low	There is potential for landfill gases to be present within the landfill and landfill extension. The gas generation is anticipated to be low as the landfill was licenced to only receive inert and non biodegradable waste. This needs to be considered as buried structures will be constructed to the east of the landfills. The exposure durations are limited and the receptor class is less sensitive; the Generating Equipment Site is relatively distant from the landfill hence the "Low" classification.
	Migration of ground gases / vapours into buildings including accumulation in confined spaces	Human Health: Future workers on the Generating Equipment	Low	
		Built environment / structures / services		
Mine gas generation	Inhalation of soil vapours outdoors	Construction workers	Moderate / Low	During the construction works there is a possibility that ground gas from coal bed methane or mine workings may be disturbed. The Coal Authority report indicates that there are shallow workings present in 3 seams of coal to depths of 380 m. Ground investigation is required to assess the likelihood and level of risk. With current land use the risk is considered to be moderate to low as there has been minimal ground disturbance.
	Migration of ground gases / vapours into buildings including accumulation in confined spaces	Human Health: Future workers on the Generating Equipment		
		Built environment / structures / services		

Source	Pathway	Receptor	Risk	Risk Description
Natural gas from potential peat stratum	Inhalation of soil vapours outdoors	Human Health: Future workers on the Generating Equipment	Moderate / Low	There is potential for natural ground gases to be present within the peat stratum mapped in localised areas within the Project Site. The gas generation is anticipated to be moderate to low in these areas and this currently vents naturally.
	Migration of ground gases / vapours into buildings including accumulation in confined spaces	Construction workers	Moderate / Low	Construction workers may potentially disturb the peat habitat during the construction works; this is particularly relevant with sub-surface construction activities where ground gas may accumulate.
		Built environment / structures / services		
Agricultural land (potential sheep dips, use of fertilisers)	Surface run-off	Controlled waters (groundwater in Secondary A superficial and bedrock aquifers and drainage ditches within the Project Site Boundary)	Low	Fertilisers could be washed into receiving surface waters. Drainage ditches run across the Project Site and may transport contaminants. The farming practices and potential use of chemicals is unknown but as the land is predominantly used for grazing the risk is considered low.
	Dermal contact and ingestion of soils and dust Inhalation of dust	Human Health: Future workers on the Generating Equipment	Low	The majority of the development area will comprise hardstanding; therefore the risk of exposure is negligible. Regular contact with this potential contaminative source is unlikely. The presence of vegetation across the majority of the Project Site limits exposure via the direct contact pathway.
		Construction workers	Low	As above. In addition, the exposure durations are limited and the receptor class is less sensitive. Regular contact with site soils is unlikely.

Source	Pathway	Receptor	Risk	Risk Description
Natural radon gas	Inhalation of soil vapours outdoors	Human Health: Future workers on the Generating Equipment	Low	The Envirocheck report indicates that the radon potential is low in this area.
	Inhalation of soil vapours indoors	Construction workers		
Aggressive soil conditions	Direct contact with shallow groundwater and soil	Buried concrete structures of the Project	Low	Whilst aggressive soil conditions (sulphate / pH) may be present, the area which will require buried structures is on greenfield land and therefore the probability of the risk occurring is unlikely; therefore the risk is considered low.
Chemicals used during construction works including oils/fuels, liquid concrete and other materials	Accidental releases to ground including spillage/ leakage from containers and engines, followed by vertical/lateral migration	Controlled Waters: Secondary A superficial and bedrock aquifers	Low	If spillage of chemicals occurred during construction operations it is likely that this would be quickly recognised and contained, due to operational requirements. Construction industry pollution prevention guidelines will be followed, as detailed in the CEMP, such as use of bunded storage of any chemicals or fuel kept on site, the introduction of petrol interceptors to filter run off from areas of hardstanding created for construction plant.

10.6 Embedded Mitigation

10.6.1 As detailed in **Chapter 3: The Project and Site Description**, a number of embedded mitigation measures have been identified through the iterative EIA process and have been incorporated into the design and construction planning of the Project.

10.6.2 As these mitigation measures have been embedded into the design, are legal requirements or are standard practices that will be implemented, the assessment of likely significant effects assumes that they are in place.

10.7 Assessment of Effects

10.7.1 This section presents the findings of the geology, ground conditions and hydrogeology assessment for the construction phase, the operational phase and decommissioning of the Project.

10.7.2 This section identifies any likely significant effects that are predicted to occur following embedded mitigation measures and Section 10.8 highlights the additional mitigation and monitoring measures that are proposed to reduce or eliminate the identified significant effects.

a) Construction

i. Power Generation Plant

Geology and Soils: Sand and Gravel Reserves

10.7.3 The UDP Proposals Map indicates that sand and gravel reserves are present underlying the Project Site. These areas are presented in Figure 10.1. The sand and gravel reserves have historically been worked adjacent to the Project Site; the location of the disused gravel pit is shown in Figure 10.3.

10.7.4 Should the ground investigation provide evidence that sand and gravel reserves are available directly under the Power Generation Plant footprint, there will be a permanent sterilisation of those potentially available reserves. The sand and gravels reserves are considered to be of low sensitivity due to minimal economic use. The magnitude of the impact is assessed as low, as while there will be permanent (for the duration of the Project) sterilisation of the reserves, a relatively small area of the reserves will be affected compared to the full reserve extent available for potential extraction. The significance of the effects is therefore considered to be **Minor** adverse which is not significant.

Geology and Soils: Coal Reserves

10.7.5 The UDP Proposals Map indicates that coal reserves are present underlying the Project Site. These areas are presented in Figure 10.1. The coal reserves have historically been worked underlying the Project Site; the location of the workings is shown in Figure 10.2. Should the ground investigation provide evidence of further commercially viable coal reserves under the footprint of the Power Generation Site, there could be a permanent sterilisation of potentially available reserves.

10.7.6 The coal reserves are considered to be of low sensitivity due to minimal economic use. The magnitude of the impact is assessed as low, as while there will be permanent constraint on future extraction, a relatively small area of the coal reserves will be affected compared to the full extent. The significance of the effects is therefore considered to be **Minor** adverse which is not significant in EIA terms.

Geology and Soils: Peat Deposits

10.7.7 There are areas of peat identified across the region with one deposit shown to be located within or close to the Power Generation Plant. The peat deposits are characterised as being of Low sensitivity due to their limited spatial extent (pockets located north east of the Generating Equipment Site and to the north west of Abergelli Farm).

10.7.8 The interaction of the Project with the peat is likely to be minimal. The volume of peat affected will be determined through the completion of the peat survey and ground investigation and therefore cannot be currently assessed as the thickness of the unit is unknown but likely to variable. The area of mapped peat within the Project Site is ~2.3 ha compared to the total area of the mapped deposit of ~7.4 ha that extends beyond the Project Site Boundary. The magnitude of the impact is therefore considered to be low and the significance of the effects is therefore **Minor** which is not significant.

Agricultural Land

10.7.9 There will be a direct, permanent (for the duration of the Project) local loss of approximately 3 ha of Grade 4 agricultural land in the area of the Generating Equipment Site. Grade 4 land is defined as land with severe limitations which significantly restrict the range of crops and / or level of yield and therefore the sensitivity of this receptor is considered to be negligible. While there will be sterilisation of the receptor under the Project structures, this is over a relatively small area of the Project Site. Therefore the magnitude is assessed as negligible and the significance of the effects also considered to be **Negligible** which is not significant.

Structures

10.7.10 There is high potential for the ground beneath the structures to become unstable from previous mining activities, ground workings, and compressible ground (in particular the peat deposits where directly impacted). The sensitivity of the receptor is considered to be high as these effects can lead to loss or damage to plant and structures. A comprehensive ground investigation will be undertaken prior to construction (as per a DCO Requirement) which will inform the foundation design and any remediation required to be undertaken as standard and as required as part of the embedded mitigation for the Project. Once the embedded mitigation has been taken into account, the magnitude of effect is considered to be negligible. The significance of the effects has therefore been assessed as **Minor** adverse which is not significant.

Controlled Waters

10.7.11 Piling is anticipated to be the realistic worst case scenario required as part of the construction works. There is potential for the quality of the groundwater present in the Secondary A superficial and bedrock aquifers to be impacted by the piling process producing additional pollutant migration pathways for contaminated shallow groundwater or surface waters to impact deeper aquifer groundwater. The sensitivity of the groundwater is assessed as high due to the Secondary Aquifer designation and the presence of water abstractions and private water supplies. Once the embedded mitigation such as pollution control measures have been taken into account, the magnitude of effect is considered to be negligible. The significance of the effects has therefore been assessed as **Minor** adverse which is not significant.

10.7.12 The depth to and extent of coal workings is currently unconfirmed and therefore it is currently not assessed as to whether the proposed piles will intercept worked or unworked coal measures or will be founded in strata not affected by the zone of influence of mine workings. If grouting is required as part of remediation/stabilisation of mine workings this could also have an impact upon groundwater quality. However potential effects would be mitigated by the CEMP and are likely to be short term in duration once the grout has set and no bleed water is present to leach into the surrounding strata.

10.7.13 There is potential for the introduction of contaminated material to enter the ground or controlled waters during the construction phase of the Power Generation Plant. This may occur due to incorrect storage/transport/use of materials such as fuels, oils and chemicals. The pollutants from the spill/leak could infiltrate into the ground, contaminating soils and / or groundwater, or run off directly into surface water bodies. The sensitivity of the groundwater is assessed as high due to the Secondary Aquifer designation and the presence of water abstractions and private water supplies. The magnitude of this effect is however assessed as negligible once embedded mitigation measures have been taken into account such as pollution control measures. The significance of the effects considered to be **Minor** adverse which is not significant.

Human Health: Construction Workers

10.7.14 The construction workers are considered to have high sensitivity as construction groundworks will be required and as such the workforce may be in direct contact with soil and groundwater. Contamination within soils (the presence of which is to be confirmed during the ground investigation) has the potential to affect the health of construction workers adversely. Any ground disturbance has the potential to cause temporary, moderate adverse effect to health arising from oral, inhalation or dermal contact with potential contaminants including potential sheep dips, use of fertilisers, ground gas/landfill gas/mine gas or mine water during construction. However once embedded mitigation measures detailed in the CEMP are taken into account, the magnitude of this effect is assessed as negligible. The significance of the effects considered to be **Minor** adverse which is not significant.

ii. Gas Connection

10.7.15 The Gas Connection will be in the form of a new above ground installation (AGI) and the Gas Pipeline, which will be approximately 1.4 km in length.

Geology and Soils: Sand and Gravel Reserves

10.7.16 Should ground investigation works demonstrate that there is sand and gravel reserves at the depth of the Gas Connection works, there will be a permanent sterilisation of potential sand and gravel reserves along the Gas Connection where the pipe laying activities are expected to occur. The sand and gravels reserves are considered to be of low sensitivity due to minimal economic use. The magnitude of the impact is assessed as low, as while there will be permanent (for the duration of the Project) sterilisation of the reserves, a relatively small area of the reserves will be affected compared to the full extent. The significance of the effects is therefore considered to be **Minor** adverse which is not significant.

10.7.17 Sand and gravel reserves were not identified within the AGI area on the UDP Proposals Map (shown in Figure 10.1).

Geology and Soils: Coal Reserves

10.7.18 The UDP Proposals Map indicates that coal reserves are present underlying the Gas Connection (including AGI), shown in Figure 10.1. Should the ground investigation works demonstrate that coal reserves will be directly affected by the depth of the Gas Connection; there will be permanent sterilisation on future coal extraction along the Gas Pipeline route. The coal reserves are considered to be of low sensitivity due to minimal economic use. The magnitude of the impact is assessed as low, as while there will be permanent constraint on future extraction, a relatively small area of the coal reserves will be affected compared to the full extent. The significance of the effects is therefore considered to be **Minor** adverse which is not significant.

10.7.19 Coal reserves were not identified within the AGI area on the UDP Proposals Map (shown in Figure 10.1).

Agricultural Land

10.7.20 The construction phase associated with the Gas Connection will be a corridor with a working width of 50 m to 200 m wide and result in a temporary sterilisation of Grade 4 agricultural land during the construction period. Grade 4 land is defined as land with severe limitations which significantly restrict the range of crops and / or level of yield and therefore the sensitivity of this receptor is considered to be negligible. While there will be sterilisation of the receptor over a relatively small area of the Project Site and therefore the magnitude is assessed as negligible and the significance of the effects also considered to be **Negligible** which is not significant.

10.7.21 The Above Ground Installation (AGI) will be approximately 2,975 m^2, and result in the localised, permanent sterilisation of poor quality agricultural land. Grade 4 land is defined as land with severe limitations which significantly restrict the range of

crops and / or level of yield and therefore the sensitivity of this receptor is considered to be negligible. While there will be sterilisation of the receptor, it will only be over a relatively small area of the Project Site and therefore the magnitude is assessed as negligible and the significance of the effects also considered to be **Negligible** which is not significant.

iii. Electrical Connection

10.7.22 The Electrical Connection will involve short sections of open cut trench at either end of the access road and the installation of cable ducts. The baseline conditions and receptors are the same to that of the Power Generation Plant and Gas Connection (described above). The Electrical Connection also coincides with the Access Road for approximately 500 m which extends to the Substation.

Geology and Soils: Sand and Gravel Reserves

10.7.23 The Electrical Connection will be routed adjacent to the Felindre Gas Compressor Station and the Substation, and adjacent to the Access Road. Therefore the land is already sterilised in this area. The sand and gravels reserves are considered to be of low sensitivity due to minimal economic use. The magnitude of the impact is assessed as low, as while there will be permanent sterilisation of the reserves, a relatively small area of the reserves will be affected compared to the full extent. The significance of the effects is therefore considered to be **Minor** adverse which is not significant.

Geology and Soils: Coal Reserves

10.7.24 The Electrical Connection will be routed adjacent to Felindre Gas Compressor Station and the Substation and adjacent to the Access Road, where the land is already sterilised in this area. The coal reserves are considered to be of low sensitivity due to minimal economic use. The magnitude of the impact is assessed as low, as while there will be permanent constraint on future extraction, a relatively small area of the coal reserves will be affected compared to the full extent. The significance of the effects is therefore considered to be **Minor** adverse which is not significant.

Agricultural Land

10.7.25 The construction works associated with the Electrical Connection will result in the direct, local and permanent sterilisation of agricultural land. However, the route will be result in the permanent loss of approximately 0.33 ha of agricultural land. As above, the sensitivity of the agricultural land is considered to be negligible and the magnitude also negligible due to the limited extent of the impact. The significance of effect is therefore considered to be **Negligible** which is not significant.

iv. Project

10.7.26 Overall, it is considered that the construction phase of the Project will have a localised, minor adverse significance of effect on mineral resources (sand and gravel reserves) but a negligible effect on peat deposits and agricultural land. Effects on controlled waters, structures and human health have been assessed that

Minor adverse significance. The significance of effect is not considered to be significant.

Table 10-12: Summary of Potential Impacts during the Construction Phase

Receptor	Receptor Sensitivity	Type of Effect	Magnitude	Assessment of significance (pre- mitigation)
Power Generation Plant				
Mineral resources – sand and gravel reserves	Low	Sterilisation of available mineral deposits for extraction.	Low	Minor Adverse Local spatial extent Direct. Permanent
Mineral resources – coal reserves	Low	Permanent constraint on future extraction.	Low	Minor Adverse Local spatial extent Direct. Permanent
Peat deposits	Low	Loss of peat habitat.	Negligible	Negligible
Agricultural land	Negligible	Sterilisation of Grade 4 agricultural land	Negligible	Negligible
Structures (Potential injuries / fatalities, loss or damage to Plant and Structures)	High	Unstable ground from previous mining activities/ workings/ compressible ground	Negligible	Minor Adverse Local spatial extent Direct. Permanent
Controlled Waters	High	Impact to groundwater quality, from creating migration pathways for potentially contaminated soils and groundwater through the piling process	Negligible	Minor Adverse Local spatial extent Direct. Permanent
Quality of land and / or Controlled waters	High	Incorrect storage / transport / use of materials leading to spills/leaks contaminating soils, groundwater or surface waters	Negligible	Minor Adverse Local spatial extent Direct. Permanent
Human health: Construction Workers	High	Disturbance and mobilisation of potentially contaminated soils, groundwater, ground gas impacting on human health, ground instability	Negligible	Minor Adverse Local extent Direct. Temporary

Receptor	Receptor Sensitivity	Type of Effect	Magnitude	Assessment of significance (pre- mitigation)
Gas Connection				
Mineral resources – sand and gravel reserves	Low	Sterilisation of available mineral deposits for extraction.	Low	Minor Adverse Local spatial extent Direct. Permanent No mapped reserves - AGI
Mineral resources – coal reserves	Low	Sterilisation of available mineral deposits for extraction.	Low	Minor Adverse Local spatial extent Direct. Permanent No mapped reserves - AGI
Agricultural land	Negligible	Sterilisation of Grade 4 agricultural land	Negligible	Negligible
Electrical Connection				
Mineral resources – sand and gravel reserves	Low	Sterilisation of available mineral deposits for extraction.	Low	Minor Adverse Local spatial extent Direct. Permanent No mapped reserves - AGI
Mineral resources – coal reserves	Low	Sterilisation of available mineral deposits for extraction.	Low	Minor Adverse Local spatial extent Direct. Permanent No mapped reserves - AGI
Agricultural land	Negligible	Sterilisation of Grade 4 agricultural land	Negligible	Negligible
Project				
Ground conditions (mineral resources)	Low	Sterilisation of future mineral resources and permanent constraint on future extraction	Low	Minor Adverse Local spatial extent

Receptor	Receptor Sensitivity	Type of Effect	Magnitude	Assessment of significance (pre- mitigation)
				Direct. Permanent
Ground conditions (peat and agricultural land)	Negligible	Sterilisation of agricultural land and loss of peat habitat	Negligible	Negligible
Controlled waters, structures and human health	High	Unstable ground, impacts to human health and controlled waters	Negligible	Minor Adverse Local extent Direct. Temporary to permanent

b) Operation and Maintenance

10.7.27 Potential impacts during the operational phase of the Project (including expected maintenance activities) are detailed below.

i. Power Generation Plant

Geology and Soil - Sand and Gravel, Coal and Peat Reserves and Agricultural Land

10.7.28 The geology and soils are considered to be of low sensitivity and the magnitude of the impact is therefore considered to be low, Operation and maintenance is anticipated to have a **Minor** adverse significance of effect on the geology and soils present on the Power Generation Plant as the potential impact would have occurred during the construction phase which is not significant.

Structures

10.7.29 Previously unstable land will be directly stabilised during the construction works. The sensitivity of the structures is assessed high as the effect of unstable land can lead to loss or damage to operational plant and structures. Once embedded mitigation measures have been taken into account the magnitude of effect is considered to be negligible. The significance of the effects has therefore been assessed as **Minor** beneficial which is not significant.

10.7.30 There is potential for long term chemical attack on the foundations of the structures. Chemical compounds such as sulphate and pH levels in natural ground or polluted ground can cause damage to foundations and other sub surface structures. The sensitivity of the structures is assessed as high as the receptor has low ability to absorb change without fundamentally altering its character. Once embedded mitigation measures are taken into account the magnitude of the effect is assessed as negligible. The significance of the effect has been assessed as **Minor** adverse which is not significant.

Land and/or Controlled Waters

10.7.31 There is potential for the accidental release of stored fuels and chemicals directly affecting localised areas of the land or groundwater quality, during the operation and maintenance phase of the Project. These pollution incidents may occur due to incorrect storage / transport / use of materials such as fuels, oils and chemicals. With containment in place, any accidents may result in the containment system being affected and a greater risk of measures being defeated. The sensitivity of the groundwater is assessed as high due to the Secondary Aquifer designation and the presence of water abstractions and private water supplies. Once the embedded mitigation such as pollution control measures has been taken into account, the magnitude of effect is considered to be negligible. The significance of the effects has therefore been assessed as **Minor** adverse which is not significant.

Human Health: Site Workers

10.7.32 There are no potential human health pollutant linkages anticipated to remain during the operational phase or during maintenance as it is assumed that the design of the Project will embed suitable mitigation for the protection of human health. The sensitivity of the site workers is assessed as high. However once embedded mitigation measures detailed in the CEMP are taken into account it is considered to have a negligible magnitude. The resulting **Minor** effect is considered to be not significant in EIA terms.

ii. Gas Connection

Geology and Soil - Sand and Gravel, Coal and Peat Reserves and Agricultural Land

10.7.33 The geology and soils are considered to be of low sensitivity and the magnitude of the impact is therefore considered to be low, Operation and maintenance is anticipated to have a **Minor** adverse effect on the geology and soils present at the Gas Connection as the potential impact would have occurred during the construction phase which is not significant.

Structures

10.7.34 There is potential for long term chemical attack on the Gas Pipeline during the operational phase of the Project. Chemical compounds such as sulphate and pH levels in natural ground or polluted ground can cause damage to sub surface structures. The sensitivity of the structures is assessed as high as the receptor has low ability to absorb change without fundamentally altering its character. Once the embedded mitigation has been taken into account, the magnitude of effect is considered to be negligible. The significance of the effects has therefore been assessed as **Minor** adverse which is not significant.

Controlled Waters

10.7.35 Operation and maintenance of the Project is anticipated to have a **Minor** adverse effect on the controlled waters as while the potential impact would have occurred during the construction phase, the sensitivity of the receptor remains high although the magnitude is considered to be negligible. This is not significant.

Human Health: Site Workers

10.7.36 During the operation and maintenance of the Project it is anticipated that, while the sensitivity of the receptor is high, the magnitude is considered to be negligible as the potential impact would have occurred during the construction phase. The significance of the effects has therefore been assessed as **Minor** adverse which is not significant.

iii. Electrical Connection

Geology and Soil - Sand and Gravel, Coal and Peat Reserves and Agricultural Land

10.7.37 The geology and soils are considered to be of low sensitivity and the magnitude of the impact is therefore considered to be low. Operation and maintenance is anticipated to have a **Minor** adverse effect on the geology and soils present at the Electrical Connection as the potential impact would have occurred during the construction phase which is not significant.

Structures

10.7.38 There is potential for long term chemical attack on the underground cable ducts during the operational phase of the Project. Chemical compounds such as sulphate and pH levels in natural ground or polluted ground can cause damage to sub surface structures. The sensitivity of the structures is assessed as high as the receptor has low ability to absorb change without fundamentally altering its character. Once the embedded mitigation has been taken into account, the magnitude of effect is considered to be negligible. The significance of the effects has therefore been assessed as **Minor** adverse which is not significant.

Controlled Waters

10.7.39 During the operation and maintenance of the Project it is anticipated that, while the sensitivity of the receptor is high, the magnitude is considered to be negligible as the potential impact would have occurred during the construction phase. The significance of the effects on controlled waters has therefore been assessed as **Minor** adverse which is not significant.

Human Health: Site Workers

10.7.40 During the operation and maintenance of the Project it is anticipated that, while the sensitivity of the receptor is high, the magnitude is considered to be negligible as the potential impact would have occurred during the construction phase. The significance of the effects on human health has therefore been assessed as **Minor** adverse which is not significant.

iv. Project

10.7.41 Overall, it is considered that the operational phase and maintenance of the Project will have a localised, **Minor** adverse significance of effect on mineral resources (sand, gravel and reserves), peat deposits and agricultural land. Stability effects on structures have been assessed as **Minor** beneficial and effects on controlled waters, structures and human health have been assessed as **Minor** adverse significance.

Table 10-13: Summary of Potential Impacts during the Operation Phases of the Project

Receptor	Receptor Sensitivity	Type of Effect	Magnitude	Classification of effect (pre-mitigation)
Power Generation Plant				
Geology and Soil - sand and gravel, coal and peat reserves and agricultural land	Medium	Sterilisation of available mineral deposits for extraction and agricultural land.	Negligible	Minor Adverse Local spatial extent Direct. Permanent
Structures (Potential injuries / fatalities, loss or damage to Plant and Structures)	High	Stabilisation of previously unstable ground from previous mining activities /workings / compressible ground conditions	Negligible	Minor Beneficial Local Extent Direct. Permanent
End structure	High	Chemical attack on foundations and other subsurface structures	Negligible	Minor Adverse Local Extent Direct. Temporary
Quality of land and or Controlled waters	High	Incorrect storage / transport / use of materials leading to spills / leaks contaminating soils, groundwater or surface waters	Negligible	Minor Adverse Local Extent Direct. Temporary
Human health: Site workers	High	N/A	Negligible	Minor Adverse Local extent Direct. Temporary
Gas Connection				
Geology and Soil - sand and gravel, coal and peat reserves and agricultural land	Medium	Sterilisation of available mineral deposits for extraction and agricultural land.	Negligible	Minor Adverse Local spatial extent Direct. Permanent
End structure	High	Chemical attack on Gas Pipeline.	Negligible	Minor Adverse

Receptor	Receptor Sensitivity	Type of Effect	Magnitude	Classification of effect (pre-mitigation)
				Local Extent Direct. Temporary
Controlled waters	High	Incorrect storage / transport / use of materials leading to spills / leaks contaminating soils, groundwater or surface waters	Negligible	Minor Adverse Local Extent Direct. Temporary
Human health: Site workers	High	N/A	Negligible	Minor Adverse Local extent Direct. Temporary
Electrical Connection				
Geology and Soil - sand and gravel, coal and peat reserves and agricultural land	Medium	Sterilisation of available mineral deposits for extraction and agricultural land.	Negligible	Minor Adverse Local spatial extent Direct. Permanent
End structure	High	Chemical attack on underground Gas Pipeline	Negligible	Minor Adverse Local Extent Direct. Temporary
Controlled waters	High	Incorrect storage / transport / use of materials leading to spills / leaks contaminating soils, groundwater or surface waters	Negligible	Minor Adverse Local Extent Direct. Temporary
Human health: Site workers	High	N/A	Negligible	Minor Adverse Local extent Direct. Temporary
Project				
Geology and Soil -	Medium	Sterilisation of available mineral	Negligible	Minor Adverse

Receptor	Receptor Sensitivity	Type of Effect	Magnitude	Classification of effect (pre-mitigation)
sand and gravel, coal and peat reserves and agricultural land		deposits for extraction and agricultural land.		Local spatial extent Direct. Permanent
Structures (Potential injuries / fatalities, loss or damage to Plant and Structures)	High	Stabilisation of previously unstable ground from previous mining activities /workings / compressible ground conditions	Negligible	Minor Beneficial Local Extent Direct. Permanent
Controlled waters, structures and human health	High	Chemical attack, impacts to human health and controlled waters	Negligible	Minor Adverse Local Extent Direct. Temporary

c) Decommissioning

i. Power Generation Plant

Geology and Soil

10.7.42 The Power Generation Plant will be returned to a pre-construction condition. The potential mineral reserves underlying the Power Generation Plant that may have been sterilised during the construction and operation phases of the Project may become available again. The geology and soils are considered to be of low sensitivity and the magnitude of the impact is therefore considered to be low, The significance of the effect is therefore considered to be **Minor** adverse which is not significant.

10.7.43 If mine workings are stabilised as part of the pre-construction works, the land will be returned to a better than baseline condition which will enable future development. The coal reserves are considered to be of low sensitivity due to minimal economic use however the magnitude of the impact is assessed as high, as the baseline has fundamentally been changed. The significance of the effect is therefore considered to be **Moderate** beneficial which is significant.

Agricultural Land

10.7.44 The Power Generation Plant will be returned to a pre-construction condition. Therefore the land will become available for potential agricultural use once again. The sensitivity of the agricultural land is considered negligible due to the low quality nature of the land and the magnitude considered to be low due to the permanent loss of surface soils. This is anticipated to result in a **Negligible** effect which is not significant.

Controlled Waters

10.7.45 If piled foundations are used, these will likely be retained in the ground following decommissioning of the Power Generation Plant as this would create less direct disturbance to the groundwater regime and ground conditions. The sensitivity of the groundwater is assessed as high due to the Secondary Aquifer designation and the presence of water abstractions and private water supplies. The magnitude of this effect is however assessed as negligible as there will only be a minor shift from baseline conditions. The significance of the effects considered to be **Minor** adverse which is not significant.

10.7.46 There is potential for the accidental release of stored fuels and chemicals directly affecting localised areas of the land or groundwater quality, during the decommissioning of the Project. These pollution incidents may occur due to incorrect storage / transport / use of materials such as fuels, oils and chemicals. With containment in place, any accidents may result in the containment system being affected and a greater risk of measures being defeated. The sensitivity of the groundwater is assessed as high due to the Secondary Aquifer designation and the presence of water abstractions and private water supplies. Once the embedded mitigation such as pollution control measures has been taken into account, the

magnitude of effect is considered to be negligible. The significance of the effects has therefore been assessed as **Minor** adverse which is not significant.

Human Health: Demolition Workers

10.7.47 The demolition workers are considered to have high sensitivity as groundworks will be required during demolition and as such the workforce may be in direct contact with soil and groundwater. The construction phase of the project is likely to have addressed any contamination issues within soils which would have the potential to affect the health of demolition workers adversely and once embedded mitigation measures detailed in the CEMP are taken into account it is considered to have a **Minor** adverse effect which is considered to be not significant.

ii. Gas Connection

10.7.48 The decommissioning works associated with the Gas Connection will include the Gas Pipeline being capped and left in situ. The AGI will be removed and land will be returned to a pre-construction condition.

Geology and Soil - Sand and Gravel, Coal and Peat Reserves

10.7.49 The Gas Pipeline is to be left in situ and a narrow strip of land and potentially any easement permanently sterilised until it is removed for any future development. The sand, gravel and coal reserves are considered to be of low sensitivity due to minimal economic use. The magnitude of the impact is assessed as low, as while there will be permanent constraint on future extraction, a relatively small area of the mineral reserves will be affected compared to the full extent. The significance of the effects is therefore considered to be **Minor** adverse which is not significant.

10.7.50 The decommissioning of the AGI is anticipated to make potential mineral reserves that may have been sterilised during the construction and operation phases of the Project become available again. The sand, gravel and coal reserves are considered to be of low sensitivity due to minimal economic use. The magnitude of the impact is assessed as low, as the underlying composition of the mineral reserves will be similar to the pre-development situation. The significance of the effect is therefore considered to be **Minor** adverse which is not significant.

Agricultural Land

10.7.51 The Gas Connection will be left in situ and the narrow strip of land therefore permanently sterilised until it is removed for any future development. The AGI land area will be returned to a pre-construction condition. Therefore the land will become available for agricultural use once again. The sensitivity of the agricultural land is considered low, as while there will be permanent constraint on future agricultural only a relatively small area will be affected and the land is considered to be low quality in nature. The magnitude considered low due to the permanent loss of low quality surface soils. This is anticipated to result in a **Minor** adverse effect which is not significant.

Controlled Waters

10.7.52 There is potential for the accidental release of stored fuels and chemicals directly affecting localised areas of the land or groundwater quality, during the decommissioning of the Project. These pollution incidents may occur due to incorrect storage / transport / use of materials such as fuels, oils and chemicals. With containment in place, any accidents may result in the containment system being affected and a greater risk of measures being defeated. The sensitivity of the groundwater is assessed as high due to the Secondary Aquifer designation and the presence of water abstractions and private water supplies. Once the embedded mitigation such as pollution control measures has been taken into account, the magnitude of effect is considered to be negligible. The significance of the effects has therefore been assessed as **Minor** adverse which is not significant.

Human Health: Demolition Workers

10.7.53 The demolition workers are considered to have high sensitivity as groundworks will be required during demolition and as such the workforce may be in direct contact with soil and groundwater. The construction phase of the project is likely to have addressed any contamination issues within soils which would have the potential to affect the health of demolition workers adversely and once embedded mitigation measures detailed in the CEMP are taken into account it is considered to have a negligible magnitude of effect. The significance of the effects has therefore been assessed as **Minor** adverse which is not significant.

iii. Electrical Connection

Geology and Soil - Sand and Gravel, Coal and Peat Reserves

10.7.54 The decommissioning works will include the Electrical Connection being capped and left in situ and the narrow strip of land and potentially an easement therefore permanently sterilised until it is removed for any future development. The sand, gravel and coal reserves are considered to be of low sensitivity due to minimal economic use. The magnitude of the impact is assessed as low, as while there will be permanent constraint on future extraction, a relatively small area of the mineral reserves will be affected compared to the full extent. The significance of the effects is therefore considered to be **Minor** adverse which is not significant.

Agricultural Land

10.7.55 The Electrical Connection will be left in situ therefore the land will become available for agricultural use once again. There is anticipated to be permanent sterilisation of narrow strip of land directly over the cable and any potential easement. The sensitivity of the agricultural land is considered negligible due to the low quality nature of the land and the magnitude considered to be low due to the permanent loss of low quality surface soils. This is anticipated to result in a **Negligible** effect which is not significant.

Controlled Waters

10.7.56 There is potential for the accidental release of stored fuels and chemicals directly affecting localised areas of the land or groundwater quality, during the decommissioning of the Project. These pollution incidents may occur due to incorrect storage / transport / use of materials such as fuels, oils and chemicals. With containment in place, any accidents may result in the containment system being affected and a greater risk of measures being defeated. The sensitivity of the groundwater is assessed as high due to the Secondary Aquifer designation and the presence of water abstractions and private water supplies. Once the embedded mitigation such as pollution control measures has been taken into account, the magnitude of effect is considered to be negligible. The significance of the effects has therefore been assessed as **Minor** adverse which is not significant.

Human Health: Demolition Workers

10.7.57 The demolition workers are considered to have high sensitivity as groundworks will be required during demolition and as such the workforce may be in direct contact with soil and groundwater. The construction phase of the project is likely to have addressed any contamination issues within soils which would have the potential to affect the health of demolition workers adversely and once embedded mitigation measures detailed in the CEMP are taken into account it is considered to have a negligible magnitude of effect. The significance of the effects has therefore been assessed as **Minor** adverse which is not significant.

iv. Project

10.7.58 Overall, it is considered that the decommissioning phase of the Project will have a localised, Minor adverse significance of effect on mineral resources (sand, gravel and reserves), peat deposits and agricultural land. Stability effects on structures have been assessed as moderate beneficial and effects on controlled waters and human health from contamination have been assessed as **Minor** adverse significance.

Table 10-14: Summary of Potential Impacts Following Decommissioning

Receptor	Receptor Sensitivity	Type of Effect	Magnitude	Classification of effect (pre- mitigation)
Power Generation Plant				
Mineral resources – sand, gravel and coal reserves	Low	Previously sterilised mineral reserves will become available again for extraction if all development is decommissioned to preconstruction condition.	Low	Minor Adverse Local spatial extent Direct. Permanent
	Low	The Gas Connection and Electrical Connection are to be left insitu following decommissioning permanently sterilising a thin strip of land.	Low	Minor Adverse Local spatial extent Direct. Permanent
	Low	If mine workings are stabilised as part of pre-construction works land will be returned to better than baseline condition.	High	Moderate beneficial Local extent Direct. Permanent
Agricultural land	Low	Previously sterilised Grade 4 agricultural land will become available again for use.	Low	Minor Adverse Local extent Direct. Permanent
Controlled waters	High	If piles are used, they will likely be retained to create less direct disturbance.	Negligible	Minor adverse Local extent Direct. Permanent
	High	Incorrect storage / transport / use of materials leading to spills / leaks contaminating soils, groundwater or surface waters.	Negligible	Minor Adverse Local extent Direct. Temporary
Human Health: Demolition Workers	High	Disturbance and mobilisation of potentially contaminated soils, groundwater, ground gas impacting on human health, ground instability.	Negligible	Minor Adverse Local extent Direct. Temporary

Receptor	Receptor Sensitivity	Type of Effect	Magnitude	Classification of effect (pre- mitigation)
Gas Connection				
Mineral resources – sand, gravel and coal reserves	Low	The Gas Pipeline to be capped and left in-situ. Permanent sterilisation of narrow strip of land and potential easement.	Low	Minor Adverse Local extent Direct. Permanent
Agricultural Land	Low	Previously sterilised Grade 4 agricultural land available for use however permanent loss of surface soils.	Low	Minor Adverse Local extent Direct. Permanent
Controlled Waters	High	Incorrect storage / transport / use of materials leading to spills / leaks contaminating soils, groundwater or surface waters.	Negligible	Minor Adverse Local extent Direct. Temporary
Human Health: Demolition Workers	High	Disturbance and mobilisation of potentially contaminated soils, groundwater, ground gas impacting on human health, ground instability.	Negligible	Minor Adverse Local extent Direct. Temporary
Electrical Connection				
Mineral resources – sand, gravel and coal reserves	Low	Electrical Connection to be capped and left in-situ. Permanent sterilisation of narrow strip of land and potential easement.	Low	Minor Adverse Local extent Direct. Permanent
Agricultural Land	Low	Previously sterilised Grade 4 agricultural land available for use however permanent loss of surface soils.	Low	Minor Adverse Local extent Direct. Permanent
Controlled Waters	High	Incorrect storage / transport / use of materials leading to spills / leaks contaminating soils, groundwater or surface waters.	Negligible	Minor Adverse Local extent Direct. Temporary

Receptor	Receptor Sensitivity	Type of Effect	Magnitude	Classification of effect (pre- mitigation)
Human Health: Demolition Workers	High	Disturbance and mobilisation of potentially contaminated soils, groundwater, ground gas impacting on human health, ground instability.	Negligible	Minor Adverse Local extent Direct. Temporary
Project				
Geology and soils - sand, gravel and coal reserves and agricultural land	Low	Previously sterilised agricultural land and future mineral resources becoming available again.	Low	Minor Adverse Local spatial extent Direct. Permanent
Mineral resources – coal reserves	Low	Land is stabilised as part of pre-construction works.	High	Moderate beneficial Local extent Direct. Permanent
Controlled waters and human health	High	Impacts to human health and controlled waters from contamination.	Negligible	Minor Adverse Local extent Direct. Permanent to Temporary

10.8 Additional Mitigation Measures

10.8.1 As a general rule, additional mitigation measures are proposed where a significant effect is predicted to occur. Embedded mitigation measures, which have been incorporated within the design of the Project or are standard practice measures that have been committed to are summarised in **Chapter 3: Project and Site Description** and have been taken account of in the assessment described above. These include the ground investigation which is expected to be undertaken post-consent and as required by a DCO Requirement.

10.8.2 This assessment did not identify any significant effects to Geology Ground Conditions and Hydrogeology receptors during construction, operation and decommissioning of the Project. No additional mitigation or monitoring is therefore deemed necessary.

10.9 Residual Effects

10.9.1 There were no significant effects identified during the life cycle of the Power Generation Plant, Gas Connection, Electrical Connection, or the Project. Therefore, there are no residual effects identified and therefore no additional mitigation measures were deemed necessary.

10.10 Cumulative Effects

10.10.1 It is considered that there is no potential for cumulative impacts on geology, ground conditions and hydrogeology receptors as a result of construction, operation and maintenance or decommissioning of the Project in combination with other schemes for the following reasons:

- Solar park developments such as Abergelli Solar Farm and Brynwhilach Solar Park would not impact significantly on the geology and hydrogeology of the Project Site as it is understood there would be limited excavation works for the construction of those projects. The identified potential impacts on the geology and hydrogeology of the Project would comprise accidental pollution incidents during the construction phase. This would not have a cumulative effect with the other projects.
- Based on information available at this time, it is anticipated that the planning applications for the sustainable urban village at Felindre, and Felindre Business Park will not have an impact on geology and hydrogeology such that a cumulative impact would occur alongside the Project's impacts; and
- The development of the Project or other planned developments within the area are not anticipated to have any cumulative effects as they will not likely create a larger contamination or ground instability impact than the individual projects taken in isolation. In addition, none of the planned developments will remove large amounts of good quality agricultural land or sites of important geology.

10.11 References

Ref. 10.1 Parson Brinckerhoff. Preliminary Geo-Environmental Risk Assessment. March 2014

Ref. 10.2 Directive 2010/75/EU on industrial emissions (integrated pollution prevention and control)

Ref. 10.3 Directive 2000/60/EC Water Framework Directive

Ref. 10.4 Directive 2006/118/EC Groundwater Framework Directive.

Ref. 10.5 Decision No. 1386/2013/EU. General Union Environment Action Programme to 2020 'Living well, within the limits of our planet'. November 2013

Ref. 10.6 Department of Energy and Climate Change. Overarching National Policy Statement for Energy (EN1). July 2011.

Ref. 10.7 Department of Energy and Climate Change. National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4). July 2011.

Ref. 10.8 Department of Energy and Climate Change. National Policy Statement for Electricity Networks Infrastructure (EN-5). July 2011

Ref. 10.9 Environmental Protection Act 1990, Part 2A (Contaminated Land).

Ref. 10.10 Environment Agency. Model Procedures for the Management of Land Contamination (Contaminated Land Report 11 (CLR11)). 2004

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Ref. 10.13 CIRIA. Control of water pollution from construction sites (C532). 2001

Ref. 10.14 CIRIA. The SuDS (Sustainable Urban Drainage Systems) manual (C753). 2015.

Ref. 10.15 CIRIA. The SuDS manual (C697). 2007

Ref. 10.16 CIRIA. Environmental good practice on site guide (C741). 2015

Ref. 10.17 CIRIA. Assessing risks posed by hazardous ground gases to buildings (C665). 2007

Ref. 10.18 CIRIA. Contaminated land risk assessment - a guide to good practice (C552). 2001.

Ref. 10.19 Welsh Government. Planning Policy Wales. Edition 9, November 2016.

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Ref. 10.21 City and County of Swansea. Unitary Development Plan (UDP) Proposals Map. November 2008. (Online) Available from URL address: http://swansea.devplan.org.uk/map.aspx?map=41&layers=all (accessed October 2017)

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Ref. 10.24 The Planning Inspectorate. Scoping Opinion Proposed Abergelli Power Project. August 2014

Ref. 10.25 British Geological Survey. Digital Geological map of Great Britain at 1:50,000 scale. (Online) Available from URL address: www.bgs.ac.uk/geoindex (accessed October 2017)

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Chapter 11

Landscape and Visual Effects

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11. Landscape and Visual

11.1 Introduction

11.1.1 This chapter provides an assessment of the likely significant Landscape and Visual effects arising from construction, operation and decommissioning of the Project as part of this ES.

11.1.2 A detailed description of the Project Site and the Project is provided in **Chapter 3: Project and Site Description**. A glossary of terms and list of abbreviations used in this chapter is provided in **Document Reference 1.4.**

11.1.3 Landscape and visual effects are interrelated with other environmental effects but are assessed separately. Whilst elements of the landscape, such as Listed Buildings or ecologically designated areas, are important elements of the landscape and contribute to its character and influence its quality and value, assessment of the significance of effects on these features is considered in **Chapter 8: Ecology**, **Chapter 13: Historic Environment** and **Chapter 14: Socio-economics**.

11.1.4 This chapter is supported by the following technical appendices presented in:

- Appendix 11.1: LANDMAP Aspect Data;
- Appendix 11.2: Landscape Assessment; and
- Appendix 11.3: Visual Assessment.

a) Objectives of the assessment

11.1.5 The LVIA considers how the Project may have an effect upon landscape character and visual amenity. It considers how:

- Landscape effects associated with a development relate to change to the fabric, character and quality of the landscape resource and how it is experienced; and
- Visual effects relate closely to landscape effects but also concern changes in views as visual assessment is also concerned with people's perception and response to changes in visual amenity.

11.2 Changes since the 2014 PEIR

11.2.1 There have been changes to the Project design as a result of design evolution and consultation as detailed in **Chapter 3: Project and Site Description**. To aid the reader, Table 11-1 outlines the changes to this assessment compared with the Landscape and Visual section of the 2014 PEIR and 2018 PEIR.

Table 111-1: Summary of changes since the 2014 PEIR to the Landscape and Visual Assessment

Section	Changes since the 2014 PEIR	Section Reference
Methodology	The detail contained in the methodology including the criteria for sensitivity, magnitude and significance varies between the 2014 PEIR and the 2018 PEIR and ES, however both are in accordance with GLVIA3 and the differences reflect professional judgements on methodology. Viewpoint 10 has been replaced with Viewpoint 17 as the site visit in November 2017 revealed that foreground views now contain a solar farm and associated security fencing. The stack height has increased to 45 m in the 2018 PEIR; however the study area for visual amenity has remained the same in both the PEIRs at 15 km. This has been agreed through consultation.	Section 11.5, Methodology
Baseline	The baseline has changed since the 2014 PEIR, most notably with the construction of solar farms within the 5 km landscape study area. This was observed during the site visit in November 2017. Updated photography reflecting winter (March 2018) and summer (August/September 2017) seasonal variations have also been captured.	Section 11.6, Baseline
Significance of Effect	Effects are similar between the 2014 PEIR, 2018 PEIR and this ES with the same conclusions drawn on overall significance.	Section 11.7, Significance of Effect

11.3 Legislation, policy and guidance

11.3.1 This section identifies and describes legislation, policy and guidance of relevance to the assessment of the potential landscape and visual impacts associated with the Project.

11.3.2 Legislation and policy has been considered on an international, national, regional and local level. The following is considered to be relevant to the landscape and visual assessment as it has influenced the sensitivity of receptors and requirements for mitigation or the scope and/or methodology of the ES.

a) International

11.3.3 The European Landscape Convention (ELC) came into force on 1st March 2007 in the UK and is the first international convention to be exclusively devoted to all aspects of the landscape. Its purpose is to develop policies to the protection, management and planning of landscape and the integration into relevant policies, including cultural, heritage and economic policies. In 2008 the Council of Europe adopted guidelines for the implementation of the ELC. In delivering the outcomes of the ELC in the UK, a framework for Implementation in England has been drawn up (Integrating the European Landscape Convention: Part 1-3 Guidance (2009) (Ref.11.1)).

b) National

11.3.4 There are three NPSs that are relevant to the Project; the overarching NPS EN-1 covering all nationally important energy infrastructure and the technology specific NPS EN-2 for Fossil Fuel Electricity Generating Infrastructure and NPS EN-4 for Gas Supply Infrastructure and Gas Oil Pipelines.

i. Overarching National Policy Statement for Energy (NPS EN-1)

11.3.5 NPS EN-1 directs those deciding applications on what general policies and considerations they should assess with regards to an energy Nationally Significant Infrastructure Project (NSIP), such as the Project. Within, it recognises that NSIPs will have potential landscape and visual impacts, which is outlined in section 5.9 and the therefore the Applicant should "…*include the effects during construction of the project and the effects of the completed development and its operation on landscape components and landscape character. The assessment should include the visibility and conspicuousness of the project during construction and of the presence and operation of the project and potential impacts on views and visual amenity. This should include light pollution effects, including on local amenity, and nature conservation"*.

11.3.6 NPS EN-1 also recognises that the scale of development located outside the boundaries of national designated areas may have impacts as structures may be visible within such designated areas. It states that "*the aim should be to avoid compromising the purposes of designation and such projects should be designed sensitively given the various siting, operational, and other relevant constraints. … The fact that a proposed project will be visible from within a designated area should not in itself be a reason for refusing consent*."

11.3.7 In response to the potential landscape and visual impacts, NPS EN-1 has outlined guidance in terms of mitigation. It states “Within a defined site, adverse landscape and visual effects may be minimised through appropriate siting of infrastructure within that site, design including colours and materials, and landscaping schemes, depending on the size and type of the proposed project. Materials and designs of buildings should always be given consideration.”

ii. National Policy Statement for Fossil Fuel Electricity Generating Infrastructure (NPS EN-2)

11.3.8 The NPS EN-2 is to be read in conjunction with NPS EN-1, with EN-2 specifically covering gas fired infrastructure projects such as the Project. It recognises that applicants should demonstrate good design in respect to landscape and visual amenity set out in section 2.6 and detailed in EN-1. NPS EN-2 also requires the Applicant to have given considerations to the aesthetic design of a development, and siting of the development in the context of existing landscape, landform and vegetation.

iii. National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines (NPS EN-4)

11.3.9 The NPS EN-4 covers infrastructure involving underground gas pipelines, such as included in the Project. The potential landscape and visual impacts are outlined in section 2.14 of which it notes that pipeline construction can cause temporary landscape and visual impacts.

iv. National Policy Statement for Electricity Networks Infrastructure (NPS EN-5)

11.3.10 The NPS EN-5 covers infrastructure for electricity networks including transmission systems and the associated infrastructure such as substations. Section 2.8 identifies principles to be followed when designing the route of overhead line proposals including consideration of undergrounding lines where there is the potential for adverse landscape and visual effects.

v. Future Landscapes: Delivering for Wales

11.3.11 The Future Landscapes: Delivering for Wales was published in 2017 and provides an independent review of designated landscapes in Wales. The findings and recommendations contained in this report follow in the spirit of the Well-Being of Future Generations (Wales) Act 2015 and the Environment (Wales) Act 2016.

vi. Planning Policy Wales (Edition 9)

11.3.12 Planning Policy Wales (Edition 9, November 2016) (PPW) sets out the land use planning policies of the Welsh Government and is supplemented by topic based Technical Advice Notes (TANs).

11.3.13 TANs considered to be relevant to the landscape and visual resource include Technical Advisory Note 12: Design (TAN12) (2016).

11.3.14 TAN 12 provides advice on how developments should promote sustainability through good design. Specifically in relation to landscape, it states "*appraisal of the landscape should focus on its quality in terms of geology and geomorphology, vegetation and habitats, visual and sensory quality and historic and cultural quality*." It also provides design solutions and guidance to help promote sustainability in terms of landscape setting and local environment outlined in section 5.5.2 in the following terms: "*The aim should be to achieve good design solutions which maximise the natural landscape assets and minimise environmental impact on the landscape. It is particularly important that proposals to amend or create new landscape are not considered as an afterthought and that the long term impact of development on the landscape is fully understood*."

c) Local

11.3.15 The City and Council of Swansea Unitary Development Plan (UDP) was adopted on the 10th November 2008. It sets out a range of policies and proposals relating to future development and contains a number of policies which are relevant to the landscape and visual resource as follows:

- Policy EV1: Design – Outlines a number of objectives to achieve good design in all new developments such as "be appropriate to its local context in terms of scale, height, massing, elevational treatment, materials and detailing, layout, form, mix and density." Such developments should be sensitive to the county's unique settings and respect its surroundings.
- Policy EV2: Siting and Location – The policy recognises that new proposed developments must have regards to the physical character and topography of the site and its surroundings. It outlines guidance such as "*effectively integrating with the landscape, seascape or coastline by utilising topography to integrate into the contours of the site and avoiding conspicuous locations on prominent skylines and ridge*".
- Policy EV11: Historic Parks, Gardens and Landscapes – Insures that all new development will not harm registered historic parks and gardens and the character of the historic landscapes.
- Policy EV26: Areas of Outstanding Natural Beauty – Within the Gower AONB, the policy's objective is the conservation and enhancement of the area's beauty. Therefore, proposed development will not have adverse effect or impact on the area.
- Policy EV30: Trees, Woodland and Hedgerow Protection – The policy ensures the protection of existing woodland, trees and hedgerow.
- Policy EV32: Environment Enhancement – The policy recognises that new developments should be combined with improvements to the overall environmental quality, and to avoid significant adverse environmental impacts from the new development.

11.3.16 The Deposit Local Development Plan (LDP) was published for consultation between the 18th July and 31st August 2016. The deposit LDP presents the policies and proposals for managing the future growth and change that will occur within the City and County of Swansea. The LDP is not yet adopted and is not therefore part of the statutory development plan. As emerging policy, it cannot be afforded full weight. Please see **Chapter 2: Regulatory and Policy Background** for further detail. The policies relevant to the Landscape and Visual resource are as follows:

- ER 2: Strategic Green Infrastructure Network: This Policy seeks to maintain or enhance the extent, quality and connectivity of the County's multi-functional green infrastructure network.
- ER 3: Green Belt and Green Wedges. This Policy seeks to ensure that within the Greenbelt and Green Wedges, development will only be permitted if it maintains the openness and character of the land.
- ER 4: Gower Area of Outstanding Natural Beauty. This Policy seeks to conserve and enhance the natural beauty of the AONB, whilst accommodating the sustainable development needs of the local community and visitors to the area.
- ER 5: Landscape Protection. The aim of this policy is to ensure that the character and quality of the County's most valued landscapes are protected from inappropriate development and to encourage the management, enhancement and creation of key landscape features wherever possible. This Policy relates to areas outside the AONB including Special Landscape Areas (SLAs) of which three separate areas are identified.
- ER 7: Undeveloped Coast. This purpose of this policy is to safeguard the undeveloped coast from inappropriate development.
- ER 11: Trees and Development. This Policy seeks to protect trees, woodland and hedgerows of public amenity, natural/cultural heritage value or that provide important ecosystem services from being adversely affected by development.

11.4 Methodology

11.4.1 This section sets out the methodology for the LVIA for the Project. It builds on the general assessment methodology presented in **Chapter 4: Approach to Environmental Impact Assessment** and develops this to take account of the range of likely significant effects on the landscape character and visual amenity arising from the construction, operation and decommissioning of the Project.

11.4.2 This section of the chapter presents the following:

- Identification of the information sources that have been consulted throughout preparation of this chapter;
- Details of consultation undertaken with respects to the landscape and visual resource;
- The methodology behind the assessment of landscape and visual effects, including the criteria for the determination of the significance of the receptor and the magnitude of change from the baseline condition;
- An explanation as to how the identification and assessment of potential landscape and visual effects has been reached; and;
- The significance criteria and terminology for assessment of the residual effects to the landscape and visual resource.

11.4.3 The approach to the LVIA has been devised to address the specific effects likely to result from developments of this scale and nature. The methodology draws upon the following established best practice guidance:

- Guidelines for Landscape and Visual Impact Assessment, 3rd Edition (GLVIA3) (Landscape Institute and Institute of Environmental Assessment and Management, 2013) (Ref. 11.2);
- LANDMAP Methodological Guidance Series 2016 (Ref. 11.3);
- Photographs from representative viewpoints and Visually Verified Montages (VVM) of the Project have been produced in compliance with Landscape Institute Advice Note 01/11: Photography and photomontage in landscape and visual impact assessment (Landscape Institute, 2011) (Ref. 11.4).

11.4.4 The following terminology has been used throughout the assessment:

- **Landscape Character Areas (LCA)**: Areas of relatively homogenous landscape character. They are defined by the combination of elements that contribute to landscape context, character and value. Typical landscape elements include landform, land use, built development, vegetation and open space. More subjective criteria are also considered such as scale, unity and enclosure. In Wales landscape character is mapped using LANDMAP. LANDMAP is an all-Wales landscape resource where landscape characteristics, qualities and influences on the landscape are recorded and evaluated.
- **Zone of Theoretical Visibility (ZTV)**: A computer generated map based on a 3D model of the Project and the topography within the surrounding landscape, which shows areas of land within which the Project will theoretically be visible.
- **Visual amenity:** Relates to the way in which people visually experience the surrounding landscape. Adverse visual effects may occur through the intrusion of new elements into established views, which are out of keeping with the existing structure, scale and composition of the view. Visual effects may also be beneficial, where an attractive focus is created in a previously unremarkable view or the influence of previously detracting features is reduced. The significance of effects will vary, depending on the nature and degree of change experienced and the perceived value and composition of the existing view.
- **Visual Receptors**: Special interest or viewer groups who will have views of the Project. Visual receptors have been identified through desk study and fieldwork.
- **Representative Viewpoint**: Viewpoints selected to represent the experience of different types of visual receptor (viewer) including settlements and residential properties, transport and recreational routes and other outdoor locations. Representative viewpoints are located predominantly within publicly accessible locations and have been selected in consultation with CCS and NRW.

a) Basis of Assessment

11.4.5 Table 3-2 in **Chapter: 3 Project and Site Description** outlines the parameters which form the basis of the assessment of likely significant effects on landscape and visual amenity. The LVIA assesses only the effects of the maximum parameters, as for this topic the maximum parameters represent the realistic worst-case scenario.

b) Scope of the assessment

11.4.6 GLVIA3 requires that a clear distinction is drawn between landscape and visual effects:

- Landscape effects relate to the degree of change to characteristics or physical components of a rural area, which together form the character of that landscape, e.g. topography, land use, vegetation and open space.
- Visual effects relate to the degree of change to an individual receptor's or a receptor group's view of that landscape, e.g. local residents, users of public open space, footpaths or motorists passing through the area.

11.4.7 By assessing the construction, operational and decommissioning stages of the Project separately, distinctions may be drawn between temporary and permanent effects, with permanent effects typically being of greater importance. Residual effects are those likely to arise from the Project taking into account all additional mitigation measures.

11.4.8 The scope of this assessment has been determined through a formal EIA scoping process undertaken with the Secretary of State. Comments raised on the EIA Scoping Report have been taken into account in the development of the assessment methodology and these are detailed where relevant in this chapter. Responses to the comments raised in the EIA Scoping Opinion can be found in Appendix 4.1. Additional consultation has been carried out with both NRW and CCS and these are outlined in more detail below.

c) Consultation

11.4.9 The scope of the assessment has also been informed by ongoing consultation with statutory consultees throughout the design and assessment process, including NRW and CCS.

11.4.10 A summary of the comments raised and responses are detailed in Table 11-2.

Table 11-2: Summary of consultation responses that have informed the scope and methodology of the Landscape and Visual Effects assessment

Consultee	Date	Comment	Response
2014 Consultation			
SoS Scoping Opinion (paragraph 3.66)	August 2014	Recommends that NRW and CCS are consulted over viewpoint locations.	NRW and CCS have been consulted during November 2017 over viewpoint locations – refer to entry below.
SoS Scoping Opinion (paragraph 3.66)	August 2014	Consideration to be given to potential views from Brecon Beacons National Park and that the National Park Authority should be consulted about viewpoints.	The ZTV shows that there will be no theoretical visibility from any part of the National Park. NRW confirmed by email on the 4th December 2017 that a viewpoint in the Brecon Beacons National

Consultee	Date	Comment	Response
			Park would not be necessary.
SoS Scoping Opinion (paragraph 3.67)	August 2014	Recommends that the Applicant provides a description of existing landscape interests within and in the vicinity of the Project Site.	A full description of the landscape character and its characteristic features within the Project Site and wider area is contained in the LVIA.
SoS Scoping Opinion (paragraph 3.68)	August 2014	Lighting impacts to be considered in the ES.	The LVIA considers lighting within the overall assessment of effects.
SoS Scoping Opinion (paragraph 3.75)	August 2014	Recommends that where any landscape is proposed only slow and low growing species of trees and shrubs should be planted beneath and adjacent to the existing transmission line.	The landscape mitigation proposals take this into account.
2017 Consultation			
NRW	15th Nov 2017	NRW responded on the 4th December 2017 requesting an additional two viewpoints are considered at Mynydd Gelliwastad and Fairwood Common.	On the 6th December, AECOM requested clarification of the exact location of the two viewpoints either with grid-references or a plan. These viewpoints are included in this ES and are referred to as Viewpoint 10 and Viewpoint 19 respectively,
CCS	15th Nov 2017	CCS responded on the 21st November querying why the ZTV had decreased in extent from the 2014 PEIR despite the increase in stack height. They also suggested that viewpoints within the two neighbouring authorities (Carmarthenshire and Neath Port Talbot) could be considered. A final comment was made that the impact of the Project on heritage assets will need to be assessed along with discussion with Cadw (Welsh Government's historic environment service).	AECOM responded on the 30th November 2017 clarifying that the change in the ZTV is due to not only the maximum stack height, but also the reduction in the number of stacks from 5 to 1. A viewpoint table was also provided showing the AECOM viewpoint numbering and the 2014 PIER viewpoints. AECOM suggested that based on the areas of theoretical visibility within the neighbouring authorities combined with AECOM's assessment findings from viewpoints at a similar distance from the site (VP 12 and VP13) that the combination

Consultee	Date	Comment	Response
			of distance and intervening built form, vegetation and landform means that the development would not be discernible in views. AECOM therefore suggested that additional viewpoints in the neighbouring authorities would not provide additional benefit to the LVIA. The CCS s42 consultation response confirmed that CCS were satisfied that additional viewpoints from neighbouring authorities would not provide any additional benefit to the process. With regards to heritage assets AECOM clarified that the Archaeology and Cultural Heritage assessment would specifically look at the effects on heritage assets and would consult with CADW as required.
CCS	29th November 2017	A subsequent email received on the 29th November 2017 requested an additional viewpoint at Brynwhilach.	AECOM undertook a site visit including reference photography on the 7th February 2018 in an attempt to identify an appropriate viewpoint location in the Brynwhilach area. The site visit revealed that, even in winter, a combination of vegetation and landform prevented open views to the Project Site from publically accessible locations in the Brynwhilach area. These findings were set out in an email to CCS on the 27th February 2018. CCS confirmed that they were satisfied with AECOM's evaluation via email on 14th March 2018 and that withdrew the requirement for this additional viewpoint.
2018 Consultation			
NRW - S42 Consultation	February 2018	Required further information regarding the landscape mitigation and restoration proposals including details of proposed habitats and drainage	An Outline Landscape and Ecology Mitigation Strategy and Plan have been produced (Appendix 3.4 and Figure 3.6 respectively) which show the

Consultee	Date	Comment	Response
response		proposals. Requested further detail on the colour scheme for the development. Additional information was requested on the photography used in the production of the VVMs including distance to the Project, horizontal field of view; providing the wireline for each viewpoint; as well as inclusion of a single frame photograph with a 40 degree horizontal angle of view reproduced at A3 as an extract from the panoramas. Confirmation that the distances identified in A.2 Table 1 are correct.	integrated approach to landscape, ecology and drainage. Colours of the final Project will be subject to detailed design and those used on the VVMs are for illustrative purposes, however, for the purposes of the assessment, it has been assumed that colours will be matt and recessive. All VVMs have been updated to provide the requested information including distance to Project and horizontal field of view. All distances between the viewpoints and the stack have been verified and are presented on each VVM. A single frame image at A3 has been provided for each viewpoint, using a 39.6 degree horizontal field of view using a 50 mm fixed focal lens. Wirelines have been provided for each viewpoint (**Document Reference 7.1: Photographs and Photomontages**)
CCS - S42 Consultation response and subsequent meeting on 6th February 2018	February 2018	Additional information was requested on the VVMs including providing a wireline for each viewpoint to help identify the Project Site in view as well as adding annotations to identify elements of the Project in the view as well as features within the landscape including adjacent pylon heights.	Wirelines have been provided for each viewpoint (**Document Reference 7.1: Photographs and Photomontages**) along with additional annotations where appropriate.

d) Study area

11.4.11 The extent of the study area for the landscape assessment has been determined by desk based study and field survey and is defined by a 5 km radius from the location of the stack within the Project Site. Beyond this distance the Project is not considered likely to have any potential to give rise to significant landscape effects, due to the distance and intervening landform, settlement pattern and vegetation.

11.4.12 In order to determine an initial broad study area for the visual baseline it is necessary to understand the likely visibility of the Project. The extent of the study area for the visual assessment has been identified through a review of maps and aerial photographs of the Project Site and surrounding area alongside the ZTV. The ZTV was developed using a 3D model of the maximum parameters of the Project and the topography within 15 km of the Project, to take account of the 45 m maximum height of the stack (beyond this distance significant adverse effects on views and visual amenity are considered unlikely). Fieldwork has been used to refine the theoretical visibility by establishing the influence of existing landform, buildings and vegetation. It is considered that significant adverse effects on visual amenity are likely to be limited to within 5 km of the Project Site which is reflected in the spread of viewpoints chosen to represent the variety of potential views of the Project Site.

11.4.13 The study area for the landscape assessment is 5 km from the stack and for the visual assessment is 15 km from the stack as illustrated in Figures 11.7 and 11.8.

11.4.14 Photographs and Visually Verified Montages (VVMs) have been used to describe and illustrate the view from each viewpoint and are contained in **Document Reference 7.1: Photographs and Photomontages.**

e) Temporal Scope

11.4.15 Landscape and visual effects change over time as the existing landscape external to the Project evolves and the proposed embedded mitigation planting establishes and matures. The assessments therefore report on potential effects during construction, decommissioning and at operation both during winter (Year of opening) and summer (Year 15 once the embedded mitigation is expected to be established). The assessments have been carried out, as is best practice, by assuming the worst case scenario, i.e. on a clear bright day, when haze would not interfere with the clarity of the view obtained.

f) Baseline Data Collection

11.4.16 The baseline data has been informed by a combination of desktop study and fieldwork. Desk based research has been undertaken with the aid of various published documents, including LANDMAP Aspect Data, designation citations, policy documents, and computer tools/software, including Ordnance Survey maps / digital terrain models (DTM), Google Maps and ArcGIS.

11.4.17 Field survey visits have been undertaken during periods of clear visibility between July 2017 and February 2018. This has allowed the landscape character and visual amenity of the study area to be experienced in a range of different conditions and takes into account seasonal variation.

11.4.18 A detailed study of the existing landscape components and character of the study area and views within and around the Project Site has been carried out in consideration of the following:

- Site context;

- Topography and hydrology;
- Movement and connectivity;
- Land use including settlement and vegetation patterns;
- Landscape character (with reference to LANDMAP Aspect Areas); and
- Representative views.

11.4.19 The visual amenity of the study area was surveyed to note the general characteristics and nature of existing views. This included identification of a comprehensive range of viewpoints that represent a cross section of locations, views and viewer types likely to experience views of the Project. These viewpoints include locations at a variety of distances, aspects, elevations and visual extent and are representative of a range of receptor types, including residential areas and individual properties, transport and recreational routes.

11.4.20 Field survey is essential to develop an understanding of the key characteristics of the existing landscape or view, in order to establish the baseline against which proposed change can be assessed.

g) Impact Assessment Methodology

11.4.21 The following provides details of the process and classification criteria employed in undertaking the landscape and visual assessments. The criteria detailed in Tables 11-3 to Table 11-11 are not intended to be prescriptive. Rather these examples are used to illustrate potential combinations of judgements which relate to the scales for value, susceptibility, sensitivity to change, magnitude of change and significance of effect as described subsequently.

h) Sensitivity

i. Landscape Receptors

11.4.22 Landscape receptors are described within GLVIA3 (para 5.34) as *'components of the landscape that are likely to be affected by the Project*'. These can include overall character and key characteristics, individual elements or features and specific aesthetic or perceptual aspects. It is the interaction between the different components of the Project and these landscape receptors which has potential to result in landscape effects (both adverse and beneficial).

11.4.23 The sensitivity of the landscape receptor is a combination of the value of the landscape (undertaken as part of the baseline study) and the susceptibility to change of the receptor to the specific type of development being assessed.

11.4.24 Landscape value is frequently addressed by reference to international, national, regional and local designations, determined by statutory bodies and planning agencies. Absence of such a designation does not necessarily imply a lack of quality or value. Factors such as accessibility and local scarcity can render areas of nationally unremarkable quality, highly valuable as a local resource. The quality and condition has also been considered in the determination of the value of a landscape. The evaluation of landscape value has been undertaken with reference to a three point scale, as outlined in Table 11-3.

Table 11-3: Landscape Value Criteria

Value	Classification Criteria
High	Protected by a statutory landscape designation, an iconic landscape contributing strongly to a sense of place, or an unspoilt landscape containing unique or scarce elements/features with few, if any, detracting elements/features.
Medium	Regionally or locally designated landscape or an undesignated landscape with locally important, but more commonplace, features and containing some detracting elements/features.
Low	Undesignated landscape with few, if any, notable elements/features, or containing several detracting elements/features.

11.4.25 The susceptibility to change is a measure of the ability of a landscape to "accommodate the proposed development without undue consequences for the maintenance of the baseline situation and/or the achievement of landscape planning policies and strategies" (Ref. 11.1 para 5.40, GLVIA).

11.4.26 The guidance also refers to the fact that many existing assessments provide a valuation of landscape character areas/types for their 'intrinsic' or 'inherent' sensitivity, with no reference to specific development types. Paragraph 5.42 of GLVIA (Ref. 11.1) states that "*these cannot reliably inform assessment of the susceptibility to change since they are carried out without reference to any particular type of development and so do not relate to the specific development proposed.*" Furthermore, it goes on to say "*since landscape effects in LVIA are particular to both the specific landscape in question and the specific nature of the project, the assessment of susceptibility must be tailored to the project. It must not be recorded as part of the landscape baseline but should be considered as part of the assessment of the effects.*"

11.4.27 Landscape susceptibility has been appraised through consideration of the baseline characteristics of the landscape, and in particular, the scale or complexity of a given landscape. The evaluation of landscape susceptibility has been undertaken with reference to a three point scale, as outlined in Table 11-4, below.

Table 11-4: Landscape Susceptibility Criteria

Susceptibility	Classification Criteria
High	Attributes that contribute to a landscape which is considered to be intolerant of even minor change without fundamentally altering key characteristics.
Medium	Attributes that contribute to a landscape which offers some opportunities to accommodate change without fundamentally altering the key characteristics.
Low	Attributes that contribute to a landscape which is considered to be tolerant of a large degree of change without fundamentally altering the key characteristics.

11.4.28 Landscape sensitivity to change has been determined by employing professional judgement to combine and analyse the identified value and susceptibility and has been defined with reference to the three point scale outlined in Table 11-5, below. Combining susceptibility and value GLVIA3 indicates that this can be achieved in a number of ways and needs to include professional judgement. However it is generally accepted that a combination of high susceptibility and high value is likely to result in the highest sensitivity, whereas a low susceptibility and low value is likely to result in the lowest level of sensitivity.

Table 11-5: Sensitivity of Landscape Receptors

Sensitivity	Classification Criteria
High	Landscape of national or regional value with distinctive elements and characteristics, considered to have a limited ability to absorb change without fundamentally altering the key characteristics.
Medium	Landscape of regional or local value, or rarity, exhibiting some distinct elements/features, considered tolerant of some degree of change without fundamentally altering the key characteristics.
Low	Landscape with few distinctive elements/features or valued characteristics and considered tolerant of a large degree of change without fundamentally altering the key characteristics.

ii. Visual Receptors

11.4.29 Sensitivity of visual receptors has been defined through appraisal of the viewing expectation, or value placed on the view as identified in the baseline study, and its susceptibility to change.

11.4.30 Value of the view is an appraisal of the value attached to views and is often informed by the appearance on Ordnance Survey or tourist maps and in guidebooks, literature or art. Value can also be indicated by the provision of parking or services and signage and interpretation. The nature and composition of the view is also an indicator. Value of the view has been determined with reference to the three point scale and criteria outlined in Table 11-6.

Table 11-6: Value of the View

Value	Classification Criteria
High	Nationally recognised view, a view with cultural associations (recognised in art, literature, or other medium), or a recognised high quality view of the landscape with very few, if any detracting elements.
Medium	Regionally or locally recognised view, or unrecognised but pleasing and well composed view, with few detracting elements.
Low	Typical or poorly composed view, often with numerous detracting elements.

11.4.31 Visual susceptibility relates to the importance of views to receptors at a certain location and is informed by the type of receptor and the activity with which they are engaged. This considers the extent to which receptors' attention or interest is focused on the view or visual amenity. For example, residents in their home, walkers whose interest may tend to be focused on the landscape or a particular view, or visitors at an attraction where views are an important part of the experience, may indicate a higher level of susceptibility. Whereas, receptors occupied in outdoor sport where views are not important or at their place of work could be considered less susceptible to change. Visual susceptibility has been determined with reference to the three point scale and criteria outlined in Table 11-7, below.

Table 11-7: Visual Susceptibility Criteria

Susceptibility	Classification Criteria
High	Locations where the view is of primary importance and receptors are likely to notice even minor change.
Medium	Locations where the view is important but not necessarily the primary focus and receptors are tolerant of some change.
Low	Locations where the view is incidental or unimportant to receptors and tolerant of a high degree of change.

11.4.32 Visual sensitivity to change has been determined by employing professional judgement to combine and analyse the identified value and susceptibility and has been defined with reference to the three point scale outlined in Table 11-8. In combining susceptibility and value it is generally accepted that a combination of high susceptibility and high value is likely to result in the highest sensitivity, whereas a low susceptibility and low value is likely to result in the lowest level of sensitivity.

Table 11-8: Sensitivity of Visual Receptors

Sensitivity	Classification Criteria
High	Locations where receptors experience an impressive or well composed view containing few detracting elements, with limited ability to absorb change.
Medium	Locations where receptors experience a valued view which generally represents a pleasing composition but may include some detracting features and is tolerant of a degree of change.
Low	Locations where the view is incidental or not important to the receptors and the nature of the view is of limited value or poorly composed with numerous detracting features and is tolerant of a large degree of change.

i) Landscape Magnitude of Change

11.4.33 The magnitude of landscape change refers to the extent to which the Project would alter the existing characteristics of the landscape. Changes to landscape characteristics can be both direct and indirect.

11.4.34 Magnitude of landscape change refers to the extent to which the Project would alter the existing characteristics of the landscape. It is an expression of the size or scale of change to the landscape, the geographical extent of the area influenced and its duration and reversibility. The variables involved are described below:

- The extent of existing landscape elements that would be lost, the proportion of the total extent that this represents and the contribution of that element to the character of the landscape;
- The extent to which aesthetic or perceptual aspects of the landscape are altered either by removal of existing components of the landscape or by addition of new ones;
- Whether the change alters the key characteristics of the landscape, which are integral to its distinctive character;
- The geographic area over which the change will be felt (within the application boundary itself, the immediate setting, at the scale of the landscape character area, on a larger scale influencing several landscape character areas); and
- The duration of the change short term, medium term or long term and its reversibility (whether it is permanent, temporary or partially reversible).

11.4.35 Magnitude of landscape change has been evaluated with reference to Table 11-9 below ranging from higher to lower levels of magnitude described using a four point scale (high, medium, low, negligible).

Table 11-9: Magnitude of Landscape Change

Level of Magnitude	Size or Scale of Change	Geographical Extent	Duration	Reversibility
Higher	Highly noticeable change, affecting many key characteristics and dominating the experience of the landscape; and Introduction of highly incongruous development	Very extensive affecting several landscape types or character areas.	Long-term (10 years +)	Irreversible
	Noticeable change, affecting some key characteristics and the experience of the landscape; and Introduction of some uncharacteristic elements.	Affecting a substantial proportion of the landscape character area.	Medium-term (5-10 years)	Partially reversible
	Minor change, affecting some characteristics and the experience of the landscape to an extent; and Introduction of elements that are not uncharacteristic.	Affecting the immediate setting of the Project Site.	Short-term (0-5 years)	Reversible
Lower	Little perceptible change	Limited to within the Development application boundary.	Short-term (0-5 years)	Reversible

j) Visual Magnitude of Change

11.4.36 Visual magnitude of change relates to the extent to which the Project would alter the existing view and is an expression of the size or scale of change in the view, the geographical extent of the area influenced and its duration and reversibility. The variables involved are described below:

- The scale of the change in the view with respect to the loss or addition of features in the view and changes in its composition, including the proportion of the view occupied by the Project;
- The degree of contrast or integration of any new features or changes in the form, scale, composition and focal points of the view;
- The nature of the view of the Project in relation to the amount of time over which it will be experienced and whether views will be full, partial or glimpsed;
- The angle of view in relation to the main activity of the receptor, distance of the viewpoint from the Project and the extent of the area over which the changes would be visible; and
- The duration of the change short term, medium term or long term and its reversibility (whether it is permanent, temporary or partially reversible).

11.4.37 Visual magnitude of change has been evaluated with reference to Table 11-10, ranging from higher to lower levels of magnitude described using a four point scale (high, medium, low, negligible).

Table 11-10: Magnitude of Visual Change

Level of Magnitude	Size or Scale of Change	Geographical Extent	Duration	Reversibility
Higher  **Lower**	Extensive change to the existing view including the loss of existing characteristic features, and/or introduction of new discordant features; A change to an extensive proportion of the view. Views where the Project would become the dominant landscape feature or contrast heavily with the current view.	The development is located in the main focus of the view; and or at close range over a large area	Long-term (10 years +)	Irreversible
	The Project will result in a change to the view but not fundamentally change its characteristics. Changes that would be immediately visible but not the key feature of the view.	Changes where the Project is located obliquely to the main focus of the view; and/or at medium range; and/or over a narrow area.	Medium-term (5-10 years)	Partially irreversible
	The Project would result in a small change to the composition of the view. Changes that would only affect a small portion of the view or introduce new features that were partially screened.	Changes where the Project is located on the periphery to the main focus of the view; and/or long range; and/or over a small area	Short-term (0-5 years)	Partially reversible
	Little perceptible change in the existing view	Changes where the Project is peripheral to the overall view.	Short-term (0-5 years)	Reversible

a) Significance of Landscape Effect

11.4.38 Determination of the significance of landscape effects has been undertaken by employing professional judgement to combine and analyse the magnitude of change, against the identified sensitivity of the receptor. The assessment takes account of direct and indirect change on existing landscape elements, features and key characteristics and evaluates the extent to which these would be lost or modified, in the context of their importance in determining the existing baseline character.

11.4.39 The levels of landscape effects are described with reference to the four point scale outlined in Table 11-11, below.

Table 11-11: Significance of Landscape Effect

Significance	Classification Criteria
Major	Considerable change over an extensive area of a more sensitive landscape, fundamentally affecting the key characteristics and the overall impression of its character.
Moderate	Small or noticeable change to a more sensitive landscape or more intensive change to a less sensitive landscape, affecting some key characteristics and the overall impression of its character.
Minor	Small change to a limited area of more sensitive landscape or a more widespread area of a less sensitive landscape, affecting few characteristics and not altering the overall impression of its character.
Negligible	Scarcely any perceptible change to the existing landscape.

11.4.40 Following the classification of an effect as detailed in Table 11-10, a clear statement is made as to whether the effect is ‘significant’ or ‘not significant’. As a general rule, major and moderate effects are considered to be significant and minor and negligible effects are considered to be not significant. However, professional judgement is also applied where appropriate.

b) Significance of Visual Effect

11.4.41 Determination of the significance of visual effects has been undertaken by employing professional judgement to combine and analyse the magnitude of change against the sensitivity of the receptor. The assessment takes into account likely changes to the visual composition, including the extent to which new features would distract or screen existing elements in the view or disrupt the scale, structure or focus of the existing view.

11.4.42 The levels of visual effects are described with reference to the four point scale outlined in Table 11-12, below.

Table 11-12: Significance of Visual Effect

Significance	Classification Criteria
Major	Substantial loss, alteration or replacement of existing components which causes a very noticeable change in the existing view.
Moderate	Whilst some existing characteristic components of the existing view remain, there is a noticeable change in the overall composition.
Minor	The Project would be visible in the view but would form a small component and the majority of the view would be unaffected.
Negligible	The Project would be scarcely perceptible in the existing view.

11.4.43 Following the classification of an effect as detailed in Table 11-12, a clear statement is made as to whether the effect is 'significant' or 'not significant'. As a general rule, major and moderate effects are considered to be significant and minor and negligible effects are considered to be not significant. However, professional judgement is also applied where appropriate.

11.5 Baseline Environment

11.5.1 This section describes the baseline environmental characteristics for the Project and surrounding areas with specific reference to the landscape and visual resource and respective study areas. It should be read with reference to Figures 11.1 – 11.8.

a) Project Site Location and Context

i. Site Location and Landform

11.5.2 The Project Site is situated on open agricultural land located approximately 2 km north of junction 46 of the M4 within the administrative boundary of the City and County of Swansea Council (CCS). Figure 11.1 shows the location of the Project approximately 1 km southeast of Felindre and 1.4 km north of Llangyfelach. The Project Site covers an area of up to approximately 35 ha and lies centrally within the Afon Lian Valley which forms a wide lowland basin with higher ground and steep valleys to the north and east. The valley floor is wide and undulating, backed to the north by upland moorland rising to over 250 m AOD and divided by numerous steep, narrow valleys.

11.5.3 The Project Site is located within a valley with ground rising to the north, east and west which provides visual containment. Ground levels vary across the Project Site from approximately 140 m AOD in the north-west corner to 80 m AOD along the southern perimeter. Ground levels generally fall in a southerly and south easterly direction.

ii. Movement and Connectivity

11.5.4 Junction 46 on the M4 lies approximately 2 km to the south of the Project Site providing immediate access to the strategic road network between London and South Wales. To the immediate north of Junction 46 lies the Felindre Park and Share at Brynwhilhach adjacent to the un-developed Felindre Business Park. A network of minor roads dissect the 5 km study area, connecting settlements and farmsteads. These are typically surrounded by earthbanks with hedgerow and tree planting which contains views along them and successfully integrates them into the wider landscape. The study area is well served with Public Rights of Way (PRoW) although not all are easily accessible nor do they appear to be regularly used. A section of the Gower Way, a long distance footpath through the Afon Lliw valley passes within approximately 2 km at its closest point to the northern boundary of the Project Site.

iii. Land Use and Built Form

11.5.5 The Project Site is predominantly covered with pasture which is currently used for sheep and horse grazing as well as a band of broadleaf woodland to the east. A soft surface horse training track, known as 'The Gallops', crosses the Project Site and runs diagonally north-west to south-east. Broadleaf woodland which is classified in part as Ancient Woodland lies to the east of the Project Site as well as around the Access Road to the Substation and Felindre Gas Compressor Station. Fields across the Project Site are subdivided by ditches, post and wire fencing, remnant hedgerows and are interspersed with scrub vegetation.

11.5.6 Pastoral land and woodland are the predominant land uses within the wider valley, including Penllergaer Forest and other smaller broadleaved woodlands that are scattered throughout the valley. Combined with the network of hedgerows and hedgerow tree planting which define many of the small and irregular shaped fields as well as the network of minor roads, the landscape displays a well vegetated character. This character of woodland, rolling topography and visual containment helps integrate developments in the rural fabric.

11.5.7 The western part of the Project Site encompasses the Access Road National Grid Car Park, adjacent to the Felindre Gas Compressor Station. Both the Substation and the Felindre Gas Compressor Station comprise large scale power infrastructure facilities characterised by tall industrial structures enclosed by security fencing and set within woodland planting. Pylons are prominent across the landscape and converge at the Substation. Pylons range in height with the closest pylon to the north of the Project Site 44 m in height and the pylon to the south of the Project Site, 51 m tall.

11.5.8 To the west of the Project Site lies an Air-Insulated Switchgear (AIS) substation at Waun Ffyrdd. The associated overhead transmission lines and steel pylons are prominent elements within the valley landscape. To the north lies the Felindre Water Treatment Works at Waun y Garn-wen which is partially screened by planting although apparent in more elevated views from the north.

11.5.9 A number of solar farms lie around the Project Site particularly to the north-east and east as well as to the north-west. The Felindre Business Park adjacent to the Park and Share at Brynwhilhach has been partially constructed with service infrastructure in place along with an outline landscape structure including stone walls and planting.

11.5.10 The main settlement in the 5 km study area is Swansea, with the northern edges of the city forming notable built form in the south and south eastern parts of the study area, approximately 2 km from the Project Site. The Driver and Vehicle Licensing Agency (DVLA) office block forms a prominent tall building and local landmark in many views that look south. Morriston hospital complex at Pant-lasau lies to the south-east of the Project Site with the settlement of Clydach extending to the east. Settlement locally is dispersed comprising small villages such as Felindre to the north-west or scattered properties and farmsteads.

b) Landscape Character

i. Landscape Designations

11.5.11 Landscapes can be given international, national, regional or local designations in recognition of their importance, outstanding scenic interest or attractiveness. The Brecon Beacons National Park lies 12.8 km to the northern edge of the Project Site at its closest point. The ZTV (Figure 11.8) indicates that there is no theoretical visibility between the Project and the National Park and as such the Brecon Beacons National Park as a landscape receptor is not considered further in the assessment.

11.5.12 The Gower Area of Outstanding Natural Beauty (AONB) lies 9.1 km to the south-west of the Project Site. The Gower AONB was designated in 1956 for its classic limestone coast and the variety of natural habitats. The Gower's scenery ranges from dune and salt marsh in the north to dramatic limestone cliffs along the south coast, interspersed by sandy beaches. Inland the hills of Cefn Bryn and Rhossili Down dominate the landscape of traditional small fields, wooded valleys and open commons. The ZTV illustrates limited visibility between the Project and the AONB. Views of the Project Site from within the Gower AONB are substantially screened by intervening woodland at Penllergaer Forest and Valley Wood, intervening hedgerows, hedgerow trees and copses and built form within settlements at Gorseinion, Penllergaer, Gowerton and Waunarlwydd, as well as extensive urban development within Swansea.

11.5.13 Special Landscape Areas (SLAs) are identified in the draft UDP within Policy ER 5: Landscape Protection and are identified on Figure 11.1. The Policy state states that priority will be given to protecting, managing and enhancing the character and quality of the three SLAs:

- Mawr Uplands;
- Lower Loughor Valley and Estuary and Southern part of the Burry Inlet; and
- North East Gower and Cockett Valley.

11.5.14 Within the SLAs, development will only be permitted where proposals include measures to protect, manage and enhance the character and quality of the particular landscape features for which the SLA has been designated. The aim of the Policy is to ensure that the character and quality of the County's most valued landscapes are protected from inappropriate development and to encourage the management, enhancement and creation of key landscape features where possible.

11.5.15 There are four Country Parks within the wider landscape but all lie beyond the 15 km study area and do not experience any theoretical visibility.

ii. Landscape Character Areas

11.5.16 LANDMAP is the formally recognised national landscape resource in Wales to understand Landscape Character. It is an all-Wales landscape resource where landscape characteristics, qualities and influences on the landscape are recorded and evaluated. LANDMAP evaluates areas in terms of five key spatial datasets or Aspect areas:

- Geological Landscape: considers the physical, primarily geological influences that have shaped the contemporary landscape and identifies those landscape qualities which are linked to the control or influence exerted by bedrock, surface processes, landforms and hydrology;
- Landscape Habitats: identifies the characteristics and spatial relationships of habitats and vegetation at scales broadly comparable to other Evaluated Aspects;
- Visual and Sensory: identifies perceptual landscape qualities as well as the physical attributes of landform and land cover including visible patterns of distribution and the relationships between them;
- Historic Landscape: identifies those qualities that depend on key historic land uses, patterns and features; and
- Cultural Landscape: considers the links between landscape and people, how human activity shapes the landscape and how culture can shape the way people think about the landscape. Its aim is to identify those cultural patterns that are keeping the landscape alive today, rather than those that sustained it in the past.

11.5.17 All of the above Aspect areas have been analysed with respect to the Project in order to inform the assessment of landscape character and are presented in Appendix 11.1 and Figures 11.2 to 11.6. NRW in response to the 2018 PEIR noted '*that the assessment of landscape character and sensitivity should consider information from all five aspect areas. As well as the overall evaluation for each aspect, the rarity/uniqueness evaluation for Geological Landscape, the connectivity/cohesion evaluation for Landscape Habitats, the scenic quality and character evaluation for Visual and Sensory and the rarity and group value for Historic Landscape and Cultural Landscape should be taken account of*'. Landscape character derives from all five aspects within LANDMAP and it is the analysis and evaluation of all the aspects which has informed judgements on value, susceptibility and sensitivity.

11.5.18 Effects on landscape character are considered at a Project Site level and also within the 5 km study area. All five aspects have been analysed within the Project Site and immediate visual influence to inform judgements on value, susceptibility and sensitivity of the landscape character at the Project Site level. The Visual and Sensory Aspect areas have been considered in greater detail within the 5 km study area as it is considered that this Aspect area is most likely to be affected by indirect effects on the wider landscape setting. However, where theoretical visibility exists within the 5 km study area, other Aspect data including Historic and Cultural elements have also been considered to understand the potential indirect effects on the landscape resource.

c) Visual Amenity

11.5.19 A series of 19 representative viewpoint locations have been selected to form the basis of the visual assessment. These have been identified to provide a representative cross section of visual receptors within the study area and have been selected in consultation with CCS and NRW. The locations of the viewpoints are provided on Figures 11.7 and 11.8 and details of each, including a description of the baseline view are provided in Table 11.13. **Document Reference 7.1: Photographs and Photomontages** provides photography of the baseline view from each of the viewpoint locations.

Table 11-13: Representative Viewpoints

No.	Viewpoint name/description	Grid Reference		Approximate Distance to stack (km)	Receptor Groups
		Easting	Northing		
1	**North side of J64 of M4, on B4489**: This view is representative of road users travelling north along the B4489. Wide, panoramic views are experienced across the rural wooded landscape extending to the rising upland which defines the skyline to the north. Road infrastructure including lighting columns and signage are prominent in the foreground view along with the extensive network of pylons and overhead lines which extend into and across the mid-ground of the view, punctuating the skyline. The Felindre Gas Compressor Station and Substation are prominent features within the centre of the view, all set within the extensive wooded landscape.	264903.57	199456.46	1.95	Road User
2	**Fforest-newydd** This view is representative of views from a nearby residential property. Foreground views extend over gently rising grazing land with woodland along field boundaries to the periphery of the view. Pylons and associated overhead lines are prominent and dominate in the view.	263926.24	201366.08	1.61	Residential
3	**Gower Way, Felindre** This view is representative of views from the Gower Trail to the east of Felindre. Views extend over a shallow valley, under pasture with a farmstead in the middle distance. Woodland extends along the skyline and on the lower slopes of the valley as well as along field boundaries. Pylons and overhead lines are visible in the periphery of the view.	264164.92	202975.05	2.16	Recreational

No.	Viewpoint name/description	Grid Reference		Approximate Distance to stack (km)	Receptor Groups
		Easting	Northing		
4	**Llwyngwenno, Heol Glyn-Dyfal** This view is representative of views from an adjacent residential property, which sits in an elevated position above the road level. Views from this elevated position are wide and extend across the rolling mosaic of woodland and grazed fields subdivided by hedgerow plating and copses of trees. Prominent features include the Felindre Water Treatment Works buildings in the mid distance along with a network of pylons and overhead lines which converge at the Substation. Solar farms are also apparent in the view along with the Felindre Gas Compressor Station. The southern edge of Swansea is visible in the distance with the DVLA premises a noticeable landmark building on the skyline. Note: The baseline photograph was taken from the road at the end of the property's drive. Tall hedgerows along earth banks surround the Heol Glyn-Dyfal minor road which screen large sections of the view described above.	263713.69	203508.13	2.86	Residential
5	**Mynydd Pysgodlyn** This view is representative of walkers using the Public Right of Way that follows a farm track to access neighbouring communities. Views are panoramic from this elevated position on the edge of the high moorland sweeping across a series of wide, shallow valleys towards the northern suburbs of Swansea. This expansive view sweeps from the surrounding moorland across the rolling valleys beyond where a mosaic of fields interspersed by vegetated field boundaries and tracts	263515.23	204260.20	3.58	Recreational

No.	Viewpoint name/description	Grid Reference		Approximate Distance to stack (km)	Receptor Groups
		Easting	Northing		
	of woodland predominate. The Felindre Water Treatment Works buildings, Gas Compressor Station and Substation are visible in the middle distance of the view along with network of pylons and transmission lines which are prominent in the view.				
6	**Tor Clawdd, adjacent to Ring Cairn** This view is representative of walkers using the open access area, near a heritage feature (Ring Cairn – a banked and ditched circular earthwork, about 20 m in diameter). Views from this exposed hillside are expansive with wide views to the south over moorland towards distant valleys and hills. The northern suburbs of Swansea and the DVLA premises provide a distant backcloth to views. Pylons and associated transmission lines are discernible stretching across the middle distance of the view.	267025.48	206300.56	5.22	Recreational
7	**Tor Clawdd, southern end** This view is representative of road users travelling along the local road to Ammanford, just north of Rhhd-y-gwin overlooking the patchwork of smaller pastoral fields on the lower valley sides that give way to open grazed moorland on the upper slopes. Views extend into the well wooded Afon Llan valley where extensive woodland cover is evident with large mature trees. Pylons and transmission lines are apparent within the view terminating at the Substation in the middle distance of the view. The northern suburbs of Swansea including the DVLA premises are visible in the distance along with the distant Gower	267111.55	204576.74	3.64	Road User

No.	Viewpoint name/description	Grid Reference		Approximate Distance to stack (km)	Receptor Groups
		Easting	Northing		
	peninsula.				
8	**Rhyd-y-pandy road near Cynghordy** This view is representative of road users travelling along Rhyd-y-pandy road near the property of Cynghordy. Views from the majority of this local road are screened by the adjacent earth banks and hedgerows. This view is taken from a break in the roadside vegetation where views of scrub and rough grassland can be seen in the foreground of the view with glimpsed views of pasture enclosed by hedgerows and mature trees in the middle distance. Swansea is visible in the distance against a ridgeline with a rural backdrop. Pylons and wood pole lines are prominent vertical features in both the foreground and mid ground of the view.	266079.85	203076.56	1.85	Road User
9	**Public Right of Way, north of Aber-gelli fach** This view is representative of walkers using the PRoW north of Aber-gelli fach, just south of the junction of footpaths LC35B and LC35A. Views extend across pasture with occasional farm buildings in view. Field boundaries defined by hedgerows and mature trees are particular features in the view along with extensive woodland beyond the farm. Pylons and wood pole lines are prominent in the view along with solar farms visible in the periphery of the view. The northern Swansea suburbs are visible in the distance with the DVLA building visible against the skyline.	265289.87	202233.17	0.96	Recreational

No.	Viewpoint name/description	Grid Reference		Approximate Distance to stack (km)	Receptor Groups
		Easting	Northing		
10	**Trig Point, Mynydd Gelliwastad** This view is representative of recreational users of the Common Land at Mynydd Gelliwastad, higher ground to the east of the Project Site. Expansive, open, panoramic views extend across the heathland, stretching across the valleys either side of the hill, from Port Talbot, Kuilvey Hill to Swansea Bay, the Gower AONB and north to the hills in the Brecon Beacons NP. The foreground is characterised by heathland with occasional pockets of young deciduous trees on the lower slopes. Overhead lines and pylons are prominent in the foreground and mid-ground views connecting to Swansea North Substation which is visible in the mid-ground of the view along with Felindre Gas Compressor Station. This cluster of infrastructure along with extensive tracts of solar farms which form particularly prominent elements in the mid-ground of the view are set within the extensive wooded landscape.	267799.67	201456.50	2.28	Recreational
11	**Llangyfelach Churchyard** This view is representative of people visiting the churchyard and views from adjacent residential properties. The view is from the northern side of the valley looking towards Abergelli where the Felindre Gas Compressor Station, Substation and pylons and solar farms are noticeable in the mid ground view with a backdrop of higher ground beyond. Foreground views are concentrated on the immediate graveyard setting where vegetation even in winter substantially limits views beyond.	264667.81	198972.21	2.49	Residential Recreational

No.	Viewpoint name/description	Grid Reference		Approximate Distance to stack (km)	Receptor Groups
		Easting	Northing		
12	**Carnglas** This view is representative of residential and recreational users. The view is from an elevated location overlooking an industrial estate at Myndd bach-y-glo in the foreground and the north western edge of Swansea in the middle distance. On clear days distant views of the high ground at Cwmcerdinen and Tor Cawdd can be seen with the Brecon Beacons National Park in the far distance.	261771.15	194480.84	7.79	Residential Recreational
13	**Three Crosses** This view is representative of residential and recreational users. The foreground of the view overlooks a shallow valley under pasture with riparian woodland on the lower slopes. Settlements at Waunarlwydd and the north western edge of Swansea are visible in the middle distance. Distant views extend to the higher ground at Cwmcerdinen and Tor Cawdd and the Brecon Beacons National Park in the far distance.	257580.52	194915.11	10.2	Residential Recreational
14	**Public Right of Way near Maes-eglwys Farm** This view is representative of recreational users of the PRoW and views from the nearby residential properties. Views from the path are occasionally screened by boundary planting but otherwise open out with foreground views of the pastoral field and cluster of properties and farm buildings at Maes-eglwys farm. The small fields are subdivided by low earth banks and hedgerow trees with woodland in the distance	265348.65	200565.45	0.76	Residential Recreational

No.	Viewpoint name/description	Grid Reference		Approximate Distance to stack (km)	Receptor Groups
		Easting	Northing		
	providing a vegetated backcloth to the view. Pylons and overhead lines are prominent features across the view and are often seen against the skyline. Maes-eglwys farm and associated residential buildings are apparent in the right hand side of the view. Views from the rear of the properties extend over the intervening farmland along with the pylons appearing prominent in the view.				
15	**Public Right of Way and minor road** This view is representative of recreational users of the PRoW and minor road which lead to the small settlement of Pant-lasau. The PRoW follows the minor (no through) road and views are generally contained by roadside hedgerows and trees. Breaks in the hedgerow planting and field access gates provide views across agricultural land to extensive woodland which extends across the entire mid ground view. Land rises to the north and the mosaic of grazing land and hedgerow tree planting is evident in the distance of the view with a backcloth of hills within the Mawr uplands in long distance views. Pylons and associated transmission lines are prominent across the view, appearing against the skyline with a cluster around the Substation which along with the Felindre Gas Compressor Station is noticeable built elements in the mid ground left of the view.	265734.84	200069.07	1.25	Recreational
16	**Dorglwyd** This view is representative of views from Dorglwyd farmhouse looking	265943.79	200652.58	0.77	Residential

No.	Viewpoint name/description	Grid Reference		Approximate Distance to stack (km)	Receptor Groups
		Easting	Northing		
	northwest across agricultural land. Filtered views are available from this property through intervening boundary vegetation. Views of grazing land rising to the northwest are interspersed by woodland and hedgerow tree planting. Pylons and transmission lines are prominent features within the view, seen against the skyline. Moorland within the Mawr uplands is visible on the horizon in the far distance of the view.				
17	**Cefn Betingau Farm** This view is representative of views from the cluster of properties at Cefn Betingau Farm. Foreground views extend across the gardens of the properties and the small pastoral field defined by post and wire fence and hedgerow planting. Solar panels, part of the larger solar farm are prominent in the view with some mature specimen trees partially screening views towards them. Within the mid ground of the view extensive woodland planting screens the majority of views of the valley beyond. Where views extend to the valley beyond, grazed fields and further planting are apparent along with structures associated with the Felindre Gas Compressor Station. Pylons and transmission lines are prominent in the view and seen against the skyline. The northern suburbs of Swansea are visible in the distance.	265986.97	201509.92	0.50	Residential
18	**Footpath on the north side of the A48 Clasemont Road** This view is representative of views from the residential properties which line the south side of Clasemont Road. There are very few publicly accessible views due to the roadside hedgerow and tree	265591.10	198863.65	2.44	Residential

No.	Viewpoint name/description	Grid Reference		Approximate Distance to stack (km)	Receptor Groups
		Easting	Northing		
	planting which line the north side of the road and provide an effective screen even in the winter. Foreground views extend across grazing land with pockets of marshy vegetation. Extensive tree and woodland cover with hedgerows defining field boundaries extends across the mid ground of the view. Pylons and transmission lines are prominent features in the view converging on the Substation which is apparent in the centre of the middle ground of the view. The open moorland on the distant hills provides a backdrop to the view.				
19	**Fairwood Common on the boundary of the Gower AONB, adjacent to the B4271** This view is representative of views from recreational users of Fairwood Common adjacent to the B4271. Foreground views extend across the rough grassland of the Common to the wooded valley and settlement in the mid ground of the view extending to the north western edge of Swansea. On clear days, distant views extend to the higher ground at Cwmcerdinen Tor Cawdd and the Brecon Beacons National Park in the far distance.	257939.00	192692.00	11.45	Recreational

11.6 Embedded Mitigation

11.6.1 As detailed in **Chapter 3: Project and Site Description**, a number of embedded mitigation measures have been identified through the iterative EIA process and have been incorporated into the design and construction planning of the Project.

11.6.2 As these mitigation measures have been embedded into the design, are legal requirements or are standard practices that will be implemented, the assessment of likely significant effects assumes that they are in place.

11.6.3 Embedded mitigation measures are described in **Chapter 3: Project Site and Description** and summarised below.

11.6.4 Mitigation measures will be implemented during the construction phase as set out in the Outline CEMP (Appendix 3.1) in order to limit impacts on the landscape and visual resource.

11.6.5 Utilising technology (OCGT) will allow a significant reduction in stack height compared to other technology types. As a result of selecting OCGT technology, there will be no visible plume arising from the stack. The high temperature of the exhaust gases means that water vapour is well above the condensation point which would give rise to a visible plume.

11.6.6 The architectural design of the buildings and structures on the Project Site has been designed to reduce glare and to assimilate the Project into the surrounding landscape as much as possible by using neutral recessive colours to lessen the contrast with the surrounding landscape and break up the overall massing of the large scale structures.

11.6.7 External lighting has been designed to reduce trespass and configured to avoid glare and spillage (Appendix 3.5 Outline Lighting Strategy), in accordance with the Outline CEMP (Appendix 3.1), and undertaken in accordance with the Institution of Lighting Professionals Guidelines.

11.6.8 An Outline Landscape and Ecology Mitigation Strategy (LEMS) has been developed to both provide reinstatement planting as well as to integrate the Project into the landscape and its wider setting (Appendix 3.4). The outline planting proposals shown in Figure 3.6 Landscape and Ecology Mitigation Plan would be developed further prior to construction, in accordance with the various utility and service constraints within the Project Site.

11.6.9 The landscape proposals will cover a minimum period of 25 years of monitoring, management and maintenance to ensure the landscape objectives are successfully achieved, with a review every five years.

11.6.10 No additional or secondary mitigation measures have been proposed as there is no feasible additional landscape mitigation within the Project Site which could further reduce the landscape and visual effects due to the height of the stack and the scale and mass of the Power Generation Plant. However, there may be an opportunity for affected parties to be engaged in a voluntary scheme of off-site planting. As this would be entirely voluntary and would not be committed, it isn't included in this assessment. All effects described in Assessment of Effects (Section 11.7) below are, therefore, residual.

11.7 Assessment of Effects

11.7.1 This section presents the findings of the landscape and visual effects assessment for the construction phase, operational and decommissioning phase of the Project. Landscape and visual effects arising from the construction and decommissioning phases would be similar and have been grouped together under the construction phase to avoid repetition.

11.7.2 This section should be read in conjunction with the following Appendices and figures:

- Appendix 11.2 – Assessment of Landscape Effects;
- Appendix 11.3 – Assessment of Visual Effects; and
- Figures and Photomontages (Document Reference 7.1)

11.7.3 Appendix 11.2 provides a detailed assessment of landscape effects for the construction/decommissioning and operational phases of the Project, identifying the value, susceptibility and sensitivity of the Aspect areas affected along with magnitude of change and resulting level of effect.

11.7.4 Similarly, Appendix 11.3 provides a detailed assessment of visual effects on each of the viewpoints for the construction/decommissioning and operational phases of the Project, identifying the value, susceptibility and sensitivity of the receptors affected along with the magnitude of change and resulting level of effect.

11.7.5 The sections below therefore provide a summary of the likely significant effects during construction/decommissioning and operation on the landscape and visual resource. For the full assessment, reference should be made to Appendix 11.2 and 11.3.

a) Construction – Summary of likely significant landscape effects

11.7.6 A detailed assessment of landscape effects during the construction/ decommissioning phase is contained in Appendix 11.2. The likely significant effects are summarised below. Whilst construction effects are all temporary (up to 2 years), there will be differences in the duration of the temporary effects for the Power Generation Plant, Gas Connection and Electrical Connection with the construction effects associated with the Power Generation Plant extending for the longest period of time.

11.7.7 Significant landscape effects are only predicted to result on the landscape resource of the Project Site. Effects on the surrounding landscape character within the 5 km study area would not be significant and are described in detail in Appendix 11.2.

i. Landscape Character – Project Site

11.7.8 The landscape character of the Project Site is made up of the following LANDMAP Aspect Areas:

- Visual and Sensory Aspect Areas – Rhyd-y-pandy and Penllergaer forest;
- Landscape Habitats Aspect Areas – North of Gorseinon and Swansea; East of Penllergaer; Waun Y Garn Wen;
- Historic Landscape Aspect Area – H27 Gower Supraboscus Agricultural;
- Geological Landscape Aspect Area – Penllergaer; and
- Cultural Landscape Aspect Area – The Mawr.

11.7.9 It is the combination of all of the above Aspect areas which defines the overall character of the landscape at the Project Site level and as such value, susceptibility and sensitivity have been determined by consideration of each of these Aspect areas which have led to the following judgements.

11.7.10 **Value**: With reference to the LANDMAP overall evaluation, the Aspect areas range from Moderate to Outstanding. The Aspect areas considered to be of High or Outstanding value tend not to be particularly apparent within the Project Site and consequently the landscape character of the Project Site is considered to be of Medium value.

11.7.11 **Susceptibility**: The landscape resource of the Project Site is considered to have some capacity to accommodate the Project without effects upon its overall integrity. The pattern of the landscape reflects a mostly intact pattern of elements, with features in reasonable condition although a number of detracting elements exist such as the prominent power lines and adjacent Felindre Gas Compressor Station and Substation. Taking all of this into account, landscape susceptibility to change is considered to be Medium.

11.7.12 **Sensitivity**: Taking into account value judgements and susceptibility, overall sensitivity of the landscape character for the Project Site is considered to be Medium.

ii. Power Generation Plant

11.7.13 Construction of the Power Generation Plant would result in temporary adverse effects as a result of the construction plant and activities, laydown areas and temporary structures on site. During construction there would be a permanent loss of landscape features including grazing land, trees and scrub vegetation along with extensive earth re-profiling. Construction noise, activities and lighting would reduce the relative tranquillity in the vicinity of the Project Site. Construction of the Access Road would result in the removal of trees and some woodland although the wider woodland structure including the Ancient Woodland and the associated strong degree of enclosure and shelter it currently provides would remain intact.

11.7.14 Across the entire Project Site, the temporary presence of construction plant, activities and lighting would introduce noticeable features uncharacteristic of the landscape at present. As a result of these changes and the partial loss and alteration of some of the key characteristics, magnitude of change is considered to be Medium.

11.7.15 The Medium sensitivity of the landscape character of the Project Site combined with the Medium magnitude of change would result in a **Moderate Adverse effect** on the landscape character of the Project Site during construction.

iii. Gas Connection

11.7.16 The construction of the Gas Connection would result in temporary adverse effects as a result of the construction plant and activity involved in constructing the Above Ground Installation (AGI) along with an access road into it off the Rhyd-y-pandy road and the Gas Pipeline. The open trench method of constructing the Gas Pipeline would result in the temporary removal of grazing land and the permanent removal of sections of field boundary hedgerow and trees.

11.7.17 The temporary presence of construction plant, activities and lighting would introduce noticeable features uncharacteristic of the landscape at present. As a result of these changes and the partial loss and alteration of some of the key characteristics, magnitude of change is considered to be Medium.

11.7.18 The Medium sensitivity assessed combined with the Medium magnitude of change would result in a **Moderate Adverse** effect on the landscape character of the Project Site during construction.

iv. Electrical Connection

11.7.19 The Electrical Connection route would run immediately adjacent to the alignment of the new Access Road and so disruption associated with its construction would be similar to that of the new Access Road as described above. However, the construction activity and plant associated with the Electrical Connection alone would only result in localised and limited effects to the landscape character resulting in a small loss of woodland and some trees which would not affect the integrity or key characteristics of the landscape. Magnitude of change would be Low which combined with the Medium sensitivity would result in a **Minor Adverse** effect on the landscape character of the Project Site during construction.

v. The Project (all components)

11.7.20 Construction of the Power Generation Plant would result in temporary adverse effects as a result of the construction plant and activities, laydown areas and temporary structures on site. During construction there would be a permanent loss of landscape features including grazing land, trees and scrub vegetation along with extensive earth re-profiling. Construction noise, activities and lighting would reduce the relative tranquillity in the vicinity of the Project Site. Construction of the Access Road would result in the removal of trees and some woodland although the wider woodland structure including the Ancient Woodland and its associated strong degree of enclosure and shelter it currently provides would remain intact.

11.7.21 The construction of the Gas Connection would result in temporary adverse effects as a result of the construction plant and activity involved in constructing the AGI along with an access road into it off the Rhyd-y-pandy road and the Gas Connection. The open trench method of constructing the Gas Pipeline would result in the temporary removal of grazing land and the permanent removal of sections of field boundary hedgerow and trees.

11.7.22 The Electrical Connection route would follow the alignment of the new Access Road and so disruption associated with its construction would be similar to that of the new Access Road as described above.

11.7.23 Across the entire Project Site, the temporary presence of construction plant, activities and lighting would introduce noticeable features uncharacteristic of the landscape at present. As a result of these changes and the partial loss and alteration of some of the key characteristics, magnitude of change is considered to be Medium.

11.7.24 The Medium sensitivity assessed combined with the Medium magnitude of change would result in a **Moderate Adverse** effect on the landscape character of the Project Site during construction.

b) Construction – Summary of likely significant visual effects

11.7.25 A detailed assessment of visual effects during the construction and decommissioning phases is contained in Appendix 11.3. Of the 19 representative viewpoints assessed only 5 of the viewpoints (9, 14, 15, 16 and 17) representing views from residential receptors or recreational routes within 700 m of the Project Site would experience significant effects during the construction and decommissioning phases of the Project. All other viewpoints across the 15 km study area would either experience a **Minor Adverse** or **Negligible** effect or No Effect at all.

11.7.26 The Project Site lies within a valley where it is visually contained from the north, east and west by the higher valley sides and vegetation. Views from local roads are screened or filtered by hedges and earth banks. Views overlooking the Project Site from higher ground to the north and more distant views from the south east close to the Gower AONB would not experience significant effects due to the intervening distance, vegetation and built form. Where views of the construction of the upper parts of the Power Generation Plant and stack are visible in the middle distance of views, they would be seen in the context of the existing network of pylons and transmission lines as well as the tall structures present at the Felindre Gas Compressor Station and Substation and as a result would not experience significant visual effects.

11.7.27 The remaining significant effects would be experienced by viewpoints representative of residential and recreational receptors within close proximity to the Project Site and are summarised below.

i. Power Generation Plant

11.7.28 Significant effects during construction are predicted to be experienced at 5 of the 19 representative viewpoints assessed.

11.7.29 **Viewpoint 9** – Public Right of Way, north of Aber-gelli fach.

11.7.30 This view overlooks the Power Generation Plant where construction plant and activity associated with the upper parts of the gas turbine unit and stack would be visible in the view. Much of the Project Site would be screened by intervening woodland and scrub vegetation. The degree of screening provided by existing vegetation would reduce during winter months when some construction plant and activities including lighting would be more visible through the intervening woodland and hedgerows.

11.7.31 Magnitude of change would be Medium which when combined with a Medium sensitivity would result in a **Moderate Adverse** effect.

11.7.32 **Viewpoint 14** – Public Right of Way near Maes-eglwys Farm

11.7.33 Construction activity and plant associated with the Power Generation Plant would be prominent in views from this location. Whilst some of the construction of the lower sections of plant would be screened by tall hoardings (>3 m high) and intervening vegetation in summer months, the change to the view whilst temporary would be extensive and prominent affecting a wide part of the view.

11.7.34 Magnitude of change would be High which when combined with the High sensitivity would result in a **Major Adverse** effect.

11.7.35 **Viewpoint 15** – Public Right of Way and Minor Road

11.7.36 Temporary construction activity and taller plant such as cranes associated with the construction of the stack and upper parts of the Power Generation Plant would be visible against the skyline. Intervening trees and woodland would limit the extent of construction activity visible in the view although, the degree of screening provided by existing vegetation would reduce during winter months when some construction plant and activities including lighting would be more visible through the intervening woodland and hedgerows.

11.7.37 Magnitude of change would be Medium which combined with the Medium Sensitivity would result in a **Moderate Adverse** effect.

11.7.38 **Viewpoint 16** – Dorglwyd

11.7.39 The lower part of the Power Generation Plant would be screened by intervening trees during the construction period. Construction plant associated with the gas turbine unit and stack would be prominent in the view and visible against the skyline. The change to the view whilst temporary would be extensive and prominent affecting a wide part of the view.

11.7.40 Magnitude of change would be High which combined with the High Sensitivity would result in a **Major Adverse** effect.

11.7.41 **Viewpoint 17** – Cefn Betingau Farm

11.7.42 Construction activity and plant associated with the Power Generation Plant would be prominent in views from this location. Whilst some of the construction of the lower sections of plant would be screened by extensive intervening woodland and landform the taller plant and lighting would be prominent in the view.

11.7.43 Whilst the intervening woodland would limit the extent of construction activity visible in the view in the summer months, the degree of screening provided by the woodland would reduce during winter months when construction plant and activities including lighting, whilst temporary, would be extensive and prominent affecting a wide part of the view.

11.7.44 Magnitude of change would be High which when combined with the High sensitivity would result in a **Major Adverse** effect.

ii. Gas Connection

11.7.45 During construction significant effects resulting from the construction of the Gas Connection are predicted to only occur at one of the representative viewpoints.

11.7.46 **Viewpoint 9** – Public Right of Way, north of Aber-gelli fach.

11.7.47 The focus of this view is towards the Power Generation Plant; however, the Gas Connection route would cut across the fields to the right of the view where the construction activity and plant would be a prominent although temporary element of the view. Further south some screening would be provided by intervening trees and hedges. Whilst the construction of the AGI would not be visible from this particular point on the PRoW, construction of it would be prominent in the view of walkers as they travel north.

11.7.48 Magnitude of change would be Medium which when combined with a Medium sensitivity would result in a **Moderate Adverse** effect.

iii. Electrical Connection

11.7.49 There would be no significant effects on any of the views from the representative viewpoints as a result of construction of the Electrical Connection.

iv. The Project (all components)

11.7.50 The construction plant and activity associated with the construction of the most visually prominent element of the Project would be the Power Generation Plant including the stack. As such the significant visual effects experienced by receptors for the construction and decommissioning phases of the Project as a whole would be as described in the Power Generation Plant section above with significant effects experienced at 5 of the 19 representative viewpoints assessed (viewpoints 9, 14, 15, 16 and 17).

c) Operation – Summary of significant landscape effects

11.7.51 A detailed assessment of landscape effects during the operation phase is contained in Appendix 11.2. The significant effects are summarised below.

11.7.52 Significant landscape effects are only predicted to result on the landscape resource of the Project Site. Effects on the surrounding landscape character within the 5 km study area would not be significant and are described in detail in Appendix 11.2.

11.7.53 Landscape Character – Project Site

11.7.54 The landscape character of the Project Site is made up of the following LANDMAP Aspect Areas:

- Visual and Sensory Aspect Areas – Rhyd-y-pandy and Penllergaer forest;
- Landscape Habitats Aspect Areas – North of Gorseinon and Swansea; East of Penllergaer; Waun Y Garn Wen;
- Historic Landscape Aspect Area – H27 Gower Supraboscus Agricultural;
- Geological Landscape Aspect Area – Penllergaer; and
- Cultural Landscape Aspect Area – The Mawr.

11.7.55 It is the combination of all of the above Aspect areas which defines the overall character of the landscape at the Project Site level and as such value, susceptibility and sensitivity have been determined by consideration of each of these Aspect areas which have led to the following judgements.

11.7.56 **Value**: With reference to the LANDMAP overall evaluation, the Aspect areas range from Moderate to Outstanding. The Aspect areas considered to be of High or Outstanding value tend not to be particularly apparent within the Project Site and consequently the landscape character of the Project Site is considered to be of Medium value.

11.7.57 **Susceptibility**: The landscape resource of the Project Site is considered to have some capacity to accommodate the Project without effects upon its overall integrity. The pattern of the landscape reflects a mostly intact pattern of elements, with features in reasonable condition although a number of detracting elements exist such as the prominent power lines and adjacent Felindre Gas Compressor Station and Substation. Taking all of this into account, landscape susceptibility to change is considered to be Medium.

11.7.58 **Sensitivity**: Taking into account value judgements and susceptibility, overall sensitivity of the landscape character for the Project Site is considered to be Medium.

i. Power Generation Plant

11.7.59 Once operational the Power Generation Plant would be a prominent feature within the immediate landscape of the Generating Equipment Site. It would result in the partial loss to landscape features, including grazing land, trees and scrub vegetation, which would result in a partial change to some of the landscape characteristics although it would not diminish the overall integrity of the landscape.

11.7.60 The Access Road would lie substantially within the woodland characteristic of the Penllergaer Forest Aspect Area which would retain its qualities providing a strong degree of enclosure and shelter.

11.7.61 Across the wider Generating Equipment Site there would be a partial loss to some of the key characteristics of the landscape but this would not result in an obvious change to the overall character of the area. These effects would be long term. At year of opening the magnitude of change would be Medium which when combined with the Medium sensitivity to change would result in a **Moderate Adverse** effect on the landscape character of the Project Site.

11.7.62 Once the structure planting around the Power Generation Plant establishes it would assist in providing some additional structure to the landscape which would assist in integrating elements of the development into the local landscape. Nonetheless, despite the establishment of the planting, the magnitude of effect is considered to remain Medium in the long term (Year 15) as there would remain a noticeable alteration of the existing components of the landscape of the Generating Equipment Site. This would result in a **Moderate Adverse** effect on the landscape character.

ii. Gas Connection

11.7.63 There would be no significant effects on the landscape character as a result of the Gas Connection.

iii. Electrical Connection

11.7.64 There would be no significant effects on the landscape character as a result of the Electrical Connection.

iv. The Project (all components)

11.7.65 Once operational the Power Generation Plant would be a prominent feature within the immediate landscape of the Project Site. It would result in the partial loss to landscape features, including grazing land, trees and scrub vegetation, which would result in a partial change to some of the landscape characteristics although it would not diminish the overall integrity of the landscape.

11.7.66 The Access Road would lie substantially within the woodland characteristic of the Penllergaer Forest Aspect Area which would retain its qualities providing a strong degree of enclosure and shelter.

11.7.67 The Gas Pipeline would be reinstated upon operation with fields returned to grazing and field boundaries reinstated with hedgerow and tree planting. Structure planting and reinstatement boundary vegetation would be planted around the AGI to assist in assimilating it within the immediate landscape pattern. Planting would extend up to existing field boundaries in order to retain the field pattern and avoid land severance.

11.7.68 The Electrical Connection route would be buried immediately adjacent to the Access Road and the long term residual effects on the landscape would be similar to the Access Road as described above.

11.7.69 Across the wider site there would be a partial loss to some of the key characteristics of the landscape but would not result in an obvious change to the overall character of the area. These effects would be long term. At year of opening the magnitude of change would be Medium which when combined with the Medium sensitivity to change would result in a **Moderate Adverse** effect on the landscape character of the Project Site.

11.7.70 Once the structure planting around the Power Generation Plant and AGI establishes it would assist in providing some additional structure to the landscape which alongside the reinstatement hedgerow planting and fields returned to grazing along the Gas Pipeline route would assist in integrating elements of the development into the local landscape. Nonetheless, despite the establishment of the planting, the magnitude of effect is considered to remain Medium at year 15 as there would remain a noticeable alteration of the existing components of the landscape of the Project Site. This would result in a **Moderate Adverse** effect on the landscape character of the Project Site.

d) Operation – Summary of significant visual effects

11.7.71 A detailed assessment of visual effects during the operation phase is contained in Appendix 11.3. Of the 19 representative viewpoints assessed only 5 of the viewpoints (9, 14, 15, 16 and 17) representing views from residential receptors or recreational routes within 700 m of the Project Site would experience significant effects once the Project is operational. All other viewpoints across the 15 km study area would either experience a **Minor Adverse** or **Negligible** effect or No Effect at all.

11.7.72 The Project Site lies within a valley where it is visually contained from the north, east and west by the higher valley sides and vegetation. Views from local roads are screened or filtered by hedges and earth banks. Views overlooking the Project Site from higher ground to the north and more distant views from the south east close to the Gower AONB would not experience significant effects due to the intervening distance, vegetation and built form. Where the upper parts of the Power Generation Plant and stack are visible in the middle distance of views, they would be seen in the context of the existing network of pylons and transmission lines as well as the tall structures present at the Felindre Gas Compressor Station and Substation and as a result would not experience significant visual effects.

11.7.73 The remaining significant effects would be experienced by viewpoints representative of residential and recreational receptors within close proximity (700 m) to the Project Site where the landscape mitigation planting (Figure 3.6) would not be able to reduce the significant effects experienced. These significant effects are summarised below.

i. Power Generation Plant

11.7.74 Significant effects associated with the Power Generation Plant during operation would be experienced at 5 of the 19 representative viewpoints assessed.

11.7.75 **Viewpoint 9** – Public Right of Way, north of Aber-gelli fach.

11.7.76 Once operational the upper part of the gas turbine and stack would be visible against the vegetated backcloth of rising ground to the south, within a small portion of the centre of the mid ground of the view. Whilst they would be seen in the immediate context of the pylons and the stack would not be visible against the skyline, it would introduce a noticeable element into the view resulting in a partial change to the composition of the view.

11.7.77 Magnitude of change would be Medium which when combined with a Medium sensitivity would result in a **Moderate Adverse** effect.

11.7.78 **Viewpoint 14** – Public Right of Way near Maes-eglwys Farm

11.7.79 The Power Generation Plant and in particular the upper part of the Generating Equipment Site would appear prominent in the view and at close range. The stack would appear against the skyline at a similar height as the adjacent pylons but more apparent due to the solid mass of the stack structure. Whilst mitigation structure planting once established would help to screen lower parts of the Power Generation Plant, the taller structures would remain prominent. Overall there would be an extensive change to the composition of the existing view.

11.7.80 Magnitude of change would be High which combined with the High Sensitivity would result in a **Major Adverse** effect.

11.7.81 **Viewpoint 15** – Public Right of Way and Minor Road

11.7.82 The taller structures in the Power Generation Plant including the stack would be visible from this viewpoint. The stack would be seen against the skyline and at a similar height as the adjacent pylons although would appear more prominent as it would be a denser structure. There would be a partial change to the composition of the view which whilst immediately visible would not become the key features in the view particularly given the existing industrial elements apparent in the view.

11.7.83 Magnitude of change would be Medium which combined with the Medium Sensitivity would result in a **Moderate Adverse** effect.

11.7.84 Viewpoint 16 – Dorglwyd

11.7.85 Once operational and during winter months, there would be clear views of the taller structures within the Power Generation Plant, viewed over extensive intervening woodland. The stack would be prominent and seen against the skyline. Whilst it would appear smaller than the adjacent pylon in the view, the stack would appear as prominent due to its denser structure. During summer months the Power Generation Plant including the stack would be barely discernible due to the boundary screen planting, however, the degree of screening provided by this vegetation would reduce during winter months when the taller structures would remain prominent. Overall there would be an extensive change to the composition of the existing view.

11.7.86 Magnitude of change would be High which combined with the High Sensitivity would result in a **Major Adverse** effect.

11.7.87 **Viewpoint 17** – Cefn Betingau Farm

11.7.88 The Power Generation Plant and in particular the upper part of the generating equipment would appear prominent in the view, at close range, changing an extensive proportion of the view, particularly during winter months. The stack would appear against the skyline and whilst seen in the context of the adjacent pylons, would be more apparent due to the solid mass of the stack structure. This along with the taller structures would remain prominent in the view, particularly during the winter when the intervening vegetation would offer less screening. Overall there would be an extensive change to the composition of the existing view.

11.7.89 Magnitude of change would be High which combined with the High Sensitivity would result in a **Major Adverse** effect.

ii. Gas Connection

11.7.90 Once operational, the Gas Connection would not result in any significant visual effects from the representative viewpoints assessed.

iii. Electrical Connection

11.7.91 Once operational, the Electrical Connection would not result in any significant visual from the representative viewpoints assessed.

iv. Project "in combination" Effects

11.7.92 The most visually prominent element of the Project would be the Power Generation Plant including the stack. Although the Project Site is surrounded by existing woodland and undulating topography which would screen the lower parts of the Power Generation Plant the stack and upper parts of the Power Generation Plant would be visible above it. The existing vegetation screen would be strengthened by woodland and hedgerow planting as part of the Outline Landscape and Ecology Mitigation Strategy (Appendix 3.4) and Outline Landscape and Ecology Mitigation Plan (LEMP) (Figure 3.6). Nonetheless the Power Generation Plant would result in significant adverse visual effects for the viewpoints representative of views experienced by nearby residential properties and recreational receptors within 700 m of the Project Site.

11.7.93 As such the visual effects associated with the Project as a whole would be the same as those described in the Power Generation Plant section above with significant effects experienced at 5 of the 19 representative viewpoints assessed (viewpoints 9, 14, 15, 16 and 17).

11.8 Mitigation and Monitoring

11.8.1 Embedded mitigation measures, which have been incorporated within the design of the Project or are standard practice measures that have been committed to are summarised in Section 11.5. All mitigation measures for the landscape and visual assessment are embedded. Whilst residual significant effects remain for some of the landscape and visual receptors, no additional mitigation is available that would be effective in further reducing effects.

11.9 Residual Effects

11.9.1 As all mitigation is embedded in the Project and there is no additional mitigation, all effects described in the Assessment of Effects section above are residual. The following tables therefore present a summary of the landscape and visual assessment.

Table 11-14: Landscape and Visual Assessment Summary of Effects Arising during Construction and Decommissioning Phases

Receptor	Description of Effect	Classification of effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
The Project (all components)					
Landscape Character around Project Site (refer to 11.2 for LANDMAP Aspect Areas)	Effect on Landscape Character	Moderate Adverse	N/A	Moderate Adverse	Significant
Landscape Character within 5 km study area (refer to Appendix 11.2 for LANDMAP Aspect Areas)	Effect on Landscape Character	Minor Adverse to Negligible (refer to Appendix 11.2)	N/A	Minor Adverse to Negligible (refer to Appendix 11.2)	Not significant
VP 1	Effect on Visual Amenity	Minor Adverse	N/A	Minor Adverse	Not significant
VP 2	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 3	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 4	Effect on Visual Amenity	Negligible	N/A	Negligible	Not significant
VP 5	Effect on Visual Amenity	Negligible	N/A	Negligible	Not significant
VP 6	Effect on Visual Amenity	Negligible	N/A	Negligible	Not significant
VP 7	Effect on Visual Amenity	Negligible	N/A	Negligible	Not significant
VP 8	Effect on Visual Amenity	Minor Adverse	N/A	Minor Adverse	Not significant
VP 9	Effect on Visual Amenity	Moderate Adverse	N/A	Moderate Adverse	Significant
VP 10	Effect on Visual Amenity	Minor Adverse	N/A	Minor Adverse	Not significant
VP 11	Effect on Visual Amenity	Minor Adverse	N/A	Minor Adverse	Not significant

Receptor	Description of Effect	Classification of effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
VP 12	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 13	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 14	Effect on Visual Amenity	Major Adverse	N/A	Major Adverse	Significant
VP 15	Effect on Visual Amenity	Moderate Adverse	N/A	Moderate Adverse	Significant
VP 16	Effect on Visual Amenity	Major Adverse	N/A	Major Adverse	Significant
VP 17	Effect on Visual Amenity	Major Adverse	N/A	Major Adverse	Significant
VP 18	Effect on Visual Amenity	Minor Adverse	N/A	Minor Adverse	Not significant
VP 19	Effect on Visual Amenity	Negligible	N/A	Negligible	Not significant
Power Generation Plant					
Landscape Character around Project Site (refer to Appendix 11.2 for LANDMAP Aspect Areas)	Effect on Landscape Character	Moderate Adverse	N/A	Moderate Adverse	Significant
Landscape Character within 5 km study area (refer to Appendix 11.2 for LANDMAP Aspect Areas)	Effect on Landscape Character	Minor Adverse to Negligible (refer to Appendix 11.2)	N/A	Minor Adverse to Negligible (refer to Appendix 11.2)	Not significant
VP 1	Effect on Visual Amenity	Minor Adverse	N/A	Minor Adverse	Not significant
VP 2	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 3	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 4	Effect on Visual Amenity	Negligible	N/A	Negligible	Not significant

Receptor	Description of Effect	Classification of effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
VP 5	Effect on Visual Amenity	Negligible	N/A	Negligible	Not significant
VP 6	Effect on Visual Amenity	Negligible	N/A	Negligible	Not significant
VP 7	Effect on Visual Amenity	Negligible	N/A	Negligible	Not significant
VP 8	Effect on Visual Amenity	Minor Adverse	N/A	Minor Adverse	Not significant
VP 9	Effect on Visual Amenity	Moderate Adverse	N/A	Moderate Adverse	Significant
VP 10	Effect on Visual Amenity	Minor Adverse	N/A	Minor Adverse	Not significant
VP 11	Effect on Visual Amenity	Minor Adverse	N/A	Minor Adverse	Not significant
VP 12	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 13	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 14	Effect on Visual Amenity	Major Adverse	N/A	Major Adverse	Significant
VP 15	Effect on Visual Amenity	Moderate Adverse	N/A	Moderate Adverse	Significant
VP 16	Effect on Visual Amenity	Major Adverse	N/A	Major Adverse	Significant
VP 17	Effect on Visual Amenity	Major Adverse	N/A	Major Adverse	Significant
VP 18	Effect on Visual Amenity	Minor Adverse	N/A	Minor Adverse	Not significant
VP 19	Effect on Visual Amenity	Negligible	N/A	Negligible	Not significant
Gas Connection					
Landscape Character around Project Site (refer to Appendix 11.2 for LANDMAP Aspect Areas)	Effect on Landscape Character	Moderate Adverse	N/A	Moderate Adverse	Significant

Receptor	Description of Effect	Classification of effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
Landscape Character within 5 km study area (refer to Appendix 11.2 for LANDMAP Aspect Areas)	Effect on Landscape Character	Minor Adverse to Negligible (refer to Appendix 11.2)	N/A	Minor Adverse to Negligible (refer to Appendix 11.2)	Not significant
VP 1	Effect on Visual Amenity	Minor Adverse	N/A	Minor Adverse	Not significant
VP 2	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 3	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 4	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 5	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 6	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 7	Effect on Visual Amenity	Negligible	N/A	Negligible	Not significant
VP 8	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 9	Effect on Visual Amenity	Moderate Adverse	N/A	Moderate Adverse	Significant
VP 10	Effect on Visual Amenity	Negligible	N/A	Negligible	Not significant
VP 11	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 12	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 13	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 14	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 15	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 16	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant

Receptor	Description of Effect	Classification of effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
VP 17	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 18	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 19	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
Electrical Connection					
Landscape Character around Project Site (refer to Appendix 11.2 for LANDMAP Aspect Areas)	Effect on Landscape Character	Minor Adverse	N/A	Minor Adverse	Not significant
Landscape Character within 5 km study area (refer to Appendix 11.2 for LANDMAP Aspect Areas)	Effect on Landscape Character	Minor Adverse to Negligible (refer to Appendix 11.2)	N/A	Minor Adverse to Negligible (refer to Appendix 11.2)	Not significant
VP 1	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 2	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 3	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 4	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 5	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 6	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 7	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 8	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 9	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant

Receptor	Description of Effect	Classification of effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
VP 10	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 11	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 12	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 13	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 14	Effect on Visual Amenity	Minor Adverse	N/A	Minor Adverse	Not significant
VP 15	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 16	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 17	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 18	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 19	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant

Table 11-15: Landscape and Visual Assessment Summary of Effects Arising during Operational Phase

Receptor	Description of Effect	Classification of effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
The Project (all components)					
Landscape Character around Project Site (refer to Appendix 11.2 for LANDMAP Aspect Areas)	Effect on Landscape Character	Moderate Adverse	N/A	Moderate Adverse	Significant
Landscape Character within 5 km study area (refer to Appendix 11.2 for LANDMAP Aspect	Effect on Landscape Character	Minor Adverse to Negligible (refer to Appendix 11.2)	N/A	Minor Adverse to Negligible (refer to Appendix 11.2)	Not significant

Receptor	Description of Effect	Classification of effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
Areas)					
VP 1	Effect on Visual Amenity	Minor Adverse	N/A	Minor Adverse	Not significant
VP 2	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 3	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 4	Effect on Visual Amenity	Negligible	N/A	Negligible	Not significant
VP 5	Effect on Visual Amenity	Negligible	N/A	Negligible	Not significant
VP 6	Effect on Visual Amenity	Negligible	N/A	Negligible	Not significant
VP 7	Effect on Visual Amenity	Negligible	N/A	Negligible	Not significant
VP 8	Effect on Visual Amenity	Minor Adverse	N/A	Minor Adverse	Not significant
VP 9	Effect on Visual Amenity	Moderate Adverse	N/A	Moderate Adverse	Significant
VP 10	Effect on Visual Amenity	Minor Adverse	N/A	Minor Adverse	Not significant
VP 11	Effect on Visual Amenity	Minor Adverse	N/A	Minor Adverse	Not significant
VP 12	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 13	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 14	Effect on Visual Amenity	Major Adverse	N/A	Major Adverse	Significant
VP 15	Effect on Visual Amenity	Moderate Adverse	N/A	Moderate Adverse	Significant
VP 16	Effect on Visual Amenity	Major Adverse	N/A	Major Adverse	Significant
VP 17	Effect on Visual Amenity	Major Adverse	N/A	Major Adverse	Significant
VP 18	Effect on Visual Amenity	Minor Adverse	N/A	Minor Adverse	Not significant
VP 19	Effect on Visual Amenity	Negligible	N/A	Negligible	Not significant

Receptor	Description of Effect	Classification of effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
Power Generation Plant					
Landscape Character around Project Site (refer to Appendix 11.2 for LANDMAP Aspect Areas)	Effect on Landscape Character	Moderate Adverse	N/A	Moderate Adverse	Significant
Landscape Character within 5 km study area (refer to Appendix 11.2 for LANDMAP Aspect Areas)	Effect on Landscape Character	Minor Adverse to Negligible (refer to Appendix 11.2)	N/A	Minor Adverse to Negligible (refer to Appendix 11.2)	Not significant
VP 1	Effect on Visual Amenity	Minor Adverse	N/A	Minor Adverse	Not significant
VP 2	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 3	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 4	Effect on Visual Amenity	Negligible	N/A	Negligible	Not significant
VP 5	Effect on Visual Amenity	Negligible	N/A	Negligible	Not significant
VP 6	Effect on Visual Amenity	Negligible	N/A	Negligible	Not significant
VP 7	Effect on Visual Amenity	Negligible	N/A	Negligible	Not significant
VP 8	Effect on Visual Amenity	Minor Adverse	N/A	Minor Adverse	Not significant
VP 9	Effect on Visual Amenity	Moderate Adverse	N/A	Moderate Adverse	Significant
VP 10	Effect on Visual Amenity	Minor Adverse	N/A	Minor Adverse	Not significant
VP 11	Effect on Visual Amenity	Minor Adverse	N/A	Minor Adverse	Not significant
VP 12	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant

Receptor	Description of Effect	Classification of effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
VP 13	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 14	Effect on Visual Amenity	Major Adverse	N/A	Major Adverse	Significant
VP 15	Effect on Visual Amenity	Moderate Adverse	N/A	Moderate Adverse	Significant
VP 16	Effect on Visual Amenity	Major Adverse	N/A	Major Adverse	Significant
VP 17	Effect on Visual Amenity	Major Adverse	N/A	Major Adverse	Significant
VP 18	Effect on Visual Amenity	Minor Adverse	N/A	Minor Adverse	Not significant
VP 19	Effect on Visual Amenity	Negligible	N/A	Negligible	Not significant
Gas Connection					
Landscape Character around Project Site (refer to Appendix 11.2 for LANDMAP Aspect Areas)	Effect on Landscape Character	Minor Adverse	N/A	Minor Adverse	Not significant
Landscape Character within 5 km study area (refer to Appendix 11.2 for LANDMAP Aspect Areas)	Effect on Landscape Character	Minor Adverse to Negligible (refer to Appendix 11.2)	N/A	Minor Adverse to Negligible (refer to Appendix 11.2)	Not significant
VP 1	Effect on Visual Amenity	Negligible	N/A	Negligible	Not significant
VP 2	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 3	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 4	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 5	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant

Receptor	Description of Effect	Classification of effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
VP 6	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 7	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 8	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 9	Effect on Visual Amenity	Negligible	N/A	Negligible	Not significant
VP 10	Effect on Visual Amenity	Negligible	N/A	Negligible	Not significant
VP 11	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 12	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 13	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 14	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 15	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 16	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 17	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 18	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 19	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
Electrical Connection					
Landscape Character around Project Site (refer to Appendix 11.2 for LANDMAP Aspect Areas)	Effect on Landscape Character	Negligible	N/A	Negligible	Not significant
Landscape Character within 5 km study area (refer to Appendix 11.2 for	Effect on Landscape Character	Negligible	N/A	Negligible	Not significant

Receptor	Description of Effect	Classification of effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
LANDMAP Aspect Areas)					
VP 1	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 2	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 3	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 4	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 5	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 6	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 7	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 8	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 9	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 10	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 11	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 12	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 13	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 14	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 15	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 16	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 17	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 18	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant
VP 19	Effect on Visual Amenity	No Effect	N/A	No Effect	Not significant

11.10 Cumulative Effects

a) Assessment of Potential Cumulative Effects – Construction and Decommissioning

i. Description of Impact

11.10.1 The following potential cumulative effects on landscape and visual receptors have been identified as potentially arising as a result of construction and decommissioning of the Project in combination with other schemes set out in **Chapter 17: Cumulative Impacts**. Only receptors considered to experience significant residual effects as identified in the landscape and visual assessment of the Project have been considered below in combination with the potential effects from the cumulative projects.

- Landscape character of the Project Site comprising the following Aspect Areas:
  - Visual and Sensory Aspect Areas – Rhyd-y-pandy and Penllergaer forest;
  - Landscape Habitats Aspect Areas – North of Gorseinon and Swansea; East of Penllergaer; Waun Y Garn Wen;
  - Historic Landscape Aspect Area – H27 Gower Supraboscus Agricultural;
  - Geological Landscape Aspect Area – Penllergaer; and
  - Cultural Landscape Aspect Area – The Mawr
- Viewpoint 9 – views experienced from the PRoW north of Aber-gelli fach;
- Viewpoint 14 – views experienced from the PRoW near Maes-eglwys Farm;
- Viewpoint 15 – views experienced from the PRoW and minor road which lead to Pant-lasau;
- Viewpoint 16 – views from Dorglwyd residential property; and
- Viewpoint 17 – views from Cefn Betingau Farm.

11.10.2 However, no cumulative development would be visible from viewpoints 14, 16 and 17 and are therefore not considered any further in the cumulative assessment.

ii. Assessment of cumulative effect

11.10.3 The following cumulative developments are located within the Aspect areas which characterise the landscape of the Project Site:

<u>Rhyd-y-pandy (Visual and Sensory)</u>

- 1,10,12 (Felindre Business Park)
- Identified/Allocated sites 23, 24, 27-29

<u>Penllergaer forest (Visual and Sensory)</u>

- 6 – Former J R Steelworks, Bryntywod
- 11 – Llettyr Morfil Farm
- 13 – Griffiths Waste Management Site
- 21 – Land at Bryntywod

11.10.4 The construction activity and plant associated with the Project in combination with the construction of these cumulative developments would result in localised effects on these Visual and Sensory Aspect areas, with the cumulative developments concentrated in areas that are already influenced by development. As such the introduction of construction activity and lighting associated with the Project into this cumulative picture would result in a partial change to some of the landscape characteristics although it would not be sufficient to diminish the overall integrity of the landscape.

North of Gorseinon and Swansea (Landscape Habitats)

- Identified/Allocated sites 23, 28, 29

East of Penllergaer (Landscape Habitats)

- 1, 10, 12 (Felindre Business Park)
- 6 – Former J R Steelworks, Bryntywod
- 11 – Llettyr Morfil Farm
- 13 – Griffiths Waste Management Site
- 21 – Land at Bryntywod
- 24 – NW of M4 J46, Llangyfelach

Waun Y Garn Wen (Landscape Habitats)

- No cumulative schemes

11.10.5 The construction activity and plant associated with the Project in combination with these cumulative schemes is considered to have localised effects on the grassland habitats but not sufficient to result in a noticeable change to the landscape habitat characteristics.

H27 Gower Supraboscus Agricultural (Historic Landscape)

- 1, 10, 12 (Felindre Business Park)
- 6 – Former J R Steelworks, Bryntywod
- 11 – Llettyr Morfil Farm
- 13 – Griffiths Waste Management Site
- 24 – NW of M4 J46, Llangyfelach
- Identified/Allocated sites 21, 27-29

11.10.6 The construction activity and plant associated with the Project in combination with these cumulative schemes is considered to have a localised effect on the enclosed pattern of fields typical of this historic landscape Aspect area.

Penllergaer (Geological Landscape)

- 1, 10, 12 (Felindre Business Park)
- 6 – Former J R Steelworks, Bryntywod
- 11 – Llettyr Morfil Farm
- 13 – Griffiths Waste Management Site
- 24 – NW of M4 J46, Llangyfelach

- Identified/Allocated sites 21, 27-29

11.10.7 The construction activity and plant associated with the Project in combination with these cumulative schemes is not considered to affect key features of geological or geomorphological significance.

The Mawr (Cultural Landscape)

- 1, 10, 12 (Felindre Business Park)
- 6 – Former J R Steelworks, Bryntywod
- 11 – Llettyr Morfil Farm
- 13 – Griffiths Waste Management Site
- 24 – NW of M4 J46, Llangyfelach
- Identified/Allocated sites 21, 27-29

11.10.8 The construction activity and plant associated with the Project in combination with these cumulative schemes is not considered to affect the multi-period historic and evolved cultural significance.

11.10.9 Overall the construction activity and plant associated with the Project in combination with the construction of these cumulative schemes would result in localised effects on these Aspect areas which define the landscape character of the Project Site, with the cumulative developments mainly concentrated in areas that are already influenced by development. As such the introduction of construction plant and lighting associated with the Project into this cumulative picture would result in a partial change to some of the landscape characteristics of the Project Site area although it would not be sufficient to diminish the overall integrity of the landscape.

11.10.10 Cumulative magnitude of change would be Low which combined with the Medium sensitivity would result in a **Minor Adverse** cumulative effect which is not significant.

Viewpoint 9 – PRoW, north of Aber-gelli fach

11.10.11 The construction of the following cumulative developments would potentially be visible from this viewpoint:

- 1 – Felindre Business Park
- 6 – Former Steelworks, Bryntywod
- 11 – Llettyr Morfil Farm
- 12 – Plot 8 Felindre Business Park
- 13 – Griffiths Waste Management Site
- 15 – Land at Llewellyn Road
- 16 – Royal Fern Golf Resort
- 8 – Parc Ceirw
- 19 – Former Civic Centre Penllergaer
- Identified/Allocated sites 21-24, 26-29

11.10.12 Construction associated with the majority of the above cumulative schemes would be barely discernible in the view due to distance, intervening planting, landform and built fabric. The only cumulative developments where the plant and construction activity might be visible in combination with the Project would be sites 24, 27 and 29, all of which are Identified/Allocated sites, where little information is currently available. Construction plant and activity associated with the residential development in site 27 might appear in the distant view against the urban backcloth of north Swansea. The construction of the potential Combined Heat and Power (CHP) facility (site 29) and site 24 (northwest of M4 J46, Llangyfelach) might potentially be visible in the mid-ground of the view.

11.10.13 The construction of the Project in combination with these three sites has the potential to introduce construction activity into small, separate parts of the view resulting in a limited cumulative change. As such the construction of the Project in combination with these three cumulative sites would result in a Low magnitude of cumulative change which when combined with the Medium sensitivity of the receptor would result in a **Minor Adverse** cumulative effect which is not significant.

11.10.14 **Viewpoint 15** – PRoW and Minor Road

11.10.15 The construction of the following cumulative development would potentially be visible from this viewpoint:

- 28 – Morriston Hospital

11.10.16 This is an Identified/Allocated site and little information is available about the future development, either in terms of location or scale. Construction plant and activity associated with the Project in combination with the construction of cumulative site 28 might result in small changes to the mid-ground view, although intervening vegetation would limit the extent of construction activity visible.

11.10.17 At worst, cumulative magnitude of change would be Low which combined with the Medium sensitivity would result in a **Minor Adverse** cumulative effect which is not significant.

ii. Mitigation

11.10.18 As no significant cumulative effects are predicted, it is not considered necessary to identify additional mitigation, management actions or monitoring.

iii. Residual cumulative effect

11.10.19 As no mitigation is proposed, all effects described above are residual. These are summarised in Table 11-16.

Table 11-16: Cumulative landscape and visual effects arising during construction and decommissioning phases

Receptor	Sensitivity	Cumulative Magnitude	Level of cumulative effects/significance
Landscape Character around Project Site (refer to	Medium	Low	Minor Adverse

Receptor	Sensitivity	Cumulative Magnitude	Level of cumulative effects/significance
Appendix 111.2 for LANDMAP Aspect Areas)			Not significant
Viewpoint 9	Medium	Low	Minor Adverse Not significant
Viewpoint 15	Medium	Low	Minor Adverse Not significant

b) Assessment of Potential Cumulative Effects – Operation

i. Description of impact

11.10.20 The following potential cumulative impacts on landscape and visual receptors have been identified as potentially arising as a result of operation of the Project in combination with other schemes set out in Chapter 17. Only receptors considered to experience significant residual effects as identified in the landscape and visual assessment of the Project have been considered below in combination with the potential effects from the cumulative projects.

- Landscape character of the Project Site comprising the following Aspect Areas:
  - Visual and Sensory Aspect Areas – Rhyd-y-pandy and Penllergaer forest;
  - Landscape Habitats Aspect Areas – North of Gorseinon and Swansea; East of Penllergaer; Waun Y Garn Wen;
  - Historic Landscape Aspect Area – H27 Gower Supraboscus Agricultural;
  - Geological Landscape Aspect Area – Penllergaer; and
  - Cultural Landscape Aspect Area – The Mawr
- Viewpoint 9 – views experienced from the PRoW north of Aber-gelli fach;
- Viewpoint 14 – views experienced from the PRoW near Maes-eglwys Farm;
- Viewpoint 15 – views experienced from the PRoW and minor road which lead to Pant-lasau;
- Viewpoint 16 – views from Dorglwyd residential property; and
- Viewpoint 17 – views from Cefn Betingau Farm.

11.10.21 However, no cumulative development would be visible from viewpoints 14, 16 and 17 and are therefore not considered any further in the cumulative assessment.

ii. Assessment of cumulative effect

11.10.22 The following cumulative developments are located within the Aspect areas which characterise the landscape of the Project Site:

<u>Rhyd-y-pandy (Visual and Sensory)</u>

- 1,10,12 (Felindre Business Park)
- Identified/Allocated sites 23, 24, 27-29

Penllergaer forest (Visual and Sensory)

- 6 – Former J R Steelworks, Bryntywod
- 11 – Llettyr Morfil Farm
- 13 – Griffiths Waste Management Site
- 21 – Land at Bryntywod

11.10.23 The Project in combination with these cumulative developments would result in localised effects on these Visual and Sensory Aspect areas, with the cumulative developments concentrated in areas that are already influenced by development. As such the introduction of the Project into this cumulative picture would result in a partial change to some of the landscape characteristics although it would not be sufficient to diminish the overall integrity of the landscape.

North of Gorseinon and Swansea (Landscape Habitats)

- Identified/Allocated sites 23, 28, 29

East of Penllergaer (Landscape Habitats)

- 1, 10, 12 (Felindre Business Park)
- 6 – Former J R Steelworks, Bryntywod
- 11 – Llettyr Morfil Farm
- 13 – Griffiths Waste Management Site
- 21 – Land at Bryntywod
- 24 – NW of M4 J46, Llangyfelach

Waun Y Garn Wen (Landscape Habitats)

- No cumulative schemes

11.10.24 The Project in combination with these cumulative schemes is considered to have localised effects on the grassland habitats but not sufficient to result in a noticeable change to the landscape habitat characteristics.

H27 Gower Supraboscus Agricultural (Historic Landscape)

- 1, 10, 12 (Felindre Business Park)
- 6 – Former J R Steelworks, Bryntywod
- 11 – Llettyr Morfil Farm
- 13 – Griffiths Waste Management Site
- 24 – NW of M4 J46, Llangyfelach
- Identified/Allocated sites 21, 27-29

11.10.25 The Project in combination with these cumulative schemes is considered to have a localised effect on the enclosed pattern of fields typical of this historic landscape Aspect area.

Penllergaer (Geological Landscape)

- 1, 10, 12 (Felindre Business Park)
- 6 – Former J R Steelworks, Bryntywod

- 11 – Llettyr Morfil Farm
- 13 – Griffiths Waste Management Site
- 24 – NW of M4 J46, Llangyfelach
- Identified/Allocated sites 21, 27-29

11.10.26 The Project in combination with these cumulative schemes is not considered to affect key features of geological or geomorphological significance.

The Mawr (Cultural Landscape)

- 1, 10, 12 (Felindre Business Park)
- 6 – Former J R Steelworks, Bryntywod
- 11 – Llettyr Morfil Farm
- 13 – Griffiths Waste Management Site
- 24 – NW of M4 J46, Llangyfelach
- Identified/Allocated sites 21, 27-29

11.10.27 The Project in combination with these cumulative schemes is not considered to affect the multi-period historic and evolved cultural significance.

11.10.28 Overall the Project in combination with these cumulative schemes would result in localised effects on these Aspect areas which define the landscape character of the Project Site, with the cumulative developments mainly concentrated in areas that are already influenced by development. As such the introduction of the Project into this cumulative picture would result in a partial change to some of the landscape characteristics of the Project Site area although it would not be sufficient to diminish the overall integrity of the landscape.

11.10.29 Cumulative magnitude of change would be Low which combined with the Medium sensitivity would result in a **Minor Adverse** cumulative effect which is not significant.

Viewpoint 9 – PRoW, north of Aber-gelli fach

11.10.30 The following cumulative developments would potentially be visible from this viewpoint:

- 1 – Felindre Business Park
- 6 – Former Steelworks, Bryntywod
- 11 – Llettyr Morfil Farm
- 12 – Plot 8 Felindre Business Park
- 13 – Griffiths Waste Management Site
- 15 – Land at Llewellyn Road
- 16 – Royal Fern Golf Resort
- 8 – Parc Ceirw
- 19 – Former Civic Centre Penllergaer
- Identified/Allocated sites 21-24, 26-29

11.10.31 The majority of the above cumulative schemes would be barely discernible in the view due to distance, intervening planting, landform and built fabric. The only cumulative developments which might be visible in combination with the Project would be schemes 24, 27 and 29, all of which are Identified/Allocated sites and so little information is currently available. Once operational the residential mixed use development (scheme 27) would be barely discernible from the northern urban edge of Swansea. Depending on the scale of the CHP facility (scheme 29) it might be visible in the mid-ground of the view, partially screened by intervening vegetation and site 24 might be visible set within the wooded valley structure in the periphery of the view. The Project in combination with site 29 would introduce another industrial development into the mid-ground of the view, and in combination with site 24 both would occupy a different horizontal extent of the view and would be partially screened by vegetation. The Low cumulative magnitude of change combined with the medium sensitivity would result in a **Minor** Adverse cumulative effect which would not be significant.

Viewpoint 15 – PRoW and Minor Road

11.10.32 The following cumulative development would potentially be visible from this viewpoint:

- 28 – Morriston Hospital

11.10.33 This is an Identified/Allocated site and little information is available about this future development, either in terms of location or scale. There is a possibility that the Project would be visible in combination with cumulative site 28, however, intervening vegetation is likely to screen much of cumulative site 28 and the introduction of the Project into this cumulative picture would at worst result in a Low cumulative magnitude of change. This combined with the Medium sensitivity would result in a **Minor Adverse** cumulative effect which would not be significant.

iii. Mitigation

11.10.34 As no significant cumulative effects are predicted, it is not considered necessary to identify additional mitigation, management actions or monitoring.

iv. Residual cumulative effect

11.10.35 As no mitigation is proposed, all effects described above are residual. These are summarised in Table 11-17.

Table 11-17: Cumulative landscape and visual effects arising during operation phase

Receptor	Sensitivity	Cumulative Magnitude	Level of cumulative effects/significance
Landscape Character around Project Site (refer to Appendix 11.2 for LANDMAP Aspect Areas)	Medium	Low	Minor Adverse Not significant

Receptor	Sensitivity	Cumulative Magnitude	Level of cumulative effects/significance
Viewpoint 9	Medium	Low	Minor Adverse Not significant
Viewpoint 15	Medium	Low	Minor Adverse Not significant

11.11 References

Ref. 11.1 Prepared by Natural England by Land Use Consultants. Integrating the European Landscape Convention: Parts 1-3 Guidance. 2009.

Ref. 11.2 Landscape Institute and Institute of Environmental Assessment and Management. Guidelines for Landscape and Visual Impact Assessment. 3rd Edition. 2013.

Ref. 11.3 Natural Resources Wales. LANDMAP Methodological Guidance Series. 2016.

Ref. 11.4 Landscape Institute. Landscape Institute Advice Note 01/11: Photography and photomontage in landscape and visual impact assessment. Landscape Institute, 2011.

Chapter 12

Traffic, Transport, & Access

CONTENTS

TABLES

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APPENDICES

12. Traffic, Transport and Access

12.1 Introduction

12.1.1 This chapter provides an assessment of the likely transport effects arising from construction, operation and decommissioning of the Project. Maintenance is included within the operational assessment of the Project.

12.1.2 A detailed description of the Project Site and the Project is provided in **Chapter 3: Project and Site Description**. A glossary of terms and list of abbreviations used in this chapter is provided in **Document Reference 1.4.**

12.1.3 A Transport Assessment (TA) has been incorporated into this chapter to provide a single source for the analysis of the likely transport effects of the Project. This is in line with approach undertaken in relation to other nationally significant infrastructure projects. A Construction Traffic Management Plan (CTMP) and a Construction Staff Travel Plan (CSTP) are presented in Appendix 3.3a and 3.3b respectively.

a) Objectives of the assessment

12.1.4 The objectives of the assessment were to:

- Identify the national and local legislation and policy considered relevant to the Project;
- Identify the baseline conditions of the study area, including existing movements associated with the Project Site, the local highway network and operational conditions, road safety and accessibility by sustainable modes;
- Identify the significance of effects of the Project during the construction, operational and decommissioning periods following implementation of embedded mitigation;
- Identify the additional mitigation required to prevent, reduce or offset any significant adverse effects; and
- Identify the likely residual effects and cumulative effects once these measures have been employed.

12.2 Changes since the 2014 PEIR

12.2.1 There have been changes to the design as a result of design evolution and consultation as detailed in **Chapter 3: Project and Site Description**. To aid the reader, Table 12-1 below outlines the changes to this assessment compared with the 2014 PEIR. There are no changes to report since the 2018 PEIR.

Table 12-1: A summary of changes to the Transport Assessment since the 2014 and 2018 PEIR

Section	Changes since the 2014 PEIR	Section Reference
Legislation, Policy and Guidance	Regional – Inclusion of the *Joint Transport Plan South West Wales 2015-2020*	Section 12.3
	Local – Inclusion of the *Local Development Plan 2010-2025: Deposit Plan*	Section 12.3

Section	Changes since the 2014 PEIR	Section Reference
Baseline	Walking, cycling and public transport information (inclusion of new route and timetable information.	Section 12.5
	Road safety (updated analysis of recent data).	Section 12.5
Methodology	Confirmation of route of the section of new of Access Road.	Section 12.4
	Inclusion of details of AGI access.	Section 12.4
	Assessment criteria in respect of pedestrian receptors.	Section 12.4
	Assessment criteria in respect of driver delay.	Section 12.4
	Assessment year.	Section 12.4
Significance of Effect	Traffic generation forecasts and corresponding effects.	Section 12.7

12.3 Legislation, Policy and Guidance

12.3.1 This section identifies and describes legislation, policy and guidance of relevance to the assessment of the potential transport impacts associated with the Project.

12.3.2 Legislation and policy has been considered on a national, regional and local level. The following is considered to be relevant to the TA as it has influenced the sensitivity of receptors and requirements for mitigation or the scope and/or methodology of the ES.

a) National

12.3.3 The national (UK and Wales) legislation, policy and guidance that has been consulted is as follows:

- Overarching National Policy Statement for Energy (EN-1), Department of Energy and Climate Change (July 2011) (Ref. 12.1);
- Planning Policy Wales, Edition 9, Welsh Government (November 2016) (Ref. 12.2);
- Technical Advice Note 18: Transport, Welsh Government (March 2007) (Ref. 12.3);
- *Wales Transport Strategy*, Welsh Government (April 2008) (Ref. 12.4);
- *Active Travel (Wales) Act*, Welsh Government (2013) (Ref. 12.5); and
- Guidelines for the Environmental Assessment of Road Traffic, Institute of Environmental Assessment (1993) (Ref. 12.6).

12.3.4 Relevant provisions and policies from these documents have been identified under the following sub-sections.

i. Overarching National Policy Statement for Energy (EN-1)

12.3.5 The *Overarching National Policy Statement for Energy (EN-1)* was published in July 2011 (Ref. 12.1). It sets out the national policy for energy infrastructure.

12.3.6 Section 5.13 deals with 'Traffic and Transport'. It requires projects that are likely to have significant transport implications to include a TA as part of the Environmental Statement (ES), prepared in accordance with the appropriate guidance at that time. Where appropriate, a travel plan should be prepared including demand management measures to mitigate transport impacts, and details of proposed measures to improve access by public transport, walking and cycling, to reduce the need for parking associated with the proposal and to mitigate transport impacts. Where mitigation is needed, possible demand management measures must be considered and if feasible and operationally reasonable, required, before considering requirements for the provision of new inland transport infrastructure to deal with remaining transport impacts. Where the proposed mitigation measures are insufficient to reduce the impact on the transport infrastructure to acceptable levels, the Secretary of State (SoS) should consider requirements to mitigate adverse impacts on transport networks arising from the development.

ii. Planning Policy Wales, Edition 9

12.3.7 Edition 9 of *Planning Policy Wales* (PPW) was published in November 2016 and sets out the land use planning policies of the Welsh Government (WG) (Ref. 12.2). It is supported by a number of Technical Advice Notes (TANs), which provide detailed planning advice on subjects contained within PPW. *TAN 18: Transport* is considered of particular relevance to the Project and is included in this policy review. An overarching theme within PPW is the commitment of the WG to sustainability.

12.3.8 Planning policy in Wales is plan-led, with up to date Local Development Plans (LDPs) forming a fundamental part of the system. PPW states that planning applications *"must be determined in accordance with the adopted plan unless material considerations indicate otherwise"*.

iii. Technical Advice Note 18: Transport

12.3.9 TAN 18 was published in March 2007 (Ref. 12.3). It describes how to integrate land use and transport planning, and explains how transport impacts should be assessed and mitigated. It supports and should be read in conjunction with PPW.

12.3.10 Paragraph 9.2 states that *"developers should be required by local authorities to submit transport assessments to accompany planning applications for developments that are likely to result in significant trip generation"*. A TA is included as part of this ES.

12.3.11 TAN 18 requires a Transport Implementation Strategy (TIS). This should seek to:

- *"Identify what policy objectives and requirements are set by the development plan in terms of access to the development and movements in and around the site;*

- *Identify what access arrangements are required for a successful development (meeting the needs of the developer, end user, addressing impacts on neighbours and existing movements surrounding the site); and*
- *Specify the package of physical, management and promotional measures needed to accommodate the requirements identified above, such as physical infrastructure, the design and location of buildings, parking management, financial incentives and dedicated travel plan co-ordinators."*

12.3.12 The requirements of a TIS are addressed in this ES chapter. Policy is discussed at Section 12.2. The access arrangements, embedded mitigation and package of measures are set out at **Chapter 3: Project and Site Description**.

iv. Wales Transport Strategy

12.3.13 The *Wales Transport Strategy* (WTS) was published in April 2008 (Ref. 12.4). This seeks to ensure that transport features strongly in the WG's policy spectrum:

- *"Getting the most out of our existing transport system;*
- *Making greater use of more sustainable modes of travel; and*
- *Reducing demands on the transport system."*

v. Active Travel (Wales) Act

12.3.14 The *Active Travel (Wales) Act* came into force in Wales in November 2013 (Ref. 12.5). The Act makes it a legal requirement for local authorities in Wales to map and plan for suitable routes for active travel, and to build and improve their infrastructure for walking and cycling every year. It also requires both the WG and Local Authorities to promote walking and cycling as a mode of transport.

12.3.15 The Act is accompanied by a statutory design guidance document, published in December 2014, which provides advice on the planning, design, construction and maintenance of active travel networks and infrastructure, and is to be used at all stages of the process. This is more specifically aimed at residential and employment development.

vi. Guidelines for the Environmental Assessment of Road Traffic

12.3.16 The *Guidelines for the Environmental Assessment of Road Traffic* (the IEA Guidelines) suggests rules-of-thumb to delimit the scale and the extent of assessment (Ref. 12.6). It also identifies numerous receptors for consideration in assessment. These rule-of-thumb and receptors are discussed in further detail in Section 12.4.

b) Regional

12.3.17 The regional policy and guidance that has been consulted is as follows:

- *Joint Transport Plan for South West Wales 2015-2020*, South West Wales Integrated Transport Consortium (2015) (Ref. 12.7).

i. Joint Transport Plan South West Wales 2015-2020

12.3.18 The *Joint Transport Plan South West Wales 2015-2020* sets out the vision and objectives for transport in the four Local Authorities in South West Wales, namely

Carmarthenshire County Council, Neath Port Talbot County Borough Council, Pembrokeshire County Council and the CCS (Ref. 12.7).

12.3.19 The document references a number of key issues across the South West Wales area. This includes *"increased congestion on the strategic highway network, increasing journey times and reduced journey time reliability for the movement of people and goods"*. Proposed actions include encouraging travel plan development, car sharing and the use of Park and Ride (P&R) sites.

12.3.20 It provides a short, medium and long term programme of interventions to work towards achieving its goals. The short-term programme sets out those schemes that are priorities for the next five years up to 2020. The medium and long term programme identifies aspirations up to 2030. The medium and long term programme lists the 'Felindre Strategic Business Park Northern Roads Improvement' scheme, described as *"improvements to accommodate greater levels of traffic generated by new development being established at the Felindre Strategic Business Park and a possible large residential development adjacent to it (subject to LDP approval)"*. This is relevant as the Project Site lies approximately 1.5 km to the northwest of this development area.

c) Local

12.3.21 The local policy and guidance that has been consulted is as follows:

- *Unitary Development Plan*. City and County of Swansea (2008) (Ref. 12.8); and
- *Local Development Plan 2010-2025: Deposit Plan*. City and County of Swansea (2016) (Ref. 12.9).

i. Unitary Development Plan

12.3.22 The *Unitary Development Plan* (UDP) was adopted in November 2008 (Ref. 12.8). It sets out the policies and proposals to guide future development in the CCS up to 2016. It will remain the current LDP until adoption of the *Local Development Plan 2010-2015*.

12.3.23 Policy EV21 relates to non-residential development in rural areas. Part V states that schemes will be permitted where it can be demonstrated it is essential for utilities provision.

12.3.24 Policy R9 states:

"The renewal, upgrading or extension of the infrastructure of utility services providers will be supported where the development:

- *Contributes towards objectives of economic regeneration or forms part of the planned development of a wider network; and*
- *Incorporates all reasonable measures to minimise any significant adverse impact on the natural heritage, historic environment, health and communities."*

ii. Local Development Plan 2010-2025: Deposit Plan

12.3.25 The CCS is currently in the process of developing a new LDP, which, when adopted, will replace the existing UDP. The latest LDP document is the *Deposit*

Plan, published in July 2016 (Ref. 12.9). Following a period of public consultation, this was submitted for independent examination in July 2017. Most policies relate to residential and employment developments, but there are some that are relevant to the Project, as identified in the following paragraphs. As emerging policy this is not yet part of the statutory development plan, and it is likely that it would only be afforded limited weight in decision-making.

12.3.26 Policy IO1 (Supporting Infrastructure) states that *"development must be supported by appropriate infrastructure, facilities and other requirements considered necessary as part of the proposal"* and *"where there is a deficiency in provision or capacity that arrangements are in place to support the development with new or improved infrastructure, facilities or other measures."*

12.3.27 Policy CV2 (Development in the Countryside) states that there is a presumption against development in the countryside, except where it is for necessary infrastructure provision.

12.3.28 Policy T1 (Transport Measures and Infrastructure) states *"development must be supported by appropriate transport measures and infrastructure"*. This includes ensuring safe and efficient access to the transport network can be achieved and that developments are served by appropriate parking provision and circulation areas. It concludes by stating that *"development that would have an unacceptable impact on the safe and efficient operation of the transport network will not be permitted"*.

12.3.29 Policy T5 (Design Principles for Transport Measures and Infrastructure) states that the design of development together with any supporting transport measures and infrastructure must allow for the safe, efficient and effective movement of vehicles.

12.3.30 Policy T6 (Parking) states that proposals must be served by appropriate parking provision, in accordance with maximum parking standards. Where parking cannot be provided on-site, provision should be made for alternative transport measures.

12.3.31 Policy T7 (Public Rights of Way and Recreational Routes) seeks to ensure the protection of Public Rights of Way (PRoW) and requires an alternative route to be identified and provided where an existing route is adversely affected by a development.

12.4 Methodology

a) Scope of the Assessment

12.4.1 The scope of this assessment has been determined through a formal EIA scoping process undertaken with the SoS. Comments raised on the EIA Scoping Report have been taken into account in the development of the assessment methodology and these are detailed where relevant in this chapter. Full responses to the comments raised in the EIA Scoping Opinion can be found in Appendix 4.3, which are also summarised in Table 12-2 below.

b) Consultation

12.4.2 The scope of the assessment has also been informed by ongoing consultation with statutory consultees throughout the design and assessment process. With regard to the assessments and studies carried out for this chapter, AECOM has liaised with the CCS (the Local Highway Authority (LHA)). The discussions were used to inform and agree an appropriate extent and methodology for carrying out the work.

12.4.3 A summary of the comments raised and responses that have informed the scope and methodology of the TA are detailed in Table 12-2.

Table 12-2: Summary of Consultation Responses

Consultee	Date	Comment	Response
SoS (paragraphs 2.49 and 2.57)	August 2014	Requirement for details of the transport routes.	Included at Section 12.4.
SoS (paragraphs 2.59)	August 2014	Requirement for details of construction traffic.	Included at Section 12.7.
SoS (paragraphs 2.60)	August 2014	Requirement for details of operational traffic.	Included at Section 12.7.
SoS (paragraphs 2.61)	August 2014	Requirement for details of decommissioning traffic.	Included at Section 12.7.
SoS (paragraphs 3.87)	August 2014	Recommendation to consult with Network Rail regarding abnormal loads.	APL has contacted Network Rail's Asset Protection Team.
Local Planning Authority	10/10/2017	Request to contact case Highway Officer direct.	Agreed and Highway Officer contacted directly.
LHA	20/10/2017	Telephone discussion with Highway Officer to scope out extent of work.	Meeting arranged.
LHA	26/10/2017	Scoping meeting with LHA.	Study area agreed and methodology for progress of work. Set out in Section 12.4.
LHA	02/11/2017	Request for Personal Injury Collision (PIC) data.	Information received. See Section 12.5.
LHA	09/11/2017	Meeting/discussion on traffic data validity.	Agreed. Set out in Section 12.5.
LHA	24/11/2017	Submission of Scoping Note to LHA.	A draft Scoping Note formed the basis of discussions at the meeting with the LHA on 09/11/2017. This was formalised to reflect what was agreed in the

Consultee	Date	Comment	Response
			discussions, with the LHA welcomed to provide any further comments, if appropriate. No further comments were received.
Network Rail	February 2018	Consultation required regarding routes that include Network Rail assets.	APL has contacted Network Rail's Asset Protection Team.
LHA	February 2018	Incorrect naming of link within the 'Summary of Residual Effects'.	Corrected for final ES.
LHA	February 2018	Requirement for assessment of decommissioning phase.	Growth rate calculators only go as far as 2030 and therefore it is possible to assess at this stage. It has been confirmed that the impact of decommissioning will be less than that identified for construction.
LHA	February 2018	Requirement for inclusion of two strategic sites ('SD E: North of Clasemont Road, Morriston' and 'SD G: Northwest of M4 J46, Llangyfelach') in the cumulative assessment.	Set out in Section 12.10.

c) Study Area

12.4.4 Access to the Project Site will be from the B4489 approximately 1.7 km from M4 Junction 46. Traffic will utilise the Access Road to the Substation and Felindre Gas Compressor Station and then along a new section of Access Road. The new section of Access Road is to be constructed as a permanent feature of the Project and would run across agricultural land to the Generating Equipment Site. In the 2014 PIER the new section of Access Road was proposed to be taken from the existing Substation car park (Option A).The 2018 PIER proposed a new section of Access Road (Option B), which is described in detail within **Chapter 3: Project & Site Description.** The new section of Access Road will commence around 850 m along the Access Road at a point where a junction already exists. The Access Road options have been developed in order to avoid disruptive works to the existing Substation and to avoid significant earthworks and Ancient Woodland. The current proposals are progressing Option B. For the purposes of the assessments, the choice of new section of Access Road is not a material concern and does not in any way affect the findings or outcomes of the extensive analysis undertaken. The Generating Equipment Site is approximately 1.7 km from the B4489 (measured along the Access Road and new section of Access Road).

12.4.5 An access point will also be created at the northern extent of the Project Site for the AGI (the AGI Access). In travel terms, the AGI Access is located a further 2 km north along the B4489 from the Access Road, then 1.6 km east along Rhyd-y-Pandy Road. Rhyd-y-Pandy Road also serves the Felindre Water Treatment Works.

12.4.6 The transport study area includes the Access Road between the Project Site and the B4489 and continues south to incorporate the M4 Junction 46 and the A48/Pant Lasau Road junction. The section of the B4489 north of the Access Road and the section of Rhyd-y-Pandy Road to the AGI Access is also included. This study area was selected to include the necessary junctions and access routes agreed with the CCS as part of the consultation process.

12.4.7 The study area remains constant between the construction, operational and decommissioning periods. The study area is shown on Figure 12.1.

d) Assessment Approach and Scenarios

i. Construction

12.4.8 For the assessment of the construction period, the methodology has been designed to assess the impact of the construction traffic generated by the Project against background traffic conditions. 2020 has been identified as the peak year of activity for traffic generation during the construction period. The Project is expected to be in operation by 2022. 2022 is likely to be the final year of construction and therefore represents the year at which background traffic will be highest prior to the opening of the Project. Therefore, to ensure a 'worst case' assessment, 2022 has been selected as the future assessment year and compounded with the peak construction traffic activity from 2020. The following scenarios have been assessed:

- 2017 Base Year (for establishing the existing conditions);
- 2022 Baseline (for establishing the future conditions);
- 2022 Baseline + Power Generation Plant Construction Traffic (for establishing the future conditions with the addition of the Power Generation Plant construction traffic);
- 2022 Baseline + Gas Connection Construction Traffic (for establishing the future conditions with the addition of the Gas Connection construction traffic);
- 2022 Baseline + Electrical Connection Construction Traffic (for establishing the future conditions with the addition of the Electrical Connection construction traffic); and
- 2022 Baseline + Project Construction Traffic (for establishing the future conditions with the addition of the Project construction traffic).

12.4.9 Information relating to existing traffic patterns on local roads was obtained through commissioned traffic surveys undertaken in October 2014.

12.4.10 In order to estimate future growth in traffic flows, traffic growth factors have been obtained from TEMPro. The TEMPro program is based on the National Trip End Model (Dataset 7.2) and takes into account changes in car ownership and local planning forecasts regarding housing and employment.

12.4.11 The forecast has been based on a 'rural' road in the 'Swansea 004' TEMPro zone. An average of the factors for the 'motorway', 'trunk' and 'principal' road types has been taken, consistent with the road types in the study area. The factors have been derived for growth from 2014, as this was the year in which the traffic data was collected. The factors are set out in Table 12-3.

Table 12-3: TEMPro Growth Factors

Growth Period	Time Period	Growth Factor
2014-2017	Weekday AM Peak	1.0317
	Weekday PM Peak	1.0333
	Weekday 24-Hour	1.0369
2014-2022	Weekday AM Peak	1.0945
	Weekday PM Peak	1.0943
	Weekday 24-Hour	1.1022

12.4.12 The traffic generated by the Project during the construction period has been quantified using contractor estimates of the resources required and refined using calculations based on available information. Construction traffic will be associated with both the construction staff working on the Project Site (travelling in cars and vans) and the delivery of materials (by HGVs). There will also be a requirement for abnormal deliveries; these will be very few in number and managed outside of normal working hours. More information on abnormal loads is provided in Section 12.7. From this, an approximate construction programme has been developed and used to estimate the peak traffic generated. The traffic generation has been calculated based on the following assumptions:

- All construction staff will arrive at and depart the Project Site in private cars or vans at average vehicle occupancy of 1.6 (this value was agreed with the CCS as part of previous assessment work). Due to the limitations of public transport provision, no staff are expected to arrive or depart by public transport. The contractor will be responsible for implementing a CSTP to encourage car sharing amongst staff;
- All imports and exports of materials required for construction will be via HGVs.
- The assessment of construction has included weekdays only as the base levels of traffic were surveyed and were shown to be higher on a weekday than a Saturday. Saturdays have therefore not been considered in this assessment as weekdays present the worst case. The core working hours during construction are between 08:00 and 18:00hrs (Monday to Friday) and 08:00 and 13:00hrs (Saturdays and Bank Holidays);
- All construction staff will arrive and depart during the peak hours to ensure a robust worst case assessment. Therefore, all staff are assumed to arrive between 07:45 and 08:45hrs, and depart between 16:30 and 17:30hrs. Temporary parking spaces for staff will be made available within the Laydown Area during construction of the new Access Road. No construction staff vehicles will be parked on any of the public roads surrounding the Project Site at any time;

- For all imports, HGVs will arrive full and depart empty. For all exports, HGVs will arrive empty and depart full. This will ensure a robust worst case assessment. However, it is likely to be the case that HGV usage will be more efficiently optimised to ensure that HGVs arrive and depart with a full load to reduce the total number of trips on the network; and
- The import and export of materials to and from the Project Site will occur throughout the duration of the site's operational hours. At this stage, it is not possible to estimate groupings of deliveries and therefore a flat profile of deliveries has been assumed throughout the day.

12.4.13 There are two peaks, one associated with construction staff and one associated with the delivery of materials. These will occur at different times in the construction period. In this assessment the two peaks have been assessed together, i.e. compounded to ensure a robust worst case assessment in the event of any changes to the construction programme. The assessment considers the likely transport effects during the weekday AM and PM peak hours, and for the weekday 24-hour period. The peak hours have been determined as 07:45-08:45hrs and 16:30-17:30hrs respectively from the traffic survey information.

ii. Operation and Maintenance

12.4.14 The impacts of the operational period have not been assessed to the same extent as the construction period as the traffic generation will be relatively minor compared to the construction period, with the increases in traffic well within both rules-of-thumb identified in the IEA Guidelines (see paragraph 12.3.16) (Ref. 12.6); these are discussed at paragraph 12.4.16.

iii. Decommissioning

12.4.15 Traffic forecasts for the decommissioning phase are not available, but are likely to be of a similar level to that generated during the construction period. However, traffic growth forecasts are not available to assess as far in the future as decommissioning (25 years after opening). Therefore, the impact has been assessed, in detail, only in terms of the traffic generated during the construction period.

e) Determining the Significance of Effect

12.4.16 The assessment has been based upon the Institute of Environmental Assessment's *Guidelines for the Environmental Assessment of Road Traffic* (the IEA Guidelines). The IEA Guidelines suggest in paragraph 3.15 that two broad rules-of-thumb be used as a screening process to delimit the scale and extent of the assessment. These are:

- *"Rule 1 include highway links where traffic flows will increase by more than 30% (or the number of heavy goods vehicles will increase by more than 30%).*
- *Rule 2 include any other specifically sensitive areas where traffic flows have increased by 10% or more."* (Ref. 12.6)

12.4.17 These rules-of-thumb form the starting point for the assessment of effects. Specifically sensitive areas under Rule 2 include accident black-spots, conservation areas, hospitals and links with high pedestrian flows.

12.4.18 The significance of the effects of the Project have been considered in respect of the following receptors based on the IEA Guidelines:

- Severance;
- Driver delay;
- Pedestrian delay;
- Pedestrian amenity;
- Fear and intimidation; and
- Accidents and safety.

12.4.19 For many receptors, the IEA Guidelines do not contain simple rules or formulae which define the thresholds of significance. Therefore, there is a need to exercise professional judgement in determining the degree of the effect and whether or not an improvement is required and, if required, what the improvement should comprise. The following tables have been developed in this manner.

i. Severance, Pedestrian Delay, Pedestrian Amenity, Fear and Intimidation

12.4.20 Receptors relating to severance, pedestrian delay, pedestrian amenity, and fear and intimidation are associated primarily with the pedestrian experience. The criteria for the sensitivity of these receptors and magnitude of change have been developed based on changes in the volume and composition of traffic. An increase in traffic volumes and HGV composition can result in difficulties for pedestrians when crossing roads and affect the pleasantness of journeys. The criteria for assessment are set out in Table 12-4.

Table 12-4: Receptor Sensitivity and Magnitude of Change Criteria – Severance, Pedestrian Delay, Pedestrian Amenity, Fear and Intimidation

Sensitivity	**Criteria**
Very Low	Traffic flows of less than 100 vehicles per hour or HGV flow of less than 100 HGVs per day.
Low	Traffic flows of between 100 and less than 1,000 vehicles per hour or HGV flow of between 100 and less than 1,000 HGVs per day.
Medium	Traffic flows of between 1,000 vehicles and less than 2,000 vehicles per hour or HGV flow of between 1,000 and less than 2,000 HGVs per day.
High	Traffic flows of 2,000 vehicles and greater per hour or HGV flow of 2,000 HGVs and greater per day.
Magnitude	**Criteria**
Very Low	Changes in traffic flows/HGV flow of between 1% and less than 30%.
Low	Changes in traffic flows/HGV flow of between 30% and less than 60%.
Medium	Changes in traffic flows/HGV flow of between 60% and less than 90%.
High	Change in traffic flows/HGV flow of 90% and greater.

12.4.21 The significance of effects for these receptors have also been assessed in qualitative terms in the context of existing pedestrian infrastructure, including the quality of footways, presence of street lighting and availability and type of crossing facilities.

12.4.22 In respect of PRoW, it is considered inappropriate to use this criteria given the existing PRoW in the vicinity of the Project Site are not adjacent to the carriageway. As will be discussed at Section 12.5.19, there are PRoW that cross the Project Site and, in view of the negligible existing traffic movements at these locations, it is considered appropriate to use a qualitative assessment criteria, as set out in Table 12-5.

Table 12-5: Receptor Sensitivity and Magnitude of Change Criteria – PRoW

Sensitivity	Criteria
Very Low	-
Low	-
Medium	-
High	Assumed as a worst case.
Magnitude	**Criteria**
Very Low	Little or no hindrance to pedestrian movement.
Low	All people wishing to make pedestrian movements will be able to do so, but there will be some hindrance to movement.
Medium	Some people, particularly vulnerable user groups, are likely to be deterred from making journeys on foot. For others, pedestrian journeys will be longer or less attractive.
High	People are likely to be deterred from making pedestrian journeys to an extent sufficient to induce a reorganisation of their activities. Those who do make journeys on foot will experience considerable hindrance.

ii. Driver Delay

12.4.23 Changes in levels of delay at junctions have been used in the assessment of driver delay. The criteria for sensitivity of receptor and magnitude of change are set out in Table 12-6.

Table 12-6: Receptor Sensitivity and Magnitude of Change Criteria – Driver Delay

Sensitivity	**Criteria**
Very Low	Junction delay of less than 10 seconds per vehicle.
Low	Junction delay of between 10 seconds and less than 30 seconds per vehicle.
Medium	Junction delay of between 30 seconds and less than 60 seconds per vehicle.
High	Junction delay greater of 60 seconds and greater per vehicle.
Magnitude	**Criteria**
Very Low	Change in junction delay per vehicle of between 1% and less than 30%.
Low	Change in junction delay per vehicle of between 30% and less than 60%.
Medium	Change in junction delay per vehicle of between 60% and less than 90%.
High	Change in junction delay per vehicle of 90% and greater.

12.4.24 The level of driver delay is derived from the capacity assessment of junctions in the study area network. The capacity assessment has been undertaken using the Transport Research Laboratories (TRL) software program 'Junctions 9'. This summarises the performance for all movements/approach arms in terms of their ratio of flow to capacity (RFC), queues in vehicles and delay in seconds per vehicle. Delay is the key measurement for this receptor.

iii. Accidents and Safety

12.4.25 The number of collisions on a road is an indicator of the current road safety conditions. An analysis of Personal Injury Collision (PIC) data has been undertaken over a three year period to identify whether there are any locations within the study area where there is an existing safety issue. Where an issue has been identified, a qualitative assessment has been undertaken to ascertain the likelihood that the Project will lead to further deterioration in safety.

iv. Interaction of Magnitude of Change and Sensitivity of Receptor

12.4.26 Effects on receptors can be beneficial, adverse or negligible, and of minor, moderate or major significance. The significance criteria are derived from the interaction of receptor sensitivity and magnitude of change of effect. A matrix of magnitude of change and sensitivity of receptor is set out in Table 12-7, and in **Chapter 4: Approach to Environmental Impact Assessment**. Major and moderate effects are considered significant, and minor and negligible effects are considered not significant.

Table 12-7: Assessment Matrix

Magnitude of Change	Sensitivity of Receptor			
	High	Medium	Low	Very Low
High	Major	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Minor
Low	Moderate	Minor	Minor	Negligible
Very Low	Minor	Minor	Negligible	Negligible

12.5 Baseline Environment

12.5.1 This section describes the baseline environmental characteristics for the Project and surrounding areas with specific reference to transport.

a) Project Site Description and Context

12.5.2 The Project Site is currently used for agricultural purposes (sheep and horse grazing). The western extent of the Project Site includes parts of the Substation and the Access Road from the B4489 that serves the Substation and Felindre Gas Compressor Station. The level of traffic generation associated with the agricultural activities and maintenance visits to the Substation and Felindre Gas Compressor Station is immaterial and likely to be accommodated in the daily variation of traffic flows.

b) Data Collection

12.5.3 In order to determine the baseline conditions in the study area, data was collected from numerous sources, as summarised in Table 12-8.

Table 12-8: Data Collection

Subject Area	Source
Local Highway Network	Site visit (21/11/2017) / OS mapping / online desktop review.
Highway Operational Conditions	Traffic surveys undertaken by Sky High (now Tracsis) in 2014. Growth factors have been applied to this data to represent conditions in 2017.
Walking, Cycling and Public Transport	Site visit (21/11/2017)/ online desktop review (PRoW mapping obtained from the CCS, public transport timetables).
Road Safety	PIC data obtained from the CCS.

12.5.4 The data was used to determine the:

- Weekday AM and PM peak hours for use in the assessment;
- Locations of concern in terms of highway operation;
- Collision history within the study area; and
- Opportunities for sustainable travel to/from the Project Site.

i. Local Highway Network

12.5.5 The local highway network is shown on Figure 12.2.

12.5.6 The Project Site is served by a privately maintained Access Road from the B4489. The Access Road is unlit. The width of the Access Road varies along its length between 3.5 m and 7.5 m, and is generally bordered by trees and intermittent hedgerows. The Access Road connects to the B4489 via a simple priority junction. This is characterised by large radii on the minor arm (the Access Road) to accommodate HGV movements.

12.5.7 The B4489 routes between the village of Felindre to the north (approximately 2.3 km from the Access Road) and the M4 Junction 46 to the south (approximately 1.8 km from the Access Road). The B4489 is subject to a 40 mph speed limit at its junction with the Access Road. At this location, the road has a 5.5 m wide carriageway and is unlit. Approximately 330 m to the north of the Access Road, the B4489 becomes subject to the national speed limit. The B4489 continues a further 1.7 km north where it connects to Rhyd-y-Pandy Road at a priority junction. This section of the B4489 is unlit and ranges in width between 4.5 m and 5.5 m, with numerous passing places. The junction with Rhyd-y-Pandy Road and its approaches are subject to a 30 mph speed limit. Rhyd-y-Pandy Road routes east for 1.6 km where it passes the northern extent of the Project Boundary. This section of Rhyd-y-Pandy Road is unlit and ranges in width between 4.5 m and 5.5 m, with numerous passing places. It is subject to a 30 mph speed limit, increasing to the national speed limit around 900 m east of its junction with the B4489. It also serves the Felindre Water Treatment Works.

12.5.8 Approximately 475 m to the south of the Access Road, the B4489 is street lit. A further 75 m south from this point, the B4489 forms a three-arm roundabout with the access to the Felindre Park and Share.

12.5.9 The B4489 forms a dumbbell roundabout with the M4 Junction 46. The northern dumbbell roundabout junction comprises three arms; the B4489 and the eastbound on/off-slips of the M4. The southern dumbbell roundabout junction comprises six arms; the A48 (three arms), the B4489 Swansea Road, and the westbound on/off-slips of the M4. The south-eastern arm of the A48 forms a mini-roundabout junction with Pant Lasau Road approximately 90 m southeast of the southern dumbbell roundabout. These junctions are subject to a 40 mph speed limit and are lit.

ii. Highway Operational Conditions

12.5.10 An Automatic Traffic Count (ATC) survey was undertaken on the B4489 between the Access Road and the roundabout junction with the Felindre Park and Share. The survey was undertaken between Thursday 16th October 2014 and Wednesday 22nd October 2014. The traffic flow information for an average weekday is summarised in Table 12-9. Growth factors have been applied to the 2014 data to represent conditions in 2017.

Table 12-9: Summary Traffic Flow Information – B4489

Time Period	Direction	Total Vehicles	Number of HGVs	HGV%
Weekday AM Peak Hour (07:45-08:45)	Northbound	44	1	2%
	Southbound	88	2	2%
	Two-Way	132	2	2%
Weekday PM Peak Hour (16:30-17:30)	Northbound	55	0	0%
	Southbound	30	0	0%
	Two-Way	85	0	0%
Weekday 24-Hour	Northbound	476	4	1%
	Southbound	510	8	2%
	Two-Way	987	12	1%

Note: Summation errors due to rounding.

12.5.11 Table 12-9 shows that, on an average weekday, the B4489 carries approximately 130 vehicles during the AM peak hour, 90 vehicles during the PM peak hour, and 1,000 vehicles over the 24-hour period. HGVs account for no more than 2% of total traffic.

12.5.12 Junction Turning Count (JTC) surveys were also undertaken on Thursday 16th October 2014 at the following junctions in the study area network:

- M4 Junction 46 Northern Dumbell Roundabout;
- M4 Junction 46 Southern Dumbell Roundabout; and
- A48/Pant Lasau Road Mini-Roundabout.

12.5.13 The traffic survey data is reproduced in Appendix 12.1. The 2014 traffic flows at the surveyed locations during the weekday AM and PM peak hours are shown on Figures 12.3 and 12.4 respectively. Growth factors have been applied to represent traffic flows in 2017, as shown on Figures 12.5 and 12.6 respectively.

12.5.14 The surveyed junctions have been modelled using the TRL software program 'Junctions 9'. They have been modelled as a linked network in view of their proximity to each other. This has required the use of the lane simulation tool, which only provides outputs for queuing and delay. The capacity assessment results for 2017 during the weekday AM and PM peak hours are summarised in Table 12-10. These are shown for the entry arms to the network (listed clockwise from the northern arm of the B4489) and exclude the internal links. The capacity assessment output reports are reproduced in Appendix 12.2.

Table 12-10: 2017 Capacity Assessment Results

Entry Arm	Weekday AM Peak Hour		Weekday PM Peak Hour	
	Queue (Vehicles)	Delay (Secs/ Vehicle)	Queue (Vehicles)	Delay (Secs/ Vehicle)
B4489 (North)	2	34	1	6
M4 WB Off-Slip	211	884	2	6
Pant Lasau Road	6	43	25	134
A48 (Southeast)	3	17	75	372
B4489 (South)	36	171	2	8
A48 (Southwest)	59	638	1	6
M4 EB Off-Slip	113	823	1	6

12.5.15 Table 12-10 shows that, during the AM peak hour, the highest levels of queuing and delay are experienced on the M4 eastbound and westbound off-slips, followed by the A48 (Southwest) and B4489 (South). During the PM peak hour, levels of queuing and delay are significantly lower across the junction, with Pant Lasau Road and the A48 (Southeast) experiencing the highest levels of queuing and delay.

12.5.16 On-site observations carried out by AECOM during the AM peak hour on Tuesday 21st November 2017 suggests that the M4 Junction 46 is operating well within capacity. At the time of the observational visit, it was apparent that the queues reported by the modelling were not present at that time. This is particularly the case for the M4 off-slips, which appeared to be free flowing or with minimal queuing. The modelling is therefore considered to represent a 'worst-case' of existing conditions at the junctions.

12.5.17 The analyses is carried out as part of this chapter will be based upon the previously observed traffic flows and queues and will therefore be a robust assessment of this part of the network.

iii. Road Safety

12.5.18 A review of PIC data has been undertaken to determine whether there are any locations on the local highway network with poor collision records.

12.5.19 The data was obtained from CCS for the three-year period from 1st October 2014 to 30th September 2017 (the most recent three-year period for which data was available). The reports for each of the PICs recorded in the study area together with a plan showing the location of each PIC (these are not included in this ES for data protection reasons).

12.5.20 A total of 25 PICs were recorded in study area over the three-year period, of which three were 'serious'. The remaining 22 PICs were all 'slight'. No 'fatal' PICs were recorded in the study area. For ease of analysis the PICs have been separated into those occurring at junctions and on links in the study area. The following account of the events which led to a PIC was taken from the records provided.

PICs at Junctions

12.5.21 One ‘slight’ PIC was recorded at the M4 Junction 46 Northern Dumbbell Roundabout. This involved a collision between a vehicle entering the roundabout and a vehicle already on the roundabout.

12.5.22 Four ‘slight’ PICs were recorded at the A48/Pant Lasau Road Mini-Roundabout. These all involved a collision between a vehicle entering the mini-roundabout and a vehicle already on the roundabout. These types of collisions are not uncommon on mini-roundabouts, due to the limited separation between entry arms. Further analysis has been undertaken of the listed causation factors for the PICs (these cannot be explicitly stated here for data protection reasons); this has not identified any highway defects contributing to these PICs.

12.5.23 One ‘serious’ PIC was recorded at the M4 Junction 46 Southern Dumbbell Roundabout. This involved a vehicle on the M4 westbound off-slip losing control and colliding with a tree on the central roundabout island.

PICs Recorded on Links

12.5.24 One ‘slight’ PIC was recorded on the B4489, south of its junction with Rhyd-y-pandy Road. This involved a collision between two vehicles on a bend; one vehicle was travelling northbound, and the other vehicle was travelling southbound.

12.5.25 Three ‘slight’ PICs were recorded on the M4 eastbound, between the off and on slips of the M4 Junction 46. Two of these PICs involved vehicles losing control, and the remaining PIC involved a rear-end shunt collision.

12.5.26 Two ‘slight’ PICs were recorded on the M4 eastbound, east of the M4 Junction 46, both of which involved rear-end shunt collisions.

12.5.27 Two ‘slight’ PICs were recorded on the M4 westbound, east of the M4 Junction 46. These involved a rear-end shunt collision, and a collision between two vehicles as one vehicle was changing lanes.

12.5.28 One ‘slight’ PIC was recorded on the M4 westbound off-slip. This involved a vehicle losing control and leaving the carriageway.

12.5.29 Three ‘PICs’ were recorded on the M4 westbound, between the off and on slips of the M4 Junction 46. The ‘serious’ PIC involved a vehicle losing control after entering the drainage system. The ‘slight’ PICs involved a rear-end shunt collision, and a vehicle losing control and colliding with the central barrier.

12.5.30 One ‘slight’ PIC was recorded on the M4 eastbound, west of the M4 Junction 46. This involved a rear-end shunt collision.

12.5.31 Two ‘slight’ PICs were recorded on the M4 eastbound off-slip. One of the PICs involved a vehicle losing control, colliding with the barrier and overturning. No description was provided for the remaining PIC.

12.5.32 One ‘slight’ PIC was recorded on the A48 between the M4 Junction 46 Southern Dumbbell Roundabout and the A48/Pant Lasau Road Mini-Roundabout. This

involved a vehicle travelling southeast-bound entering the opposite side of the carriageway and colliding with an oncoming vehicle.

12.5.33 One 'serious' PIC was recorded on Pant Lasau Road, northeast of the A48/Pant Lasau Road Mini-Roundabout. This involved a collision between a vehicle and a pedestrian that had entered the carriageway.

12.5.34 One 'slight' PIC was recorded on the A48, southeast of the A48/Pant Lasau Road Mini-Roundabout. This involved a collision between a vehicle performing a u-turn and another vehicle.

12.5.35 One 'slight' PIC was recorded on the A48, southwest of the M4 Junction 46. This involved a collision between a vehicle pulling off from the side of the carriageway and a vehicle travelling southwest-bound.

Summary

12.5.36 Overall, the analysis of the PIC data and listed causation factors has not identified any existing highway safety issues in the study area. Where PICs have been recorded, these have been identified as being as a result of causation factors relating to driver/road user error and weather conditions. No causation factors relating to highway defects have been reported in the PIC data.

iv. Walking and Cycling

12.5.37 The walking and cycling facilities and PRoW are shown on Figure 12.7.

12.5.38 There are no footways that serve the Project Site. The nearest footways are on the B4489, approximately 475m south of the Access Road (on the approach to the junction with the Felindre Park and Share. This footway continues to the M4 Junction 46. The 500 m section of the footway to the north of the M4 Junction 46 is separated from the carriageway edge by a barrier. At the M4 Junction 46 the footways continues south along the east side of the carriageway, serving the southern arms of the southern dumbbell roundabout, with dropped kerbs and tactile paving to facilitate crossing movements across entry arms.

12.5.39 There are no formal cycling routes in the vicinity of the Project Site. Part of the B4489 is identified as an 'advisory cycling route' on the CCS's cycle map. This covers the section of the B4489 that routes north from the Access Road to Felindre and to a point approximately 475 m south of the Access Road. Due to distance from the Project Site, no assessment of cycle routes has therefore been undertaken in this chapter to cycle routes, although is discussed in **Chapter 16: Socio-economics**.

12.5.40 There are numerous PRoW crossing/in the vicinity of the Project Site. Footpaths LC34 and LC117 cross the Access Road (and the new section of Access Road) at points approximately 350 m and 1.3 km from the B4489. Footpath LC35B passes through the northern part of the Project Site, connecting to Rhyd-y-Pandy Road to in the vicinity of the AGI Access.

v. Public Transport

12.5.41 The nearest bus stop to the Project Site is the 'Lliw Reservoirs' stop located on Rhyd-y-pandy Road. This is situated to the east of Felindre and approximately 500 m to the northwest of the northern extent of the Project Site boundary. There is no footway between the Project Site and this bus stop. It provides access to Service 142, which routes between Morriston and Garnswllt. This service is operated by DANSA, a community transport organisation. There are three to four services per day in each direction, although these can generally only be pre-booked.

12.5.42 Service 141 passes to the south of the Project Site, routeing between Gorseinon and Morriston. The nearest stop that provides access to this service is the 'Pant Lasau Cross' stop located on Mynydd Gelli Wastad Road. It is situated approximately 750 m to the southeast of the southern extent of the Project Site boundary and can be accessed via Footpath LC117.

12.5.43 There are no railway stations in the vicinity of the Project Site. Llansamlet railway station is situated approximately 5.5 km southeast of the Project Site, accessible by car via the A48 (from M4 Junction 44 and 46). Swansea railway station is a further 7 km from the Project Site; this is a key local transport hub and is more easily accessible by public transport. Swansea railway station is managed by Arriva Trains Wales. There are four services daily from Swansea to Shrewsbury; an hourly service from Swansea to Manchester Piccadilly, which calls at Cardiff Central; and a total of two to three services hourly from Swansea to Cardiff Central. Great Western Railway also provides services from Swansea to London Paddington, calling at Bristol Parkway.

12.5.44 Overall, the opportunities to access the Project Site by public transport are limited, and it is therefore considered that, for the purposes of this assessment, no trips by construction, maintenance and permanent staff will be undertaken by these modes.

vi. Parking

12.5.45 Felindre Park and Share is accessed from the B4489, approximately 550 m south of the Access Road. It is located on the site of the proposed Felindre Business Park. It has capacity for 480 spaces and its use is encouraged for employees of the Driver and Vehicle Licensing Agency (DVLA) Headquarters HQ in Clase. A shuttle bus service runs between the Felindre Park and Share and the DVLA. There are no other parking facilities in the study area. The Felindre Park and Share is understood to be managed by the DVLA and will not be available for use by the Project.

12.6 Embedded Mitigation

12.6.1 As detailed in **Chapter 3: Project and Site Description**, a number of embedded mitigation measures have been identified through the iterative EIA process and have been incorporated into the design and construction planning of the Project.

12.6.2 As these mitigation measures have been embedded into the design, are legal requirements or are standard practices that will be implemented, the assessment of likely significant effects assumes that they are in place.

12.7 Assessment of Effects

12.7.1 This section presents the findings of the TA for the construction, operation and maintenance and decommissioning phases of the Project.

12.7.2 This section also identifies any likely significant effects that are predicted to occur and Section 12.8 highlights the additional mitigation and monitoring measures that are proposed to reduce or eliminate the identified significant effects.

a) Construction

i. Traffic Generation

Power Generation Plant

12.7.3 The construction of the Power Generation Plant is estimated to take 22 months. The new section of Access Road will be constructed as part of the Power Generation Plant and is expected to take around six months. To ensure a robust assessment, the peaks in construction staff traffic and HGV traffic have been assessed together against the background traffic. The traffic generation for these peaks are shown for the weekday AM and PM peak hours and 24-hour period in Table 12-11. On average, it is forecast that it will generate around 80 HGV movements and around 140 light vehicle movements per day.

Table 12-11: Power Generation Plant Peak Traffic Generation

Time Period	Vehicle Type	Arrivals	Departures	Total
Weekday AM Peak Hour (07:45-08:45)	Light Vehicles (Staff)	64	0	64
	HGVs	11	0	11
	Total	**75**	**0**	**75**
Weekday PM Peak Hour (16:30-17:30)	Light Vehicles (Staff)	0	64	64
	HGVs	0	11	11
	Total	**0**	**75**	**75**
Weekday 24-Hour	Light Vehicles (Staff)	123	123	246
	HGVs	57	57	114
	Total	**180**	**180**	**360**

12.7.4 The traffic generation consists of tankers transporting foul effluent and water, delivery of materials and the export of waste/excavated materials not suitable for use on site (it is assumed that all excavated material will be unsuitable for re-use to represent the worst case).

12.7.5 There will also be a requirement to transport some abnormal loads. The shape and scale of these loads will be refined as the construction process develops in more detail. At this stage in the assessments we have taken instruction from the current design and from previous experience from within the Applicant team. There are expected to be two abnormal loads; these are likely to be around 5m in width, potentially 6.5 m in height and up to around 50 m in length. The total vehicle weight could be up to 400 tonnes per vehicle. The new section of Access Road has been

designed to accommodate these vehicles, and provision will made along the Access Road through widening as appropriate. These loads will be travelling with a full complement of technical operators, mobile safety entourage and police escort. It is assumed that the heavy and large equipment will arrive via water transport to either Swansea or Port Talbot Docks. The route to the Project Site will be confined to the strategic highway network wherever possible and will take as direct a route as available given the local circumstances. The pre planning and lead up time required for the transportation of such loads will ensure that all appropriate measures are in place and relevant authorities are notified.

Gas Connection

12.7.6 The construction of the Gas Connection is expected to take place alongside and within the period of the construction of the Power Generation Plant. The peaks in construction staff traffic and HGV traffic are shown for the weekday AM and PM peak hours and 24-hour period in Table 12-12. This includes traffic associated with the construction of the AGI.

Table 12-12: Gas Connection Peak Traffic Generation

Time Period	Vehicle Type	Arrivals	Departures	Total
Weekday AM Peak Hour (07:45-08:45)	Light Vehicles (Staff)	5	0	5
	HGVs	1	0	1
	Total	**6**	**0**	**6**
Weekday PM Peak Hour (16:30-17:30)	Light Vehicles (Staff)	0	5	5
	HGVs	0	1	1
	Total	**0**	**6**	**6**
Weekday 24-Hour	Light Vehicles (Staff)	10	10	20
	HGVs	2	2	4
	Total	**12**	**12**	**24**

Electrical Connection

12.7.7 The construction of the Electrical Connection is estimated to take place alongside and within the period of construction of the Power Generation Plant. The peaks in construction staff traffic and HGV traffic are shown for the weekday AM and PM peak hours and 24-hour period in Table 12-13.

Table 12-13: Electrical Connection Peak Traffic Generation

Time Period	Vehicle Type	Arrivals	Departures	Total
Weekday AM Peak Hour (07:45-08:45)	Light Vehicles (Staff)	2	0	2
	HGVs	2	0	2
	Total	**4**	**0**	**4**
Weekday PM Peak Hour (16:30-17:30)	Light Vehicles (Staff)	0	2	2
	HGVs	0	2	2

Time Period	Vehicle Type	Arrivals	Departures	Total
	Total	**0**	**4**	**4**
Weekday 24-Hour	Light Vehicles (Staff)	2	2	4
	HGVs	3	3	6
	Total	**5**	**5**	**10**

Project

12.7.8 The traffic generation of the Power Generation Plant, Gas Connection and Electrical Connection has been combined to enable an assessment of the Project, as shown in Table 12-14. This ensures a robust assessment as it combines the peaks in construction staff traffic and HGV traffic of each component of the Project; in reality, the construction programme is such that these peaks will not coincide.

Table 12-14: Project Peak Traffic Generation

Time Period	Vehicle Type	Arrivals	Departures	Total
Weekday AM Peak Hour (07:45-08:45)	Light Vehicles (Staff)	71	0	71
	HGVs	14	0	14
	Total	**85**	**0**	**85**
Weekday PM Peak Hour (16:30-17:30)	Light Vehicles (Staff)	0	71	71
	HGVs	0	14	14
	Total	**0**	**85**	**85**
Weekday 24-Hour	Light Vehicles (Staff)	135	135	270
	HGVs	62	62	124
	Total	**197**	**197**	**394**

ii. Traffic Flows

12.7.9 Growth factors have been applied to the observed traffic flows in the study area network to represent the traffic flow conditions on the study area network in 2022 (the '2022 Baseline' assessment scenario). These are shown for the weekday AM and PM peak hours on Figures 12.8 and 12.9 respectively.

12.7.10 The construction traffic flows generated by the individual Project components and the full Project have been applied to the study area network. It is assumed that all construction staff trips will route to/from the M4 Junction 46, where it has been distributed based on observed turning proportions. All HGV traffic will route to/from the M4, where it has been distributed equally between the eastbound and westbound movements. These routeing arrangements will maximise the efficiency of movements to/from the Project Site given its proximity to the strategic highway network, and therefore minimise the effect of the Project on the wider highway network. The construction traffic forecasts for the Gas Connection include traffic associated with the AGI. Construction traffic associated with the AGI will follow the same routeing arrangements, but will continue north along the B4489 and then east along Rhyd-y-Pandy Road. This is considered the optimum route to the AGI Access

both in terms of distance and minimising disruption to local communities. These routeing arrangements form part of the CTMP.

12.7.11 Although some traffic associated with the Gas Connection will enter the Project Site via the Access Road and new section of Access Road, to ensure a robust assessment of the B4489 and Rhyd-y-Pandy Road it has been assumed that all traffic associated with the Gas Connection will route to/from the AGI Access.

12.7.12 The resulting construction traffic flows on the study area network during the weekday AM and PM peak hours are shown on the following figures:

- Power Generation Plant Construction Traffic – Figures 12.10 and 12.11;
- Gas Connection Construction Traffic – Figures 12.12 and 12.13;
- Electrical Connection Construction Traffic – Figures 12.14 and 12.15;
- Project Construction Traffic – Figures 12.16 and 12.17.

12.7.13 These have been added to the '2022 Baseline' traffic flows to derive the traffic flows for the following scenarios:

- 2022 Baseline + Power Generation Plant Construction Traffic – see Figures 12.18 and 12.19;
- 2022 Baseline + Gas Connection Construction Traffic – see Figures 12.20 and 12.21;
- 2022 Baseline + Electrical Connection Construction Traffic – see Figures 12.22 and 12.23; and
- 2022 Baseline + Project Construction Traffic – see Figures 12.24 and 12.25.

iii. Severance, Pedestrian Delay, Pedestrian Amenity, Fear and Intimidation – Traffic Flows

12.7.14 The assessment of severance, pedestrian delay, pedestrian amenity, and fear and intimidation has primarily been based on changes in traffic flows on the study area network. The key links are as follows:

- Link 1 – Rhyd-y-Pandy Road, between the AGI Access and the B4489;
- Link 2 – B4489, between Rhyd-y-Pandy Road and the Access Road;
- Link 3 – B4489, between the Access Road and the Felindre Park and Share;
- Link 4 – B4489, between the Felindre Park and Share and the M4 Junction 46;
- Link 5 – M4 eastbound on-slip;
- Link 6 – A48, between the northern and southern dumbbell roundabouts of the M4 Junction 46;
- Link 7 – M4 westbound off-slip;
- Link 8 – A48, between the M4 Junction 46 and the A48/Pant Lasau Road mini-roundabout;
- Link 9 – Pant Lasau Road;
- Link 10 – A48, southeast of the A48/Pant Lasau mini-roundabout;
- Link 11 – B4489, south of the M4 Junction 46; and
- Link 12 – A48, southwest of the M4 Junction 46.

12.7.15 These links have been identified with reference to the location of existing pedestrian infrastructure, i.e. where existing pedestrian movements can reasonably be expected to occur.

12.7.16 An assessment has been undertaken of the individual Project components and the full Project in respect of changes in two-way total link flows during the weekday AM and PM peak hours, and changes in two-way HGV traffic flows over the weekday 24-hour period. Traffic flows are presented in the following sub-sections for 2022 both without and with the individual Project components/full Project, the difference between the two and the percentage change. For each link, the significance of effect has been determined with reference to the magnitude of change and sensitivity of the link.

12.7.17 In terms of HGV traffic flows, data for the existing weekday 24-hour period is only available for Link 2, (B4489, between Rhyd-y-Pandy Road and the Access Road), Link 3 (B4489, between the Access Road and the Felindre Park and Share) and Link 4 (B4489, between the Felindre Park and Share and the M4 Junction 46).

Power Generation Plant

12.7.18 Tables 12-15 and 12-16 show the two-way total link flows during the weekday AM and PM peak hours respectively for the '2022 Baseline' and '2022 Baseline + Power Generation Plant Construction Traffic' scenarios, the difference between the two and the percentage change.

Table 12-15: 2022 Two-Way Total Traffic Flows (Power Generation Plant) – Weekday AM Peak Hour (07:45-08:45)

Link No.	2022 Baseline	2022 Baseline + Power Generation Plant Construction Traffic	Difference	% Change	Magnitude of Change	Sensitivity	Significance of Effect
1	-	-	+0	+0%	-	-	Negligible
2	140	140	+0	+0%	-	Low	Negligible
3	140	215	+75	+53%	Low	Low	Minor Adverse
4	382	457	+75	+20%	Very Low	Low	Negligible
5	415	415	+0	+0%	-	Low	Negligible
6	1,223	1,277	+54	+4%	Very Low	Medium	Minor Adverse
7	876	889	+13	+2%	Very Low	Low	Negligible
8	2,334	2,354	+20	+1%	Very Low	High	Minor Adverse
9	1,365	1,374	+9	+1%	Very Low	Medium	Minor Adverse
10	1,239	1,250	+11	+1%	Very Low	Medium	Minor Adverse

Link No.	2022 Baseline	2022 Baseline + Power Generation Plant Construction Traffic	Difference	% Change	Magnitude of Change	Sensitivity	Significance of Effect
11	1,112	1,131	+19	+2%	Very Low	Medium	Minor Adverse
12	938	940	+2	+0%	-	Low	Negligible

Table 12-16: 2022 Two-Way Total Traffic Flows (Power Generation Plant) – Weekday PM Peak Hour (16:30-17:30)

Link No.	2022 Baseline	2022 Baseline + Power Generation Plant Construction Traffic	Difference	% Change	Magnitude of Change	Sensitivity	Significance of Effect
1	-	-	+0	+0%	-	-	Negligible
2	90	90	+0	+0%	-	Very Low	Negligible
3	90	165	+75	+83%	Medium	Very Low	Minor Adverse
4	242	317	+75	+31%	Low	Low	Minor Adverse
5	842	876	+35	+4%	Very Low	Low	Negligible
6	1,239	1,279	+40	+3%	Very Low	Medium	Minor Adverse
7	606	606	+0	+0%	-	Low	Negligible
8	2,023	2,046	+23	+1%	Very Low	High	Minor Adverse
9	950	960	+11	+1%	Very Low	Low	Negligible
10	1,221	1,233	+12	+1%	Very Low	Medium	Minor Adverse
11	1,124	1,134	+10	+1%	Very Low	Medium	Minor Adverse
12	948	948	+0	+0%	-	Low	Negligible

Note: Summation errors due to rounding.

12.7.19 Tables 12-15 and 12-16 show that, in terms of total traffic flows, Links 3, 6, 8, 9, 10 and 11 will experience a **Minor adverse** effect during the AM peak hour. Links 3, 4, 6, 8, 10 and 11 will experience a **Minor adverse** effect during the PM peak hour. The routeing arrangements for the Power Generation Plant will not involve the use

of Links 1 and 2, and therefore the effect will be **Negligible**. All other links will experience a **Negligible** effect.

12.7.20 Table 12-17 shows the two-way HGV link flows during the weekday 24-hour period in 2022 both without and with the Power Generation Plant construction traffic, the difference between the two and the percentage change.

Table 12-17: 2022 Two-Way HGV Traffic Flows (Power Generation Plant) – Weekday 24-Hour

Link No.	2022 Baseline	2022 Baseline + Power Generation Plant Construction Traffic	Difference	% Change	Magnitude of Change	Sensitivity	Significance of Effect
2	13	13	+0	+0%	-	Very Low	Negligible
3	13	127	+114	+877%	High	Very Low	Minor Adverse
4	154	268	+114	+74%	Medium	Low	Minor Adverse

12.7.21 Table 12-17 shows that Link 2 will experience a **Negligible** effect, and Links 3 and 4 will experience a **Minor adverse effect**. No pedestrian movements have been observed on Link 3; there is no footway along the majority of this link and no key destinations that pedestrians are likely to travel to. There is a short section of footway at the southern end of the link, which serves the Access Road that serves Bryn Whilach Farm. The footway is approximately 2m wide and is of sufficient width to accommodate the limited pedestrian movements at this location. Minimal pedestrian movement has been observed on Link 4. There is a 2m wide footway along the entirety of this link, which is separated from the carriageway edge along much of its length by a barrier. The area is also street lit.

12.7.22 The other links in the study area on which the Power Generation Plant construction traffic will result in an increase in HGV traffic movements are Links 5 (M4 eastbound on-slip), 6 (A48, between the northern and southern dumbbell roundabouts of the M4 Junction 46) and 7 (M4 westbound off-slip), associated with movements to/from the M4. These links are part of the strategic highway network and are designed to carry high volumes of HGV traffic. Whilst the increase in HGV traffic from the Power Generation Plant will result in a deterioration of the pedestrian experience, minimal pedestrian movement has been observed at these locations, which is typical given the nature of the strategic access junction. It is also likely that any pedestrians at these locations will already be accustomed to the levels of general traffic and HGVs.

Gas Connection

12.7.23 Tables 12-18 and 12-19 show the two-way total link flows (all vehicles) during the weekday AM and PM peak hours respectively for the ‘2022 Baseline’ and ‘2022 Baseline + Gas Connection Construction Traffic’ scenarios, the difference between the two and the percentage change.

Table 12-18: 2022 Two-Way Total (All Vehicle) Traffic Flows (Gas Connection) – Weekday AM Peak Hour (07:45-08:45)

Link No.	2022 Baseline	2022 Baseline + Gas Connection Construction Traffic	Difference	% Change	Magnitude of Change	Sensitivity	Significance of Effect
1	-	-	+6	-	-	-	Negligible
2	140	147	+6	+4%	Very Low	Low	Negligible
3	140	147	+6	+4%	Very Low	Low	Negligible
4	382	388	+6	+2%	Very Low	Low	Negligible
5	415	415	+0	+0%	-	Low	Negligible
6	1,223	1,227	+5	+0%	-	Medium	Negligible
7	876	877	+1	+0%	-	Low	Negligible
8	2,334	2,335	+2	+0%	-	High	Negligible
9	1,365	1,366	+1	+0%	-	Medium	Negligible
10	1,239	1,240	+1	+0%	-	Medium	Negligible
11	1,112	1,114	+2	+0%	-	Medium	Negligible
12	938	938	+0	+0%	-	Low	Negligible

Note: Summation errors due to rounding.

Table 12-19: 2022 Two-Way Total Traffic Flows (All Vehicle) (Gas Connection) – Weekday PM Peak Hour (16:30-17:30)

Link No.	2022 Baseline	2022 Baseline + Gas Connection Construction Traffic	Difference	% Change	Magnitude of Change	Sensitivity	Significance of Effect
1	-	-	+6	-	-	-	Negligible
2	90	96	+6	+7%	Very Low	Very Low	Negligible
3	90	96	+6	+7%	Very Low	Very Low	Negligible
4	242	248	+6	+3%	Very Low	Low	Negligible
5	842	844	+3	+0%	-	Low	Negligible
6	1,239	1,242	+3	+0%	-	Medium	Negligible
7	606	606	+0	+0%	-	Low	Negligible

Link No.	2022 Baseline	2022 Baseline + Gas Connection Construction Traffic	Difference	% Change	Magnitude of Change	Sensitivity	Significance of Effect
8	2,023	2,025	+2	+0%	-	High	Negligible
9	950	951	+1	+0%	-	Low	Negligible
10	1,221	1,222	+1	+0%	-	Medium	Negligible
11	1,124	1,125	+1	+0%	-	Medium	Negligible
12	948	948	+0	+0%	-	Low	Negligible

Note: Summation errors due to rounding.

12.7.24 Tables 12-18 and 12-19 show that, in terms of total traffic flows, all links will experience a **Negligible** effect during the AM and PM peak hours. It is not possible to determine the magnitude of change and sensitivity of Link 1 given the absence of existing traffic data. However, it considered that the effect of an increase in traffic of only six vehicle movements in both the AM and PM peak hours will be **Negligible**.

12.7.25 Table 12-20 shows the two-way HGV link flows during the weekday 24-hour period in 2022 both without and with the Gas Connection construction traffic, the difference between the two and the percentage change.

Table 12-20: 2022 Two-Way HGV Traffic Flows (Gas Connection) – Weekday 24-Hour

Link No.	2022 Baseline	2022 Baseline + Gas Connection Construction Traffic	Difference	% Change	Magnitude of Change	Sensitivity	Significance of Effect
2	13	17	+4	+31%	Low	Very Low	Negligible
3	13	17	+4	+31%	Low	Very Low	Negligible
4	154	158	+4	+3%	Very Low	Low	Negligible

12.7.26 Table 12-20 shows that Links 2, 3 and 4 will experience a **Negligible** effect. Again, it is not possible to determine the magnitude of change and sensitivity of Link 1 given the absence of existing traffic data. However, it considered that the effect of an increase of only four HGV movements over the 24-hour period will be **Negligible**. The other links in the study area on which the Gas Connection construction traffic will result in an increase in HGV traffic movements are Links 5 (M4 eastbound on-slip), 6 (A48, between the northern and southern dumbbell roundabouts of the M4 Junction 46) and 7 (M4 westbound off-slip), associated with movements to/from the M4. These links are part of the strategic highway network and are designed to carry high volumes of HGV traffic. The level of increase in HGV traffic associated with the Gas Connection will have a **Negligible** effect on the

pedestrian experience on these links. Minimal pedestrian movement has been observed at these locations, which is typical given the nature of the strategic access junction. It is also likely that any pedestrians at these locations will already be accustomed to the levels of general traffic and HGVs.

Electrical Connection

12.7.27 Tables 12-21 and 12-22 show the two-way total link flows during the weekday AM and PM peak hours respectively for the '2022 Baseline' and '2022 Baseline + Electrical Connection Construction Traffic' scenarios, the difference between the two and the percentage change.

Table 12-21: 2022 Two-Way Total Traffic Flows (All Vehicle) (Electrical Connection) – Weekday AM Peak Hour (07:45-08:45)

Link No.	2022 Baseline	2022 Baseline + Electrical Connection Construction Traffic	Difference	% Change	Magnitude of Change	Sensitivity	Significance of Effect
1	-	-	+0	+0%	-	-	Negligible
2	140	140	+0	+0%	-	Low	Negligible
3	140	144	+4	+2%	Very Low	Low	Negligible
4	382	385	+4	+1%	Very Low	Low	Negligible
5	415	415	+0	+0%	-	Low	Negligible
6	1,223	1,225	+2	+0%	-	Medium	Negligible
7	876	877	+1	+0%	-	Low	Negligible
8	2,334	2,334	+0	+0%	-	High	Negligible
9	1,365	1,365	+0	+0%	-	Medium	Negligible
10	1,239	1,239	+0	+0%	-	Medium	Negligible
11	1,112	1,113	+0	+0%	-	Medium	Negligible
12	938	938	+0	+0%	-	Low	Negligible

Note: Summation errors due to rounding.

Table 12-22: 2022 Two-Way Total Traffic Flows (All Vehicle) (Electrical Connection) – Weekday PM Peak Hour (16:30-17:30)

Link No.	2022 Baseline	2022 Baseline + Electrical Connection Construction Traffic	Difference	% Change	Magnitude of Change	Sensitivity	Significance of Effect
1	-	-	+0	+0%	-	-	Negligible
2	90	90	+0	+0%	-	Very Low	Negligible
3	90	93	+4	+4%	Very Low	Very Low	Negligible
4	242	245	+4	+1%	Very Low	Low	Negligible
5	842	843	+2	+0%	-	Low	Negligible
6	1,239	1,241	+2	+0%	-	Medium	Negligible
7	606	606	+0	+0%	-	Low	Negligible
8	2,023	2,024	+1	+0%	-	High	Negligible
9	950	950	+0	+0%	-	Low	Negligible
10	1,221	1,222	+0	+0%	-	Medium	Negligible
11	1,124	1,124	+0	+0%	-	Medium	Negligible
12	948	948	+0	+0%	-	Low	Negligible

Note: Summation errors due to rounding.

12.7.28 Tables 12-21 and 12-22 show that, in terms of total traffic flows, all links will experience a **Negligible** effect in both the AM and PM peak hours. The routeing arrangements for the Electrical Connection will not involve the use of Links 1 and 2, and therefore the effect will be **Negligible**.

12.7.29 Table 12-23 shows the two-way HGV link flows during the weekday 24-hour period in 2022 both without and with the Electrical Connection construction traffic, the difference between the two and the percentage change.

Table 12-23: 2022 Two-Way HGV Traffic Flows (Electrical Connection) – Weekday 24-Hour

Link No.	2022 Baseline	2022 Baseline + Electrical Connection Construction Traffic	Difference	% Change	Magnitude of Change	Sensitivity	Significance of Effect
2	13	13	+0	+0%	-	Very Low	Negligible
3	13	19	+6	+46%	Low	Very Low	Negligible
4	154	160	+6	+4%	Very Low	Low	Negligible

12.7.30 Table 12-23 shows that Links 2, 3 and 4 will experience a **Negligible** effect. The other links in the study area on which the Electrical Connection construction traffic will result in an increase in HGV traffic movements are Link 5 (M4 eastbound on-slip), Link 6 (A48, between the northern and southern dumbbell roundabouts of the M4 Junction 46) and Link 7 (M4 westbound off-slip), associated with movements to/from the M4. These links are part of the strategic highway network and are designed to carry high volumes of HGV traffic. The level of increase in HGV traffic associated with the Electrical Connection will have a **Negligible** effect on the pedestrian experience on these links. Minimal pedestrian movement has been observed at these locations, which is typical given the nature of the strategic access junction. It is also likely that any pedestrians at these locations will already be accustomed to the levels of general traffic and HGVs.

Project

12.7.31 Tables 12-24 and 12-25 show the two-way total link flows during the weekday AM and PM peak hours respectively for the '2022 Baseline' and '2022 Baseline + Project Construction Traffic' scenarios, the difference between the two and the percentage change.

Table 12-24: 2022 Two-Way Total Traffic Flows (All Vehicle) (Project) – Weekday AM Peak Hour (07:45-08:45)

Link No.	2022 Baseline	2022 Baseline + Project Construction Traffic	Difference	% Change	Magnitude of Change	Sensitivity	Significance of Effect
1	-	-	+6	-	-	-	Negligible
2	140	147	+6	+4%	Very Low	Low	Negligible
3	140	225	+85	+60%	Medium	Low	Minor Adverse
4	382	466	+84	+22%	Very Low	Low	Negligible
5	415	415	+0	+0%	-	Low	Negligible
6	1,223	1,283	+61	+5%	Very Low	Medium	Minor Adverse
7	876	891	+16	+2%	Very Low	Low	Negligible
8	2,334	2,356	+22	+1%	Very Low	High	Minor Adverse
9	1,365	1,375	+10	+1%	Very Low	Medium	Minor Adverse
10	1,239	1,251	+12	+1%	Very Low	Medium	Minor Adverse
11	1,112	1,133	+21	+2%	Very Low	Medium	Minor Adverse

Link No.	2022 Baseline	2022 Baseline + Project Construction Traffic	Difference	% Change	Magnitude of Change	Sensitivity	Significance of Effect
12	938	940	+2	+0%	-	Low	Negligible

Note: Summation errors due to rounding.

Table 12-25: 2022 Two-Way Total Traffic Flows (All Vehicle) (Project) – Weekday PM Peak Hour (16:30-17:30)

Link No.	2022 Baseline	2022 Baseline + Project Construction Traffic	Difference	% Change	Magnitude of Change	Sensitivity	Significance of Effect
1	-	-	+6	-	-	-	Negligible
2	90	96	+6	+7%	Very Low	Very Low	Negligible
3	90	174	+85	+94%	High	Very Low	Minor Adverse
4	242	326	+85	+35%	Low	Low	Minor Adverse
5	842	881	+39	+5%	Very Low	Low	Negligible
6	1,239	1,284	+45	+4%	Very Low	Medium	Minor Adverse
7	606	606	+0	+0%	-	Low	Negligible
8	2,023	2,048	+25	+1%	Very Low	High	Minor Adverse
9	950	962	+12	+1%	Very Low	Low	Negligible
10	1,221	1,234	+13	+1%	Very Low	Medium	Minor Adverse
11	1,124	1,135	+11	+1%	Very Low	Medium	Minor Adverse
12	948	948	+0	+0%	-	Low	Negligible

Note: Summation errors due to rounding.

12.7.32 Tables 12-24 and 12-25 show that, in terms of total traffic flows, Links 3, 6, 8, 9, 10 and 11 will experience a **Minor adverse** effect during the AM peak hour. Links 3, 4, 6, 8, 10 and 11 will experience a **Minor adverse** effect during the PM peak hour. It is not possible to determine the magnitude of change and sensitivity of Link 1 given the absence of existing traffic data. However, it considered that the effect of an increase in traffic of only six vehicle movements in both the AM and PM peak hours will be **Negligible**. All other links will experience a **Negligible** effect.

12.7.33 Table 12-26 shows the two-way HGV link flows during the weekday 24-hour period in 2022 both without and with the Project construction traffic, the difference between the two and the percentage change.

Table 12-26: 2022 Two-Way HGV Traffic Flows (Project) – Weekday 24-Hour

Link No.	2022 Baseline	2022 Baseline + Project Construction Traffic	Difference	% Change	Magnitude of Change	Sensitivity	Significance of Effect
2	13	17	+4	+31%	Low	Very Low	Negligible
3	13	137	+124	+953%	High	Very Low	Minor Adverse
4	154	278	+124	+81%	Medium	Low	Minor Adverse

12.7.34 Table 12-26 shows that Link 2 will experience a **Negligible** effect, and Links 3 and 4 will experience a **Minor adverse** effect. No pedestrian movements have been observed on Link 3; there is no footway along the majority of this link and no key destinations that pedestrians are likely to travel to. There is a short section of footway at the southern end of the link, which serves the Access Road that serves Bryn Whilach Farm. The footway is approximately 2 m wide and is of sufficient width to accommodate the limited pedestrian movements at this location. Minimal pedestrian movement has been observed on Link 4. There is a 2 m wide footway along the entirety of this link, which is separated from the carriageway edge along much of its length by a barrier. The area is also street lit.

12.7.35 Again, it is not possible to determine the magnitude of change and sensitivity of Link 1 given the absence of existing traffic data. However, it considered that the effect of an increase of only four HGV movements over the 24-hour period will be **Negligible**. The other links in the study area on which the Project construction traffic will result in an increase in HGV traffic movements are Links 5 (M4 eastbound on-slip), 6 (A48, between the northern and southern dumbbell roundabouts of the M4 Junction 46) and 7 (M4 westbound off-slip), associated with movements to/from the M4. These links are part of the strategic highway network and are designed to carry high volumes of HGV traffic. Whilst the increase in HGV traffic from the Project will result in a deterioration of the pedestrian experience, minimal pedestrian movement has been observed at these locations, which is typical given the nature of the strategic access junction. It is also likely that any pedestrians at these locations will already be accustomed to the levels of general traffic and HGVs.

iv. Severance, Pedestrian Delay, Pedestrian Amenity, Fear and Intimidation – PRoW

12.7.36 In respect of PRoW, Footpath L35B passes through the Project Site perpendicular to the route of the Gas Connection, connecting to Rhyd-y-Pandy Road in the vicinity of the AGI Access. Footpaths LC34 and LC117 cross the Access Road. Footpath LC34 crosses the Access Road at a point approximately 350 m from the

B4489. This would be affected by works to widen the Access Road. Footpath LC117 routes adjacent to the perimeter of the Felindre Gas Compressor Station and would be affected by the construction of the new section of Access Road to serve the Project Site, crossing at a point approximately 1.3 km from the Access Road. The proposed management of the PRoW is set out in the CTMP and will be developed further in consultation with the PRoW Officer at the CCS.

12.7.37 There is no recent usage data for these footpaths and therefore their sensitivity has been assessed as high to ensure a robust assessment using a worst case. The magnitude of impact is anticipated to low, as all users should still be able to make a pedestrian movement, but there will be some hindrance in doing so (e.g. due to short term closures/diversions). The significance of effect will therefore be **Moderate adverse**, which is significant, albeit temporary. This level of effect is considered to apply to the individual Project components and the full Project.

v. Driver Delay

12.7.38 The assessment of driver delay has been based on the capacity assessment of the junction network described at Sections 12.4 and 12.5. The following sub-sections present the driver delay at the junction network during the weekday AM and PM peak hours in 2022 both without and with the individual Project components/full Project, the difference between the two and the percentage change. The capacity assessment output reports are reproduced in Appendix 12.2.

Power Generation Plant

12.7.39 Tables 12-27 and 12-28 show the driver delay at the junction network during the weekday AM and PM peak hours respectively in 2022 both without and with the Power Generation Plant construction traffic.

Table 12-27: Capacity Assessment Results (Power Generation Plant) – Weekday AM Peak Hour (07:45-08:45)

Entry Arm	Delay (Seconds/Vehicle)			% Change	Magnitude of Change	Sensitivity	Significance of Effect
	2022 Baseline	2022 Baseline + Power Generation Plant Construction Traffic	Difference				
A	38	33	-5	-13%	Very Low	Medium	Minor Beneficial
B	1,040	1,001	-39	-4%	Very Low	High	Minor Beneficial
C	54	66	+12	+22%	Very Low	Medium	Minor Adverse
D	20	22	+2	+10%	Very Low	Low	Negligible
E	287	357	+70	+24%	Very Low	High	Minor Adverse

Entry Arm	Delay (Seconds/Vehicle)			% Change	Magnitude of Change	Sensitivity	Significance of Effect
	2022 Baseline	2022 Baseline + Power Generation Plant Construction Traffic	Difference				
F	859	882	+23	+3%	Very Low	High	Minor Adverse
G	1,030	961	-69	-7%	Very Low	High	Minor Beneficial

Note: A = B4489 (North). B = M4 WB Off-Slip. C = Pant Lasau Road. D = A48 (Southeast). E = B4489 (South). F = A48 (Southwest). G = M4 EB Off-Slip.

Table 12-28: Capacity Assessment Results (Power Generation Plant) – Weekday PM Peak Hour (16:30-17:30)

Entry Arm	Delay (Seconds/Vehicle)			% Change	Magnitude of Change	Sensitivity	Significance of Effect
	2022 Baseline	2022 Baseline + Power Generation Plant Construction Traffic	Difference				
A	6	7	+1	+17%	Very Low	Very Low	Negligible
B	7	7	+0	+0%	-	Very Low	Negligible
C	220	241	+21	+10%	Very Low	High	Minor Adverse
D	552	557	+5	+1%	Very Low	High	Minor Adverse
E	9	10	+1	+11%	Very Low	Very Low	Negligible
F	6	6	+0	+0%	-	Very Low	Negligible
G	7	7	+0	+0%	-	Very Low	Negligible

Note: A = B4489 (North). B = M4 WB Off-Slip. C = Pant Lasau Road. D = A48 (Southeast). E = B4489 (South). F = A48 (Southwest). G = M4 EB Off-Slip.

12.7.40 Table 12-27 shows that, during the AM peak hour, the entry arms of Pant Lasau Road, A48 (Southwest), B4489 (South) and A48 (Southwest) will experience a **Minor adverse** effect. The B4489 (North) and M4 eastbound and westbound off-slips will experience a **Minor beneficial** effect; this is as a result of changes in the balance of traffic flows at the junction, which will result in more gaps for traffic

exiting from this arm as priorities are changed. This will result in a reduction in the level of delay of the arms benefitting from traffic flow balancing and an increase in arms which are forced to concede priority more than before flows were balanced. The A48 (Southeast) will experience a **Negligible** effect, which is not significant.

12.7.41 Table 12-28 shows that, during the PM peak hour, the entry arms of Pant Lasau Road and the A48 (Southeast) will experience a **Minor adverse** effect. All other arms will experience a **Negligible** effect.

12.7.42 In summary, the Power Generation Plant will, at worst, have a **Minor adverse** effect in terms of driver delay, which is not considered significant. This effect will be temporary in nature, and only experienced during the peak of construction traffic movements.

Gas Connection

12.7.43 Tables 12-29 and 12-30 show the driver delay at the junction network during the weekday AM and PM peak hours respectively in 2022 both without and with the Gas Connection construction traffic.

Table 12-29: Capacity Assessment Results (Gas Connection) – Weekday AM Peak Hour (07:45-08:45)

Entry Arm	Delay (Seconds/Vehicle)			% Change	Magnitude of Change	Sensitivity	Significance of Effect
	2022 Baseline	2022 Baseline + Gas Connection Construction Traffic	Difference				
A	38	36	-2	-5%	Very Low	Medium	Minor Beneficial
B	1,040	1,049	+9	+1%	Very Low	High	Minor Adverse
C	54	65	+9	+17%	Very Low	Medium	Minor Adverse
D	20	21	+1	+5%	Very Low	Low	Negligible
E	287	276	-11	-4%	Very Low	High	Minor Beneficial
F	859	861	+2	+0%	-	High	Negligible
G	1,030	1,021	-9	-1%	Very Low	High	Minor Beneficial

Note: A = B4489 (North). B = M4 WB Off-Slip. C = Pant Lasau Road. D = A48 (Southeast). E = B4489 (South). F = A48 (Southwest). G = M4 EB Off-Slip.

Table 12-30: Capacity Assessment Results (Gas Connection) – Weekday PM Peak Hour (16:30-17:30)

Entry Arm	Delay (Seconds/Vehicle)			% Change	Magnitude of Change	Sensitivity	Significance of Effect
	2022 Baseline	2022 Baseline + Gas Connection Construction Traffic	Difference				
A	6	6	+0	+0%	-	Very Low	Negligible
B	7	7	+0	+0%	-	Very Low	Negligible
C	220	230	+10	+5%	Very Low	High	Minor Adverse
D	552	564	+12	+2%	Very Low	High	Minor Adverse
E	9	9	+0	+0%	-	Very Low	Negligible
F	6	6	+0	+0%	-	Very Low	Negligible
G	7	7	+0	+0%	-	Very Low	Negligible

Note: A = B4489 (North). B = M4 WB Off-Slip. C = Pant Lasau Road. D = A48 (Southeast). E = B4489 (South). F = A48 (Southwest). G = M4 EB Off-Slip.

12.7.44 Table 12-29 shows that, during the AM peak hour, the entry arms of the M4 westbound off-slip and Pant Lasau Road will experience a **Minor adverse** effect. The B4489 (North and South) and the M4 eastbound off-slip will experience a **Minor beneficial** effect; this is as a result of changes in the balance of traffic flows at the junction, which will result in more gaps for traffic exiting from this arm as priorities are changed. This will result in a reduction in the level of delay of the arm benefitting from traffic flow balancing and an increase in arms which are forced to concede priority more than before flows were balanced. The A48 (Southeast and Southwest) will experience a **Negligible** effect, which is not considered significant.

12.7.45 Table 12-30 shows that, during the PM peak hour, all entry arms will experience a **Negligible** effect, with the exception of Pant Lasau Road and the A48 (Southeast), which will experience a **Minor adverse** effect.

12.7.46 In summary, the Gas Connection will, at worst, have a **Minor adverse** effect in terms of driver delay, which is not considered significant. This effect will be temporary in nature, and only experienced during the peak of construction traffic movements.

Electrical Connection

12.7.47 Tables 12-31 and 12-32 show the driver delay at the junction network during the weekday AM and PM peak hours respectively in 2022 both without and with the Electrical Connection construction traffic.

Table 12-31: Capacity Assessment Results (Electrical Connection) – Weekday AM Peak Hour (07:45-08:45)

Entry Arm	Delay (Seconds/Vehicle)			% Change	Magnitude of Change	Sensitivity	Significance of Effect
	2022 Baseline	2022 Baseline + Electrical Connection Construction Traffic	Difference				
A	38	38	+0	+0%	-	Medium	Negligible
B	1,040	1,028	-12	-1%	Very Low	High	Minor Beneficial
C	54	58	+4	+7%	Very Low	Medium	Minor Adverse
D	20	21	+1	+5%	Very Low	Low	Negligible
E	287	297	+10	+3%	Very Low	High	Minor Adverse
F	859	870	+11	+1%	Very Low	High	Minor Adverse
G	1,030	1,023	-7	-1%	Very Low	High	Minor Beneficial

Note: A = B4489 (North). B = M4 WB Off-Slip. C = Pant Lasau Road. D = A48 (Southeast). E = B4489 (South). F = A48 (Southwest). G = M4 EB Off-Slip.

Table 12-32: Capacity Assessment Results (Electrical Connection) – Weekday PM Peak Hour (16:30-17:30)

Entry Arm	Delay (Seconds/Vehicle)			% Change	Magnitude of Change	Sensitivity	Significance of Effect
	2022 Baseline	2022 Baseline + Electrical Connection Construction Traffic	Difference				
A	6	6	+0	+0%	-	Very Low	Negligible
B	7	7	+0	+0%	-	Very Low	Negligible
C	220	231	+11	+5%	Very Low	High	Minor Adverse

Entry Arm	Delay (Seconds/Vehicle)			% Change	Magnitude of Change	Sensitivity	Significance of Effect
	2022 Baseline	2022 Baseline + Electrical Connection Construction Traffic	Difference				
D	552	571	+19	+3%	Very Low	High	Minor Adverse
E	9	9	+0	+0%	-	Very Low	Negligible
F	6	6	+0	+0%	-	Very Low	Negligible
G	7	7	+0	+0%	-	Very Low	Negligible

Note: A = B4489 (North). B = M4 WB Off-Slip. C = Pant Lasau Road. D = A48 (Southeast). E = B4489 (South). F = A48 (Southwest). G = M4 EB Off-Slip.

12.7.48 Table 12-31 shows that, during the AM peak hour, the entry arms of Pant Lasau Road, the B4489 (South) and A48 (Southwest) will experience a **Minor adverse** effect. The M4 eastbound and westbound off-slips will experience a **Minor beneficial** effect; this is as a result of changes in the balance of traffic flows at the junction, which will result in more gaps for traffic exiting from this arm as priorities are changed. This will result in a reduction in the level of delay of the arm benefitting from traffic flow balancing and an increase in arms which are forced to concede priority more than before flows were balanced. The B4489 (North) and A48 (Southeast) will experience a **Negligible** effect, which is not significant.

12.7.49 Table 12-32 shows that, during the PM peak hour, all entry arms will experience a **Negligible** effect, with the exception of Pant Lasau Road and the A48 (Southeast), which will experience a **Minor adverse** effect.

12.7.50 In summary, the Electrical Connection will, at worst, have a **Minor adverse** effect in terms of driver delay, which is not considered significant. This effect will be temporary in nature, and only experienced during the peak of construction traffic movements.

Project

12.7.51 Tables 12-33 and 12-34 show the driver delay at the junction network during the weekday AM and PM peak hours respectively in 2022 both without and with the Project construction traffic.

Table 12-33: Capacity Assessment Results (Project) – Weekday AM Peak Hour (07:45-08:45)

Entry Arm	Delay (Seconds/Vehicle)			% Change	Magnitude of Change	Sensitivity	Significance of Effect
	2022 Baseline	2022 Baseline + Project Construction Traffic	Difference				
A	38	33	-5	-13%	Very Low	Medium	Minor Beneficial
B	1,040	975	-65	-6%	Very Low	High	Minor Beneficial
C	54	62	+8	+15%	Very Low	Medium	Minor Adverse
D	20	22	+2	+10%	Very Low	Low	Negligible
E	287	350	+63	+22%	Very Low	High	Minor Adverse
F	859	901	+42	+5%	Very Low	High	Minor Adverse
G	1,030	942	-88	-9%	Very Low	High	Minor Beneficial

Note: A = B4489 (North). B = M4 WB Off-Slip. C = Pant Lasau Road. D = A48 (Southeast). E = B4489 (South). F = A48 (Southwest). G = M4 EB Off-Slip.

Table 12-34: Capacity Assessment Results (Project) – Weekday PM Peak Hour (16:30-17:30)

Entry Arm	Delay (Seconds/Vehicle)			% Change	Magnitude of Change	Sensitivity	Significance of Effect
	2022 Baseline	2022 Baseline + Project Construction Traffic	Difference				
A	6	7	+1	+17%	Very Low	Very Low	Negligible
B	7	7	+0	+0%	-	Very Low	Negligible
C	220	249	+29	+13%	Very Low	High	Minor Adverse
D	552	551	-1	-0%	-	High	Negligible
E	9	10	+1	+0%	-	Very Low	Negligible
F	6	6	+0	+0%	-	Very Low	Negligible

Entry Arm	Delay (Seconds/Vehicle)			% Change	Magnitude of Change	Sensitivity	Significance of Effect
	2022 Baseline	2022 Baseline + Project Construction Traffic	Difference				
G	7	7	+0	+0%	-	Very Low	Negligible

Note: A = B4489 (North). B = M4 WB Off-Slip. C = Pant Lasau Road. D = A48 (Southeast). E = B4489 (South). F = A48 (Southwest). G = M4 EB Off-Slip.

12.7.52 Table 12-33 shows that, during the AM peak hour, the entry arms of Pant Lasau Road, B4489 (South) and A48 (Southwest) will experience a **Minor adverse** effect. The B4489 (North) and the M4 eastbound and westbound off-slips will experience a **Minor beneficial** effect; this is as a result of changes in the balance of traffic flows at the junction, which will result in more gaps for traffic exiting from these arms as priorities are changed. This will result in a reduction in the level of delay of the arms benefitting from traffic flow balancing and an increase in arms which are forced to concede priority more than before flows were balanced. The A48 (Southeast) will experience a **Negligible** effect, which is not considered significant.

12.7.53 Table 12-34 shows that, during the PM peak hour, all entry arms will experience a **Negligible** effect, with the exception of the A48 (Southeast), which will experience a **Minor adverse** effect.

12.7.54 In summary, the Project will, at worst, have a **Minor adverse** effect in terms of driver delay, which is not significant. This effect will be temporary in nature, and only experienced during the peak of construction traffic movements.

vi. Accidents and Safety

12.7.55 As discussed in Section 12.5, the analysis of the PIC data and listed causation factors has not identified any existing highway safety issues in the study area. Where PICs have been recorded, these have been identified as being as a result of causation factors relating to driver/road user error and weather conditions. No causation factors relating to highway defects have been reported in the PIC data. On the basis of this analysis, it is considered that the sensitivity of this receptor is very low.

12.7.56 The individual Project components and Project will result in an increase in traffic flows in the study area. Whilst an increase in traffic flows may result in an increase in the risk levels, the increases in traffic that will occur from the individual Project components and Project are such that the magnitude of change in terms of risk level will be very low. On this basis, the individual Project components and Project will have a **Negligible** effect.

b) Operation and Maintenance

12.7.57 The traffic generation of the Project during the operational phase is expected to be minimal. The Project will employ up to 15 permanent staff working on a shift pattern. This will likely generate 30 movements per day (two movements per staff

member). A demineralised water trailer and diesel fuel tanker will visit the Project Site periodically.

12.7.58 Maintenance periods will occur annually. During these periods, there may be up to 40 additional staff on-site for a period of one month. Based on a vehicle occupancy level of 1.6, this will equate to an additional 50 movements per day (25 arrivals during the AM peak hour, 25 departures during the PM peak hour); this is well within the peak traffic generation forecast for staff during the construction phase.

12.7.59 Overall, when assessed against the same receptors as construction and assuming the same sensitivity of each receptor, the significance of the effect of operation is anticipated to be **Negligible**, which is not significant.

c) Decommissioning

12.7.60 The decommissioning phase for the Power Generation Plant is likely to be similar in nature to construction although some elements are expected to be left in situ. The number of construction staff will be less as the new section of Access Road will be constructed for the development and left in place and therefore the impacts are likely to be similar or less than those described for the construction phase. The decommissioning phase for the gas and electrical connection will generate very few vehicle movements, as it is likely that the Gas Pipeline and Electrical Connection will be capped and left in situ.

12.7.61 Overall, the impact of the Project during the decommissioning phase is expected to be lesser in nature to the construction phase as many aspects are to be left in situ. As a result, no further assessment of the decommissioning phase has been undertaken.

12.8 Mitigation and Monitoring

12.8.1 As a general rule, additional mitigation measures have been proposed where a significant effect is predicted to occur. Embedded mitigation measures, which have been incorporated within the design of the Project or are standard practice measures that have been committed to are summarised in **Chapter 3: Project and Site Description**.

12.8.2 The assessment has identified that the individual Project components and full Project will have a **Moderate adverse** effect during the construction phase and this is restricted to the three PRoW; these effects will be temporary. No other significant adverse effects have been identified through this robust assessment. The CTMP that has been prepared includes proposed measures for management of the PRoW, which will be developed further in consultation with the PRoW Officer. Where possible, connectivity will be maintained by the use of temporary diversions and working methods to allow the PRoWs to remain open for the majority of the construction period.

12.8.3 No additional mitigation measures are proposed in view of the temporary nature of these effects. There will ongoing monitoring of the CTMP and CSTP during the construction phase to establish the effectiveness of the measures contained within these documents.

12.9 Residual Effects

12.9.1 Table 12-35 presents a summary of the TA. It identifies the receptor/s likely to be impacted, the level of effect and, where the effect is deemed to be significant, includes the mitigation proposed and the resulting residual effect.

12.9.2 As discussed, the effects will be **Negligible** during the operational phase and similar to construction during the decommissioning phase. Therefore, only the residual effects during the construction phase are shown. Negligible effects are not included.

12.9.3 Table 12-35 provides a breakdown of the effects by Project component (i.e. Power Generation Plant, Gas Connection, and Electrical Connection) and the full Project.

12.9.4 Table 12-35 shows that the effects of each of the Project components and the Project as a whole will be significant in regard to receptors relating to the pedestrian experience (severance, pedestrian amenity, pedestrian delay, fear and intimidation) on the three PRoW (Footpaths LC34, LC35B and LC117). The embedded mitigation measures will seek to manage these effects and their associated risks but will not reduce the significance of effect. No additional mitigation measures are proposed in view of the temporary nature of these effects. There will ongoing monitoring of the CTMP and CSTP during the construction phase to establish the effectiveness of the measures contained within these documents.

Table 12-35: Transport Summary of Effects – Construction Phase

Receptor	Description of Effect	Classification of Effect	Additional Mitigation	Classification of Residual Effect	Significance
Power Generation Plant					
Severance, Pedestrian Delay, Pedestrian, Amenity, Fear and Intimidation	Weekday AM Peak Hour – Increased total traffic on Links 3, 6, 8, 9, 10 and 11	Minor Adverse (Temporary)	None	Minor Adverse (Temporary)	Not Significant
	Weekday PM Peak Hour – Increased total traffic on Links 3, 4, 6, 8, 10, 11	Minor Adverse (Temporary)	None	Minor Adverse (Temporary)	Not Significant
	Weekday 24-Hour – Increased HGV traffic on Link 3 and 4	Minor Adverse (Temporary)	None	Minor Adverse (Temporary)	Not Significant
	PRoW (Footpaths L34, L35B and LC117)	Moderate Adverse (Temporary)	None	Moderate Adverse (Temporary)	Significant
Driver Delay	Weekday AM Peak Hour – Reduced delay on B4489 (North) and M4 EB and WB Off-Slips	Minor Beneficial (Temporary)	None	Minor Beneficial (Temporary)	Not Significant
	Weekday AM Peak Hour – Increased delay on Pant Lasau Road, B4489 (South) and A48 (Southwest)	Minor Adverse (Temporary)	None	Minor Adverse (Temporary)	Not Significant
	Weekday PM Peak Hour – Increased delay on Pant Lasau Road and	Minor Adverse (Temporary)	None	Minor Adverse (Temporary)	Not Significant

Receptor	Description of Effect	Classification of Effect	Additional Mitigation	Classification of Residual Effect	Significance
	A48 (Southeast)				
Gas Connection					
Severance, Pedestrian Delay, Pedestrian, Amenity, Fear and Intimidation	PRoW (Footpaths L34, L35B and LC117)	Moderate Adverse (Temporary)	None	Moderate Adverse (Temporary)	Significant
Driver Delay	Weekday AM Peak Hour – Reduced delay on B4489 (North and South) and M4 EB Off-Slip	Minor Beneficial (Temporary)	None	Minor Beneficial (Temporary)	Not Significant
	Weekday AM Peak Hour – Increased delay on M4 WB Off-Slip and Pant Lasau Road	Minor Adverse (Temporary)	None	Minor Adverse (Temporary)	Not Significant
	Weekday PM Peak Hour – Increased delay on Pant Lasau Road and A48 (Southeast)	Minor Adverse (Temporary)	None	Minor Adverse (Temporary)	Not Significant
Electrical Connection					
Severance, Pedestrian Delay, Pedestrian, Amenity, Fear and Intimidation	PRoW (Footpaths L34, L35B and LC117)	Moderate Adverse (Temporary)	None	Moderate Adverse (Temporary)	Significant
Driver Delay	Weekday AM Peak Hour – Reduced delay on M4 EB and WB Off-Slips	Minor Beneficial (Temporary)	None	Minor Beneficial (Temporary)	Not Significant
	Weekday AM Peak Hour	Minor Adverse	None	Minor Adverse	Not Significant

Receptor	Description of Effect	Classification of Effect	Additional Mitigation	Classification of Residual Effect	Significance
	– Increased delay on Pant Lasau Road, B4489 (South) and A48 (Southwest)	(Temporary)		(Temporary)	
	Weekday PM Peak Hour – Increased delay on Pant Lasau Road and A48 (Southeast)	Minor Adverse (Temporary)	None	Minor Adverse (Temporary)	Not Significant
Project					
Severance, Pedestrian Delay, Pedestrian, Amenity, Fear and Intimidation	Weekday AM Peak Hour – Increased total traffic on Links 3, 6, 8, 9, 10 and 11	Minor Adverse (Temporary)	None	Minor Adverse (Temporary)	Not Significant
	Weekday PM Peak Hour – Increased total traffic on Links 3, 4, 6, 8, 10, 11	Minor Adverse (Temporary)	None	Minor Adverse (Temporary)	Not Significant
	Weekday 24-Hour – Increased HGV traffic on Link 3 and 4	Minor Adverse (Temporary)	None	Minor Adverse (Temporary)	Not Significant
	PRoW (Footpaths L34, L35B and LC117)	Moderate Adverse (Temporary)	None	Moderate Adverse (Temporary)	Significant
Driver Delay	Weekday AM Peak Hour – Reduced delay on B4489 (North) and M4 EB and WB Off-Slips	Minor Beneficial (Temporary)	None	Minor Beneficial (Temporary)	Not Significant
	Weekday AM Peak Hour – Increased delay on	Minor Adverse (Temporary)	None	Minor Adverse (Temporary)	Not Significant

Receptor	Description of Effect	Classification of Effect	Additional Mitigation	Classification of Residual Effect	Significance
	Pant Lasau Road, B4489 (South) and A48 (Southwest)				
	Weekday PM Peak Hour – Increased delay on A48 (Southeast)	Minor Adverse (Temporary)	None	Minor Adverse (Temporary)	Not Significant

12.10 Cumulative Effects

a) Assessment of Potential Cumulative Effects – Construction and Decommissioning

i. Description of baseline where cumulative impacts expected

12.10.1 The following sensitive receptors have been identified which could, potentially, experience cumulative effects generated by the construction phase of the Project in combination with other schemes set out in Table 4-6, **Chapter 4: Approach to Environmental Impact Assessment.**

- Severance;
- Pedestrian Delay;
- Pedestrian Amenity;
- Fear and Intimidation; and
- Driver Delay.

ii. Description of Impact

12.10.2 The following potential cumulative impacts on transport receptors have been identified as potentially arising as a result of construction of the Project in combination with other schemes set out in Table 4-6, **Chapter 4: Approach to Environmental Impact Assessment.**

- Deterioration in the pedestrian experience (associated with severance, pedestrian delay, pedestrian amenity, fear and intimidation) resulting from increased vehicle movements associated with the construction of the Project, in combination with the increased vehicle movements associated with the construction/operation of cumulative development; and
- Increased driver delay at junctions resulting from increased vehicle movements associated with the construction of the Project, in combination with the increased vehicle movements associated with the construction/operation of cumulative development.

iii. Assessment of Cumulative Effect

12.10.3 The assessment which has been carried out and presented in Section 12.7 has been repeated to take into account the effect of cumulative development on locations where the Project will have a significant residual effect. It is important to give appropriate consideration to the cumulative impacts arising from other committed development. This is defined by a development that is consented or allocated where there is a reasonable degree of certainty that it will proceed within the next three years.

12.10.4 A list of the cumulative development considered as part of the ES is included and agreed with CCS in Table 4-6 of **Chapter 4: Approach to Environmental Impact Assessment.** From this list the developments shown in Table 12-36 have been considered suitable for inclusion in the TA.

12.10.5 The request for inclusion of the two strategic sites from CCS has been considered. Under the guidance, it is important to give appropriate consideration to the

cumulative impacts arising from other committed development (i.e. development that is consented or allocated where there is a reasonable degree of certainty that it will proceed within the next three years).

12.10.6 In considering the current status of the LDP and the timeline of the Project, it is considered that, under the guidance set out above, it is unlikely that the Project and Sites SD, E and G will impact upon each other in the near future. The guidance defines committed development as a development which is consented or allocated and where there is a reasonable amount of certainty that it will come forward in the next three years. The Swansea Local Development Plan is, at the time of writing, at the inspector's hearing and may become formally adopted by the end of summer or autumn 2018. Therefore, the official status of all the strategic development sites is unallocated. In the case of SD and G, the tender for transport planning services was released approximately 18 months ago. At present, there is no planning application submitted or sufficient information in the public domain. Therefore, the sites in question is also not classed as consented.

12.10.7 Notwithstanding the above, this Chapter does consider the likelihood of the strategic sites coming forward in the next three years and in the timeline of the Project construction period. If a planning application was to be submitted for the strategic sites within the next six months, it could take another six months or more to gain a formal decision. Following any grant of planning permission, there will be conditions to discharge. The form the applications will take is not known; if only an outline application is submitted the timeline could double. If the applications are in full or a hybrid then the detailed design of new highways and/or improvements will begin. These will be submitted for technical approval by the LHA; this process of design and approval is likely to take around 12 months or more. The anticipated time for this development to become consented is between 6-12 months from submission and then a further 12 months or more to be able to proceed.

12.10.8 The Project is adhering to a legislative timeline for submission with a substantial amount of work already been completed and within the public domain. Once accepted, a decision on the DCO Application is expected in autumn 2019. Therefore the probability of the Project and the strategic sites being in construction at the same time is low. In the worst case (which is considered unlikely), construction on the strategic sites may commence at the end of the Project construction period. This would be after peak construction traffic for the Project, which occurs around 11 months from commencement. Construction on the strategic sites would also be limited to initial preliminary construction activities at that time.

12.10.9 The conclusions that were drawn at the time of consideration was that the Project consenting process was considerably ahead of the nearby potential strategic site allocations. Thus if, in the unlikely scenario, the sites were to overlap construction periods for less than a year, the strategic sites would need to account for the Project as committed. This approach would also ensure robust assessments were undertaken in the future given that Project traffic impact will be in the public domain and agreed with the LHA; this eliminates the need for broad assumptions and

follows logical steps. There are complexities with trying to assume development quantum, access arrangements and mitigation measures associated with strategic sites that would prevent meaningful assessment at this stage.

Table 12-36: Cumulative Development included in TA

Application Reference	Site Name
2013/0795	Tyle Coch Mawr Wind Farm
2013/1835	Felindre Business Park
2015/1529 (Appeal Reference: 4369653)	Llettyr Morfil Farm
2015/0308	Plot 8 Felindre Business Park
2015/1716	Land at Abergelli Farm
2016/1478	Land North of Garden Village, Swansea
2017/1822	Land West of Llangyfelach Road, Tirdeunaw

12.10.10 Other cumulative development listed in **Chapter 4: Approach to Environmental Impact Assessment** has been omitted for one or more of the following reasons:

- Construction phase will not coincide with construction of the Project (i.e. will be completed prior to commencement of the Project);
- Operational phase will involve maintenance only (such as for solar and wind farm uses), the traffic generation of which is negligible;
- An existing use or will result in a net reduction in traffic generation;
- Not yet been subject to a planning application, so no details of traffic generation are available. Where these sites are part of the LDP, it has been are assumed that these have been accounted for in background traffic growth;
- No details of traffic generation included in the planning application documentation; and
- Does not comply with the assessed definition of committed development.

12.10.11 The traffic generation and distribution of traffic associated with the included cumulative development has been derived from supporting documentation contained within the respective planning applications. The cumulative development traffic flows during the weekday AM and PM peak hours are shown on Figures 12.26 and 12.27 respectively. These have been added to the traffic flows on Figures 12.18 to 12.25 (i.e. the '2022 Baseline' with individual Project components/full Project) to derive traffic flows for the following cumulative development scenarios:

- 2022 Baseline + Power Generation Plant Construction Traffic + Cumulative Development – see Figures 12.28 and 12.29;
- 2022 Baseline + Gas Connection Construction Traffic + Cumulative Development – see Figures 12.30 and 12.31;
- 2022 Baseline + Electrical Connection Construction Traffic + Cumulative Development – see Figures 12.32 and 12.33; and

- 2022 Baseline + Project Construction Traffic + Cumulative Development – see Figures 12.34 and 12.35.

iv. Severance, Pedestrian Delay, Pedestrian Amenity, Fear and Intimidation – Traffic Flows

Power Generation Plant

12.10.12 In terms of total traffic flows, it has been identified that the residual effect of the Power Generation Plant on Links 3, 6, 8, 9, 10 and 11 will be **Minor adverse** during the AM peak hour. During the PM peak hour, the residual effect of the Power Generation Plant on Links 3, 4, 6, 8, 10 and 11 will be **Minor adverse**. The effect of cumulative development on these links during the AM and PM peak hours is shown in Tables 12-37 and 12-38.

Table 12-37: 2022 Two-Way Total Traffic Flows (All Vehicle) – Cumulative Assessment (Power Generation Plant) – Weekday AM Peak Hour (07:45-08:45)

Link No.	2022 Baseline	2022 Baseline + Power Generation Plant Construction Traffic + Cumulative Development	Difference	% Change	Magnitude of Change	Sensitivity	Significance of Effect
3	140	225	+85	+60%	Medium	Low	Minor Adverse
6	1,223	1,454	+231	+19%	Very Low	Medium	Minor Adverse
8	2,334	2,442	+109	+5%	Very Low	High	Minor Adverse
9	1,365	1,423	+58	+4%	Very Low	Medium	Minor Adverse
10	1,239	1,290	+51	+4%	Very Low	Medium	Minor Adverse
11	1,112	1,340	+228	+21%	Very Low	Medium	Minor Adverse

Note: Summation errors due to rounding.

Table 12-38: 2022 Two-Way Total Traffic Flows (All Vehicle) – Cumulative Assessment (Power Generation Plant) – Weekday PM Peak Hour (16:30-17:30)

Link No.	2022 Baseline	2022 Baseline + Power Generation Plant Construction Traffic + Cumulative Development	Difference	% Change	Magnitude of Change	Sensitivity	Significance of Effect
3	90	175	+85	+94%	High	Very Low	Minor Adverse
4	242	383	+141	+58%	Low	Low	Minor Adverse
6	1,239	1,411	+173	+14%	Very Low	Medium	Minor Adverse
8	2,023	2,127	+104	+5%	Very Low	High	Minor Adverse
10	1,221	1,279	+58	+5%	Very Low	Medium	Minor Adverse
11	1,124	1,432	+308	+27%	Very Low	Medium	Minor Adverse

Note: Summation errors due to rounding.

12.10.13 Tables 12-37 and 12-38 show that, in terms of total traffic flows, there will be no change in the significance of effect with the cumulative development.

12.10.14 In terms of HGV traffic flows, it has been identified that the residual effect of the Power Generation Plant on Links 3 and 4 will be **Minor adverse**. The effect of cumulative development on these links is shown in Table 12-39.

Table 12-39:2022 Two-Way HGV Traffic Flows – Cumulative Assessment (Power Generation Plant) – Weekday 24-Hour

Link No.	2022 Baseline	2022 Baseline + Power Generation Plant Construction Traffic + Cumulative Development	Difference	% Change	Magnitude of Change	Sensitivity	Significance of Effect
3	13	146	+133	+1,020 %	High	Very Low	Minor Adverse
4	154	268	+114	+74%	Medium	Low	Minor Adverse

12.10.15 Table 12-39 shows that, in terms of HGV traffic flows, Links 3 and 4 will experience no change in the significance of effect with the cumulative development.

12.10.16 The cumulative development will result in no change in the effect on the PRoW discussed at Section 12.7.

Gas Connection

12.10.17 In terms of both total traffic flows and HGV traffic flows, it has been identified that the residual effect of the Gas Connection will be **Negligible** and therefore no assessment with cumulative development has been undertaken.

12.10.18 The cumulative development will result in no change in the effect on the PRoW discussed at Section 12.7.

Electrical Connection

12.10.19 In terms of both total traffic flows and HGV traffic flows, it has been identified that the residual effect of the Electrical Connection will be **Negligible** and therefore no assessment with cumulative development has been undertaken.

12.10.20 The cumulative development will result in no change in the effect on the PRoW discussed at Section 12.7.

Project

12.10.21 In terms of total traffic flows, it has been identified that the residual effect of the Project on Links 3, 6, 8, 9, 10 and 11 will be **Minor adverse** during the AM peak hour. During the PM peak hour, the residual effect of the Power Generation Plant on Links 3, 4, 6, 8, 10 and 11 will be **Minor adverse**. The effect of cumulative development on these links during the AM and PM peak hours is shown in Tables 12-40 and 12-41.

Table 12-40: 2022 Two-Way Total Traffic Flows (All Vehicle) – Cumulative Assessment (Project) – Weekday AM Peak Hour (07:45-08:45)

Link No.	2022 Baseline	2022 Baseline + Project Construction Traffic + Cumulative Development	Difference	% Change	Magnitude of Change	Sensitivity	Significance of Effect
3	140	235	+95	+67%	Medium	Low	Minor Adverse
6	1,223	1,461	+238	+19%	Very Low	Medium	Minor Adverse
8	2,334	2,444	+111	+5%	Very Low	High	Minor Adverse
9	1,365	1,424	+59	+4%	Very Low	Medium	Minor Adverse
10	1,239	1,291	+52	+4%	Very Low	Medium	Minor Adverse
11	1,112	1,342	+230	+21%	Very Low	Medium	Minor Adverse

Note: Summation errors due to rounding.

Table 12-41: 2022 Two-Way Total Traffic Flows (All Vehicle) – Cumulative Assessment (Project) – Weekday PM Peak Hour (16:30-17:30)

Link No.	2022 Baseline	2022 Baseline + Project Construction Traffic + Cumulative Development	Difference	% Change	Magnitude of Change	Sensitivity	Significance of Effect
3	90	184	+95	+105%	High	Very Low	Minor Adverse
4	242	392	+151	+62%	Medium	Low	Minor Adverse
6	1,239	1,416	+178	+14%	Very Low	Medium	Minor Adverse
8	2,023	2,129	+106	+5%	Very Low	High	Minor Adverse
10	1,221	1,280	+59	+5%	Very Low	Medium	Minor Adverse
11	1,124	1,433	+309	+28%	Very Low	Medium	Minor Adverse

Note: Summation errors due to rounding.

12.10.22 Tables 12-40 and 12-41 show that, in terms of total traffic flows, there will be no change in the significance of effect with the cumulative development.

12.10.23 In terms of HGV traffic flows, it has been identified that the residual effect of the Project on Links 3 and 4 will be **Minor adverse**. The effect of cumulative development on these links is shown in Table 12-42.

Table 12-42:2022 Two-Way HGV Traffic Flows – Cumulative Assessment (Project) – Weekday 24-Hour

Link No.	2022 Baseline	2022 Baseline + Power Generation Plant Construction Traffic + Cumulative Development	Difference	% Change	Magnitude of Change	Sensitivity	Significance of Effect
3	13	156	+143	+1,097 %	High	Very Low	Minor Adverse
4	154	278	+124	+81%	Medium	Low	Minor Adverse

12.10.24 Table 12-42 shows that, in terms of HGV traffic flows, Links 3 and 4 will experience no change in the significance of effect with the cumulative development.

12.10.25 The cumulative development will result in no change in the effect on the PRoW discussed at Section 12.7.

v. Driver Delay

Power Generation Plant

12.10.26 It has been identified that the residual effect of the Power Generation Plant on the entry arms of Pant Lasau Road, the B4489 (South) and A48 (Southwest) will be **Minor adverse** during the AM peak hour. There will be a **Minor beneficial** effect on the B4489 (North) and the M4 eastbound and westbound off-slips. The residual effect on the entry arms of Pant Lasau Road and the A48 (Southeast) will be **Minor adverse** during the PM peak hour.

12.10.27 The effect of cumulative development on driver delay at the junction network during the weekday AM and PM peak hours is shown in Tables 12-43 and 12-44.

Table 12-43: Capacity Assessment Results – Cumulative Assessment (Power Generation Plant) – Weekday AM Peak Hour (07:45-08:45)

Entry Arm	Delay (Seconds/Vehicle)			% Change	Magnitude of Change	Sensitivity	Significance of Effect
	2022 Baseline	2022 Baseline + Power Generation Plant Construction Traffic + Cumulative Development	Difference				
A	38	58	+20	+53%	Low	Medium	Minor Adverse
B	1,040	1,100	+60	+6%	Very Low	High	Minor Adverse
C	54	69	+15	+28%	Very Low	Medium	Minor Adverse
D	20	25	+5	+25%	Very Low	Low	Negligible
E	287	716	+429	+149%	High	High	Major Adverse
F	859	999	+140	+16%	Very Low	High	Minor Adverse
G	1,030	1,102	+72	+7%	Very Low	High	Minor Adverse

Note: A = B4489 (North). B = M4 WB Off-Slip. C = Pant Lasau Road. D = A48 (Southeast). E = B4489 (South). F = A48 (Southwest). G = M4 EB Off-Slip.

Table 12-44: Capacity Assessment Results – Cumulative Assessment (Power Generation Plant) – Weekday PM Peak Hour (16:30-17:30)

Entry Arm	Delay (Seconds/Vehicle)			% Change	Magnitude of Change	Sensitivity	Significance of Effect
	2022 Baseline	2022 Baseline + Power Generation Plant Construction Traffic + Cumulative Development	Difference				
A	6	8	+2	+33%	Low	Very Low	Negligible
B	7	10	+3	+43%	Low	Very Low	Negligible
C	220	389	+169	+77%	Medium	High	Major Adverse
D	552	699	+147	+27%	Very Low	High	Minor Adverse
E	9	14	+5	+56%	Low	Very Low	Negligible
F	6	7	+1	+17%	Very Low	Very Low	Negligible
G	7	8	+1	+14%	Very Low	Very Low	Negligible

Note: A = B4489 (North). B = M4 WB Off-Slip. C = Pant Lasau Road. D = A48 (Southeast). E = B4489 (South). F = A48 (Southwest). G = M4 EB Off-Slip.

12.10.28 Table 12-43 shows that, during the AM peak hour, the additional traffic associated with cumulative development will result in changes in the significance of the effect on entry arms when compared with the residual effect of the Power Generation Plant. On the B4489 (North) and the M4 eastbound and westbound off-slips, the effect will change from **Minor beneficial** to **Minor adverse**. On the B4489 (South), the effect will change from **Minor adverse** to **Major adverse**.

12.10.29 Table 12-44 shows that, during the PM peak hour, the additional traffic associated with cumulative development will result in a change in the significance of the effect on Pant Lasau Road from **Minor adverse** to **Major adverse**.

Gas Connection

12.10.30 It has been identified that the residual effect of the Gas Connection on the entry arms of the M4 westbound off-slip and Pant Lasau Road will be **Minor adverse** effect during the AM peak hour. There will be a **Minor beneficial** effect on the B4489 (North and South) and M4 eastbound off-slip. The residual effect on the

entry arm of Pant Lasau Road and the A48 (Southeast) will be **Minor adverse** during the PM peak hour.

12.10.31 The effect of cumulative development on driver delay at the junction network during the weekday AM and PM peak hours is shown in Tables 12-45 and 12-46.

Table 12-45: Capacity Assessment Results – Cumulative Assessment (Gas Connection) – Weekday AM Peak Hour (07:45-08:45)

Entry Arm	Delay (Seconds/Vehicle)			% Change	Magnitude of Change	Sensitivity	Significance of Effect
	2022 Baseline	2022 Baseline + Gas Connection Construction Traffic + Cumulative Development	Difference				
A	38	57	+19	+50%	Low	Medium	Minor Adverse
B	1,040	1,129	+89	+9%	Very Low	High	Minor Adverse
C	54	63	+9	+17%	Very Low	Medium	Minor Adverse
D	20	22	+2	+9%	Very Low	Low	Negligible
E	287	628	+341	+119%	High	High	Major Adverse
F	859	977	+118	+14%	Very Low	High	Minor Adverse
G	1,030	1,163	+133	+13%	Very Low	High	Minor Adverse

Note: A = B4489 (North). B = M4 WB Off-Slip. C = Pant Lasau Road. D = A48 (Southeast). E = B4489 (South). F = A48 (Southwest). G = M4 EB Off-Slip.

Table 12-46: Capacity Assessment Results – Cumulative Assessment (Gas Connection) – Weekday PM Peak Hour (16:30-17:30)

Entry Arm	Delay (Seconds/Vehicle)			% Change	Magnitude of Change	Sensitivity	Significance of Effect
	2022 Baseline	2022 Baseline + Gas Connection Construction Traffic + Cumulative Development	Difference				
A	6	7	+1	+17%	Very Low	Very Low	Negligible
B	7	10	+3	+43%	Low	Very Low	Negligible
C	220	362	+142	+65%	Medium	High	Major Adverse
D	552	698	+146	+26%	Very Low	High	Minor Adverse
E	9	13	+4	+44%	Low	Very Low	Negligible
F	6	7	+1	+17%	Very Low	Very Low	Negligible
G	7	8	+1	+14%	Very Low	Very Low	Negligible

Note: A = B4489 (North). B = M4 WB Off-Slip. C = Pant Lasau Road. D = A48 (Southeast). E = B4489 (South). F = A48 (Southwest). G = M4 EB Off-Slip.

12.10.32 Table 12-45 shows that, during the AM peak hour, the additional traffic associated with cumulative development will result in changes in the significance of the effect on numerous entry arms when compared with the residual effect of the Gas Connection. On the B4489 (North) and M4 eastbound off-slip, the effect will change from **Minor beneficial** to **Minor adverse**. On the B4489 (South), the effect will change from **Minor beneficial** to **Major adverse**. On the A48 (Southwest), the effect will change from **Negligible** to **Minor adverse**.

12.10.33 Table 12-46 shows that, during the PM peak hour, the additional traffic associated with cumulative development will result in a change in the significance of the effect on Pant Lasau Road from **Minor adverse** to **Major adverse.**

Electrical Connection

12.10.34 It has been identified that the residual effect of the Electrical Connection on the entry arms of Pant Lasau Road, the B4489 (South) and A48 (Southwest) will be **Minor adverse** during the AM peak hour. There will be a **Minor beneficial** effect on the M4 eastbound and westbound off-slips. The residual effect on the entry arms of

Pant Lasau Road and the A48 (Southeast) will be **Minor adverse** during the PM peak hour.

12.10.35 The effect of cumulative development on driver delay at the junction network during the weekday AM and PM peak hours is shown in Tables 12-47 and 12-48.

Table 12-47: Capacity Assessment Results – Cumulative Assessment (Electrical Connection) – Weekday AM Peak Hour (07:45-08:45)

Entry Arm	Delay (Seconds/Vehicle)			% Change	Magnitude of Change	Sensitivity	Significance of Effect
	2022 Baseline	2022 Baseline + Electrical Connection Construction Traffic + Cumulative Development	Difference				
A	38	57	+19	+50%	Low	Medium	Minor Adverse
B	1,040	1,116	+76	+7%	Very Low	High	Minor Adverse
C	54	62	+8	+15%	Very Low	Medium	Minor Adverse
D	20	23	+3	+15%	Very Low	Low	Negligible
E	287	620	+333	+116%	High	High	Major Adverse
F	859	972	+113	+13%	Very Low	High	Minor Adverse
G	1,030	1,153	+123	+12%	Very Low	High	Minor Adverse

Note: A = B4489 (North). B = M4 WB Off-Slip. C = Pant Lasau Road. D = A48 (Southeast). E = B4489 (South). F = A48 (Southwest). G = M4 EB Off-Slip.

Table 12-48: Capacity Assessment Results – Cumulative Assessment (Electrical Connection) – Weekday PM Peak Hour (16:30-17:30)

Entry Arm	Delay (Seconds/Vehicle)			% Change	Magnitude of Change	Sensitivity	Significance of Effect
	2022 Baseline	2022 Baseline + Electrical Connection Construction Traffic + Cumulative Development	Difference				
A	6	7	+1	+17%	Very Low	Very Low	Negligible
B	7	10	+3	+43%	Low	Very Low	Negligible
C	220	362	+142	+65%	Medium	High	Major Adverse
D	552	698	+146	+26%	Very Low	High	Minor Adverse
E	9	14	+5	+56%	Low	Very Low	Negligible
F	6	7	+1	+17%	Very Low	Very Low	Negligible
G	7	7	+0	+0%	-	Very Low	Negligible

Note: A = B4489 (North). B = M4 WB Off-Slip. C = Pant Lasau Road. D = A48 (Southeast). E = B4489 (South). F = A48 (Southwest). G = M4 EB Off-Slip.

12.10.1 Table 12-47 shows that, during the AM peak hour, the additional traffic associated with cumulative development will result in changes in the significance of the effect on numerous entry arms when compared with the residual effect of the Electrical Connection. On the M4 eastbound and westbound off-slips, the effect will change from **Minor beneficial** to **Minor adverse**. On the B4489 (North), the effect will change from **Negligible** to **Minor adverse**. On the B4489 (South), the effect will change from **Minor adverse** to **Major adverse**.

12.10.2 Table 12-48 shows that, during the PM peak hour, the additional traffic associated with cumulative development will result in a change in the significance of the effect on Pant Lasau Road from **Minor adverse** to **Major adverse**.

Project

12.10.3 It has been identified that the residual effect of the Electrical Connection on the entry arms of Pant Lasau Road, the B4489 (South) and A48 (Southwest) will be **Minor adverse** during the AM peak hour. There will be a **Minor beneficial** effect on the M4 eastbound and westbound off-slips. The residual effect on the entry arms of

Pant Lasau Road and the A48 (Southeast) will be **Minor adverse** during the PM peak hour.

12.10.4 The effect of cumulative development on driver delay at the junction network during the weekday AM and PM peak hours is shown in Tables 12-49 and 12-50.

Table 12-49: Capacity Assessment Results – Cumulative Assessment (Project) – Weekday AM Peak Hour (07:45-08:45)

Entry Arm	Delay (Seconds/Vehicle)			% Change	Magnitude of Change	Sensitivity	Significance of Effect
	2022 Baseline	2022 Baseline + Project Construction Traffic + Cumulative Development	Difference				
A	38	50	+12	+32%	Low	Medium	Minor Adverse
B	1,040	1,082	+42	+4%	Very Low	High	Minor Adverse
C	54	75	+21	+39%	Low	Medium	Minor Adverse
D	20	24	+4	+20%	Very Low	Low	Negligible
E	287	707	+420	+146%	High	High	Major Adverse
F	859	981	+122	+14%	Very Low	High	Minor Adverse
G	1,030	1,080	+50	+5%	Very Low	High	Minor Adverse

Note: A = B4489 (North). B = M4 WB Off-Slip. C = Pant Lasau Road. D = A48 (Southeast). E = B4489 (South). F = A48 (Southwest). G = M4 EB Off-Slip.

Table 12-50: Capacity Assessment Results – Cumulative Assessment – Weekday PM Peak Hour (16:30-17:30)

Entry Arm	Delay (Seconds/Vehicle)			% Change	Magnitude of Change	Sensitivity	Significance of Effect
	2022 Baseline	2022 Baseline + Project Construction Traffic + Cumulative Development	Difference				
A	6	8	+2	+33%	Low	Very Low	Negligible
B	7	10	+3	+43%	Low	Very Low	Negligible
C	220	393	+173	+79%	Medium	High	Major Adverse
D	552	699	+147	+27%	Very Low	High	Minor Adverse
E	9	14	+5	+56%	Low	Very Low	Negligible
F	6	7	+1	+17%	Very Low	Very Low	Negligible
G	7	8	+1	+14%	Very Low	Very Low	Negligible

Note: A = B4489 (North). B = M4 WB Off-Slip. C = Pant Lasau Road. D = A48 (Southeast). E = B4489 (South). F = A48 (Southwest). G = M4 EB Off-Slip.

12.10.5 Table 12-49 shows that, during the AM peak hour, the additional traffic associated with cumulative development will result in changes in the significance of the effect on numerous entry arms when compared with the residual effect of the Project. On the B4489 (North) and M4 eastbound and westbound off-slips, the effect will change from **Minor beneficial** to **Minor adverse**. On the B4489 (South), the effect will change from **Minor adverse** to **Major adverse**.

12.10.6 Table 12-50 shows that, during the PM peak hour, the additional traffic associated with cumulative development will result in a change in the significance of the effect on Pant Lasau Road from **Minor adverse** to **Major adverse**. On the A48 (Southeast), the effect will change from **Negligible** to **Minor adverse.**

vi. Summary

12.10.7 The cumulative assessment for the individual Project components/full Project has identified that there will be no change in the significance of effects relating to the pedestrian experience (severance, pedestrian amenity, pedestrian delay, fear and intimidation). The residual cumulative effect will be **Minor** to **Moderate adverse**. Therefore, no mitigation is considered to be required.

12.10.8 In respect of driver delay, it has been identified that will be a change in the significance of effect, primarily during the AM peak hour. The residual cumulative effects will be the same for the individual Project components/full Project. During the AM peak hour, the residual cumulative effect will be **Minor adverse** on the B4489 (North), M4 eastbound and westbound off-slips, Pant Lasau Road and the A48 (Southwest), and **Major adverse** on the B4489 (South). During the PM peak hour, the residual cumulative effect will be **Minor adverse** on the A48 (Southeast) and **Major adverse** on Pant Lasau Road.

12.10.9 Whilst these effects are significant, the contribution of the individual Project components/full Project will be temporary in nature and does not require the delivery of mitigation measures such as capacity improvements. As identified in Section 12.5, observations in 2017 suggest that the junctions assessed are currently operating with a greater level of capacity than is reported based on the 2014 traffic survey data. The junctions are therefore unlikely to show the levels of delay reported in future year assessment scenarios. It should also be taken into consideration that the assessments carried out in this report are robust and compound a number of peak scenarios that would not normally coincide to create a theoretical worst case scenario.

b) Assessment of Potential Cumulative Effects – Operation

12.10.10 As discussed at Section 12.7, the residual transport effects of the individual Project components/ Project during the operational phase will be **Negligible**. Therefore, no further assessment of the cumulative effects is required.

c) Assessment of Potential Cumulative Effects – Decommissioning

12.10.11 The residual transport effects will be as for the construction phase.

12.11 References

Ref. 12.1 Department of Energy and Climate Change. Overarching National Policy Statement for Energy (EN-1). London: The Stationery Office, 2011.

Ref. 12.2 Welsh Government. Planning Policy Wales: Edition 9. Cardiff: Welsh Government, 2016.

Ref. 12.3 Welsh Government. Technical Advice Note 18: Transport. Cardiff: Welsh Government, 2007.

Ref. 12.4 Welsh Government. Wales Transport Strategy. Cardiff: Welsh Government, 2008.

Ref. 12.5 Welsh Government. Active Travel (Wales) Act. Cardiff: Welsh Government, 2013.

Ref. 12.6 Institute of Environmental Assessment. Guidelines for the Environmental Assessment of Road Traffic. Lincoln: Institute of Environmental Assessment, 1993.

Ref. 12.7 South West Wales Integrated Transport Consortium. Joint Transport Plan for South West Wales 2015-2020. Swansea: South West Wales Integrated Transport Consortium, 2015.

Ref. 12.8 City and County of Swansea. Unitary Development Plan. Swansea: City and County of Swansea, 2008.

Ref. 12.9 City and County of Swansea. Local Development Plan 2010-2025: Deposit Plan. Swansea: City and County of Swansea, 2016.

Chapter 13

Historic Environment

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13. Historic Environment

13.1 Introduction

13.1.1 This chapter of the ES provides an assessment of the effects on the historic environment arising from the construction, operation, and decommissioning of the Project. Maintenance is included within the operational assessment of the Project.

13.1.2 A detailed description of the Project and Project Site is provided in **Chapter 3: Project and Site Description**. A glossary of terms and list of abbreviations used in this chapter is provided in **Document Reference 1.4.**

13.1.3 Historic assets include Scheduled Monuments, Listed Buildings, Registered Historic Parks and Gardens, Registered Historic Landscapes, Conservation Areas, upstanding archaeological earthworks and buried remains, and historic hedgerows. For the ease of presentation in this document, all cultural heritage features are referred to as 'historic assets'.

a) Objectives of the assessment

13.1.4 The purpose of this chapter is to outline the historic environment resource of the Project Site and its environs, to identify potential constraints to the Project, to assess the likely significant impacts on historic environment receptors, to formulate mitigation measures where a significant impact is identified, and to quantify any residual effects.

13.1.5 The following tasks were undertaken for this assessment:

- Legislation and policy context review;
- Consultation with statutory and non-statutory bodies to identify interests and concerns regarding cultural heritage;
- Desk-based study to obtain baseline archaeological and historical data;
- Site survey to augment desk-based baseline data;
- Identification of the potential impacts of the Project and assessment of their significance; and
- Formulation of mitigation of potential impacts.

13.2 Changes since the 2014 PEIR

13.2.1 The main updates to this chapter since the 2014 PEIR have been in response to the change in stack height (to a maximum of 45 m instead of 40 m) and reduction in stacks as outlined in Section 3.2 in **Chapter 3: Project and Site Description**. Updates have also been made to the assessment due to the length of time since the original study; these updates have taken place alongside further dialogue with statutory consultees. Since the 2018 PEIR there have been alterations to the alignment of the new section of Access Road. These changes have not changed the findings of this chapter.

13.3 Legislation, policy and guidance

13.3.1 This section identifies and describes legislation, policy and guidance of relevance to the assessment of the potential impacts associated with the construction, operation and decommissioning of the Project, upon historic assets.

13.3.2 Legislation and policy has been considered on a national, regional, and local level (although no relevant regional-level legislation or policy was identified). The following is relevant to the assessment as it has influenced the sensitivity of receptors and requirements for mitigation or the scope and/or methodology of the Environmental Impact Assessment (EIA).

a) National

i. Overarching National Policy Statement for Energy (NPS EN1; Ref. 13.1)

13.3.3 Paragraph 5.8.1 of National Policy Statement for Energy (NPS) EN1 states that the construction, operation, and decommissioning of energy infrastructure has the potential to result in adverse impacts on the historic environment. Paragraph 5.8.2 defines the historic environment as including all aspects of the environment resulting from the interaction between people and places through time, including all surviving physical remains of past human activity, whether visible, buried or submerged, landscaped and planted or managed flora. Those elements of the historic environment that hold value to this and future generations because of their historic, archaeological, architectural or artistic interest are called heritage assets. The NPS defines a 'heritage asset' as any building, monument, site, place, area or landscape, or any combination of these. The sum of the heritage interests that a 'heritage asset' holds is referred to as its significance.

13.3.4 Paragraph 5.8.3 of the NPS discusses 'Heritage Assets' that merit designation and identifies these as assets falling within the following categories:

- A World Heritage Site;
- Scheduled Monument;
- Protected Wreck Site;
- Protected Military Remains;
- Listed Building;
- Registered Park and Garden;
- Conservation Area; and
- Registered Historic Landscape (Wales only).

13.3.5 Paragraph 5.8.4 of the NPS goes on to highlight that there are heritage assets with archaeological interest that are not currently designated as scheduled monuments, but are demonstrably of equivalent significance. These include: (i) those that have yet to be formally assessed for designation; (ii) those that have been assessed as being designatable but the SoS has decided not to designate; and (iii) those that are incapable of being designated by virtue of being outside the scope of the Ancient Monuments and Archaeological Areas Act 1979.

13.3.6 In paragraph 5.8.5, the NPS notes that the absence of designation for such heritage assets does not indicate lower significance. If the evidence before the SoS indicates that a non-designated heritage asset of the type described in 5.8.4 of the NPS may be affected by the proposed development then the heritage asset should be considered subject to the same policy considerations as those that apply to designated heritage assets.

13.3.7 Paragraph 5.8.6 dictates that the SoS should also consider the impacts on other non-designated heritage assets, as identified either through the development plan-making process (local listing) or through the SoS's decision-making process on the basis of clear evidence that the assets have a heritage significance that merits consideration in its decisions, even though those assets are of lesser value than designated assets.

13.3.8 Paragraph 5.8.8 of the NPS states that, as part of the applicant's assessment, the applicant should provide a description of the significance of the heritage assets affected by the proposed development and the contribution of their setting to that significance. The level of detail should be proportionate to the importance of the heritage assets and no more than is sufficient to understand the potential impact of the proposal on the heritage asset. As a minimum, the applicant should have consulted the relevant Historic Environment Record (HER) and assessed the heritage assets themselves, using expertise where necessary according to the proposed development's impact.

13.3.9 Paragraph 5.8.9 of the NPS is concerned with heritage assets with archaeological interest and states that the applicant should carry out appropriate desk-based assessment and, where such desk-based research is insufficient to properly assess the interest, a field evaluation.

Infrastructure Planning (Decisions) Regulations 2010

13.3.10 Section 104(2)(c) of the PA 2008 provides that in deciding an application under the PA 2008, the SoS must have regard to any "*any matters prescribed in relation to development of the description to which the application relates*".

13.3.11 Regulation 3 of the Infrastructure Planning (Decisions) Regulations 2010 sets out such a prescribed matter. It provides that:

1) When deciding an application which affects a listed building or its setting, the decision-maker must have regard to the desirability of preserving the listed building or its setting or any features of special architectural or historic interest which it possesses.

2) When deciding an application relating to a conservation area, the decision-maker must have regard to the desirability of preserving or enhancing the character or appearance of that area.

3) When deciding an application for development consent which affects or is likely to affect a scheduled monument or its setting, the decision-maker must have regard to the desirability of preserving the scheduled monument or its setting.

13.3.12 In carrying out this assessment, APL has had regard to these considerations.

The Ancient Monuments and Archaeological Areas Act 1979

13.3.13 The Act (Ref. 13.2) imposes a requirement for Scheduled Monument Consent for any works of demolition, repair and alteration that might affect a Scheduled Monument. The Act sets out a presumption in favour of preservation in-situ concerning sites and monuments of national importance.

The Planning (Listed Buildings and Conservation Areas) Act 1990

13.3.14 The Act (Ref. 13.3) sets out the principal statutory provisions which must be considered in the determination of any application affecting either listed buildings or conservation areas.

13.3.15 Section 66 of the Act states that, in considering whether to grant planning permission for development that affects a listed building or its setting, the local planning authority or 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 it possesses. By virtue of Section 1(5) of the Act, a listed building includes any object or structure within its curtilage.

13.3.16 Section 66 applies in relation to a consideration of whether to grant 'planning permission'. 'Planning permission' is defined under Section 91(2) of that Act as having the same meaning as in the principal Act (which is defined as the Town and Country Planning Act 1990 (TCPA 1990)). 'Planning permission' is defined under the TCPA 1990 as a permission under Part III of that Act. Under Part III of that Act, planning permission is required for the carrying out of any development of land (Section 57). Section 33(1)(a) of the PA 2008 provides that, to the extent that development consent is required for a development, planning permission is not required under the TCPA 1990. Therefore, Section 66 does not apply to decisions under the PA 2008.

13.3.17 Section 66 will apply for applications made under the Town and Country Planning Act 1990 for the Gas Connection and/or the Electrical Connection.

13.3.18 Although APL considers that Section 66 does not apply to decisions under the PA 2008, it has taken into account the principles from the *Barnwell Manor* Court of Appeal case in undertaking this assessment (see Barnwell Manor Wind Energy Ltd v E. Northants DC English Heritage, National Trust & SSCLG [2014] EWCA Civ 137). This is because, pursuant to Section 104(2)(d) of the PA 2008, the Secretary of State must have regard to "*any other matters which the Secretary of State thinks are both important and relevant*".

13.3.19 In the Barnwell Manor case, the Court of Appeal held that decision makers should give 'considerable importance and weight' to the desirability of preserving the setting of listed buildings when carrying out the required balancing exercise pursuant to Section 66(1).

The Hedgerow Regulations 1997

13.3.20 The Hedgerow Regulations (Ref. 13.4) allow for provisions to be made for, or in connection with, the protection of important hedgerows in England or Wales from activities that are not necessarily subject to planning consent. The identification of a hedgerow as 'important' was to be determined in accordance with criteria laid out in Hedgerow Regulations 1997.

13.3.21 The regulations state that a hedgerow is important if it is at least 30 years old and meets one of the following criteria:

- Marking a boundary of a historic parish or township (prior to 1850);
- Associated with a Scheduled Monument or site on the Sites and Monuments Record (now HER) at the relevant date;
- Marks the boundary of a pre-1600 AD estate or manor, or associated with a building of such a manor or estate;
- Part of a field system pre-dating the Inclosure Act (1845); or
- Related to a building or feature associated with a system pre-dating the Inclosure Act (1845) and that system is substantially complete or part of field system where the pattern was identified in 1997 as a key landscape characteristic.

Historic Environment (Wales) Act 2016

13.3.22 The Act (Ref. 13.5) makes amendments to the Ancient Monuments and Archaeological Areas Act 1979 and to the Planning (Listed Buildings and Conservation Areas) Act 1990 as they apply to Wales. The Act provides a better means of protecting scheduled monuments and listed buildings in Wales, aids in the management of the historic environment and imposes a greater degree of transparency and responsibility concerning decisions affecting the historic environment. It also makes provisions for the compilation of historic place names, a historic environment record for each local authority in Wales, and for the establishment of the Advisory Panel for the Welsh Historic Environment.

Planning Policy Wales 2016

13.3.23 The Welsh Government's Planning Policy Wales (PPW 2016; Edition 9, November 2016) (Ref. 13.6) aims to protect the historic environment, including archaeology and ancient monuments, listed buildings, conservation areas and historic parks, gardens and landscapes. This national policy provides guidance to local planning authorities during the determination of planning applications and makes it clear that there is no need for local plans to duplicate national policy.

13.3.24 Chapter 6 of PPW 2016 specifically relates to the protection of the historic environment in Wales. The objectives of PPW 2016 are to:

- Conserve and enhance the historic environment, which is a finite and non-renewable resource;

- Recognise its contribution to economic vitality and culture, civic pride, local distinctiveness and the quality of Welsh life, which must be maintained for future generations;
- Base decisions on an understanding of the significance of historic assets and to contribute to the recording of these assets and making these publically available; and
- Protect World Heritage Sites, safeguard the character of historic buildings, preserve or enhance conservation areas, historic parks and gardens and historic landscapes, and to conserve archaeological remains for their role in education, leisure and the economy.

Technical Advice Notice (TAN) 24 (to PPW 2016)

13.3.25 TAN 24 (Ref. 13.7) is supplement to PPW 2016 which details the advice regarding archaeology and the planning process within Wales. The purpose of this TAN is to provide technical guidance on how the planning system considers the historic environment during development plan preparation, and decision-making on planning and Listed Building applications. This TAN provides specific guidance on how the following aspects of the historic environment should be considered: World Heritage Sites; Scheduled Monuments; archaeological remains; Listed Buildings; Conservation Areas; historic parks and gardens; historic landscapes; and historic assets of special local interest.

b) Local

City and County of Swansea (CCS) Unitary Development Plan (UDP)

13.3.26 The CCS UDP (as detailed in **Chapter 2: Regulatory and Policy Background**) (Ref. 13.8) was adopted in November 2008 and sets out the key policy relating to the historic environment, as follows.

13.3.27 Policy EV6 states that the Council will seek to protect, preserve and enhance Scheduled Monuments and their settings, and also unscheduled archaeological sites and monuments and their settings. Applicants are required to submit an assessment which enables the historic environment baseline, the development impact, and the proposed mitigation to be clearly understood.

13.3.28 Policy EV9 states that development within or adjacent to a conservation area will only be permitted if it would preserve or enhance the character or appearance of the conservation area or its setting.

13.3.29 Policy EV11 states that development that would harm the character or setting of registered Historic Parks and Gardens or the character of Historic Landscapes will not be permitted.

13.3.30 Policy EV12 states that character of lanes and public paths that contribute to the amenity, natural, and historic qualities of an area will be protected. Development proposals that include requirements to set back improvement lines, remove hedgerows, and provide new access and visibility splays will be resisted where this would result in a loss of character.In rural areas the design of any necessary works

should be appropriate to the character of the area and should not detract from the landscape or suburbanise the area.

City and County of Swansea Deposit Local Development Plan

13.3.31 The City and County of Swansea Deposit Local Development Plan (Ref 13.9) sets out the key policy relating to the historic environment (as discussed in detailed in **Chapter 2: Regulatory and Policy Background**), as summarised below:

13.3.32 Strategic Policy HC1 – Historic and Cultural Environment, states that the County's distinctive historic and cultural environment will be preserved or enhanced by:

- Requiring high quality design standards in all development proposals to respond positively to local character and distinctiveness;
- Identifying and safeguarding heritage assets, sites and their settings;
- Supporting heritage and cultural led regeneration schemes; and
- Safeguarding and promoting use of the Welsh language.

13.3.33 The above policy therefore seeks to secure the sustainable management, preservation and enhancement of the character and appearance of the historic and cultural environment, whilst supporting appropriate heritage-led regeneration proposals to release the social and economic potential of these assets.

13.3.34 Strategic Policy HC2 – Preservation or Enhancement of Buildings and Features states that the County's buildings and features of historic importance will be preserved or enhanced through the following measures:

- Proposals for alteration and/or extension to a listed building or its curtilage must ensure that the special architectural character or historic interest is preserved;
- The change of use of a listed building or its curtilage will only be permitted where this contributes towards the retention of a building or its sustainable reuse without having an adverse effect on its character, special interest or structural integrity;
- Permission will not be granted for the total or substantial demolition of a listed building, or an unlisted locally important building that makes a positive contribution to the character or appearance of an area, unless there is the strongest justification and convincing evidence that the proposal is necessary;
- Proposals which have a relationship to a listed building or its curtilage must ensure that the setting is preserved;
- Development within or adjacent to a conservation area will only be permitted if it would preserve and enhance the character or appearance of the conservation area or its setting. New development in such locations must also be of a high standard of design, respond to the area's special characteristics, and pay particular regard to:
- Important views, vistas, street scenes, roofscapes, trees, open spaces, gaps and other features that contribute to the character or appearance of the conservation area;
- The retention of historically significant boundaries or other elements that contribute to the established form of development;

- The relationship to existing buildings and spaces, and grain of development;
- Scale, height and massing, architectural design, established architectural detailing, the use of materials, boundary treatment, and public realm materials; and
- Ensuring that development does not have a significant adverse effect upon historic assets of special local interest.

13.3.35 The policy seeks to ensure that the conservation of the whole built environment is taken into consideration in the determination of applications for both listed building consent and conservation area consent. It also seeks to ensure that any new development accords with the special architectural and historic interest of designated conservation areas and their settings. Whilst the character or appearance of conservation areas must be a major consideration, it does not preclude carefully considered contemporary design. Development proposals will be judged for their effect on the character and appearance of conservation areas. It must be noted that this is an emerging policy.

c) Best practice guidance documents

Conservation Principles for the Sustainable Management of the Historic Environment in Wales

13.3.36 These principles (Ref. 13.10) provide the basis upon which Cadw discharges its statutory duties, and advises and makes decisions regarding changes made to historic assets. Cadw encourages the use of the principles to assess any potential impacts on the significance of any historic asset during potential developments.

The Setting of Historic Assets in Wales

13.3.37 This document (Ref. 13.11) outlines the definition of the term 'setting' and how this can contribute to the significance of a historic asset. It also explains the standards used to assess the potential impact of a development within the setting of World Heritage Sites, ancient monuments (scheduled and unscheduled), listed buildings, registered historic parks and gardens, and conservation areas. These principles can apply to all types of historic assets regardless of their designation.

Standard and Guidance for Historic Environment Desk-based Assessments

13.3.38 This assessment complies with the professional guidance laid out by the Chartered Institute for Archaeologists' *Standard and Guidance for Historic Environment Desk-based Assessments* (Ref. 13.12).

13.4 Methodology

a) Scope of the assessment

13.4.1 The scope of this assessment has been determined through a formal EIA scoping process undertaken with the Planning Inspectorate (PINS). Comments raised on the EIA Scoping Report have been taken into account in the development of the assessment methodology and, where relevant, these are detailed within this

chapter. Responses to the comments raised in the EIA Scoping Opinion can be found in Appendix 4.1.

13.4.2 The sources consulted in the course of this assessment are as follows:

- Cadw (scheduled monuments, listed buildings, registered historic parks and gardens, and registered historic landscapes);
- Historic Environment Record (HER) curated by GGAT (non-designated assets: enquiry no. 5654);
- National Monuments Record (NMR) curated by the Royal Commission on the Ancient and Historical Monuments of Wales (RCAHMW) (non-designated assets: enquiry no. RC17-0698);
- Central Register of Air Photography for Wales (CRAPW) (aerial photographs: enquiry no. W-AP-PR 17-200);
- Natural Resources Wales (NRW) (LiDAR); and
- Published sources, unpublished reports and historic maps.

b) Consultation

13.4.3 The scope and content of the assessment has been informed by consultation with statutory consultees throughout the design and assessment process, including:

- Cadw (designated historic assets, and registered historic parks, gardens and landscapes); and
- Glamorgan-Gwent Archaeological Trust (Curatorial Section) in its capacity as the archaeological advisors to CCS.

13.4.4 A summary of the comments received and responses to them are detailed in Table 13-1. Full details of the consultations undertaken since 2014 can be found in Appendix 3.3.

Table 13-1: Summary of consultation responses that have informed the scope and methodology of the historic environment assessment

Consultee	Date	Comment	Response
SoS Scoping Opinion (paragraph 3.91)	August 2014	The SoS recommends the inclusion of aerial photographs within search information and draws the applicant's attention to the comments of Cadw in this regard.	Aerial photographs held by Central Register of Air Photography for Wales, and LiDAR data held by NRW, was used in searches as advised.
SoS Scoping Opinion (paragraph 3.92)	August 2014	The SoS directs the applicant to Cadw's comment regarding the referenced Standard and Guidance for Archaeological Assessment (2011) being superseded by the Standard and Guidance for historic environment desk-based assessment (2012).	Current CIfA guidance (2017) was used.
SoS Scoping	August 2014	The SoS notes the comments of Cadw in regard to the assessment on the setting of	The current guidance document, Setting of

Consultee	Date	Comment	Response
Opinion (paragraph 3.93)		designated assets, it is recommended that photographs from each asset towards the development be produced and where an adverse impact is thought likely to occur a photomontage should be produced.	Historic Assets in Wales (Cadw 2017), was used during this assessment. Verified photomontages for selected assets generated for the Landscape and Visual Effects assessment provided an appropriate means of assessment of key assets.
SoS Scoping Opinion (paragraph 3.94)	August 2014	The SoS directs the applicant to Cadw's comment regarding the reference to Registered Battlefields; as not applicable in Wales this reference should be removed, but the ES should include consideration of potential impacts to Registered Historic Landscapes.	Registered Historic Landscapes formed a part of the baseline search undertaken for this assessment. Registered battlefields were omitted.
SoS Scoping Opinion (paragraph 3.95)	August 2014	The SoS recommends that tranquillity be added to the list of factors considered relevant when assessing impacts on setting.	Cadw guidance note for setting (2017) refers to a variety of attributes of setting, of which tranquillity is one (see para 13.4.16).
GGAT	February 2018	GGAT advised on the need for a watching brief.	A watching brief will be in place and agreed with CCS and GGAT before commencement of construction.
CCS, PEIR 2018	February 2018	Figure 13.1 shows the heritage assets located within 1km of the site boundary. Whilst the Listed Buildings at Tredegar Fawr are located just outside of this boundary, they are readily visible on the plan and it would be useful to indicate them on this figure to provide further context.	Additional labels have been put on to provide further context in this ES.
CCS, PEIR 2018	February 2018	Table 5-5 of Appendix 13.1 (Heritage Gazetteer) indicates that Pare Llewelyn is Grade 2 Registered Historic Park and Garden. The Urban Design and Conservation Officer advised that it is not a Registered Historic Park and may therefore be excluded this from the Heritage Gazetteer.	Following receipt of CCS advice APL clarified the status of Parc Llewellyn. It is included on the Cadw register of historic parks and gardens, having Grade II status.

c) Study area

13.4.5 This assessment adopts three 'Study Areas', as follows:

- Project Site;
- 1 km Study Area (1 km buffer around the Project Site); and
- 5 km Study Area (5 km buffer around the Project Site).

13.4.6 A full suite of baseline data for both designated and non-designated assets has been gathered for the Project Site and 1 km Study Area (Figure 13.1). This provides information about all known assets within the Project Site (i.e. those potentially physically impacted by the development) and the broader context in which they exist. These data also provide a potential indication of the date and character of any undiscovered archaeology that may be present. The decision to adopt a 1 km Study Area is based upon professional judgement.

13.4.7 The 5 km Study Area enables the assessment of effects upon the setting of designated historic assets (Figure 13.2). Only data for designated assets has been acquired for this study area. The Zone of Theoretical Visibility (ZTV) for the Project has been established by **Chapter 11: Landscape and Visual Effects** (Figure 11.7) and has been refined in the field by both the landscape architect and the archaeologist undertaking the assessment. The field visits enable the true situation on the ground to be appreciated, particularly in terms of the role of tree cover and other vertical landscape elements which dictate the availability of long-distance views. This has been used to help define the potential visibility from heritage assets within the 5 km Study Area used within this chapter.

13.4.8 In subsequent parts of this chapter, where reference is made to the 'Study Areas', this applies to all ground within the Project Site, 1 km and 5 km study areas.

d) Site visit

13.4.9 The Project Site and the 1 km Study Area were visited on 8th November 2017. The purpose of this survey was to assess the character of known historic assets, identify any additional visible assets, and to assess possible factors which may affect the survival or condition of known or potential assets. Additionally, the 5 km Study Area was visited in order to allow an assessment of the potential for impacts on the significance of the setting of selected designated historic assets.

e) Sensitivity

i. Sensitivity of historic assets

13.4.10 This assessment adopts the criteria for value set out in the Design Manual for Roads and Bridges (DMRB), Volume 11 Section 3 Part 2, Annex 5 Archaeological Remains, Annex 6 Historic Buildings and Annex 7 Historic Landscape (Ref. 13.13), Table 13-2). The value of a historic asset reflects its significance and, therefore, its sensitivity to change.

13.4.11 The Cadw document Conservation Principles (Ref. 13.10) offers further complementary guidance relating to the assessment of asset value. It states that cultural heritage significance is based upon a set of prescribed values: aesthetic; communal; historic; and evidential. In order to identify the heritage value of an asset, its history, fabric, and character must first be understood. The relative significance of the different values then needs to be considered. It will be necessary

to compare the values of the asset under consideration with others in the locality, region or even nationally, depending on its importance.

Table 13-2: Value/sensitivity of historic assets

Value/Sensitivity	Asset type
Very High	• Assets described as being of universal international importance, such as World Heritage Sites • Assets that contribute significantly to acknowledged international research objectives • Buildings of recognised international importance • Historic landscapes of international value, whether designated or not • Extremely well preserved historic landscapes with exceptional coherence, time-depth or other critical factor(s)
High	• Scheduled Monuments with extant remains, or sites and remains of comparable quality • Assets that contribute significantly to acknowledged national research objectives • Grade I and Grade II* Listed Buildings • Other listed buildings that can be shown to have exceptional qualities in their fabric or historical association not adequately reflected in their listing grade, including non-designated structures of clear national importance • Conservation areas containing very important buildings • Designated and non-designated historic landscapes of outstanding interest of high quality and importance, and of demonstrable national value
Medium	• Designated or undesignated assets that contribute to regional research objectives • Grade II Listed Buildings • Historic (unlisted) buildings that can be shown to have exceptional qualities in their fabric or historic association • Conservation areas containing important buildings • Historic Townscape or built-up areas with historic integrity in their buildings, or built settings (e.g. including street furniture and other structures) • Designated special historic landscapes and non-designated landscapes that would justify special historic landscape designation, landscapes of regional value
Low	• Sites of low importance • Assets compromised by poor preservation and/ or poor survival of contextual associations • Locally listed buildings • Historic (unlisted) buildings of modest quality in their fabric or historical association • Historic Townscape or built-up areas of limited historic integrity in their

Value/Sensitivity	Asset type
	buildings, or built settings (e.g. including street furniture and other structures) • Undesignated historic landscapes • Historic landscapes with importance to local interest group
Negligible	• Assets with very little or no surviving archaeological interest • Buildings of no architectural or historical note; buildings of an intrusive character • Landscapes with little or no significant historical interest
Unknown	• Assets the importance of which has not been ascertained

f) Magnitude

13.4.12 The criteria for magnitude of harm (impact) are set out in Table 13-3.

Table 13-3: Criteria for magnitude of harm (impact)

Magnitude of harm (impact)	Description
High	• Total loss or significant change in environmental factors; • Complete destruction of the site or feature; • Change to the site or feature resulting in a fundamental change in ability to understand and appreciate the resource and its cultural heritage or archaeological value/historical context and setting.
Medium	• Significant change in environmental factors; • Change to the site or feature resulting in an appreciable change in ability to understand and appreciate the resource and its cultural heritage or archaeological value/historical context and setting.
Low	• Change to the site or feature resulting in a small change in our ability to understand and appreciate the resource and its cultural heritage or archaeological value/historical context and setting.
Negligible	• Negligible change or no material changes to the site or feature. No real change in our ability to understand and appreciate the resource and its cultural heritage or archaeological value/historical context and setting.

g) Effect definitions

13.4.13 Table 13-4 is a matrix that combines asset value with impact magnitude. Effects are either positive or negative, and either significant or not significant. For the purposes of this assessment, major and moderate impacts are considered to be significant.

Table 13-4: Significance of effect

Magnitude	Value and sensitivity of receptor				
	Very High	High	Medium	Low	Negligible
High	Major	Major	Moderate	Moderate	Minor
Medium	Major	Moderate	Moderate	Minor	Negligible
Low	Moderate	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Minor	Negligible	Negligible	Negligible

h) Setting of historic assets

13.4.14 The principles of historic setting are expressed in a number of planning-related documents, including for Wales within *Conservation Principles* and the *Setting of Historic Assets in Wales* (Ref. 13.10 and Ref. 13.11). The latter also sets out a staged approach for the assessment of the impact of change or development within the setting of historic assets, as follows:

- Stage 1: Identify the historic assets that might be affected by a proposed change or development;
- Stage 2: Define and analyse the settings to understand how they contribute to the significance of the historic assets and, in particular, the ways in which the assets are understood, appreciated and experienced;
- Stage 3: Evaluate the potential impact of a proposed change or development on that significance; and
- Stage 4: If necessary, consider options to mitigate or improve the potential impact of a proposed change or development on that significance.

13.4.15 Beyond these broad guidelines on process, there is no detailed methodology prescribed for the assessment of visual impacts on cultural heritage assets in Wales.

13.4.16 Factors that may contribute to the setting of a historic asset include:

- Functional and physical relationships with other structures/historic assets and how these have changed over time;
- Topographic features that influenced its location;
- Physical character of the surrounding landscape or townscape, including any formal design or land use;
- The original layout of the historic asset and how this has changed;
- Potential buried or archaeological elements surrounding the historic asset;
- Views to, from and across the historic asset or place;
- Formal or planned vistas;
- The prominence of the historic asset in views throughout the surrounding area
- Views associated with the aesthetic, functional or ceremonial purpose of the asset; for example, defensive sites, beacons or designed landscapes;
- Historical, artistic, literary, place name, cultural or scenic associations might all contribute to the significance of a historic asset;

- Other sensory elements — noise or smell associated with the historic asset; and
- Tranquillity, remoteness, 'wildness'.

13.4.17 In respect of setting, Cadw guidelines laid out within the *Setting of Historic Assets in Wales* (Ref. 13.11) suggest that impacts be ascribed a positive, neutral or negative description with varying degrees of magnitude. Within this assessment, the same categories for magnitude of harm are applied as for all other effects (Table 13-3).

13.5 Baseline Environment

13.5.1 The following sections describe the archaeological and historical context of the 1 km and 5 km Study Areas and the known sites within it. Full details are contained in the cultural heritage gazetteer (Appendix 13.1) and the assets are shown on Figures 13.1 and 13.2.

13.5.2 In the following discussion, the following asset identity codes (IDs) are used:

- Five digit IDs with a letter suffix (w) are Primary Record Numbers (PRNs) recorded in the GGAT HER;
- Five or six digit IDs without a letter suffix are National Primary Record Numbers (NPRNs) of the NMR;
- Numbers preceded by the letters 'LB' are Listed Buildings;
- Numbers prefixed by the letters 'GM' are Scheduled Monuments; and
- Numbers prefixed by the letters 'AB' (for Abergelli) are new assets identified by the present assessment.

13.5.3 Table 13-5 summarises the number of historic assets within the Project Site, and within the 1 km and 5 km Study Areas.

Table 13-5: Summary of historic assets

Historic Asset	Project Site	1 km Study Area	5 km Study Area
Scheduled Monument	0	1	16
Listed building (Grade I)	0	0	1
Listed building (Grade II*)	0	0	6
Listed Building (Grade II)	0	1	46
Listed building (all grades)	0	1	54
Non-designated asset	2	26	N/A
Conservation area	0	0	2
Registered Historic Parks and Gardens	0	0	3
Registered historic landscape	0	0	0

a) Palaeolithic and Mesolithic (1,000,000 – 4000 BC)

13.5.4 Evidence for human activity during the Palaeolithic period is extremely sparse across Wales as a whole, with the principal find sites being concentrated on the Carboniferous Limestone zone of the south-west coast and north-east Wales. The known settlement sites in South Wales have been discovered within caves, with no open sites yet recognised. The coast of Gower has yielded several very significant sites, but there is nothing known closer to the Study Area, nor have any stray finds been recovered locally. Although the Mesolithic period is somewhat better represented across Wales as a whole, known sites in South East Wales are once again concentrated in coastal areas, with few discoveries made in inland locations. No Mesolithic sites or finds are known within the Study Areas (Ref. 13.14).

b) Neolithic and Bronze Age (4000 – 700 BC)

13.5.5 The Neolithic period in Britain is differentiated from the preceding Mesolithic by the onset of a series of profound social, technological, and economic changes. The period coincides with the first domestication of animals and of cereal cultivation, and is accompanied by changes in material culture, including the development of ceramics and new lithic typologies. It was also a time when long-distance connections developed across Britain, Ireland and mainland Europe, alongside mechanisms of long-distance exchange, principally of lithic artefacts (Ref. 13.15 and Ref. 13.16). From this period the evidence for human activity increases significantly across Wales, and it becomes possible to discuss the Study Areas specifically, as opposed to merely the broader regional pattern.

13.5.6 Neolithic communities were the first to leave their mark prominently on the landscape through the construction of monuments, which have traditionally dominated interpretations of the period. The emergence of monumental architecture provides evidence for new forms of social organisation and complexity, including ritualised mortuary activity involving formal burial deposition, ceremonial practices and the construction of social and cultural identities. The range of monument types present in South Wales is narrower than in areas such as Wessex, but its uplands are characterised by numerous, highly visible Neolithic and Bronze Age funerary and ritual monuments – principally but not exclusively in the form of cairns (Ref. 13.17). The majority of cairns were funerary monuments, although some may have served as memorials or have marked territorial boundaries. Very many appear to have been located for dramatic effect, often on ridge crests or on the saddle of hills close to well-travelled paths (Ref. 13.18 and Ref. 13.19). Others had utilitarian origins, having been formed by field clearance for agriculture: however, dating these latter features is difficult and some could plausibly relate to more recent times.

13.5.7 Within the Study Areas there are five cairns of presumed Neolithic to Bronze Age date that are designated as Scheduled Monuments. All are shown on Figure 13.2. These comprise a ring cairn on Craig Fawr (SM GM380), Pant-y-Ffa Round Cairn (SM GM201), Mynydd Pysgodlyn Round Barrow (SM GM202), Garn Goch Round Barrow (SM GM199), and a ring cairn on Tor Clawdd (SM GM353). The visual interrelationship of such monuments is a well-established theory as a key to

understanding their positioning within the landscape. A study of a stone alignment at Bancbryn, located approximately 3 km north of Tor Clawdd (8 km from Project; not illustrated), posits (but cannot prove) that the inter-visibility between those stones and Hartland Point, on the north Devon Coast, is significant. Incorporated into this alignment is Tor Clawdd, which is framed to the left side of the Hartland Point (Ref. 13.20).

13.5.8 There is no evidence for contemporary settlement within the Study Areas.

c) Iron Age (700 BC – AD 43)

13.5.9 The society that emerged in the Late Bronze Age and Iron Age was markedly different from its predecessor. The emergence of the hillfort points to a changing emphasis in the settlement pattern and to a radically altered social dynamic.

13.5.10 Although hillforts are the dominant monument of the period within the modern landscape, they are known to have existed in conjunction with wider undefended rural settlement, of which traces are mostly ephemeral and easily destroyed by cultivation. As Lynch et al. comment, 'though overshadowed by the hillforts, the lightly enclosed or open farmstead must have shared a close relationship with their more impressive counterparts' (Ref. 13.18). Given this situation, it is reasonable to assume some level of settlement in the area, although its character and location remains unknown.

13.5.11 A probable Iron Age site is located within the 1 km Study Areas, located 1.5 km to the west of the Project Site, as shown in Figure 13.1 and 13.2. This is Scheduled Monument (SM GM308), which comprises an oval enclosure measuring c. 90 m x 60 m, defined by a wide earthen bank that stands up to 1 m high in places. Its date is unproven but its morphology suggests it belongs to the Iron Age, with either a defensive and/or settlement function. The monument, now standing within woodland, is well preserved and retains considerable archaeological potential.

d) Roman (AD 43 – AD 410)

13.5.12 The Study Areas are removed from the main framework of Roman forts and roads in the region, which developed during the conquest of South Wales between 47 and 77 AD (Ref. 13.21 and 13.22). Forts were established at Coelbren, Neath, Loughor and Carmarthen, connected by a road network that can, in part, still be traced in the modern landscape (Ref. 13.23). The remains of two Roman practice camps are known within the 5 km Study Area, 4.6 km south of the Project Site, on Mynydd Carn Goch (SM GM269).

13.5.13 A re-analysis of the rural evidence may challenge the widely held belief that the indigenous population was largely untouched by the Romans (Ref. 13.24). However, identifiably Roman sites are entirely absent from the 1 km Study Area, although a continuity of native occupation must be assumed throughout this period and into the immediate post-Roman era.

e) Medieval (AD 410 – AD 1540)

13.5.14 The early medieval period in South Wales is broadly characterised by the emergence of distinct regional kingdoms, and of Christianity, with the possibility of some level of Viking depredation (Ref. 13.21). Archaeologically, the period is very poorly evidenced, and no settlement sites of this era are known within the Study Areas – although it is possible that some Anglo-Norman and medieval Welsh sites may have earlier origins. One possible monument belonging to this period is the base of a stone cross within Llangyfelach churchyard, 1.7 km south of the Project Site (SM GM299). Though not precisely dated, stylistically it would appear to belong to the early medieval period.

13.5.15 Evidence from the later medieval period in South Wales (i.e. after the Norman Conquest of the region) is far more abundant. No certain medieval sites are known within the Project Site or 1 km Study Area, but Pen y Fedw (PRN 01525w) is suggested to have its origins in the 14th century (Ref. 13.25), although the evidence supporting this assertion is unclear. Assuming some degree of continuity, some of the other post-medieval farms in the district could reasonably be assumed to have earlier origins.

13.5.16 Within the 5 km Study Area, the scheduled earthwork known as Cae Castell is probably medieval in date and, on the basis of its place-name, quite possibly defensive in character (SM GM439). Meanwhile, the tower of the St David's church, Llangyfelach, is the likely standing remains of a former 14th-century church that stood within the curtilage of the present churchyard (LB 26236).

13.5.17 The present-day agricultural field pattern was largely established by the beginning of the 18th century, as evidenced by the 2":1 mile map of Glamorgan and Monmouthshire (1812-14; Ref. 13.26). Of particular interest on this map are the hedgerows identified in this assessment as AB03 and AB04, both of which are within the Project Site. The date at which the field pattern as a whole began to develop is not known, but it is possible that some parts may have medieval origins.

f) Post-medieval (AD 1540 – AD 1901)

13.5.18 Within the 1 km Study Area, the earliest forms of post-medieval remains appear to be predominately of domestic and agricultural purpose. One example (albeit immediately outside the 1 km Study Area) is Cynghordy Fawr (PRN 02750w), which is located in the north-east of the Study Area. This building is fairly typical of the architectural style of this period, comprising a 17th-century longhouse with a courtyard and further ranges including a stable block and granary.

13.5.19 George Yates' Map of Glamorgan, dated 1799 (Ref. 13.27), shows 'Abergelly Fach' (AB02) as an isolated farm building, disconnected from a north/south aligned lane that cuts across the north-western corner of the Project Site. A map of Glamorganshire (1812-14, Ref. 13.26) depicts the same farm as comprising two north-east/south-west aligned rectangular buildings set within their own grounds, and connected to the existing north/south aligned lane via a short driveway. To the east of AB02 is the farmstead of 'Abergelly-fawr' (AB01), featuring at least two buildings and an associated connecting lane to the north. The remaining land is

shown as an enclosed field system, which includes boundaries AB03 and AB04, located immediately north of Abergelly-fach.

13.5.20 By the time of the surveying of the Llangyfelach Tithe Map of 1838 (Ref. 13.28), new field boundaries had been created and the fields made smaller and more irregular in shape. Boundaries AB03 and AB04 remained intact, forming the southern boundary of three irregular fields to the east of 'Abergelly fach' (AB01). The field systems depicted on the tithe map can also been seen on OS map of 1883-1884 (Ref. 13.29). By this time 'Abergelli-fach' (AB02) had expanded, comprising a farmstead of at least six buildings. The most significant development is the establishment of a large plantation in the south-east of the Project Site boundary. The subsequent OS edition of 1897 (Ref. 13.30) names the plantation as 'Abergelli-fach Plantation'. A quarry (PRN 01349w) is depicted for the first time, and is labelled as a 'gravel pit' immediately south-west of AB02.

13.5.21 In the early post-medieval period the population of the larger Swansea area began to decline as the administrative centre for the region moved to Cardiff (Ref. 13.31). This decline reversed in the early 18th century as the transport of materials for use in industry such as coal and metals along the River Tawe became essential. The River Tawe was a vital trade route during the 18th and 19th centuries at the time when Swansea became renowned as a copper smelting centre with such works as the Hafod Copperworks (PRN 05956w) and the Landore Copperworks (PRN 01586w). Swansea's copper industry rose to prominence in the 18th century. Llangyfelach Copperworks (NPRN 34094), established in 1717, was the first of the major Swansea copperworks; its site is located beyond the 5 km Study Area, at the junction of Cwm Level Road and Neath Road to the north of Landore viaduct (Ref. 13.32).

13.5.22 No copper-working sites are known within the 1 km Study Area, but several sites attest to the supporting coal-mining industries which grew up in Swansea's hinterland. Collieries established during this period within the Study Area include Bryn Whilach Colliery (PRN 01340w) and an unnamed colliery at Mawr (PRN 01345w).

13.5.23 Industrial transport networks are also evidenced. In 1798, the Swansea Canal was opened, serving to increase the industrial capacity of the area, such that at one stage in the 19th century, three quarters of the world's copper ore was being transported to Swansea for processing (Ref. 13.33). The century following the canal's construction saw the city's population grow from approximately 10,000 people to 95,000 people. Transport routes were established over land not only to supply the copperworks with raw materials but also to link the mines and collieries with the works and ports. Within the 1 km Study Area these include a tramroad (PRN 05950.0w) linking Bryn-whilach and Pen-rhiwfelen coal pits to Clydach Road, a mineral railway (PRN 03017.0w) situated within the community of Llangyfelach, and now a dismantled railway (PRN 02916.0w) serving Felindre Pit on the east side of the Lliw Valley.

g) Modern (1901-present)

13.5.24 Due to the availability of cheaper copper and coal from overseas, the industrial prosperity of the South Wales region began to decline in the early 20th century (Ref. 13.32). Throughout this period Swansea still remained a centre of industry within South Wales, with a population at the time of the outbreak of World War II of 167,000 people (Ref. 13.35). The Velindre works (PRN 02905w; 0.8 km south of the Project Site) was built as part of a post-war development programme begun after the Steel Company of Wales was formed in 1947. In 1952 the company started work on the construction of a cold reduction and electrolytic tinning plant at the site near Llangyfelach. The Velindre works began production in October 1956. The main building, the Mill Bay, was of very significant size: 1440 ft long, 100 ft wide and 66 ft high. It was closed down in September 1989 and its buildings were subsequently demolished.

13.5.25 One historic asset immediately to the west of the Project Site originates in this period: Abergelli Colliery (NPRN 80607). When first shown on the OS map of 1931 (Ref. 13.36), it comprised a water tank, engine houses, a slant (slanted shaft), and a tramway or railway following a course from the slant to a slag heap at the north end of the colliery site. The colliery worked the Four Feet and Graigola (also known as the Brynwhilach) coal seams and was a registered colliery from 1926 to 1960 The owner, up to nationalisation, was the Graigola Merthyr Co. Ltd and it was worked in association with Clydach Merthyr Colliery located at Craig Cefn Parc, approximately 2.5 km north-east of the Project Site (Ref. 13.37).

13.5.26 Aerial photographs of the area taken in 1970 (Ref. 13.38) show the addition of an electrical substation to the south-west of Abergelli Farm. The next significant changes to the Project Site are shown on aerial photographs taken in 2008; these reflect the construction of the Felindre Gas Compressor Station. The photographs show that the works included the installation of the Oil Pipeline from the road to the north of Abergelli farm, traversing the fields to the east and south of the farm, to the Substation, which extends over much of the Abergelli fach Plantation. As a part of this development, a section of historic field boundary AB03 was removed for the pipeline easement.

13.5.27 Aerial photographs of 2010 show this complex being extended southwards. By 2015, much of the land to the east of the farm had been utilised for solar panels (Ref. 13.38).

h) Historic landscape characterisation

13.5.28 The Project Site area lies in Landmap Historic Landscape Aspect Area H27 (Gower Supraboscus Agricultural). This is characterised by an irregular fieldscape with hedgerows and hedgebanks, reflecting a history of gradual and piecemeal enclosure in the valleys and foothills throughout the medieval and post-medieval periods. There is some evidence for enclosure in the pre-Norman period, and the process continued into the second half of the 19th century. Some unenclosed land and woodland remains. Limited industrial activity (mainly mining) also took place here in the 19th century and has left residual traces in the landscape. The

settlement pattern is predominantly of dispersed character, but ribbon developments occur in areas of former industrial activity.

i) Previous Investigations

13.5.29 A watching brief was undertaken by Cambrian Archaeological Projects (Ref. 13.39) during groundworks associated with the construction of a high pressure gas pipeline between Felindre and Brecon. The watching brief was carried out within part of the Project Site through the fields to the east of Abergelli Farm. A single pit was noted and revealed evidence of *in situ* burning, which was potentially the remains of a hearth or furnace. It measured 1.5 m in diameter and was 0.2 m in depth. No date was ascertained for this feature. The site of this feature was located to the south of Abergelli farm at NGR SN 65136 01433, approximately 100 m outside of the Project Site.

13.5.30 Archaeological watching briefs undertaken by Cotswold Archaeology during the construction of the Oil Pipeline in the northern extent of the Project Site revealed two undated charcoal spreads. Elsewhere, two pits with charcoal and burnt stone were exposed, and were associated with a spread of burnt material containing two worked, undated, flints. An evaluation at Waun y Garnwen, forming part of the same scheme of works, recorded four probable former field boundaries (Ref. 13.40).

13.5.31 A geophysical survey in the area immediately to the east of the Project Site was undertaken in advance of the installation of a solar energy farm. The works identified probable soil-filled features in most of the survey areas, and concluded that although some of the anomalies were weak or diffuse, most have potential to reflect the remains of archaeological features (Ref. 13.41).

13.5.32 On the south-east fringe of the 1 km Study Area, a watching brief was undertaken by Oxford Archaeology within the grounds of Morriston Hospital prior to the development of new parking facilities. A linear field boundary and ornamental features relating to the garden of the former Maes y Gwernen Hall were recorded (Ref. 13.42).

13.6 Embedded Mitigation

13.6.1 As detailed in **Chapter 3: Project and Site Description**, a number of embedded mitigation measures have been identified through the iterative EIA process and have been incorporated into the design and construction planning of the Project.

13.6.2 As these mitigation measures have been embedded into the design of the Project, are legal requirements or are standard practices that will be implemented, the assessment of likely significant effects assumes that they are in place.

13.7 Assessment of Effects

13.7.1 This section presents the findings of the historic environment assessment for the construction, operation and decommissioning phases of the Project.

a) Construction

13.7.2 This section identifies any likely significant effects that are predicted to occur and Section 13.8 highlights the additional mitigation and monitoring measures that are proposed to reduce or eliminate the identified significant effects.

13.7.3 All impacts discussed in relation to construction are those of a physical character. No impacts on setting are predicted.

i. Power Generation Plant

13.7.4 Construction of the Power Generation Plant will not have a physical impact on any known historic asset. No known historic assets exist within its footprint.

ii. Gas Connection

13.7.5 Construction of the Gas Connection will not have a significant physical impact on any known historic asset.

13.7.6 The Gas Pipeline will cross the line of historic boundary AB03, necessitating the removal of a portion of this feature for the width of the pipe easement. However, only a small percentage of this feature is affected – and this was substantially altered when the preceding Oil Pipeline was installed, with little of the original historic fabric remaining. A negligible magnitude of impact on this low value asset is anticipated. This will result in a **Negligible** effect which is not signficant.

13.7.7 The easement for the Gas Pipeline will also run parallel to historic boundary AB04, which coincides with the western limit of the Project Site boundary. However, this feature is 25 m from the Gas Pipeline centreline, and thus beyond the limits of the pipe easement. There will be no effect upon this feature.

Table 13-6: Nature and Significance of the Impact of Construction (Gas Connection) on Historic Assets

Historic Asset	Sensitivity	Magnitude of Harm (Impact)	Significance of Effect	Duration of Effect
AB03	Low	Negligible	Negligible	Permanent

iii. Electrical Connection

13.7.8 Construction of the Electrical Connection will not have a physical impact on any known historic asset. No known historic assets exist within its footprint.

iv. Unknown Archaeology

13.7.9 As described above, a number of archaeological interventions have been carried out within the 1 km Study Area, and one within the Project Site. The findings of these suggest that there is some potential for the discovery of buried archaeological remains. However, given the sporadic and isolated nature of these recorded features, and their likely character, there is a low probability of

encountering buried archaeological remains of high value during the construction works.

b) Operation

13.7.10 Impacts upon below-ground archaeological remains will only arise if significant ground disturbance is anticipated during the operational phase of the Project. As no such activity is envisaged, there will be no further impact upon below ground archaeological remains once the Project is operational. Maintenance activities are unlikely to require significant ground disturbance.

13.7.11 Within this ES, the assessment of effects upon the setting of historic assets draws upon the Project ZTV, the Landscape and Visual Assessment (LVA) as presented in **Chapter 12: Landscape and Visual** of this ES, and supporting viewpoint graphics. The assessment has also included field visits to selected archaeological sites, historic buildings and areas, these being chosen on the basis of: a) higher significance (e.g. Scheduled Monuments, Listed Buildings, historic parks and gardens, and Conservation Areas); b) proximity to the Project; c) location within the Project ZTV; d) identification as a concern during stakeholder consultation.

13.7.12 The assessment followed the four-stage process set out by Cadw (Ref 13.11; see para. 13.4.11). In the single instance where an impact upon setting was identified, the significance of effects was quantified as per Table 13-4.

i. Power Generation Plant

13.7.13 Operation of the Power Generation Plant will not have a physical impact on any known historic asset.

13.7.14 Of the various elements of the Project, only the Power Generation Plant introduces any alteration in respect of the settings of historic assets, as follows.

Conservation Areas

13.7.15 Of the two conservation areas within the 5 km Study Area, only one lies within the ZTV for the Project: Llansamlet Conservation Area (CA027). The ZTV suggests that the stack of the Power Generation Plant will be visible from some of the northerly parts of the conservation area. However, the landscape between the Project Site and the conservation area has been extensively developed, including the Swansea Enterprise Park and the M4 motorway. Thus, despite bringing about a minor change to north-eastward views from the conservation area, neither its setting, nor those of the listed buildings within it, will be adversely affected by the Power Generation Plant. There is no effect on the conservation area.

Registered Historic Parks and Gardens

13.7.16 Of the three Registered Historic Parks and Gardens within the 5 km Study Area, only one lies within the ZTV for the Project: Penllergaer Park and Garden (GM054). The Project is theoretically visible from within a small area of this registered park. However, the park and its constituent elements are well screened by woodland on its northern and eastern margins. Moreover, the park and Project Site are separated by the M4 motorway and surrounding urban and industrial development.

As such, the park's setting will not be adversely affected by the Power Generation Plant. There is no effect on Penllergaer Park and Garden.

Scheduled Monuments and Listed Buildings

13.7.17 A number of Scheduled Monuments and listed buildings fall within the ZTV for the Project, and their settings are therefore potentially subject to change. However, as described below, where visual changes will occur this does not necessarily equate to an adverse impact, whether because of the limited extent of visibility of the Project, the attributes of setting, the existing quality of setting, or a combination of these factors. In some cases, setting may not contribute to the significance of an asset. Various assets are discussed below for which no impact is predicted – this being done in order to demonstrate the reasoning behind the outcome of the assessment.

13.7.18 The ZTV also demonstrates that certain key monuments will not be in the viewshed of the Project. These include several prehistoric monuments for which the visual environment is particularly important: the ring cairns on Tor Clawydd (SM GM353) and Craig Fawr (SM GM380); Garn Goch round barrow (SM GM199); and the Pant-y-Ffa round cairn (SM GM201). These assets will be unaffected by the Project.

13.7.19 Within the settlement of Penllergaer there are four listed buildings from which the Project Site will be visible. These relate to Bryn-rhos Farm, are located within a single cluster 3.6 km south-west of the Project Site, and are all Grade II-listed (LB26496-99). This group of buildings was listed as a little-altered 19th-century estate farm group. As such, the primary focus of their setting is their functional inter-relationship with each other and adjoining buildings. The setting of this asset group will be unaffected by the Power Generation Plant and there will be no impact upon this group of farm buildings.

13.7.20 To the north of Penllegaer is the Grade II-listed Penderi Fawr Farmhouse and attached cowhouse (LB26257; 2.4 km south-west of the Project Site). This modular building was listed due to it being a good example of a surviving 17th-century farmhouse built on the unit system. The immediate physical and functional relationship of these adjoining structures are key attributes of their setting, their wider environment of setting having been wholly compromised by the construction of the M4 motorway, McDonald's restaurant and the Moto Services less than 100 m away. The Power Generation Plant, although theoretically visible, will be a minor addition to the north-eastern views from the farm and will not cause any further adverse effects to its setting.

13.7.21 To the south-west of the Project Site (1.2 km) are two connected Grade II Listed Buildings: LB19983 (Tredegar Fawr); and LB19984 (Lofted Pigsty at Tredegar Fawr). These buildings were listed as being of historical interest due to their connection with the locally-important Morris family. The significant factor in the setting of these assets lies with their historical associations and their physical and functional relationships with each other, which will not be diminished by the Project, rather than in far-reaching views. Moreover, the outward views from these assets

have already been substantially affected by the Felindre Goods Depot (01229.10w) and the Velindre Works (02905w), as well as the construction of the M4 motorway. On all of these grounds, therefore, the Power Generation Plant will not alter the setting of these assets and there will be no impact caused by the Project.

13.7.22 To the north of the Project Site (2.9 km) is Scheduled Monument GM202 (Mynydd Pysgodlyn Round Barrow). As a Neolithic/Bronze Age funerary and ritual monument, its topographic setting and visual interrelationships with contemporary sites are deemed significant elements of its setting. The Project will be visible from this location, but the views from, and including, this monument will not be significantly changed. As demonstrated by LVA Viewpoint 5, the Power Generation Plant will be an extremely minor element of the viewshed, in which a substantial quantity of modern development is already present. An important attribute of the setting of this type of upland prehistoric monument is its sense of isolation. While the Project will be visible, marginally adding to the massing of modern elements to the south, the extent of additional change is very small and the intervening distance means that this sense of remoteness is maintained. No historic sightlines or visual connections with other monuments will be affected. The magnitude of effect is therefore considered to be no more than negligible. On an asset of high value, this results in a significance of effect of **minor adverse**, and therefore not significant (Table 13-7).

13.7.23 There are a number of assets in the settlement of Llangyfelach, 1.8 km south of the Project Site. These lie within the Project ZTV and comprise:

- GM229 (Llangyfelach Cross Base);
- LB 26235, Grade II* (The Church of St David and St Cyfelach); and
- LB 26236, Grade II* (Tower of the Church of St David).

13.7.24 The Scheduled Monument and the Grade II* Listed Buildings form a cluster within a walled churchyard located near the centre of Llangyfelach. The assets have strong functional associations and represent the continual use of land for religious activity since the medieval period. The integrity of the tower (LB26236) and church (LB26235) have been retained, despite repairs and modifications in the modern period to LB26236. The assets are located within an extensive graveyard, partially enclosed by a stone wall with mature trees to the west and north (see LVA Viewpoint 11). The setting of this group is essentially inward-looking, with little reference to the modern urban environment that surrounds it. The Power Generation Plant, while theoretically visible, will be an extremely minor addition to existing views; the modern urban development is dominant, and thus the Power Generation Plant's effect upon these assets' setting is considered neutral.

Table 13-7: Nature and Significance of the Impact of Operation on Historic Assets (Power Generation Plant)

Historic Asset	Sensitivity	Magnitude of Harm (Impact)	Significance of Effect	Duration of Effect
GM202	High (National)	Negligible	Minor Adverse	Permanent

ii. Gas Connection

13.7.25 Operation of the Gas Connection will not have an impact upon on any known historic asset.

iii. Electrical Connection

13.7.26 Operation of the Electrical Connection will not have an impact upon on any known historic asset.

iv. Unknown archaeology

13.7.27 Operation and maintenance of the Project will not have any impact on unknown archaeology.

c) Decommissioning

13.7.28 The decommissioning of the Project will not require the disturbance of previously undisturbed ground or the demolition of any standing historic asset. As a consequence, there will be no physical effect on archaeology or cultural heritage during the decommissioning phase.

13.7.29 The Minor Adverse effect on the setting of scheduled monument GM202 will cease to exist after decommissioning.

13.8 Mitigation and Monitoring

13.8.1 As a general rule, additional mitigation measures have been proposed where a significant effect is predicted to occur. Embedded mitigation measures, which have been incorporated within the design of the Project or are standard practice measures that have been committed to are summarised in **Chapter 3: Project and Site Description**. Mitigation is inherent within the final design proposals in order to prevent or reduce direct and indirect impacts and effects on heritage assets.

13.8.2 This section describes the proposed additional mitigation measures for the archaeology and cultural heritage assessment, beyond that described in embedded mitigation, **Chapter 3: Project and Site Description**.

13.8.3 This section also describes any required monitoring regimes, including monitoring of specific receptors/resources, or monitoring the effectiveness of a mitigation measure. The requirements, scope, frequency, and duration of a given monitoring regime are set out, as far as possible, in this section.

a) Mitigation

13.8.4 There is a presumption in favour of preservation *in situ* of nationally important archaeological remains, whether scheduled or not. In some cases, unscheduled remains of local and regional importance will be considered worthy of preservation *in situ*. In these cases, the results of the assessment should influence the design of the development in order to protect a monument or remains. Proposals for enhancement may also be identified.

13.8.5 Preservation 'by record' may also be considered as an option for mitigation. For buried archaeology this implies excavation, whilst standing features are recorded by a combination of drawn, photographic and written record. Preservation by record is normally considered a less satisfactory outcome for cultural heritage, since it presupposes loss of, or damage to, the feature in question.

13.8.6 In respect of setting, Cadw guidelines for mitigating the impact of a development on the setting of a historic asset suggest that in the first instance impacts are best mitigated for either by relocation of the development or changes to its design or the introduction of screening. Where relocation of the development is not possible, good design alone may be capable of reducing the harm.

i. Known historic assets

13.8.7 The only identified effect on known historic assets is that upon the boundary of AB03. Given that this feature is subject to only a limited impact, is of low value and the section of boundary in question has already effectively been removed by previous development, no additional mitigation is proposed.

ii. Unknown archaeology

13.8.8 Previous investigations within the 1 km Study Area suggest that there is potential for archaeological features to be present. However, neither the results of this fieldwork, nor the findings of the current assessment, point towards the existence of significant or high value archaeological remains within the Project Site.

13.8.9 In keeping with the other recent projects in the 1 km Study Area, an archaeological watching brief will be maintained on construction ground works which is included as embedded mitigation as set out in **Chapter 3: Project and Site Description**. This will apply to all areas subject to significant disturbance, unless scoped out due to existing conditions (e.g. made ground). No additional mitigation will be required.

13.8.10 In the event that the watching brief reveals archaeological remains, sufficient time and resources will be allowed to ensure that these are adequately excavated, and recorded, and for samples to be taken if appropriate. Provision will also be made for post-excavation analysis and, if appropriate, publication of the results.

iii. Effects upon setting

13.8.11 Due to the scale of the Project, and the fact that it is the Power Generation Plant stack which introduces the principal changes to views, no additional mitigation is possible. The effects therefore remain as described above.

b) Monitoring

13.8.12 The watching brief will be subject to monitoring by GGAT.

13.9 Residual Effects

13.9.1 The following tables present a summary of the residual effects identified by the archaeology and cultural heritage assessment.

13.9.2 With the mitigation measures implemented, it is not anticipated that there will be any significant residual adverse effects associated with the Power Generation Plant, Gas Connection or Electrical Connection relating to archaeology and cultural heritage.

Table 13-8: Historic Environment: summary of residual construction effects

Receptor	Description of Effect	Classification of effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
Field Boundary AB03	Permanent effect caused by the partial destruction of the feature	Negligible	None	Negligible	Not Significant

Table 13-9: Historic Environment: summary of residual operational effects

Receptor	Description of Effect	Classification of Effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
GM202	Alteration of setting	Negligible	None	Minor Adverse	Not Significant

a) Project '"in combination" Effects

13.9.3 The predicted effects of the Power Generation Plant, Gas Connection and Electrical Connection upon known archaeology and cultural heritage are limited to those assets listed in Table 13-8 and Table 13-9. No other known assets will be affected. The combined effect upon known archaeology and cultural heritage from the whole project is therefore **Negligible** and not significant.

13.10 Assessment of Effects on Historic Features (APFP Regulations 2009)

13.10.1 Regulation 5(2)(m) of the Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 requires DCO applicants to provide, where applicable:

"a plan with accompanying information identifying any statutory or non statutory sites or features of the historic environment, including scheduled monuments, World Heritage sites, listed buildings and other historic structures, archaeological sites and registered battlefields, together with an assessment of any effects on such sites, features or structures likely to be caused by the proposed development."

13.10.2 The sites and features of the historic environment mentioned in regulation 5(2)(m) are shown on Figure 13.1 and Figure 13.2 and are listed in Appendix 13.1. Sections 13.7 to 13.9 of this chapter assess any potential effects of the Project on these features of the historic environment, and consider whether or not they are 'significant' for EIA purposes. This EIA process, relative to cultural heritage and

archaeology assessment, has determined that there are no effects anticipated on the setting of historic assets within the study areas resulting from the Project.

13.11 Cumulative Effects

a) Construction and Decommissioning

i. Description of baseline where cumulative impacts expected

13.11.1 It is considered that there is no potential for cumulative impacts on archaeology and cultural heritage receptors arising from construction of the Project in combination with other schemes. This is for the following reasons:

- The direct residual effect of the Project on known archaeological remains is negligible, and therefore cannot not contribute in any meaningful way to any wider significant, comparable, losses to the cultural heritage resource; and
- No effects upon the setting of historic assets are predicted.

ii. Mitigation

13.11.2 No mitigation is required.

b) Operation

i. Description of baseline where cumulative effects expected

13.11.3 It is considered that there is no potential for significant cumulative impacts on archaeology and cultural heritage receptors as a result of operation of the Project in combination with other schemes. This is for the following reasons:

- No physical effects upon known historic assets are predicted; and
- Effects upon the setting of historic assets are limited to a single Scheduled Monument, for which the Project's effect was classed as minor adverse. This monument is not affected by the other identified schemes.

ii. Mitigation

13.11.4 No mitigation is required.

13.12 References

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Ref. 13.23 A. F. Pearson. Roman roads and vici in Southeast Wales: Year 2 report, GGAT Report 2002/061, 2002.

Ref. 13.24 E.P. Dillon. A Research Framework for the Archaeology of Wales Southwest Wales – Roman. 2003.

Ref. 13.25 W. Rees. South Wales and the Border in the Fourteenth Century, Ordnance Survey, 1932.

Ref. 13.26 2”:1 mile maps of Glamorgan & Monmouthshire 1812-14.

Ref. 13.27 G. Yates, Map of Glamorgan. 1 in: 1 mi. 1799.

Ref. 13.28 Llangyfelach Tithe Map 1838.

Ref. 13.29 Ordnance Survey Map, Glamorganshire. 1:10,560. 1883.

Ref. 13.30 Ordnance Survey Map, Glamorganshire. 1:10,560. 1897.

Ref. 13.31 I. Soulsby. The Towns of Medieval Wales. Chichester, Phillimore, 1983.

Ref. 13.32 S. Hughes & P. Reynold. A Guide to the Industrial Archaeology of the Swansea Region. AIA RCAHMW, 1989.

Ref. 13.33 C. James & A. Sherman. Urban Village, High Street, Swansea: archaeological watching brief, GGAT Report no. 2011/051. 2011.

Ref. 13.34 S. Hughes. Copperopolis: Landscapes of the Early Industrial Period in Swansea. Aberystwyth, RCAHMW, 2000.

Ref. 13.35 J. R. Alban. The Three Night's Blitz: Select Contemporary Reports relating to Swansea's Air Raids of February 1941. Swansea: Swansea City Council, 1994.

Ref. 13.36 Ordnance Survey Map, Glamorganshire. 1:10,560. 1931-51.

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Chapter 14

Socio-Economics

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14. Socio-Economics

14.1 Introduction

14.1.1 This chapter provides an assessment of the likely socio-economic effects arising from construction, operation, maintenance and decommissioning of the Project.

14.1.2 A detailed description of the Project Site and the Project is provided in **Chapter 3: Project and Site Description**. A glossary of terms and list of abbreviations used in this chapter is provided in **Document Reference 1.4.** Appendix 14 includes further detail to accompany this chapter.

a) Objectives of the assessment

14.1.3 The objectives of the assessment were to assess the likely significant effects on the labour market, tourism economy, and community infrastructure arising from the construction; and the operation, maintenance and decommissioning phases of the Project.

14.2 Changes since the 2014 PEIR

14.2.1 There have been changes to the Project design as a result of design evolution and consultation as detailed in **Chapter 3: Project and Site Description**. To aid the reader, Table 14-1 below outlines the changes to this assessment compared with the 2014 and 2018 PIERs.

Table 144-1: A summary of Changes since the 2014 PEIR to the Socio-Economic Assessment

Section	Changes since the 2014 PEIR	Section Reference
Baseline	Socio-economic: The socio-economic baseline was updated for 2018 PEIR and has not been updated subsequently. Tourism: Audit of tourism receptors updated with Paintball Activity Centre added. Tourism volume and value data was updated for the 2018 PEIR using most recently available data at that time, Community Infrastructure: Audit of community infrastructure receptors was updated for 2018 PEIR using most recently available data at that time.	Section 14.5
Methodology	Approach to assessing socio-economic and tourism, and associated impacts is consistent with the 2014 and 2018 PEIR assessment.	Section 14.4
Significance of Effect	No significant labour market or tourism and recreation or community infrastructure effects are expected. This is consistent with the 2014 and 2018 PEIR.	Section 14.11

14.3 Legislation, policy and guidance

14.3.1 This section identifies and describes legislation, policy and guidance of relevance to the assessment of the potential socio-economic impacts associated with the construction, operation & maintenance and decommissioning of the Project.

14.3.2 Legislation and policy has been considered on an international, national, regional, and local level. The following is considered to be relevant to the socio-economic assessment as it has influenced the sensitivity of receptors and requirements for mitigation or the scope and/or methodology of the ES.

a) National Policy

14.3.3 National Policy Statement for Energy (Ref. 14.1) (NPS EN-1) acknowledges "the construction, operation and decommissioning of energy infrastructure may have socio-economic impacts at local and regional levels". Paragraph 4.2.2 states that the Secretary of State *"will find it helpful if the applicant sets out information on the likely significant social and economic effects of the development, and shows how any likely significant negative effects would be avoided or mitigated. This information could include matters such as employment, equality, community cohesion and well-being."* Paragraphs 5.12.2 and 5.12.3 identify that where the Project is likely to have socio-economic impacts at local or regional levels, the Applicant should undertake and include in their application an assessment of relevant socio-economic impacts, which may include: creation of jobs and training opportunities; provision of additional local services and improvements to local infrastructure including provision of educational and visitor facilities; effects on tourism; the impacts of a changing influx of workers during different phases and cumulative effects.

14.3.4 NPS EN-1 (Paragraph 5.12.7 and 5.12.8) further notes that in making a decision on energy NSIPs, the Secretary of State may conclude that limited weight is to be given to assertions of socio-economic impacts that are not supported by evidence and may take into account positive provisions and mitigation such as planning obligations and in particular options as to phasing the development in relation to impacts.

14.3.5 NPS EN-2, Paragraph 1.72 details the benefits of a low carbon economy including the likely "*positive effects on the Economy and Skills, and Health and Well-being as secondary benefits and positive effects in the medium/long term on climate change*."

b) Welsh Policy/Guidance

14.3.6 Planning Policy Wales (PPW), Edition 9 (Ref. 14.2), promotes sustainable development and sets out a vision, some of which is relevant to this socio-economic assessment, including at paragraph 4.1.4:

- "*A Prosperous Wales - An innovative, productive and low carbon society which recognises the limits of the global environment and therefore uses resources efficiently and proportionately (including acting on climate change); and which develops a skilled and well-educated population in an economy which generates wealth and provides employment opportunities, allowing people to take advantage of the wealth generated through securing decent work".*

14.3.7 Chapter 7 of PPW defines economic development as "*development of land and buildings for activities that generate wealth, jobs and incomes".* Paragraph 7.1.1 of Chapter 7 of PPW states that the construction and energy sectors are important to the economy.

14.3.8 Furthermore, Chapter 7 Paragraph 7.6.1 states that "*local authorities should adopt a positive and constructive approach to applications for economic development".* PPW states that planning authority decisions should be based on a robust evidence base and should take account of factors such as the number and types of job created and whether a development enhances employment opportunities.

c) Welsh Local Policy/Guidance

14.3.9 The City and County of Swansea Unitary Development Plan (Ref. 14.3) sets out the plans and policies for development in the area, up to 2016. The goals relevant to this chapter are, "*help promote the sustainable growth of the local and regional economy,*" and "*make more efficient and sustainable use of the area's resources*".

14.3.10 The Swansea Local Development Plan (LDP) 2010-2025: Deposit Plan July 2016 (Ref. 14.4) outlines a number of strategic objectives for the area, including delivering economic growth and prosperity and of particular relevance is the aim to "*facilitate growth and diversification of the local economy and an increase in high value, skilled employment*". Policy IO 2 Employment and Training Opportunities requires that developers maximise added benefits from developments through the creation of jobs and training opportunities with particular focus on economically inactive people. **Chapter 2: Regulatory and Policy Background,** Section 2.11.31 discusses the progress of the LDP examination and weight attributable to the LDP policy.

14.4 Methodology

a) Scope of the assessment

14.4.1 The scope of this assessment has been determined through a formal Environmental Impact Assessment (EIA) scoping process undertaken with the Planning Inspectorate on behalf of the SoS. Comments raised on the EIA Scoping Report have been taken into account in the development of the assessment methodology and these are detailed where relevant in this chapter. Responses to the comments raised in the EIA Scoping Opinion and further consultation can be found in Table 14-2.

b) Consultation

14.4.2 The scope of the assessment has also been informed by ongoing consultation with statutory consultees throughout the design and assessment process. The purpose of this consultation was to: agree or refine a methodology; to secure relevant data; to ensure accurate interpretation of relevant policy; and to enable stakeholder views to inform the assessment.

14.4.3 A summary of the comments raised and responses are detailed in Table 14-2.

Table 14-2: Summary of consultation responses that have informed the scope and methodology of the socio-economic assessment

Consultee	Date	Comment	Response
SoS (Secretary of State)	August 2014	The SoS welcomes that the assessment will be carried out in accordance with NPS EN-1 and will consider all relevant socioeconomic impacts, such as tourism, influxes of workers, and cumulative impacts.	Noted, no further action required
		The SoS welcomes that at paragraph 5.11.14 of the Scoping Report, the Applicant confirms that during construction, operation, and decommissioning an effort will be made to use local goods and services, wherever possible.	No further action required
Swansea Economic Regeneration Partnership (SERP)	5th November 2014	We are an umbrella body, representing 3rd sector organisations in the City and County of Swansea. We are unclear at this stage quite what we can contribute to your proposed approach but please do get in touch should you wish, for an initial discussion at the consultation stage.	Noted, and welcome input during the consultation stage.
		We would be very happy to answer any specific questions that you have, in particular in relation to community infrastructure and are able to provide contact details for local 3rd sector organisations who you may wish to contact.	Noted, and welcome input during the consultation.
City and County of Swansea	4th November 2014	From our perspective, we would be particularly interested in impacts being assessed at two geographical levels – "City and County of Swansea" (the local authority boundary area) and the "Swansea Bay City Region" (encompassing the four local authority areas of Carmarthenshire, Neath Port Talbot, Pembrokeshire, and Swansea areas) – in addition to the study areas you have defined. Our Unitary/Local Development Plan and the economic regeneration strategy we have adopted relate to these two areas respectively.	The socio-economic study area is defined as the area within a 60-minute drive time of the Project Site. Direct employment impacts are unlikely to occur outside this area. This study area does however cover the vast majority of the Swansea Bay City Region. See Figure 14.1.

Consultee	Date	Comment	Response
		In relation to labour market impacts, we would wish to see the professional skills profile of the jobs created during the construction and operational phases to better gauge the Project's employment value, as well as identify opportunities locally/regionally for developing suitably skilled people to compete for jobs created by the Project. Also, will the Project provide opportunities for people to obtain work experience, training, or apprenticeships?	An assessment of construction skills is provided in Section 14.7. The Applicant aims to provide mechanisms to deliver an education and employment scheme in the local area.
		Beyond visual impacts on sectors, and in addition to labour market and any specific community economic impacts, we would be interested in potential economic impacts on businesses and particularly on relevant supply chain service providers in Swansea, the City Region, and the other study area.	The Applicant aims to provide mechanisms to encourage local businesses in supply chain opportunities.
City and County of Swansea Council	16th February 2018	Para 14.8.35 relates to Construction and Decommissioning and states that the adoption of the embedded mitigation in the CEMP would ensure no tourism/ recreation receptors are affected significantly during construction (no reference to decommissioning).	Reference has been added to decommissioning
		Table 14.30 (Cumulative Projects) provides the construction cost of various different projects, but it is not clear how these have been valued given that the site at Llewelyn Road (for up to 200 homes) has been valued at £23.4m whilst the site at Pare Ceirw (for up to 300 homes) is valued at £5.9m and the Strategic Sites at Llangyfelach (up to 1,950 dwellings) and Garden Village (650) are only £16.4m and £11.8m respectively.	Table 14.30 has been amended with further clarification provided as to how the figures have been derived.

c) Defining the Baseline

14.4.4 The study area's socio-economic position (provided in Section 14.4(g)) has been described using standard indicators, such as population, economic activity, skills, education, and availability of relevant workforce. This provides a baseline from which potential impacts can be assessed, as follows:

- Economic/Labour Market: The area has been defined using a combination of 2001 (Ref. 14.5) and 2011 (Ref. 14.6) Census data, indicators research available at study area level, and research into the business and labour market structure of the local economy;
- Tourism: The area's visitor attraction has been profiled including, visitor attractions; visitor accommodation; tourism volume and value; and the local tourism economy (based on Welsh Government and VisitWales data); and
- Community Infrastructure: The area's demographic structure has been examined. An audit of community infrastructure has been prepared (para. 14.5.13).

d) Assessment of Socio-economic Effects

14.4.5 A detailed assessment of likely effects on the local, regional, and national economy has been prepared. The assessment is consistent with HM Treasury Green Book Appraisal Guidance (Ref. 14.7) and the Homes and Communities Agency (HCA) Additionality Guide (Ref 14.8).

14.4.6 The assessment evaluates the scale of:

- Direct economic impacts: Jobs and Gross Value Added (GVA) that are wholly or largely related to construction, operation and decommissioning of the Project;
- Indirect economic impacts (beneficial and adverse): Jobs and GVA generated in the study area in the chain of suppliers of goods and services to the direct activities;
- Induced economic impacts: Jobs and GVA created by direct and indirect employees' spending in the study area or in the wider economy; and
- Wider economic (catalytic) impacts (beneficial and adverse): Employment and income generated in the economy related to the wider role of the Project in influencing economic activities (including wider socio-economic effects).

14.4.7 The availability of appropriate labour and skills to meet the Project's construction and operational requirements is a critical consideration in examining economic impacts. Adequate capacity results in a low sensitivity to economic impacts while a shortfall or constrained capacity yields a high sensitivity.

14.4.8 The key socio-economic indicators for the study area include:

- The proportion of skilled workers in the study area relative to national averages;
- Educational attainment levels compared with national averages;
- The proportion of employment in relevant sectors (i.e. manufacturing and construction workers) in the study area;
- The availability of labour (including the unemployed workforce); and
- Relevant education and training provision, including existing and proposed programmes provided by institutions serving the study area.

e) Assessment of Tourism Effects

14.4.9 Tourism behaviour will only be detrimentally affected where the effects of the Project either change the visitor or user patterns in terms of numbers, and/or their patterns of expenditure for the worse. As such, opportunities for tourist and visitor expenditure, any potential variation in expenditure or visitor numbers, and consequent effects on turnover or employment are of key importance.

14.4.10 A business survey was carried out to gain a more detailed understanding of the local tourism economy and its current performance. The business survey findings are summarised in Section 14.5 (c). Businesses contacted include key visitor accommodation providers, leisure activity providers, and other relevant tourism businesses.

14.4.11 The survey sought respondents' perceptions of the potential impacts of the Project on their business performance (turnover and customer base) and on tourism in the wider South-West Wales area. Impacts were categorised as follows:

- Low Impact = <10 %;
- Medium Impact = 10-15 %; and
- High Impact =>15 %.

14.4.12 The definitions of perceived impact (both beneficial and adverse) are based on market experience. In tourism-related business surveys across the UK, respondents have generally stated that reductions in turnover of in excess of 15% are critical to business sustainability/survival, while reductions of 10%-15% represent a moderate impact which can be recouped through marketing, cost saving and similar market responses. Reductions of less than 10% are seen as being within the parameters of general changes in trading conditions.

14.4.13 Visitor facilities[1] and notable points of focus[2] in the study area have been identified through carrying out web-based research[3]. The assessment reports on the likelihood of the Project influencing visitor and tourist attitudes and behaviour towards them.

14.4.14 The significance of effects on tourism is assessed by reference to the sensitivity of the receptor and the anticipated magnitude of impact which represents the extent of change to that receptor.

14.4.15 In considering the level of tourism sensitivity, the standing[4] of the receptor or resource is the defining factor. This is established against:

- Tourism business' relative attraction to customers from outside the study area and the Project's potential to influence broader perceptions of the area. Where a majority of trade is non-local this is more likely to be the case; and
- The relative importance of tourism as a business sector. Where tourism is more important relative to other sectors, impacts may have the potential to generate broader impacts (as the receptor is highly sensitive). Similarly, where

[1] E.g. Outdoor activity centre or cultural attraction with a visitor centre
[2] E.g. A prominent visitor or recreational asset
[3] Carried out from September 2014-Decmeber 2014. This follows PBA's standard approach which has been employed in a number of nationally significant projects.
[4] Based on published visitor numbers, available data and professional judgement

it is of relatively low sensitivity, impacts on tourism and related sectors are unlikely to generate a significant adverse effect across the broader economy.

f) Community infrastructure

14.4.16 An assessment of the likely significant effects on local, regional and national community receptors during construction, operation and decommissioning of the Project has been carried out. This assessment also includes an audit of community infrastructure facilities/receptors (Para. 14.5.3 and Figures 14.5-14.8) within the local area and its associated effects (i.e. effects on local schools, local authority services and other infrastructure).

g) Study areas

14.4.17 The socio-economic study area is based on drive time catchment areas from the Project. The 'local area' is defined within a 30-minute drive time; 'wider area' within a 45-minute drive time; and 'wider region' within a 60-minute drive time (Figure 14.1). The wider study area covers most of the Swansea Bay City Region (excluding the Pembrokeshire county area). The majority of employment impacts will occur within a 60-minute drive time area.[5] Smaller geographies (30 and 45-minute drive times) are also provided to show the effects of sourcing labour from smaller areas. This approach has been accepted as valid for similar DCO projects and is considered to be a robust approach.

14.4.18 The tourism/business survey study area is limited to a 10 km radius of the Project as this is where the majority of impacts are anticipated. This is based on professional judgement. However, some tourism receptors within this radius have been excluded as they are either screened by roads and/or situated in an urban area where visual impacts are unlikely to be experienced, such as:

- Businesses/receptors to the south of the M4 have been excluded as they will be physically separated from the Project Site by the M4. This separation will significantly diminish any potential visual, noise, traffic/accessibility or air quality effects on businesses which may cause tourism impacts

14.4.19 Businesses/receptors in the settlements north of the M4, such as Pontarddulais, Clydach, and Pontardawe, have been included due to their relative proximity to the Project. Businesses/receptors have also been included in settlements such as Pantyffynnon and Tycroes because of the relative flat environment to the north of the Project (Figure 14.2). This approach has been accepted as valid for similar DCO projects and is considered to be a robust approach.

14.4.20 The community infrastructure assessment is focussed on the area defined within an approximate 5 km radius from the Project (Figure 14.3). This is based on professional judgement and has been accepted for similar DCO projects and is considered to be a robust approach. As proximity is likely to be the main determinant of impacts and their magnitude, the status (or catchment) of community facility receptors in an area determines the scale and significance of any effects. Sensitivity

[5] 60 minutes is considered the upper threshold at which workers will commute on a regular basis

14.4.21 In addition to quantitative and qualitative assessment, significance of effects is defined by the combination of the sensitivity of receptors and the magnitude of impacts upon them. The criteria set out below are specific to socio-economic, tourism and community infrastructure factors and have been adopted to assess receptor sensitivity and impact magnitude. They therefore differ slightly from those in **Chapter 4: Approach to Environmental Impact Assessment** of this ES[6].

14.4.22 Socio-economic sensitivity is outlined in Table 14-3.

Table 14-3 Socio-economic Sensitivity Criteria

Value/ sensitivity	Guidelines
Very High	The area has a shortfall of appropriate labour and skills. The Project will lead to excessive labour market pressure and distortions (i.e. skills and capacity shortages, import of labour, wage inflation).
High	The area has constrained supply of labour and skills. The Project will lead to labour market pressure and distortions (i.e. skills and capacity shortages, import of labour, wage inflation).
Medium	The area has a low/limited supply of labour and skills. The Project could lead to labour market pressure or distortions.
Low	The receptor has a readily available labour force. The Project is unlikely to lead to labour market pressure or distortions.
Negligible	The area has a surplus of readily available labour with directly relevant and transferable skills. The Project will not lead to labour market pressure or distortions.

14.4.23 Tourism sensitivity is outlined in Table 15-4.

Table 14-4 Tourism Sensitivity Criteria

Value/ sensitivity	Guidelines
Very High	International status and/or high visitor numbers.
High	National status and/or high visitor numbers.
Medium	Regional status and/or medium visitor numbers.
Low	Local status and/or few visitor numbers.
Negligible	Sub-local and/or minimal numbers.

14.4.24 Community Infrastructure sensitivity is outlined in Table 15-5.

[6] The magnitude of impact criteria differs in that it is split into beneficial and adverse impacts.

Table 14-5 Community Infrastructure Sensitivity Criteria

Value/ sensitivity	Guidelines
Very High	Facility is of international importance, e.g. Major research or academic centre
High	Facility is of national importance, e.g. University, Centre of Excellence for health care
Medium	Facility is of regional importance, e.g. hospital.
Low (or lower)/Negligible	Facility is of local importance, e.g. GP facility, local schools, community centre

h) Magnitude

14.4.25 The assessment of magnitude of impact is defined using the criteria in the tables below and professional judgement relating to similar projects to estimate the amount of change to the receptor arising from this Project.

14.4.26 Socio-economic magnitude is set out in Table 14-6.

Table 14-6: Socio-economic Magnitude of Impact Criteria

Magnitude	Adverse/ Beneficial	Guidelines
High	Adverse	Impacts will be observed on an international, national or regional scale; where the number of jobs lost in the study area will be greater than 250 (based upon the EU definition of small and medium enterprises) (Ref. 14.9). and/or Impacts will be of long-term duration (i.e. greater than 5 years).
	Beneficial	Impacts will be observed on an international, national or regional scale; where the number of jobs created in the study area will be greater than 250 (based upon EU definition of small and medium enterprises). and/or Impacts will be of long-term duration (i.e. greater than 5 years).
Medium	Adverse	Noticeable impacts will arise that may be judged to be important at a local scale, either because there are large impacts on few receptors or smaller impacts on a larger proportion of receptors; where the number of jobs lost in the study area will be greater than 50, but fewer than 250. and/or Impacts will be medium-term (i.e. 3-5 years).
	Beneficial	Noticeable impacts will arise that may be judged to be important at a local scale, either because there are

Magnitude	Adverse/ Beneficial	Guidelines
		large impacts on few receptors or smaller impacts on a larger proportion of receptors; where the number of jobs created in the study area will be greater than 50, but fewer than 250. and/or Impacts will be medium-term (i.e. 3-5 years).
Low	Adverse	Small scale impacts will arise, with a limited number of affected receptors; and/or where the number of jobs lost in the study area will be greater than 10, but fewer than 50. and/or Impacts will be short-term (i.e. 1-2 years).
	Beneficial	Small scale impacts will arise, with a limited number of affected receptors; and/or where the number of jobs created in the study area will be greater than 10, but fewer than 50. and/or Impacts will be short-term (i.e. 1-2 years).
Negligible	Adverse	Very minor loss. Less than 10 jobs for 1 year
	Beneficial	Very minor benefit. More than 10 jobs for 1 year

14.4.27 Tourism magnitude criteria are set out in Table 14-7.

Table 14-7 Tourism Magnitude of Impact Criteria

Magnitude	Adverse/ Beneficial	Guidelines
High	Adverse	A permanent or long-term adverse impact on the value of receptor.
	Beneficial	Large scale or major improvement of the facilities quality; extensive restoration or enhancement; major improvement of receptor quality.
Medium	Adverse	An adverse impact on the value of receptor, but recovery is possible in the medium-term and no permanent impacts are predicted.
	Beneficial	Benefit to, or addition of, key characteristics, features, or elements or improvement of receptors quality.
Low	Adverse	An adverse impact on the value of receptor, but recovery is expected in the short-term and there will be no impact on its integrity.
	Beneficial	Minor benefit to, or addition of key characteristics, features or elements; some beneficial impact on

Magnitude	Adverse/ Beneficial	Guidelines
		receptor.
Negligible		Change is barely distinguishable, approximating to a “no change” situation.

14.4.28 Community infrastructure magnitude criteria are set out in Table 14-8.

Table 14-8 Community Infrastructure Magnitude of Impact Criteria

Magnitude	Adverse/ Beneficial	Guidelines
High	Adverse	A permanent or long term adverse impact on the integrity and value of a facility
	Beneficial	Large scale or major improvement of the facilities quality; extensive restoration or enhancement; major improvement of facilities quality.
Medium	Adverse	An adverse impact on the value of a facility, but recovery is possible in the medium term and no permanent impacts are predicted.
	Beneficial	Benefit to, or addition of, key characteristics, features, or elements or improvement of a facilities quality.
Low	Adverse	An adverse impact on the value of a facility, but recovery is expected in the short-term and there will be no impact on its integrity.
	Beneficial	Minor benefit to, or addition of key characteristics, features or elements; some beneficial impact on attribute or a reduction in the risk of an adverse impact occurring.
Negligible		Change is barely distinguishable, approximating to a “no change” situation.

i) Effect definitions

14.4.29 In line with standard EIA practice, the sensitivity of receptors, as defined in the tables above (Table 14-3, Table 14-4, and Table 14-5), are considered against the Magnitude of impact (Table 14-6, Table 14-7, and Table 14-8) to determine the significance of effect (Table 14-9).

Table 14-9 Significance of Effect

Magnitude	Sensitivity				
	Very High	**High**	**Medium**	**Low**	**Negligible**
High	Major	Major	Moderate	Moderate	Minor
Medium	Major	Moderate	Moderate	Minor	Negligible
Low	Moderate	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Minor	Negligible	Negligible	Negligible

14.4.30 Effects which are Moderate Adverse or Major Adverse are considered to be significant.

14.5 Baseline Environment

14.5.1 This section describes the baseline environmental characteristics for the Project and surrounding areas with specific reference to socio-economics, tourism, and community infrastructure.

a) Socio-economic

14.5.2 The socio-economic profile sets a context for the assessment and highlights key socio-economic issues. The socio-economic indicators are also used to determine the overall sensitivity of the labour market (socio-economic receptor). The socio-economic profile is summarised below. Supporting tables and text can be found in Appendix 14.1.

14.5.3 The socio-economic study area[7] surrounding the Project is characterised by:

- An increasing population (2001-2017);
- Projected population increase of c.7% between 2017 and 2035;
- Slightly lower levels of unemployment comparable to the UK average;
- A higher proportion of people working in construction and manufacturing jobs;
- Above average levels of employment in electricity and gas related occupations;
- A lower proportion of people working in high value professional, scientific and technical activities, and finance & insurance occupations;
- A higher proportion of people employed in semi-skilled/unskilled jobs and lower proportion of people in highly skilled jobs; and
- A higher proportion of people achieving no qualifications and low level qualifications compared to the UK average.

i. Description of socio-economic Sensitivity

14.5.4 The study area for the labour market is assessed to be of low sensitivity in accordance with the criteria provided in Table 14-3, as the area has a readily available labour force.

[7] Defined as the area within a 60-minute drive time. Comparisons are made relative to national averages.

b) Tourism Volume and Value

14.5.5 The tourism economy is assessed using visitor statistics for the Swansea local authority area and the South West Wales area.

14.5.6 Swansea had on average 7.35 million Great Britain (GB) day visits each year between 2013 and 2015 (Table 14-10; Ref. 14.10).

Table 14-10 GB Day Visits and Expenditure: 2013-2015 averages

	Visits (millions)	Expenditure (£millions)
	Annual avg. 2013-2015	***Annual avg. 2013-2015***
Swansea	7.35	£257.96
South West Wales	18	£637

14.5.7 Great Britain (GB) Overnight trips to Swansea are at their highest since 2009-11, however spending is lower (Table 14-11; Ref. 14.11).

Table 14-11 GB Overnight Trips and Spend by Local Authority - Swansea

Swansea	2009-11	2010-12	2011-13	2012-14	2013-15
Trips (thousands)	559	547	550	512	556
Spend (£millions)	£90	£93	£89	£83	£87

14.5.8 Table 14-12 shows some of the most popular visitor attractions in South West Wales (Ref. 14.12). Two indoor attractions, the Leisure Centre Swansea, Wales' biggest indoor water park, and the National Waterfront Museum are situated c.8 km from the Project in Swansea. However, these projects are outside the defined tourism study area which excludes tourism receptors to the south of the M4 due to the physical separation that the motorway creates. The tourism study area is defined in Section 14.4.8.

Table 14-12 Key Visitor Attractions in South West Wales

Attraction	Distance from Project	Visitor No. 2014	Visitor No. 2015	% Change 2014/15
The LC (Wales' biggest indoor Waterpark)	c.8 km	772,476	803,498	4%
Folly Farm Adventure Park	c.55 km	490,000	500,000	2%
Margam Country Park	c.20 km	216,790	309,430	+43%
Pembrey Country Park	c.25 km	440,000	348,811	-22%
National Waterfront Museum	c.8 km	264,949	257,617	-3%

14.5.9 There are a limited number of tourist attractions within the tourism study area, as shown on Figure 14.4, with most of the tourist attractions being located in the city of Swansea, outside the study area:

- Cwm Clydach Nature Reserve: Woodland with nature trails;

- National Cycle Route 43: Part of the National Cycle Network and the Celtic Trail, which connects Swansea with Builth Wells, north of Brecon Beacons National Park; and
- Teamforce Paintball and Laser Tag Activity Centre: Outdoor activity centre in Llangyfelach.

14.5.10 Cwm Clydach Nature Reserve is classed as having medium sensitivity due to its regional appeal. National Cycle Route 43 is classed as having a high sensitivity due to its national status as a long-distance cycle route. The activity centre is classed as being low sensitivity due to its local appeal.

c) Findings of the Business Survey

14.5.11 A tourism business survey was carried out during November and December 2014. This has not been repeated for this assessment as baseline assessment shows the visitor economy has not materially changed since 2014. The 2014 business survey findings are therefore considered to remain valid for this assessment.

14.5.12 The survey population included all businesses which could be considered to derive part of, or all of, their trade from tourism within the defined study area. The study area was selected as it was considered unlikely that tourism businesses located outside this would experience either beneficial or adverse impacts (tourism study area described at Section 14.4.19). A full write-up of the business survey results can be found in Appendix 14.2 The baseline conclusions from the business survey are summarised below:

- Of the 58 businesses surveyed, 17 responded to the tourism business survey questionnaire, giving a 29% response rate;
- A high proportion of responses were from businesses located in Pontardawe and Bryncoch. A number of the businesses were small in size;
- The highest proportion of responses was from bars and pubs. The survey identified that a high proportion of trade was from local customers. The origins of tourist/visitor customers were mainly from the UK;
- The main activities customers participated in when visiting the area were going on long and short walks, as well as sightseeing;
- The majority of businesses considered that their business performance had been increasing over the last three years. Current levels of satisfaction were high, with all respondents reporting trade as being fair or good. Respondents were also optimistic that their future business performance will improve and level of business increase; and
- Weather, reputation, product, price and value for money were deemed to be the most influential factors impacting upon business trends.

d) Community Infrastructure

14.5.13 Demand for community infrastructure facilities could arise from the in-migration of construction workers during the temporary construction phase. However, based on the number of construction workers required for this Project, professional judgement and experience of other projects, this requirement is likely to be minimal. An audit of community facilities within approximately 5 km of the Project Site indicates the provision of the following community infrastructure facilities in the area (Figures 14.5 – 14.8).

- 18 Schools;
- 5 GP Surgeries;
- 6 Dentists;
- 2 Hospitals;
- 6 Pharmacies
- 1 Park; and
- 2 Libraries.

14.5.14 A full list of these community infrastructure receptors which corresponds with Figures 14.5 – 14.8 can be found in Appendix 14.3.

14.5.15 The schools, GP surgeries, dentists, pharmacies, park and libraries are classed as low sensitivity as they are of local significance and serve a local catchment. Morriston Hospital is classed as medium sensitivity because it is of regional significance[8].

14.6 Embedded Mitigation

14.6.1 As detailed in **Chapter 3: Project and Site Description**, a number of embedded mitigation measures have been identified through the iterative EIA process and have been incorporated into the design and construction planning of the Project.

14.6.2 As these mitigation measures have been embedded into the design, are legal requirements or are standard practices that will be implemented, the assessment of likely significant effects assumes that they are in place.

14.7 Assessment of Effects – Socio-economics

14.7.1 This section assesses the nature and magnitude of construction and operational & maintenance effects. The socio-economic assessment of effects is carried out on the basis of the Project as a whole as impacts cannot be disaggregated into elements, i.e. Power Generation Plant, Gas Connection, and Electrical Connection. As a worst case scenario decommissioning effects are considered to be similar to construction effects[9].

a) Construction Effects

i. Employment and GVA

14.7.2 A detailed schedule of the level of employment and skills required to build the Project was provided based on relevant project experience[10].

14.7.3 The construction period is estimated to last 22 months from 2020-2022. The number of construction workers on site per month ranges from 25 to 122 during the peak construction period[11].

14.7.4 Table 14-13 and Table 14-14 show the average number of construction workers and full time equivalent permanent construction jobs on site for Years 1 to 2.

[8] It is recognised as the major trauma centre for South West Wales.
[9] A decommissioning programme would be required to accurately assess decommissioning effects. Impacts are therefore considered to be consistent with the level experienced during the construction phase.
[10] WSP Construction Schedule based on 299 MW.
[11] Lasting one month in an off peak period. Second highest is 118 (also in off peak)).

Project construction would support 92 temporary construction job years, equivalent to nine permanent construction jobs.[12]

Table 14-13 Workers Month, Person Year and Permanent Job Equivalents

	Year 1	Year 2	Total
Worker months on site	213	891	1,104
Person year equivalent	17.8	74.3	92
Permanent jobs equivalent	1.8	7.4	9.2

Table 14-14 Peak and Median Workers on Site

	Year 1 - 2
Peak workers on site (monthly)	122
Median workers on site (monthly)	69.5
Permanent jobs equivalent (over year 1&2)	9.2

14.7.5 Gross value added (GVA) is a measure of the value of goods and services produced in an area, industry or sector of an economy. Annual construction GVA per head in Wales is £76,725. The construction phase could therefore deliver up to £7.1 million GVA[13] to the wider economy.

ii. Magnitude of Construction Effect

14.7.6 The study area for the labour market is assessed to be of low sensitivity in accordance with the criteria provided in Table 14-3, as the area has a readily available labour force. The Project as a whole would provide a low beneficial construction employment magnitude of impact in accordance with the criteria provided in Table 14-6 and professional judgement.

iii. Skills Requirement

14.7.7 The Project's construction schedule shows approximately 40% of the construction workforce will be highly skilled[14], 45% moderately skilled[15], and 15% low skilled[16]. The majority of construction related employment will be in relatively high value and high paid positions that required a high degree of training and qualifications.

14.7.8 The baseline assessment shows construction and manufacturing employment accounts for almost a fifth of all jobs in the study area. The study area's concentration of skilled manual workers is also higher than the national average[17]. The Project will therefore present an opportunity to develop the skills of the local workforce and increase the value of the construction industry.

[12] It is generally accepted in economic appraisals that 10 years of continuous employment is equivalent to 1 Full-time equivalent (FTE).
[13] £76,725 x 92 person years= £7,058,745 (note this is the same as 9.2 FTEs x 10 years continuous employment x £76,725 = £7.1m)
[14] Highly skilled jobs include: Purchaser/ Engineer; Operator; Contractor Management; Contractor Supervisor; Electrical Installation; Cabling; Exhaust Duct; Hoists; Lagging; Trace Heating; Air Cooled Condenser
[15] Moderately skilled jobs include: Earth Moving; Civil; Fire System; Tanks and Piping
[16] Low skilled jobs include: Fencing; Painting; Scaffolding; Security; Canteen and Others
[17] Please see 14.5.3 and Section 14,1 in Appendix 14

iv. Accommodation Capacity

14.7.9 The study area accommodation capacity assessment is based on hotel and bed & breakfast accommodation, i.e. it assumes that construction based demand will be directed towards these sectors rather than other types of accommodation[18].

14.7.10 Average hotel[19] occupancy rates (Ref. 14.13) for Wales have been used to estimate the number of available bedrooms at hotels and bed & breakfast accommodation within a 10 km radius of the Project Site. The Project Site is located c.8 km from Swansea where there is a range of accommodation, retail, leisure, and other services. Construction related accommodation requirements are therefore likely to be met by accommodation providers within 10 km of the Project.

14.7.11 The Project programme indicates the estimated number of construction staff on site on a monthly basis during the construction programme. The construction programme indicates that 122 workers would be on site at the peak of the construction period.

14.7.12 The extent to which construction workers use accommodation in the study area[20] is influenced by: site proximity or ease of access to it; availability, quality and price of accommodation; the range of leisure and other services in the immediate area; and other factors.

14.7.13 Table 14-15 demonstrates that 100% of construction workers could be accommodated each month within a 10 km radius of the Project. The values in Table 14-15 assume that existing sources of trade are maintained at their current levels (as reflected in occupancy rates). Critically, it then shows the effect of construction-related accommodation demand on the residual capacity.

14.7.14 In reality, a large proportion of unspecialised jobs will be provided locally and will not require accommodation. However, Table 14-15 demonstrates that a worst-case scenario involving 100% of workers requiring accommodation could be easily accommodated without causing any shortages or pressures[21].

[18] It is more likely that construction workers would choose to stay in centrally located serviced B&B and hotel accommodation as opposed to non-serviced caravan parks or self-catering accommodation which tends to be in more remote locations.
[19] Hotel occupancy rates exceed B&B occupancy rates. Hotel occupancy rates used to investigate the impact of a worst case scenario. 68% for peak, 54% for off peak
[20] A security cabin will provide accommodation for security personnel on site 24/7 during construction phase. Construction workers will however be accommodated in Swansea.
[21] It is noted that construction workers will also provide a positive contribution through increased business. However, the assessment seeks to prove the 'worst case' i.e. all construction workers can be accommodated without creating adverse pressures on the accommodation sector by crowding out existing tourism and business visitors or by leading to price rises.

Table 14-15 Accommodation Capacity

Peak/ Off Peak	Month	Rooms Typically Available[22] (Supply)	Construction workers (Demand)	Assume 100% workers require a room each	Rooms Remaining (Supply - Demand)	% of Available
Off Peak	March	1,018	50	50	968	5%
Peak	April	699	51	51	648	7%
Peak	May	699	53	53	646	8%
Peak	June	699	54	54	645	8%
Peak	July	699	55	55	644	8%
Peak	August	699	56	56	643	8%
Peak	September	699	65	65	634	9%
Off Peak	October	1,018	70	70	948	7%
Off Peak	November	1,018	80	80	938	8%
Off Peak	December	1,018	79	79	939	8%
Off Peak	January	1,018	88	88	930	9%
Off Peak	February	1,018	113	113	905	11%
Off Peak	March	1,018	122	122	896	12%
Peak	April	699	86	86	613	12%
Peak	May	699	81	81	618	12%
Peak	June	699	78	78	621	11%
Peak	July	699	85	85	614	12%
Peak	August	699	74	74	625	11%
Peak	September	699	69	69	630	10%
Off Peak	October	1,018	40	40	978	4%
Off Peak	November	1,018	30	30	988	3%
Off-peak	December	1,018	25	25	993	2%

v. Labour Market Absorption Capacity

14.7.15 The labour market data from the baseline is used to show the extent to which the study area can supply relevant skills and labour for the construction and operation of the Project.

14.7.16 As set out above, labour market data is expressed at drive time level, i.e. a catchment reflecting travel to work patterns. The 'local area' is defined within a 30-

[22] The figures presented in this column show typical supply once average occupancy levels have been applied (68% for peak, 54% for off peak)

minute drive time; the 'wider area' within a 45-minute drive time; and the 'wider region' within a 60-minute drive time.

14.7.17 Table 14-16 shows that the required construction labour force would also account for 0.7% of the employed construction workforce or 0.6% of manufacturing workers within a 30-minute drive time.

14.7.18 If the demand for construction labour were fully sourced from the 'potentially available labour pool' (i.e. unemployed) it would account for 0.8% of unemployed workers within a 30-minute drive time.

14.7.19 The demand for construction labour arising from the Project's development would not therefore result in any pressure on labour market capacity (i.e. requiring more than 15%[23] of existing capacity).

Table 14-16 Labour Market Absorption Capacity: Construction & Operational Phases (30; 45 and 60-minute drive times)

Sector	Drive Times			
	30 mins	45 mins	60 mins	UK
	Number of people			
Economically Active	233,189	375,114	801,976	32,268,551
Economically Active: Unemployed	15,242	25,000	55,090	2,054,147
Highly Skilled	24,588	40,091	93,280	4,336,150
Skilled	46,314	71,417	156,815	6,032,985
Semi-skilled & Unskilled	34,543	55,342	110,835	4,095,520
Manufacturing	21,804	37,020	73,093	2,641,107
Construction	17,182	28,750	59,058	2,308,632
Electricity & Gas	987	1,793	5,749	174,744
Absorption Capacity: Construction jobs (Peak 122) as % of Baseline Value				
Economically Active	0.1%	0.0%	0.0%	0.0%
Economically Active: Unemployed	0.8%	0.5%	0.2%	0.0%
Highly Skilled	0.5%	0.3%	0.1%	0.0%
Skilled	0.3%	0.2%	0.1%	0.0%
Semi-skilled & Unskilled	0.4%	0.2%	0.1%	0.0%
Manufacturing	0.6%	0.3%	0.2%	0.0%
Construction	0.7%	0.4%	0.2%	0.0%
Absorption Capacity: Operational jobs (10 FTEs) as % of Baseline Value				
Economically Active	0.00%	0.00%	0.00%	0.00%

[23] 15% threshold based on professional judgement

Sector	Drive Times			
	30 mins	45 mins	60 mins	UK
Economically Active: Unemployed	0.07%	0.04%	0.02%	0.00%
Highly Skilled	0.04%	0.02%	0.01%	0.00%
Skilled	0.02%	0.01%	0.01%	0.00%
Semi-skilled & Unskilled	0.03%	0.02%	0.01%	0.00%
Electricity & Gas	1.01%	0.56%	0.17%	0.01%

b) Operation

i. Employment and GVA

14.7.20 Best practice principles outlined in HM Treasury Green Book Appraisal Guidance (Ref. 14.7) have been applied to assess the effect of permanent operational employment.

14.7.21 An Economic Impact Model was developed to measure net additional employment and GVA. The Guidance has been used along with professional judgment to estimate values for:

- Deadweight – what would happen in the absence of the Project;
- Leakage – the proportion of employment opportunities accessed by people living outside the study area;
- Displacement – the proportion of Project benefit accounted for by a reduction in benefit elsewhere;
- Substitution – when a firm substitutes one activity for another to take advantage of public sector assistances; and
- Multipliers – to estimate further economic activity associated with additional income and supplier purchases.

14.7.22 Table 14-17 shows the values used in the model. Explanatory comments are given for each value.

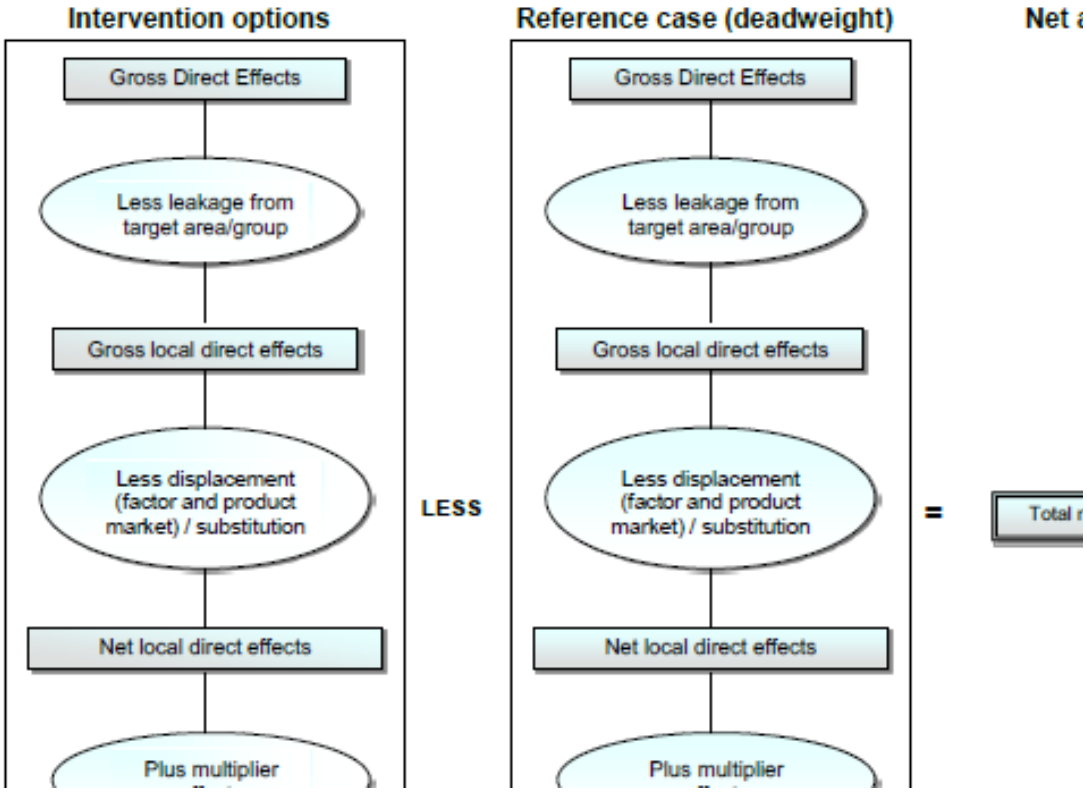
Table 14-17 Accommodation Capacity

Study area/ Additionality Factor	Value	Range	Description
Regional			
Deadweight	0%	None	Operational jobs for the Project depend solely on the Project being built
Leakage	30%	Low	The majority of operational jobs will be sourced by residents within a 60-minute drive time area
Displacement	30%	Low	Small proportion of highly skilled senior staff may be displaced from similar employment elsewhere in the region. The majority of staff will be sourced from

Study area/ Additionality Factor	Value	Range	Description
			within a 60-minute drive time area and be specifically trained for the Project
Substitution	0%	None	Assumed no incentives to influence substitution behaviour
Multiplier	1.23	-	Assumed 50% of national Gas and Electricity multiplier. This assumes 50% of benefit from the Project supply chain and the Project's employees household spending occurs within the 60-minute drive time area
National			
Deadweight	75%	High	Gas Power stations will be built elsewhere in the UK. Employment benefits will therefore derive to other parts of the UK
Leakage	0%	None	All jobs are likely to be taken up by UK residents
Displacement	10%	Low	A small proportion of highly skilled senior staff may be displaced from similar employment elsewhere in the UK. The majority of staff will be sourced from the regional area and specifically trained for the Project.
Substitution	0%	None	Assumed no incentives to influence substitution behaviour
Multiplier	2.46	-	Composite of Gas and Electricity multipliers (2016)

14.7.23 Homes and Communities Agency (HCA) has provided a methodology for calculating additionality through a 'net additionality framework'. This is represented in Figure 14-9 below and can be described as: *'Impact of intervention option' less 'impact of reference case' (deadweight) equals 'net additional impact.'*

Figure 14-9 Calculating additionality through HCA 'net additionality framework' (Ref. 14.8)



Note: Figures 14.1-14.8 are included as separate Figures

14.7.24 The operational phase of the Project would provide an estimated 10 FTE direct jobs. The net effect, taking account of the leakage, displacement, and multiplier effects shown above, would be 6.0 additional regional FTE jobs and 5.5 national FTE jobs[24]. Average GVA per utility employee in Wales is £91,053[25]. Assuming Project related employment generated average levels of GVA, the Project's operation would provide approximately £0.55m GVA[26] and £0.50m GVA[27] per annum to the regional and national UK economy respectively.

ii. Skills Requirement

14.7.25 Each of the Project's gross 10 FTE jobs will be highly skilled positions that offer permanent employment opportunities for 25 years. Each position will be relatively high paid and requires a high level of training and qualifications.

iii. Significance of Operational Effect

14.7.26 The study area for the labour market is assessed to be of low sensitivity in accordance with the criteria provided in Table 14-3. The Project as a whole would provide a minor beneficial operation employment magnitude of impact in accordance with the criteria provided in Table 14-6. The low sensitivity and low

[24] The assumptions in Table 14.23 are applied to the 10 Gross FTE Operational jobs created by the Project. This is done in an Excel Economic Impact Model created using HM Treasury Green Book Appraisal Guidance.
[25] Experian 2017
[26] 6.0 net additional local jobs x £91,053= £547,825
[27] 5.5 net additional national jobs x £91,053= £503,105

beneficial impact results in a likely negligible beneficial effect on employment, in accordance with the criteria provided in Table 14-9.

iv. Absorption Capacity

14.7.27 The labour market data from the baseline is used to show the extent to which the study area can supply relevant skills and labour for the construction and operation of the Project.

14.7.28 Labour market data is expressed at drive time level, i.e. a catchment reflecting travel to work patterns.

14.7.29 Operational impacts have been assessed against the current labour market (Table 14-16). The operational workforce requirement accounts for less than 2% of the electricity and gas workers and less than 1% of the working age, economically active and highly skilled, skilled and unskilled labour force.

14.7.30 Demand for operational employment would not therefore result in any noticeable labour market pressure on the 30-, 45-, or 60-minute drive time areas and would not exert negative pressure through labour shortages and wage increases.

14.7.31 The labour requirement during the operational phase would provide a benefit and in reality would be sourced from a number of economically active categories including workers in directly relevant industries, workers with transferable skills and unemployed workers.

14.8 Assessment of Effects – Tourism and Recreation

a) Tourism Business Survey (Impact Analysis)

14.8.1 This section summarises the tourism business survey responses in terms of perceived impact on business performance of the wider South-West Wales tourism product. A full report can be found in Appendix 14.2.

14.8.2 In terms of impact, the vast majority of respondents felt that the Project would have no impact on business performance. Some businesses felt that they would benefit at the construction phase through related demand for accommodation, food and drink, and other services.

14.8.3 Only one respondent predicted an adverse impact on business performance based mainly on perceived adverse visual impact.

14.8.4 The majority of respondents felt that the Project would have either no or low adverse impact on tourism in South West Wales. Less than a fifth expected the impact to be either medium or high adverse, with visual impact and potential traffic congestion (during construction) cited as the main factors.

14.8.5 Overall, the business survey analysis has shown that a number of accommodation providers, food and drink, and other similar businesses in the study area are not reliant on tourism trade and are reporting high/increasing business confidence. The vast majority of respondents do not predict any significantly adverse impact on either their own business performance or the wider South-West Wales tourism offer.

b) Tourism and Recreation Receptors (Impact Analysis)

14.8.6 Tourism and recreation receptors within the study area may experience the following impacts:

- Visual;
- Noise;
- Traffic/accessibility; and
- Air quality.

14.8.7 The tourism and recreation assessment assesses the potential impacts on three distinct components during two distinct phases.

14.8.8 The three distinct components include the:

- Power Generation Plant only;
- Gas Connection; and
- Electrical Connection.

14.8.9 The two district phases of the Project include the:

- Construction/decommissioning phase; and
- Operational phase.

14.8.10 The structure of this section ensures potential visual, noise, traffic, and air quality impacts on each component during each phase are individually assessed against tourism and recreation receptors in the area.

i. Power Generation Plant

Construction/Decommissioning – Visual

14.8.11 The Paintball Activity Centre may experience visual impacts during construction. For further detailed assessment of visual impact, please refer to section 11.2, **Chapter 11: Landscape and Visual Effects**.

14.8.12 The Zone of Theoretical Visibility (ZTV) shows that the other tourism and recreational receptors including one cycle route (National Route 43) and a nature reserve (Cwm Clydach Nature Reserve) are unlikely to experience visual impacts during construction of the Power Generation Plant.

Construction/Decommissioning – Noise

14.8.13 As stated in **Chapter 3: Project and Site Description,** a Construction Environmental Management Plan (CEMP) (Outline CEMP: Appendix 3.1) will be implemented during the construction period to mitigate any effects. **Chapter 7: Noise and Vibration** confirms that there will be no significant noise effects.

14.8.14 Moreover, as stated in **Chapter 3: Project Site and Description**, all construction activities would be carried out in accordance with the recommendations of BS5228 (the industry approved code of practice which is used in assessing noise from construction sites). This will ensure that no tourism or recreational related businesses or receptors are affected significantly during construction or decommissioning.

Construction/Decommissioning – Traffic/accessibility

14.8.15 The implementation of a Construction Traffic Management Plan (CTMP) [HOLD-1] during the construction phase will ensure that no tourism or recreational related businesses/receptors are affected significantly.

Construction/Decommissioning – Air quality

14.8.16 As stated in Chapters 3 and 6, a CEMP (Outline CEMP: Appendix 3.1) will prevent construction activities generating levels of atmospheric dust which would constitute a health hazard or nuisance to local people. This will ensure that no tourism or recreational related businesses or receptors are affected significantly during construction/decommissioning.

Summary: Power Generation Plant Construction/Decommissioning

14.8.17 A summary of assessed magnitude of impact of the Power Generation Plant on tourism and recreation receptors is provided below in Table 14.19. Taking into consideration the magnitude of impact identified below, together with the sensitivity of receptor (as defined in Section 14.5.9) the significance of effect on the receptors would be no greater than minor adverse.

Table 14-18 Power Generation Plant: Construction/Decommissioning

Receptor	Magnitude
Cwm Clydach Nature Reserve	Negligible
National Cycle Route 43	Negligible
Paintball and Laser Tag Activity Centre	Low

Operation - Visual

14.8.18 The ZTV shows that the stack is likely to be visible over a proportion of the study area. The ZTV analysis used to determine visual impact is based on the topography of the land and does not take into account physical or natural aspects, such as buildings and trees. Visual impact is likely to be reduced due to the screening effect of buildings and woodland. Section 11.4.12, **Chapter 11: Landscape and Visual Effects** makes reference to the fact that significant adverse effects on visual amenity are likely to be limited to within 5 km of the Project Site. The Paintball and Laser Tag Centre is located in a heavily wooded area and, as such, visual impact is likely to be reduced.

Operation – Noise

14.8.19 Any noise impacts of the Project will be localised and will not affect tourism receptors within the study area, as confirmed in **Chapter 7: Noise and Vibration** which states that there would be no significant noise impacts during operation.

Operation – Traffic/accessibility

14.8.20 **Chapter 12: Traffic and Transport** confirms traffic to the Project Site will be infrequent during the operational phase. Traffic to the Power Generation Plant

would be limited to occasional maintenance vehicles, deliveries, and visitor access and will therefore not have a significant impact on tourism and recreational receptors.

Operation – Air Quality

14.8.21 **Chapter 6: Air Quality** confirms that the Power Generation Plant is unlikely to have any significant impacts on air quality during operation and therefore will not have a significant impact on tourism and recreation receptors.

Summary: Power Generation Plant Operation

14.8.22 A summary of assessed magnitude of impact of the Power Generation Plant on tourism and recreation receptors is provided in Table 14.20. Taking into consideration the magnitude of impact identified below, together with the sensitivity of receptor (as defined in Section 14.5.9) the significance of effect on the receptors would be no greater than minor adverse.

Table 14-19 Power Generation Plant: Operation

Receptor	Magnitude
Cwm Clydach Nature Reserve	Negligible
National Cycle Route 43	Negligible
Paintball and Laser Tag Activity Centre	Low

ii. Gas Connection

Construction/Decommissioning – Visual

14.8.23 Any visual impacts would be predominately restricted to the construction phase of the Gas Connection. As noted in section 11.7.45, **Chapter 11: Landscape and Visual Effects**, the gas connection would not result in any significant visual effects from the viewpoints assessed. Any impacts would be temporary and there should be no significant adverse visual effects on tourism and recreation receptors within the study area.

Construction/Decommissioning – Noise

14.8.24 As noise impacts assessed in section 7.8.2, **Chapter 7: Noise and Vibration** will be primarily limited to the construction phase, they would be temporary. The mitigation measures noted in **Chapter 3: Project and Site Description** should ensure that no tourism or recreational related businesses or receptors are affected significantly during construction/decommissioning.

Construction/Decommissioning – Traffic/accessibility

14.8.25 Table 12-35, **12: Traffic, Transport and Access** confirms that construction vehicle movements will lead to no significant effects, with the exception of the footpath closure, which is very localised. Therefore, no tourism or recreational related businesses/receptors will be affected significantly.

Construction/Decommissioning – Air quality

14.8.26 As stated in **Chapters 3: Project and Site Description** (section 3.11.14) and **Chapter 6: Air Quality** (section 6.6.1), an outline CEMP (Appendix 3.1) will prevent construction work generating levels of atmospheric dust which would constitute a health hazard or nuisance to local people. This will ensure that no tourism or recreational related businesses or receptors are affected significantly during construction/decommissioning.

Summary: Gas Connection Construction/Decommissioning

14.8.27 A summary of the assessed magnitude of impact of the Gas Connection during construction on tourism and recreation receptors is provided in Table 14.21. Taking into consideration the magnitude of impact identified below, together with the sensitivity of receptor (as defined in Section 14.5.9) the significance of effect on the receptors would be no greater than minor adverse.

Table 14-20 Gas Connection: Construction/Decommissioning

Receptor	Magnitude
Cwm Clydach Nature Reserve	Negligible
National Cycle Route 43	Negligible
Paintball and Laser Tag Activity Centre	Low

Operation - Visual

14.8.28 The gas connection will be buried underground and will therefore not be visible during operation. The impact on tourism and recreational receptors is negligible.

Operation – Noise

14.8.29 The Gas Connection will be buried underground and therefore, it is not anticipated that they will generate any noise or vibration during operation.

Operation – Traffic/Accessibility

14.8.30 Traffic movements to the Gas Connection during the operational phase are likely to be minimal and there are therefore not anticipated to be any effects on tourism and recreation receptors.

Operation – Air Quality

14.8.31 No impacts on local air quality are anticipated from the operation of the Gas Connection and therefore this has not been assessed.

Summary: Gas Connection Operation

14.8.32 A summary of the assessed magnitude of impact of the Gas Connection during operation on tourism and recreation receptors is provided in Table 14.22. Taking into consideration the magnitude of impact identified below, together with the sensitivity of receptor (as defined in Section 14.5.9) the significance of effect on the receptors would be no greater than minor adverse.

Table 14-21 Gas Connection: Operation

Receptor	Magnitude
Cwm Clydach Nature Reserve	Negligible
National Cycle Route 43	Negligible
Paintball and Laser Tag Activity Centre	Negligible

iii. Electrical Connection

Construction/Decommissioning – Visual

14.8.33 Any visual impacts associated with the Electrical Connection would be limited to the construction phase and would be temporary. As noted in section 11.7.49, **Chapter 11: Landscape and Visual Effects**, the electrical connection would not result in any significant visual effects from the viewpoints assessed.

Construction/Decommissioning – Noise

14.8.34 As noise impacts assessed in section 7.7.14, **Chapter 7: Noise and Vibration** will be primarily limited to the construction phase, they would be temporary. The mitigation measures noted in section 3.11.21, **Chapter 3: Project and Site Description** should ensure that no tourism or recreational related businesses or receptors are affected significantly during construction or decommissioning.

Construction/Decommissioning – Traffic/Accessibility

14.8.35 Users of the road network may be affected by additional construction workers travelling to the area. However, the construction/decommissioning phase of the Electrical Connection is not anticipated to generate an amount of traffic movements which would have a likely significant detrimental effect on tourism or recreation receptor as noted in Table 12.35, **Chapter 13: Traffic and Transport and Access.**

Construction/Decommissioning – Air quality

14.8.36 Any air quality impacts are expected to be restricted to the immediate local area around the Project Site as noted in section 6.8.2, **Chapter 6: Air Quality**. The adoption of the embedded mitigation measures mentioned in section 3.11.14, **Chapter 3: Project and Site Description** should ensure that no tourism or recreation receptors are affected significantly during construction/decommissioning.

Summary: Electrical Connection Construction/Decommissioning

14.8.37 A summary of the assessed magnitude of impact of the Electrical Connection during construction/decommissioning on tourism and recreation receptors is provided in Table 14.22. Taking into consideration the magnitude of impact identified below, together with the sensitivity of receptor (as defined in Section 14.5.10) the significance of effect on the receptors would be no greater than minor adverse.

Table 14-22 Electrical Connection: Construction/Decommissioning

Receptor	Magnitude
Cwm Clydach Nature Reserve	Negligible
National Cycle Route 43	Negligible
Paintball and Laser Tag Activity Centre	Low

Operation - Visual

14.8.38 The electrical connection will be buried underground and will therefore not be visible during operation as noted in section 11.7.90, **Chapter 11: Landscape and Visual**. The impact on tourism and recreational receptors is negligible.

Operation – Noise

14.8.39 The Electrical Connection will be buried underground and therefore it is not anticipated that they will generate any noise or vibration during operation.

Operation – Traffic/Accessibility

14.8.40 Traffic movements to the Electrical Connection during the operational phase are likely to be minimal as noted in section 12.7.50, **Chapter 13 Traffic Transport and Access** and there are therefore not anticipated to be any effects on tourism and recreation receptors.

Operation – Air Quality

14.8.41 No impacts on local air quality are anticipated from the operation of the Electrical Connection and therefore this has not been assessed as noted in section 6.4.3, **Chapter 6: Air Quality**.

Summary: Electrical Connection Operation

14.8.42 A summary of the assessed magnitude of impact of the Electrical Connection during operation on tourism and recreation receptors is provided in Table 14.23. Taking into consideration the magnitude of impact identified below, together with the sensitivity of receptor (as defined in Section 14.5.9) the significance of effect on the receptors would be no greater than minor adverse.

Table 14-23 Electrical Connection: Operation

Receptor	Magnitude
Cwm Clydach Nature Reserve	Negligible
National Cycle Route 43	Negligible
Paintball and Laser Tag Activity Centre	Negligible

14.9 Assessment of Effects: Community Infrastructure

14.9.1 There are no community infrastructure facilities situated in the immediate area surrounding the Project. Therefore there will be no significant effects (visual, noise,

traffic, or air quality) on these facilities during construction/decommissioning or operation as a result of the Project as they are sufficiently far away (see Figures 14.5 – 14.8).

14.9.2 The construction period for the Project is estimated to last 22 months from 2020-2022. The number of construction workers onsite per month ranges from 25 to 122 during the peak construction period. In terms of community infrastructure capacity, the construction jobs for the Project will be temporary and therefore it is reasonable to assume that the majority of workers will not move their families for this relatively short period of time.

14.9.3 No capacity information is available at individual school level for schools in Wales but it is not envisaged that there would be any pressure on schools capacity in the area as a result of the construction of this Project for the reasons noted in Section 14.9.2. In terms of GP Surgeries, four in the study area are accepting new patients and several accept patients who are temporary residents in the area, such as construction workers. Morriston Hospital, which has A&E facilities, is situated in the study area.

14.9.4 The level of existing community infrastructure in the area is considered to be sufficient to accommodate any additional demand. The magnitude of impact is considered to be low.

14.9.5 Taking into consideration the magnitude of impact identified above, together with the low/medium sensitivity of the receptors (as defined in Section 14.5.15) the significance of effect on the receptors would be no greater than minor adverse.

14.10 Mitigation and Monitoring

14.10.1 Effects on tourism and socio-economic were not found to be significant, therefore no additional mitigation will be required.

14.10.2 The community infrastructure assessment shows that there are a limited number of community facilities in close proximity to the Project and are therefore unlikely to be any significant impacts in terms of visual, noise, traffic, and air quality. The level of existing community infrastructure in the wider area is considered to be sufficient to accommodate any additional demand and mitigation will not be required.

14.11 Significance of effects

a) Socio-economics

14.11.1 The low labour market sensitivity and minor beneficial construction and operational impact results in a likely **Negligible** beneficial effect on employment, in accordance with the criteria provided in Table 14.9. Construction and operational effects on employment and GVA are considered to be **Negligible** and therefore not significant.

b) Tourism

14.11.2 Of the three tourism and recreation receptors identified, the Paintball and Activity Centre is the only one in close proximity to the Project. The low sensitivity and low magnitude of impact results in a **Negligible** effect which is not significant. Effects

on Cwm Clydach Nature Reserve will be **Negligible** and therefore not significant. Effects on the National Cycle Route 43 will be **Minor Adverse** and also not significant.

c) Community Infrastructure

14.11.3 There are no community facilities situated in the immediate area surrounding the Project. The level of community infrastructure provision in the wider area is considered sufficient to serve any additional requirements as a result of the Project. The magnitude of impact is low. Taking into account the low/medium sensitivity, the likely effect would be at its greatest **Minor Adverse** and therefore not significant.

14.12 Residual Effects

14.12.1 The following tables (Tables 14-24 to 14-29) present a summary of the socio-economic, tourism, and community infrastructure assessment.

Table 14-24: Socio-Economic Summary of Effects Arising during Construction/Decommissioning Phase

Receptor	Description of Effect	Classification of effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
Project					
Labour Market	Beneficial employment effect	Negligible beneficial	Not required	Negligible beneficial	Not significant
Construction information is only available for the Project as a whole. As noted in Section 14.7.1 Project impacts cannot be disaggregated into elements, i.e. Power Generation Plant, Gas Connection, and Electrical Connection.					

Table 14-25: Summary of Residual Effects during Operation – Socio-Economic

Receptor	Description of Effect	Classification of Effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
Project					
Labour Market (project in combination)	Beneficial employment effect	Negligible beneficial	Not required	Negligible beneficial	Not significant

Table 14-26 Summary of Residual effects – Tourism/Recreation, Construction/Decommissioning Phases

Receptor	Description of Effect	Classification of Effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
Power Generation Plant					
Cwm Clydach Nature Reserve	Visual Noise Transport Air Quality	Negligible	None	Negligible	Not Significant
National Cycle Route 43		Minor adverse	None	Minor adverse	Not Significant
Paintball and Laser Tag Activity Centre		Negligible	None	Negligible	Not Significant
Gas Connection					
Cwm Clydach Nature Reserve	Visual Noise Transport Air Quality	Negligible	None	Negligible	Not Significant
National Cycle Route 43		Minor adverse	None	Minor adverse	Not Significant
Paintball and Laser Tag Activity Centre		Negligible	None	Negligible	Not Significant
Electrical Connection					
Cwm Clydach Nature Reserve	Visual Noise Transport Air Quality	Negligible	None	Negligible	Not Significant
National Cycle Route 43		Minor adverse	None	Minor adverse	Not Significant
Paintball and Laser Tag Activity Centre		Negligible	None	Negligible	Not Significant
Project					
Cwm Clydach Nature Reserve	Visual Noise Transport Air Quality	Negligible	None	Negligible	Not Significant
National Cycle Route 43		Minor adverse	None	Minor adverse	Not Significant
Paintball and Laser Tag Activity Centre		Negligible	None	Negligible	Not Significant

Table 14-27 Summary of residual effects – Tourism/Recreation, Operational Phase

Receptor	Description of Effect	Classification of Effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
Power Generation Plant					
Cwm Clydach Nature Reserve	Visual Noise Transport Air Quality	Negligible	None	Negligible	Not Significant
National Cycle Route 43		Minor adverse	None	Minor adverse	Not Significant
Paintball and Laser Tag Activity Centre		Negligible	None	Negligible	Not Significant
Gas Connection					
Cwm Clydach Nature Reserve	Visual Noise Transport Air Quality	Negligible	None	Negligible	Not Significant
National Cycle Route 43		Minor adverse	None	Minor adverse	Not Significant
Paintball and Laser Tag Activity Centre		Negligible	None	Negligible	Not Significant
Electrical Connection					
Cwm Clydach Nature Reserve	Visual Noise Transport Air Quality	Negligible	None	Negligible	Not Significant
National Cycle Route 43		Minor adverse	None	Minor adverse	Not Significant
Paintball and Laser Tag Activity Centre		Negligible	None	Negligible	Not Significant
Project					
Cwm Clydach Nature Reserve	Visual Noise Transport Air Quality	Negligible	None	Negligible	Not Significant
National Cycle Route 43		Minor adverse	None	Minor adverse	Not Significant
Paintball and Laser Tag Activity Centre		Negligible	None	Negligible	Not Significant

Table 14-28 Summary of Residual Effects – Community Infrastructure, Construction/Decommissioning Phases

Receptor	Description of Effect	Classification of effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
Project					
Community Infrastructure receptors	Increased demand for services	Minor adverse	None	Minor adverse	Not significant

Table 14-29 Summary of Residual Effects – Community Infrastructure, Operational Phase

Receptor	Description of Effect	Classification of effect	Additional Mitigation	Classification of Residual Effect	Significant / Not Significant
Project					
Community Infrastructure receptors	Increased demand for services	Minor adverse	None	Minor adverse	Not significant

a) Project Effects

i. Socio-economics

14.12.2 The Project in the context of employment and labour market pressure is considered in Section 14.7[28].Project impacts cannot be disaggregated into elements, i.e. Power Generation Plant, Gas Connection, and Electrical Connection, because these three elements are so intrinsically linked.

ii. Tourism

14.12.3 The Project will not cause any significant effects on tourism and recreation receptors in the study area.

14.12.1 The majority of tourism related businesses stated that the Project would have 'no impact' on their trading performance, while a proportion of survey respondents stated it would have a beneficial effect through increased trade from construction workers.

14.13 Cumulative Effects

a) Assessment of Potential Cumulative Effects – Construction

i. Description of Impact

14.13.1 Cumulative impacts on the labour market have been identified as potentially arising as a result of construction of the Project in combination with other schemes set out in **Chapter 4: Approach to Environmental Impact Assessment**.

ii. Assessment of cumulative effect

14.13.2 Table 14-31 shows the construction job requirement for each project included in the cumulative assessment. Estimates have been based on estimated construction costs using Building Cost Information Service (BCIS) data (2017)[29] (Ref. 14.14). Projects that are currently under construction are assumed to be completed by the anticipated construction start date for the Project in 2020.

Table 14-30 Cumulative Projects

Reference	Location	Overall Construction Cost	Estimated Annual Construction Cost[30]	Construction jobs (Person Years)	Construction Labour in Project Labour Market Area
	Permitted but not yet implemented				
2013/0795	Tyle Coch Mawr Wind Farm	£11m	£11m	105	0.2%
2013/1835	Felindre	£6.1m	£6.1m	58	0.1%

[28]The socio-economic employment and GVA effects are considered for the Project as a whole. Construction information is only available for the Project as a whole.
[29] Commercial database subscription held by PBA
[30] Derived using build period information (where available). If not available overall construction cost used which is worst case scenario.

Reference	Location	Overall Construction Cost	Estimated Annual Construction Cost[30]	Construction jobs (Person Years)	Construction Labour in Project Labour Market Area
	Business Park				
2015/1529 (appeal ref 4369653)	Llettyr Morfil Farm	£4.1m	£4.1m	40	0.1%
2015/0308	Plot 8 Felindre Strategic Business Park	£7.4m	£7.4m	71	0.1%
2016/1522	Griffiths Waste Management Site, Bryntywod Llangyfelach Swansea SA5 7LP	£1m	£1m	9	0.0%
2008/0912	Former Walters Yard Pontlliw Swansea	£7.9m	£7.9m	75	0.1%
	Submitted but not determined				
2011/0345*	Land at Llewellyn Road, Penllergaer	£23.4m	£23.4m	225	0.4%
2012/0721	Royal Fern Golf Resort	£25m	£8.3m	80	0.1%
2014/0977	Parc Ceirw, Cwmrhydyceirw Quarry, Swansea	£35.2m	£5.9m	56	0.1%
2017/1822/OUT	Land West of Llangyfelach Road Tirdeunaw	£230.2m	£16.4m	158	0.3%
2016/1478	Land North of Garden Village Swansea	£88.8m	£11.8m	113	0.2%
2017/0986/FUL*	Former Civic Centre Penllergaer	£9.4m	£9.4m	90	0.2%

Reference	Location	Overall Construction Cost	Estimated Annual Construction Cost[30]	Construction jobs (Person Years)	Construction Labour in Project Labour Market Area
	Swansea SA4 9GH				
	Identified/Allocated (and not referenced above)				
UDP Policy EC1(3) *†	Swansea Vale Strategic Mixed-Use Site	£59.6m	£59.6m	571	1.0%
UDP Policy EC1(10) *†	Land at Bryntywod, Felindre (Local Employment Site)	£37.7m	£37.7m	361	0.6%
UDP Policy EC1(12) *†	Penllergaer Business Park (Local Employment Site)	£19.6m	£19.6m	187	0.3%
UDP Policy HC13 *†	West of Morriston Hospital	£73.3m	£73.3m	702	1.2%
LDP Policy SD G **	Northwest of M4 J46, Llangyfelach	£99.6m	£16.6m	159	0.3%
LDP Policy SD A **	South of Glanffrwd Road, Pontarddulais	£85m	£12.1m	116	0.2%
LDP Policy SD C **	South of A4240, Penllergaer	£117.8m	£16.8m	161	0.3%
LDP Policy SD E **	North of Clasemont Road, Morriston	£79.7m	£13.3m	127	0.2%
LDP Policy SI 4	Morriston Hospital	-	N/A[31]	N/A	0%
LDP Policies	Former Tip	-	N/A[32]	N/A	0%

[31] No information available
[32] No information available

Reference	Location	Overall Construction Cost	Estimated Annual Construction Cost[30]	Construction jobs (Person Years)	Construction Labour in Project Labour Market Area
RP7 & RP8	Site, Felindre				
LDP Policy H1.11*	Land at Ramsey Road, Clydach	£7m	£7m	67	0.1%
LDP Policy H1.21*	Land east of Pontarddulais Road, Gorseinon	£10.5m	£10.5m	101	0.2%
LDP Policy H1.26*	Land at Carmel Road and Bryntirion Road, Pontlliw	£11.7m	£11.7m	112	0.2%
LDP Policy H1.30*	Land north of Llewellyn Road, Penllergaer	£5.9m	£5.9m	56	0.1%
LDP Policy H1.31*	Land at Bolgoed Road, Pontarddulais	£5.9m	£5.9m	56	0.1%
	Total	**£1,251.6m**	**£ 402.7**	**3,858**	**6.5%**
Total with the Project				**3,950**	**6.7%**
	** No build programme inputted into labour requirement calculations.* *** Full development information not available.* *† Development densities applied to approximate build costs.*				

14.13.3 A total of 3,858 temporary construction jobs would be required to build nearby projects, or 3,950 when including the Project.

14.13.4 The Absorption Capacity Table (Table 14-32) demonstrates sufficient labour in the study area to build all of the cumulative projects (i.e. the total requirement does not exceed 15% at the 60-minute drive time[33]).

14.13.5 The cumulative projects could therefore be built using labour from the Project's labour market area without creating any minor labour market distortions. In reality, the labour market for the cumulative projects will be much wider than the Project labour market area providing access to a wider labour market pool[34].

[33] The wider region (60-minute drive time) has been considered for construction employment impacts as construction labour is more likely to come from these areas than from the 30 and 45 minute areas. Smaller geographies are included to show worst case effects

[34] The Construction Industry Training Board research document (2015) suggests that about 42% of construction

Table 14-31 Cumulative Projects Absorption Capacity (30; 45 and 60-minute drive times)

	30 mins	45 mins	60 mins
No. of workers			
Economically Active	233,189	375,114	801,976
Economically active: Unemployed	15,242	25,000	55,090
Highly Skilled	24,588	40,091	93,280
Skilled	46,314	71,417	156,815
Semi-skilled & Unskilled	34,543	55,342	110,835
Manufacturing	21,804	37,020	73,093
Construction	17,182	28,750	59,058
Electricity & gas	987	1,793	5,749
Average Construction Workers Per Year (3,950) as % of:			
Economically Active	1.7%	1.1%	0.5%
Economically active: Unemployed	25.9%	15.8%	7.2%
Highly Skilled	16.1%	9.9%	4.2%
Skilled	8.5%	5.5%	2.5%
Semi-skilled & Unskilled	11.4%	7.1%	3.6%
Manufacturing	18.1%	10.7%	5.4%
Construction	23.0%	13.7%	6.7%

14.13.6 The Absorption Capacity analysis assumes a worst case scenario. All projects are assumed to be constructed during the same year. A one-year build programme is assumed for projects where construction programmes are unknown. This increases the annual labour requirement[35]. In practice, the 'worst case scenario' is unlikely to occur for a number of reasons:

- Some of the projects may not be consented or developed;
- The construction of the noted schemes is unlikely to take place concurrently;
- Some involve construction over a more extended period than the Project (further diluting absorption effects);
- The labour market catchments for a number of the noted projects will differ from that of the Project;
- A number of the projects are likely to require more specialist construction skills. It is unlikely that the construction needs for all of the projects noted can be met from within localised catchments;
- Construction labour is highly mobile and flexible. Should capacity bottlenecks emerge, labour can generally be brought in from further afield; and
- A proportion of specialist labour would be sourced from across the UK.

14.13.7 It is therefore considered based on this assessment that there will be no cumulative impact on the wider labour market area, as the total projects are anticipated to

workers in Wales regularly travel more than 50 miles to their place of work

[35] Most projects have available build programmes and these have been applied to the annual requirements.

constitute below 15% of total construction labour in the wider area. Combined, the cumulative projects will provide a positive stimulus to the study area economy through the provision of construction related training and employment opportunities, supply chain linkages and demand for accommodation, food and drink services.

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Chapter 15

Other Effects Considered

CONTENTS

APPENDIX

15. Other Effects Considered

15.1 Introduction

15.1.1 This chapter addresses topics that are not specifically addressed in the context of the main topic chapters elsewhere in this ES, or effects which are not considered to merit a chapter in their own right, but have been considered in line with requests from consultees, including through the Scoping Opinion.

15.1.2 This chapter therefore addresses the following topics:

- How waste generated by the Project will be dealt with;
- Public health;
- Aviation; and
- Health and safety.

15.1.3 Although not specifically requested within the Scoping Opinion or consultation, APL has also provided an assessment of Major Accidents or Disasters and Climate Change for completeness.

15.2 Waste

a) Construction

15.2.1 The amount of excavated material associated with the new section of Access Road is approximately 19,000m^3 and will be confirmed when further detailed cut and fill calculations are undertaken. It is expected, however, that the excavated material will be stored within the Laydown Area prior to use elsewhere on site or disposal in accordance with the Outline Site Waste Management Plan (SWMP). Management of waste will be controlled and managed via the SWMP which is presented in the Outline CEMP, Appendix 3.1.

15.2.2 For the purposes of the traffic assessment in **Chapter 12: Traffic, Transport and Access** it has been assumed that none of the excavated material will be used, as this is the worst case scenario. However, the suitability of the excavated material can only be determined during construction following a detailed geotechnical site investigation by the contractor.

15.2.3 The laying of the Electrical and Gas Connections will involve the excavation of a trench or drilling, temporary placement of the excavated soil and then backfilling with soil. The Gas Connection will require the construction of the AGI. No surplus waste materials are expected to arise from this activity if excavated material is reused onsite, which is normal practice. In the event that material is not suitable for re-use on-site it will be managed in accordance with the Outline SWMP.

15.2.4 The Project will operate in full accordance with the Waste Framework Directive (Ref. 15.1), together with the Environmental Permitting (England and Wales) Regulations 2016 (Ref. 15.2) and the Waste (England and Wales) Regulations 2011 (Ref. 15.3) (where relevant).

15.2.5 Section 5.14 of the Overarching National Policy Statement for Energy (NPS EN-1) (Ref. 15.4) requires that waste is managed through the 'waste hierarchy'. It explains the relationship with the environmental permitting regime and sets assessment principles to be used by the Secretary of State (SoS) in determining an application for development consent. The waste hierarchy consists, in order of preference, of:

- Prevention;
- Re-use;
- Recycling;
- Other recovery (e.g. energy recovery); and
- Disposal.

15.2.6 In accordance with this 'waste hierarchy', Section 4.3 of the South West Wales Regional Waste Plan (Ref. 15.5) suggests that the most effective environmental solution is to minimise the generation of waste. Where this is not practical, products should be reused. Failing that, products should be recycled and only if no other option is appropriate should waste be disposed of through incineration or landfill (paragraph 4.3.1). Regard is also given to Technical Advice Note 21 (TAN21) (Ref 15.6), and the National Waste Strategy (Ref 15.7).

15.2.7 The SWMP (within the CEMP, Appendix 3.1) demonstrates how waste volumes are to be minimised and managed during construction. Measures for controlling waste will include, amongst others, the appropriate storage of excavated spoil and testing for Waste Acceptance Criteria (WAC) to determine whether it can be re-used on or off-site.

15.2.8 The treatment of waste will follow the waste hierarchy set out in the Regional Waste Plan (Ref. 15.5), Technical Advice Note 21 (TAN21) (Ref. 15.6), and the National Waste Strategy (Ref. 15.7), with minimisation at source through construction planning and Project design, and the Engineering, Procurement, and Construction (EPC Contractor) will aim to reuse, or recycle waste where feasible.

15.2.9 The National Waste Strategy July 2015 Progress Report (Ref. 15.8) also confirms that there is good provision of waste management capacity in South West Wales to cover all types of waste arisings including industrial, construction and demolition, and hazardous waste. There are licensed thermal treatment, MBT (Mechanical Biological Treatment) and physical treatment facilities on the northern and eastern edges of the City of Swansea. There are also hazardous waste disposal services located at Swansea Enterprise Park.

15.2.10 The routes used for construction traffic entering and leaving the Project Site are described in Section 3.4 (d) of this ES. These routes will be used during construction for the removal of any waste materials.

b) Operation

15.2.11 During operation of the Power Generation Plant, a small amount of waste will arise. This generated waste will include waste which is both hazardous and non-

hazardous in nature. Appropriate treatment facilities exist locally, as discussed above. Final types and volumes have not yet been confirmed but will be restricted to the following:

- General office wastes;
- Used gas turbine air intake filters. These are typically replaced annually for generating station operating constantly and hence will require much less frequent replacement for this Project. The air filters contain approximately eight tonnes of plastic and steel a substantial proportion of which can be recycled or reused;
- Small quantities of water from compressor blade washing (five cubic metres (m^3) of water per month);
- Separated oil/sludge from any oil/water separators on site, and used oil, chemicals or chemical containers (approximately one tonne per year); and
- Other miscellaneous wastes (e.g. scrap metal, used gas bottles).

15.2.12 Only small quantities of potentially hazardous waste from the above list will be stored on the Generating Equipment Site at any time (final types and volumes have not yet been confirmed). Such substances will be held in secured containers under appropriate waste management legislation.

15.2.13 All waste management practices will be in full accordance with regulatory requirements under relevant legislation and the Waste Framework Directive (Ref. 15.1), and with industry best practice. Waste will be treated and disposed of by licensed contractors. Routes for waste removal would be as per operational access requirements described in Section 3.4 (d).

c) Decommissioning

15.2.14 A range of waste types are likely to arise during decommissioning and will include materials such as structural steel, metal cladding, and block and concrete waste, all of which will be suitable for recovery and reuse or recycling. Redundant generating equipment will include the turbine, ducting and pipework, generator and associated machinery and controls. These will be composed primarily of recyclable metals and other materials suitable for specialist commercial recycling and could also involve re-use of equipment elsewhere. It is not predicted that significant quantities of residual waste requiring disposal will arise during decommissioning.

15.2.15 Based on the above, it can be concluded that that no significant effects in relation to waste are predicted to arise either during construction, operation or decommissioning.

15.3 Public Health

15.3.1 In its response to the Scoping Report (letter dated 23rd July 2014), Public Health England (PHE) identified the local population as a sensitive receptor. In their S42 response dated 2nd January 2018, PHE noted that the PEIR was in line with current guidance and good practice. The effects on public health of impacts to air quality (Section 6.7), noise (Section 7.7), groundwater contamination (Section 9.7) and

land contamination (Section 10.6) have been assessed and the findings included in the relevant topic chapters of this ES. The relevant topic chapters also describe the risk assessment undertaken, the proposed mitigation measures, and any residual effects. These assessments are summarised below, along with health risks associated with electromagnetic fields.

a) Electromagnetic Fields

15.3.2 An Electromagnetic Field (EMF) is a physical phenomenon that is produced by electrically charged objects. EMFs comprise electric and magnetic fields:

- Electric fields: are the result of voltages applied to electrical conductors and equipment. Fences, shrubs and buildings easily block electric fields.
- Magnetic fields: are produced by the flow of electric current; however unlike electric fields, most materials do not readily block magnetic fields.

15.3.3 UK power developers rely on national guidelines in accordance with Government advice to ensure that new installations consider health risks based on current knowledge. In the absence of statutory regulations to limit the public exposure to power-frequency electric or magnetic fields, guidelines published in 1998 by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) (Ref. 15.9) are adopted in the UK as set out in National Policy Statement for Electricity Networks Infrastructure (EN-5) (Ref. 15.10).

15.3.4 A detailed EMF assessment has been undertaken and provided in Appendix 15.1. The below provides an overview of the likely significant effects.

- Underground cables, as proposed, do not give rise to electric fields above ground due to the shielding effect of the cable sheath. This is explained in the British Insulated Callender's Cables (BICC) Electric Cables Handbook (Ref. 15.11).
- In 1998, the ICNIRP issued guidelines reference level of 360 µT for public exposure (basic restriction) to magnetic fields. The EMF assessment (Appendix 15.1) predicts an additional 3.1 µT (at 1 m above ground) from the underground cable, which is considerably lower than the ICNIRP guidelines.
- The intensity of both electric fields and magnetic fields also diminishes with increasing distance from the source.
- The above-ground components of the Electrical Connection will also lie within the Substation where there are already EMFs present that were considered as part of the application for the Substation; they will not make a significant difference to the EMFs already present. It should also be noted that the general public will not spend any prolonged time in close proximity to the Electrical Connection or to the Substation.

15.3.5 The general public will thus not be exposed to any increase in EMFs from the Electrical Connection and there will be no significant effects arising from EMFs.

b) Air Quality

i. Construction and Decommissioning

15.3.6 The results of the air quality assessment are set out in **Chapter 6: Air Quality**.

15.3.7 The limited numbers of vehicle movements associated with the construction of the Project means that significant effects on human health from exhaust emissions are not anticipated. Vehicle movements during decommissioning are likely to be less than construction.

15.3.8 The likely significant effects on human health regarding air quality from construction and decommissioning of the Project relate to dust/particulate matter generated from construction activities (e.g. excavation for new foundations, Gas and Electrical Connections). These small particles (<10 µm) can give rise to effects on human health when inhaled.

15.3.9 With the implementation of dust control measures through the Outline Construction Environmental Management Plan (CEMP) (Appendix 3.1) the effects of the Project are predicted to be negligible in respect of human health and nuisance dust during construction and decommissioning. Additionally, the majority of particulates from construction and decommissioning activities settle within a very short distance of any construction site. Therefore, no significant effects are predicted in relation to human health.

ii. Operation

15.3.10 The main likely significant effects on human health in relation to air quality arising from operation of the Project are associated with the stack emissions from the combustion of natural gas in the Generating Equipment releasing emissions of NO_x.

15.3.11 However, modern gas-fired power plants are inherently clean and produce far fewer emissions than other fossil fuel power plants (e.g. coal) when compared on an energy output basis. Emissions of NO_x are strictly limited under national and international guidelines such as the Industrial Emissions Directive (IED) (Ref. 15.12) and the 2017 guidelines on Best Available Technologies (BAT) for large combustion plants (Ref. 15.13). Operation of the Generating Equipment will also be regulated by NRW under an Environmental Permit, which will limit emissions in line with national guidelines.

15.3.12 Stack height sensitivity testing was undertaken using the emissions data set out in **Chapter 6: Air Quality**, Table 6.7 and meteorological data from 2012-2016.

15.3.13 The appropriate stack height was determined as the point at which the change in maximum predicted annual and 99.79^{th} percentile NO_2 concentrations with each stack increase ceased to be significant.

15.3.14 This resulted in a conservative estimate of the minimum stack height (35 m) required for the adequate dispersion of emissions ensuring there would be no

impact from emissions on human health during operation. This would also ensure legislative limits are adhered to and any impacts to other identified receptors are prevented.

15.3.15 During the operational phase, there may be some emissions from vehicles accessing the plant for maintenance reasons. However, these will be Negligible and therefore will not have a significant effect on human health.

c) Noise

i. Construction and Decommissioning

15.3.16 Excavation for foundations for buildings across the Project Site, delivery of plant and excavation for laying the Gas and Electrical Connection during construction could lead to increases in noise in the surrounding area. This will, however, be a temporary source of noise. The noise assessment is presented in **Chapter 7: Noise and Vibration**.

15.3.17 Construction noise mitigation measures are included in the CEMP (Appendix 3.1). In order to keep noise effects from the construction phase to a minimum, all construction activities would be carried out in accordance with the recommendations of BS5228.

15.3.18 It is anticipated that core working hours during construction will be limited by a Requirement in the DCO to between 08.00 and 18.00 on weekdays, and between 08.00 and 13.00 hours on Saturdays and public holidays, unless otherwise agreed with CCS. Should it be necessary to work outside these core hours for certain activities, this would be with the prior written agreement of CCS. These limits will not apply during commissioning and testing of the Project.

15.3.19 With the implementation of mitigation measures to control noise from construction activities as set out above and in the Outline CEMP (Appendix 3.1), the residual effect at each sensitive receptor is therefore predicted to be **Negligible** during construction.

ii. Operation

15.3.20 During operation, noise could occur from the rotating components of the Generating Equipment (e.g. the Gas Turbine Generator) and there will be small amounts of noise generated by the AGI as it regulates the flow of gas from the National Gas Transmission System to the Generating Equipment.

15.3.21 There may also be a limited amount of noise from the Access Road from the small number of vehicles accessing the Generating Equipment Site for operation and maintenance activities.

15.3.22 Chapter 7: Noise and Vibration assesses the effects from the Power Generation Plant during construction as **Minor Adverse** and is therefore Not Significant.

15.3.23 In respect of noise and vibration during operation of the Power Generation Plant, the embedded mitigation to be incorporated into the design, include:

- The Gas Turbine Generator and major compressors are to be housed in acoustic enclosures. In addition, these will be housed within secondary acoustic enclosures specified at 75 dB(A) Sound Pressure Level at 1 m;
- Gas turbine air inlet filter and ventilation apertures are to be fitted with silencers, and designed such that all sensitive noise receptors benefit from screening and/or directivity corrections;
- Silencers are to be fitted in the exhaust stack. Due to the impracticality of screening stack noise, discharge noise will be controlled using these silencers, which will be tuned to attenuate low frequencies from the Gas Turbine Generator exhausts;
- All plant items will be controlled to minimise noise of an impulsive or tonal nature; and
- Noise breakout from the stack will be controlled using silencers.

15.3.24 A Requirement in the DCO (as set out in Document Reference 3.1) will impose maximum noise limits at Noise Sensitive Receptors which are not to be exceeded during operation of the Project.

15.3.25 The residual effect at each of the sensitive receptors is therefore predicted to be **Negligible** during operation and therefore not significant.

d) Pollution and Contamination

15.3.26 A desk based assessment has been carried out to assess the baseline geology and ground conditions underlying the Project Site in **Chapter 10: Geology, Ground Conditions and Hydrogeology**.

i. Construction and Decommissioning

15.3.27 During construction and decommissioning of the Project, the main potential impacts to human health are from; disturbance and mobilisation of potentially contaminated soils, groundwater, ground gas impacting on human health, and ground instability.

15.3.28 After implementation of good practice methods and mitigation measures such as working within and adhering to a detailed CEMP, an outline of which can be found at Appendix 3.1, the potential effects on human health are predicted to be **Negligible**, and therefore not significant.

ii. Operation

15.3.29 During the operational phase, there is the potential for the contamination of surface water resulting from the flushing of silts and hydrocarbons from areas of hardstanding within the Project Site. However, such impacts would be controlled by the embedded mitigation measures implicit within the Project, comprising industry standard/good practice and measures required to ensure legislative compliance, contained within an operational environmental management plan secured through the Environmental Permit (EP).

15.3.30 The effects following the implementation of embedded mitigation are therefore predicted to be **Negligible**, and therefore not significant.

15.3.31 The effects to Public Health including those effects from EMF, Air Quality, Pollution and Noise are therefore all considered not significant.

15.4 Climate Change

15.4.1 Climate change impacts have been considered throughout each of the individual topic chapters, where relevant. Climate resilience has therefore been built into the Project design to reduce effects from climate change. The following outlines the different topics associated with climate change and reference the relevant chapters within this ES:

- *Ecology*: Examples of the potential ecological consequences of climate change include the shifting of species ranges, loss of species at the limits of their ranges, eventual disruption of ecological processes, and damage to the wider functioning of ecosystems. However, these effects can be lessened on species through the strengthening of ecological networks to allow species to migrate as the climate changes. The proposed ecological mitigation (see **Chapter 8: Ecology**) and landscaping scheme (see **Chapter 11: Landscape and Visual Effects**) for this Project seeks to strengthen connectivity in the wider area and would therefore contribute to the efforts to provide opportunities for species to migrate as the climate changes.
- *Air Quality:* The effects of the Project on climate change from emissions have been assessed in **Chapter 6: Air Quality**. The Project's carbon emissions are considered marginal in relation to overall UK emissions and, therefore, considering current policy, impacts on climate change from carbon dioxide emissions are not considered significant.
- *Flood Risk:* The topic of climate change has also been addressed in **Appendix 9.1: Flood Consequences Assessment**, which considers flood risk at the Project Site. An allowance has been made for climate change (predicted more frequent and/or more severe rainfall events than historically has been the case) in the attenuation storage calculations of 20% above the 1 in 100 year flood event. This will mean sizing of culverts in the drainage design to allow for these potential more severe rainfall events. The impacts on climate change from flooding are therefore not considered significant.

15.5 Aviation

15.5.1 APL engaged with the Civil Aviation Authority (CAA), Ministry of Defence (MoD), Abertawe Bro Morgannwg University Health Board (which uses air ambulance services in relation to Morriston Hospital) and CCS between June and November 2014, and again between January and March 2018, to seek their views on the likelihood of the Project affecting aviation assets and infrastructure. In particular, their views were sought on the effect of construction of a stack at the Project Site of up to 40 metres (m) in 2014 and up to 45 m in 2018 (the anticipated maximum height at the time of Phase 1 and Phase 2 consultation respectively).

15.5.2 The MoD replied on 17th September 2014 to confirm that the Project falls outside of any safeguarding areas and therefore it has no objection to the Project. For completeness, the MoD were once again consulted during the Phase 2 consultation though the Project remained outside of safeguarding areas.

15.5.3 The CAA identified the potential to affect civil aviation in regard to the height of the stack with particular reference to Swansea Airport. As part of the EIA the safeguarding zone mapping held by CCS has been consulted and the Project falls outside these zones. As a result it is concluded that the Project will not affect civil aviation activity.

15.5.4 Abertawe Bro Morgannwg University Health Board confirmed in an email dated 23rd February 2015 that the stack will be just over 1.5 kilometres (km) away. As such they will not affect the (Bond Air Services) operations in and out of Swansea Morriston Hospital.

15.5.5 During Phase 2 consultation on 9th February 2018 the CAA responded similarly, suggesting that APL consult with Swansea Airport, local emergency services Air Support Units through the National Police Air Service (NPAS) organisation and the Wales Air Ambulance Charity. As suggested, APL then provided information to the NPAS organisation. In addition, CCS safeguard zone mapping was examined to once again confirm that the Project is located outside of the relevant safeguarding zone for Swansea Airport. Nevertheless, as a courtesy, details about the Project were shared with Swansea Airport for information purposes.

15.6 Health and Safety

a) Construction and Decommissioning

15.6.1 The site manager will have the day to day responsibility for maintaining Health and Safety throughout the construction period. They will produce a risk assessment and method statement detailing how they will minimise the risk. An approved procedure which will:

- Identify the significant Health & Safety impacts that can be anticipated;
- Assess the risks from these impacts;
- Identify the control measures to be taken and re-calculate the risk;
- Report where an inappropriate level of residual risk is identified so that action can be taken.

15.6.2 There is a small risk of construction workers coming into contact with contaminated soils and groundwater during construction.

15.6.3 There will be no access to construction areas by the general public. The Project Site will be secured to avoid unauthorised access.

15.6.4 Traffic safety will be promoted by all project personnel to prevention and control traffic related injuries. Speed restrictions will be imposed onsite. This will also minimise disturbance of bare surfaces.

15.6.5 Mitigation measures as set out in the Outline CEMP, include:

- Maintaining safe working practices and the use of correct and appropriate Personal Protective Equipment (PPE).
- Site welfare facilities will be made available;
- A protocol in the event that unexpected contaminated land is identified during ground investigation or construction; and
- Training requirements will be provided.

15.6.6 The employer will ensure that qualified first-aid can be provided at all times. Appropriately equipped first-aid stations will be easily accessible throughout the place of work.

b) Operation

15.6.7 Routine maintenance of the Generating Equipment would take place on average once every six months. Bi-annual inspections will also take place to assess general condition. Inspections to replace or refurbish combustion and turbine 'hot parts' equipment are typically carried out approximately every six years.

15.6.8 In the event of an issue with the Generating Equipment, alarms would signal any instance of abnormal operation. These alarms would not be audible externally. The plant would be shut down immediately in such instances and, if required, additional engineering staff would attend the Project Site. The Generating Equipment would not start up again until the issue had been resolved. Alarms would only be audible outside where there was an event affecting personnel safety such as a fire alarm. Operational maintenance is described in more detail in Section 3.4 of **Chapter 3: Project Site and Description**.

15.6.9 It is considered that effect on health and safety is **Negligible**, which is therefore not significant.

15.7 Major Accidents or Disasters

15.7.1 The Project's vulnerability to risk of major accidents and disasters is considered in the following sections. Details on appropriate prevention measures and mitigation for significant effects on the environment from such events are either provided in the sections below or within the referenced chapters.

a) Air Quality Events

15.7.2 In an air quality event where metrological conditions such as prevailing winds or inversion result in reduced air quality, the Project, as an emitter to air, has the potential to exacerbate the effect of the event. The effect of the Project on air quality has been considered within this ES. Details on the air quality assessment, prevention measures and appropriate mitigation to control the Project's emissions to air can be found in **Chapter 6: Air Quality**. Limits are also set within the Environmental Permit to regulate emission levels.

b) Engineering or Industrial Accidents

15.7.3 Due to fencing, and distance from residential areas, engineering and industrial accidents are limited to on-site workers. Existing legal protection for construction workers is considered to be sufficient to minimise any risk from major events to a reasonable level. Legislation in force to ensure the protection of workers in the workplace includes:

- Health and Safety at Work etc. Act 1974 (HSWA);
- The Management of Health and Safety at Work Regulations 1999;
- The Workplace (Health, Safety and Welfare) Regulations 1992;
- The Control of Substances Hazardous to Health Regulations 2002; and
- Construction (Design and Management) (CDM) 2015 Regulations.

15.7.4 Given the nature of natural gas there is an inherent risk of both fire and gas leak and explosion associated with the Project from its supply and use. The Project has been designed to comply with industry safety standards and to meet legislative requirements for safe operation.

c) Proximity to Other Third Party Infrastructure

15.7.5 The Project is in close proximity to other third party infrastructure features namely the Substation, Felindre Gas Compressor Station, Water Main, overhead lines, oil pipeline, along with other utilities such as the National Gas Transmission System.

15.7.6 Mitigation has been embedded via the design of the Project by implementing appropriate minimum distances and having due regard to the required standoff distances between the Project and these infrastructure features.

It is anticipated that potential major accidents and disasters resulting from third party infrastructure would be unlikely as the appropriate operational safety procedures relative to that installation would be implemented on a day to day basis, is regularly maintained and is closely monitored. In addition, the standoff distances from and to the Project would also take account of any effects from third party infrastructure on the Project. The Project is also being closed to the public and not in close proximity to residential areas/centres of population.

15.8 References

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Chapter 16

Summary of Residual Effects

CONTENTS

TABLES

16. Summary of Residual Effects

16.1 Introduction

16.1.1 This chapter provides a summary of the residual effects following the implementation of the embedded and any additional mitigation measures as required. Full details can be found in the respective topic chapters of this ES.

16.2 Summary of Mitigation Measures

16.2.1 Schedule 4, part 7 of the EIA Regulations requires an ES to include "*A description of the measures envisaged to prevent, reduce or where possible offset any significant adverse effects on the environment and*"

16.2.2 The mitigation, monitoring and enhancement measures included in this ES fall into one of the following categories:

- Embedded mitigation incorporated into the design, such as the height of the stack and layout of the Project;
- Embedded mitigation in methods of construction as included within the Outline CEMP (Appendix 3.1); and
- Additional mitigation measures identified as a result of the EIA, such as topic specific management plans.

16.2.3 The Mitigation Register contained within the Outline CEMP (Appendix 3.1) lists each item of mitigation relied on or identified in the ES and shows how it is secured, either in the Draft DCO (Application Document 3.1) or through other mechanisms.

16.3 Residual Effects

16.3.1 The residual effects of the Power Generation Plant, Gas Connection, Electrical Connection, and the Project as a whole following implementation of the mitigation measures have been assessed.

16.3.2 Each technical chapter contains a detailed account of residual effects and Table 16.1 summarises the main residual effects. The criteria for assigning the significance of effects are set out in section 4.6 of this ES and within relevant technical chapters where a different, topic-specific approach is followed.

16.3.3 Note, as set out in **Chapter 4: Approach to Environmental Impact Assessment**, Negligible effects are not considered to be residual and have therefore not been included in Table 16.1 below. **Minor** effects are not considered significant, and **Moderate** and **Major** Effects are considered significant.

16.3.4 The Project will result in the following beneficial residual effects:

- Socio-Economic: There will be **Negligible** beneficial effects on the labour market due to employment produced through the Project, during both construction, decommissioning and operation.

- Traffic: There will be temporary **Minor** beneficial effects on Weekday traffic on the B4489 (North) and M4 East Bound and West Bound Off-slip during the construction phase.
- Ground Conditions, Geology & Hydrogeology: There will be **Moderate** beneficial effects where the previously worked land and known mine workings are stabilised if / where discovered and remediated if required.

16.3.5 The ES has also identified a number of adverse effects that will mainly occur during construction and decommissioning as follows:

Table 16-1: List of adverse residual effects

Discipline	Residual Effect
Air Quality	• There will be no residual effects during construction, operation and decommissioning for all components of the Project.
Noise and Vibration	<u>Construction and Decommissioning of the Project</u> • The construction of the Project will have no more than a **Minor adverse** effect on Noise Sensitive Receptors which is therefore **not significant.** <u>Operation of the Power Generation Plant</u> • The noise from the operation of the Power Generation Plant at night will have at worst a **Minor adverse** effect which is therefore **not significant.**
Ecology	<u>Construction and Decommissioning of the Power Generation Plant</u> • There will be permanent **Minor adverse** habitat loss to Broadleaved Woodland, trees, and Semi-Improved Natural Grassland. • There will be a permanent **Minor adverse** effect on Invertebrates, Amphibians, Breeding Birds, due to potential loss of habitats, including breeding, foraging, and sheltering habitats. • There will be permanent **Minor adverse** habitat loss to Lletty-Morfil SINC, Marshy Grassland, removal of two ponds, and approximately 140 m of hedgerows. • There will be a permanent **Minor adverse** effect on Reptiles and Badgers caused by the removal of habitats. • There will be a temporary **Minor adverse** effect on Water Vole from disturbance from construction activities. • There will be a temporary **Minor adverse** effect on Otter from disturbance from construction activities • There will be potential for **Minor adverse** effects to Bats due to removal of habitat and disturbance to hibernation roosts, potential severance and disturbance from localised night time illumination in winter months. • There will be potential for **Minor adverse** effects to Breeding Birds due to localised night time illumination in winter months. <u>Construction of the Gas Connection</u> • There will be temporary **Minor adverse** habitat loss to Dense/Continuous Scrub, Semi-Improved Neutral

Discipline	Residual Effect
	Grassland. • There will be permanent **Minor adverse** habitat loss to trees. • There will be temporary **Minor adverse** effects Reptiles, Invertebrates, and Amphibians through the temporary loss of habitats. • There will be temporary **Minor adverse** effects to Breeding Birds from noise, loss of habitat and localised night time illumination in winter months. • There will be a **Minor adverse** temporary habitat loss to broadleaved woodland, marshy grassland, semi-improved grassland, one pond, and up to 180 m of Hedgerows. • There will be a **Minor adverse** effect to Badgers and Otters from potential to harm via construction activities. • There will be potential **Minor adverse** effects to Bats due to temporary removal of foraging habitat and disturbance from construction activities. • There is a **Minor adverse** effect from the potential for construction activities to spread invasive species. <u>Construction of the Electrical Connection</u> • There will be temporary **Minor adverse** habitat loss to broadleaved woodland and trees. • There will be a **Minor adverse** effect to Amphibians, Reptiles and Bats from construction activities. • There will be temporary **Minor adverse** effects to Breeding Birds from noise and localised night time illumination in winter months. • There is the potential for Otters to be effected due to construction of the Electrical Connection which is within 10 m of several watercourses. This is classified as a **Minor adverse** effect. <u>Operational Phase of the Power Generation Plant</u> • Bats and Invertebrates will experience **Minor adverse** effects from the operation lighting. • Reptiles will experience **Minor adverse** effects from risk of collision from the use of the Access Road by operational traffic. The residual effects from the construction, decommissioning and operation of the Project are therefore **not significant.**
Water Quality and Resources	<u>Construction and Decommissioning of the Project</u> • There is a potential effect from discharging water from construction excavations containing increased

Discipline	Residual Effect
	pollutants and sediment loads from movement of materials to the Loughor Estuary, which was considered to be **Minor adverse.** Operation of the Power Generation Plant Effects from surface water runoff from impermeable areas and disruption of water storage and flow from the presence of the Generating Equipment Site on the Afon Llan and its tributaries are predicted to be **Minor adverse.** The residual effects from the construction, decommissioning and operation of the Project are therefore **not significant.**
Geology, Ground Conditions and Hydrogeology	Construction and Decommissioning of the Power Generation Plant • The construction of the Power Generation Plant is predicted to have **Minor adverse** effects to mineral resources, structures from stability or ground conditions, land quality, human health and controlled waters. Construction of the Gas Connection and Electrical Connection • The construction of the Electrical Connection and Gas Connection are both predicted to have a **Minor adverse** effect on mineral resources for both coal and sand and gravel reserves. Operation of the Project • The operational phase is anticipated to have a **Minor adverse** effect on all receptors from the Power Generation Plant, Gas Connection and Electrical Connection, with the exception of Power Generation Plant structures which have a **Moderate beneficial** effect from the stabilisation of ground conditions as part of the presence of the Power Generation Plant. The residual effects from the construction, decommissioning and operation of the Project are therefore **not significant** with exception to the **Moderate beneficial** effect from stabilisation.
Landscape and Visual Effects	Construction and Decommissioning of the Power Generation Plant • Landscape Character around Project Site is **Moderate Adverse** • Landscape Character within 5 km study area **Minor Adverse** • Effects on visual amenity from viewpoints 9, 14, 15, 16 and 17 are **Moderate** or **Major adverse**, which is significant. All other remaining viewpoints conclude **Minor adverse** effects or **Negligible**. Construction of the Gas Connection • Construction of the Gas Connection would affect the Public Right of Way, north of Abergelli fach

Discipline	Residual Effect
	(viewpoint 9), resulting in a **Moderate adverse** effect. This is considered to be significant, however this effect is temporary as the trench would be reinstated post-construction. <u>Construction of the Electrical Connection</u> • Construction of the Electrical Connection would not have any significant effects on the landscape and visual receptors due to its location beside the Access Road and the temporary trench being reinstated after construction. <u>Operation of the Power Generation Plant</u> • The effect on Landscape Character around Project Site is **Moderate Adverse.** • The Power Generation Plant would impact the same five representative viewpoints (viewpoints 9, 14, 15, 16 and 17) as during construction, with **Moderate** to **Major** effect, which are therefore considered significant.
Traffic, Transport, and Access	<u>Construction and Decommissioning of the Power Generation Plant</u> • The majority of the transport links within the assessment will experience a **Minor adverse** effect during the peak hour for severance, pedestrian delay, pedestrian, amenity, fear and intimidation**.** • Effects to the footpaths which cross within the Project are considered to be **Moderate adverse** due to effects on the pedestrian and user experience**.** • There is predicted to be an increased delay on the B4489 (south) due to the Power Generation Plant which is considered **Minor adverse**, and a reduced delay on B4489 (north) M4 East Bound and West Bound Off-Slip which is considered **Minor beneficial**. <u>Construction of the Gas Connection</u> • The construction of the Gas Connection is predicted to cause **Minor adverse** effects from severance, pedestrian delay, pedestrian, amenity, fear and intimidation on the majority of receptors, and **Moderate** adverse effects on footpaths due to temporary closures and pedestrian experience during construction. • There is predicted to be an increased delay on the M4 WB Off-Slip and Pant Lasau Road which is considered **Minor adverse**, and a reduced delay on B4489 (north and scouth) M4 East Bound Off-Slip which is considered **Minor beneficial**. <u>Construction of the Electrical Connection</u> • The effect on footpaths during the construction of the Electrical Connection is expected to be **Moderate**

Discipline	Residual Effect
	adverse due to temporary closures and pedestrian experience. • There is predicted to be an increased delay on the M4 WB Off-Slip, A48 and Pant Lasau Road which is considered **Minor adverse**, and a reduced delay on M4 EB and WB Off-Slips which is considered **Minor beneficial**. The residual effects from the construction, decommissioning and operation of the Project are therefore **not significant** with exception to the **Moderate adverse** effect during construction and decommissioning from the footpath closure.
Historic Environment	<u>Operation of the Power Generation Plant</u> • It is anticipated that Project may be visible to the Scheduled Ancient Monument (Mynydd Pysodlyn Round Barrow) and therefore is considered to have a **Minor adverse** effect on the basis of its High value sensitivity, which is therefore **not significant.**
Socio-Economics	<u>Construction and Decommissioning of the Project</u> • The construction of all components of the Project is predicted to have little to no adverse impacts on tourism, business, and communities during construction. The National Route 43 is likely to experience **Minor Adverse** effects during construction, and is therefore **not significant.** <u>Operation of the Project</u> • During the Operational Phase of all components, the Project is predicted to have little to no adverse impacts on tourism, business, and communities. The National Route 43 is likely to experience **Minor Adverse** effects during operation, and is therefore **not considered significant.** • The Project as a whole is expected to have **Minor adverse** effect on community Infrastructure receptors which is **not significant.**

Chapter 17

Cumulative Effects

CONTENTS

TABLES

17. Cumulative Effects

17.1 Introduction

17.1.1 This chapter provides a summary of the likely significant cumulative effects associated with the Project, both for intra-project (where a single receptor is affected by multiple aspects of a project, worsening the effect) and inter-project effects (where effects are exacerbated due to other reasonably foreseeable projects either in construction, consented or yet to be built).

17.1.2 **Chapter 4: Approach to Environmental Impact Assessment** described the processes used to assess cumulative effects in this chapter. This chapter also provides the approach to the cumulative effects assessment, which has been included within Chapters 6-14 in the individual topic areas. A description of the Project is provided in **Chapter 3: Project and Site Description**,

17.2 Summary of Relevant Legislation, Planning Policy and Guidance

17.2.1 **Chapter 2: Regulatory and Policy Background** outlines the legislation and planning policy associated with the project, and that relevant to cumulative assessment is detailed below.

a) EIA Regulations

17.2.2 The EIA Regulations require a description of the likely significant effects of the Project on the environment, which should cover cumulative effects (Schedule 4, Paragraph 20). The inter-relationship of likely significant effects of the Project therefore needs to be assessed.

<u>Overarching National Policy Statement (NPS) for Energy (EN-1)</u>

17.2.3 The Overarching National Policy Statement for Energy (NPS EN-1) (Ref 17.1) states the following in relation to requirements for the assessment of cumulative effects:

Section 4.2.5 - *'When considering cumulative effects, the Environmental Statement (ES) should provide information on how the effects of the applicant's proposal would combine and interact with the effects of other developments (including projects for which consent has been sought or granted, as well as those already in existence).'*

17.2.4 Inter-relationships between effects are also referred to as follows:

Section 4.2.6 - *'The Infrastructure Planning Commission (IPC) [now the Planning Inspectorate (PINS))] should consider how the accumulation of, and interrelationship between, effects might affect the environment, economy or community as a whole, even though they may be acceptable when considered on an individual basis with mitigation measures in place.'*

17.2.5 In considering any proposed development, and in particular when weighing its adverse impacts against its benefits, the Secretary of State should take into account:

17.2.6 Section 4.1.3: *'its potential adverse impacts, including any long-term and cumulative adverse impacts, as well as any measures to avoid, reduce or compensate for any adverse impacts.'*

b) Guidance

17.2.7 Guidance that is applicable to each specific topic assessment is identified in the relevant Chapters (Chapter 6 to 14 of this ES).

17.2.8 PINS Advice Note Nine: Using the 'Rochdale Envelope' (Ref 17.2) states that:

> *'The inter-relationship between aspects of the proposed development should be assessed and careful consideration should be given by the developer to explain how inter-relationships have been assessed in order to address the environmental impacts of the proposal as a whole.'*

17.2.9 Advice Note Nine provides a definition of cumulative effects which are described as considering '…other proposed development within the context of the site and any other reasonably foreseeable proposals in the vicinity'.

17.2.10 Advice Note Nine also establishes that 'other developments' and more specifically 'major developments' need to be identified to assess the probable significant effects against the baseline position. Built and operational developments are included in this baseline. The 'major developments' that should be considered within the cumulative assessment include those that are:

- Under construction;
- Permitted application(s), but not yet implemented;
- Submitted applications(s) not yet determined;
- Projects on the Planning Inspectorate's Programme of Projects;
- Identified in the relevant Development Plan; and
- Identified in other plans and programmes (as appropriate) which set the framework for future development consents/approvals, where such development is reasonably likely to come forward.

17.2.11 This list is also included in the document Planning Act 2008: Guidance on the Pre-Application Process (Ref. 17.3). This document acknowledges that it is not always easy for applicants to assess potential cumulative effects due to the lack of information available and that a pragmatic approach should therefore be taken when determining what is feasible and reasonable.

17.2.12 PINS Advice Note Seventeen: Cumulative effects assessment (Ref. 17.4) provides advice on a 'staged process that applicants may wish to adopt in cumulative effects assessment for NSIPs'. The four assessment stages comprise:

1. Establish the NSIP's zone of influence and identify a long list of 'other development' which could potentially have effect interactions with the NSIP. This long list is presented in Table 4-6 of **Chapter 4: Approach to Environmental Impact Assessment**;

2. Develop a short list of 'other developments' which could potentially have effect interactions with the NSIP. Essentially analysing the 'long list' developed in stage 1 in more detail in order to include only those developments that have potential to give rise to significant cumulative effects by virtue of overlaps in temporal scope; due to the scale and nature of the 'other development'/receiving environment; or any other relevant factors. The projects for inclusion in each technical assessment (the 'short list') have been noted where applicable in the cumulative effects section of Chapters 6 to 14;

3. Gather available information on the shortlisted developments; and

4. Assessment of likely significant impacts arising as a result of the NSIP cumulatively with the short listed developments identified during stage 2 and available information gathered in Stage 3.

17.2.13 Table 3 of Advice Note Seventeen describes potential schemes for cumulative assessment in three tiers and recognises that for each tier, there is a decreasing level of detail likely to be available. The three tiers are:

i. Tier 1

- projects under construction (which are expected to be completed before construction of the Project and the effects of those projects are fully determined);
- permitted application(s), whether under the PA 2008 or other regimes, but not yet implemented; and
- submitted application(s) whether under the PA 2008 or other regimes but not yet determined;

ii. Tier 2

- projects on the Planning Inspectorate's programme of projects where a scoping report has been submitted.

iii. Tier 3

- projects on the Planning Inspectorate's programme of projects where a scoping report has not been submitted;
- Identified in the relevant Development Plan (and emerging Development Plans with appropriate weight being given as they move closer to adoption) recognising that much information on any relevant proposals would be limited; and
- Identified in other plans and programmes (as appropriate) which set the framework for future development consents/approvals, where such development is reasonably likely to come forward.

17.3 Methods

17.3.1 The methodology for cumulative assessment is outlined in **Chapter 4: Approach to Environmental Impact Assessment,** and summarised below.

17.3.2 The cumulative effects assessment for the Project follows the guidelines as set by the Institute of Environmental Management and Assessment (IEMA) and advice from PINS.

17.3.3 IEMA's guidelines recognise two major sources of cumulative effects:

- **Intra-project effects** – These occur where a single receptor is affected by more than one source of effect arising from different aspects of the Project. An example of an intra-project effect would be where a local resident is affected by dust, noise and traffic disruption during the construction of a scheme, with the result being a greater nuisance than each individual effect alone; and
- **Inter-project effects** – These effects occur as a result of a number of past, present or reasonably foreseeable proposed developments, which individually might not be significant, but when considered together could create a significant cumulative effect on a shared receptor, and could include developments separate from and related to the Project.

17.4 Consultation

17.4.1 Consultation regarding cumulative development undertaken in relation to the Project is listed in Table 17-1 below.

17.4.2 Through the Scoping Report and ongoing consultation with CCS, a long list was agreed for this ES, as presented in Table 4-6.

Table 17-1: Consultation summary for cumulative effects

Organisation	Comment	Response
SoS (Scoping Opinion, paras.3.69-3.70)	The SoS recommends that the Applicant consider the inclusion of the following developments identified by CCS: Mynydd y Gwair Wind Farm; Felindre Business Park; Brynwhilach Solar Park; and proposed sustainable urban village at Felindre	These proposals have been considered in relevant cumulative assessments and where still current are listed in **Chapter 4: Approach to Environmental Impact Assessment** of the ES. This is described in Section 17.6 in further detail.
CCS (email dated 23/10/17)	Email response from CCS giving agreement on an updated cumulative scheme list (from 2014 to October 2017) and details of the inclusion of additional schemes to consider.	The cumulative scheme list has been updated to include additional schemes, as listed in Table 4-6 in **Chapter 4: Approach to Environmental Impact Assessment**.
CCS response on	At a meeting on 6th February 2018,	Updated Table 4-6 and Figure

Organisation	Comment	Response
PEIR 2018 (February 2018)	CCS agreed that the end of February 2018 would be the cut-off date for the cumulative long list.	4.1.

17.5 Intra-project Effects

17.5.1 For the purpose of this chapter, consideration will be given to the additive or amplified effects resulting from environmental effects on 'shared receptors' and also where sources of effect from different components of the Project may combine to be of greater significance than when considered alone. Each of the topic specific chapters from Chapter 6 to 14 has outlined the cumulative effects from that specific individual topic including the mitigation required. These measures will be incorporated in the Outline CEMP in Appendix 3.1 where appropriate or secured via specific DCO Requirements.

17.5.2 As outlined in Chapters 6 to 14, there are unlikely to be any intra-project effects from the operation and decommissioning phases of the Project and so these are not considered further.

a) Shared Receptors

17.5.3 Shared receptors from individual elements of the Project (e.g. construction of Power Generation Plant, Gas Connection and Electrical Connection) are likely to be limited to nearby residential dwellings.

17.5.4 Potential effects at these shared receptors may comprise of the following:

- Noise effects;
- Views from residential dwellings;
- Potential effects on waterbodies and water based receptors from increased risk of sediment runoff and polluted discharges during the construction phase;
- Traffic effects from increased vehicle numbers during the construction phase; and
- Production of dust during the construction phase.

17.5.5 Due to the application of embedded and additional mitigation measures (such as the avoidance of habitats, the CEMP and topic specific management plans) which ensure that likely significant effects on shared receptors are unlikely, or the absence of any effects on shared receptors, the following topics are scoped out from the intra-cumulative assessment:

- *Ecology* - due to the embedded and additional mitigation, there is unlikely to be any cumulative effects from multiple components of the Project working simultaneously affecting several species. In addition, the total permanent habitat loss will be mitigated by the creation of the Ecological Mitigation Area and / or enhancements via the Landscape and Ecology Mitigation Plan (LEMP) (Figure 3.6) and Landscape and Ecology Mitigation Strategy (Appendix 3.4)

- *Socio-economic* - Absence of effects on shared receptors.
- *Historic Environment* – Absence of effects on shared receptors.
- *Geology, Ground Conditions and Hydrogeology* - Absence of effects on shared receptors.

17.6 Assessment of Potential Intra-project effects

17.6.1 Table 17-2 outlines the potential intra-project cumulative effects from the Project. As previously described in Chapters 6 to 14, it is considered unlikely that there will be any intra-project effects during operation or decommissioning, and so the assessment only considers construction stage effects.

Table 17-2: Intra-Project Cumulative Effects

Receptor with potential for multiple effects	Potential Intra-Project Effects	Comments
Residential	Dust, Noise, Traffic, Landscape	Construction of the whole Project will result in construction activity not previously present and additional vehicles along access routes. This creates an increase in traffic flows for all Project components, disruption of views and potential production of noise, dust and air pollutants from the Project as a whole during the construction period. This may have an effect on local communities and nearby residential dwellings. As embedded and additional mitigation is proposed within the individual topic chapters (such as a CTMP and CEMP), this will result in a **Minor adverse** in-combination effect, which is **not significant**

17.7 Inter-project Effects

17.7.1 A review of the planning applications and proposed developments within a 5 km study area around the Project was undertaken to scope any other projects that were considered to constitute 'major development' schemes within the Zone of Influence (ZoI) (the study area). A further review was undertaken to determine which developments had the potential to result in likely significant cumulative effects with the Project within each individual technical chapter.

17.7.2 Further to liaison with CCS, a "long list" of consented, in construction, or consented but not yet implemented developments, in addition to those allocated within the Local Development Plan (LDP), was agreed for the 2018 PEIR. The "long list" was then reviewed and refined, resulting in the following developments being identified as having likely cumulative effects.

17.7.3 There are no other major developments, Tier 1 or Tier 2 developments or applications present within the 5 km study area. There are 22 Tier 3 sites within the 5km study area which are the proposed strategic sites.

17.7.4 For the ES, the 'long list' was updated and agreed with CCS with a cut-off date of end February 2018 (to allow assessment and finalisation of the ES). This list is presented in Table 4-6 and located in Figure 4.1.

17.7.5 Sites where there is the potential to have cumulative effects are outlined as follows:

- The Mynydd Y Gwair windfarm (planning reference 2012/1221) is currently in construction and will be operational prior to the commencement of this Project. Therefore the potential cumulative effects are restricted to landscape and visual during operation of the windfarm. Construction traffic from the Project will not have any cumulative effects with operational traffic from the windfarm. It is considered that there will be no cumulative effects with the Mynydd y Gwair windfarm due to the intervening topography ensuring that there is no cumulative visual impact (as shown on the ZTV in Figure 11.8).
- Proposed sustainable urban village at Felindre and other allocated sites have been scoped out of the cumulative assessment as they are aspirational development opportunities which are not reasonably foreseeable to assess at this stage. Section 3.4.2 of the PINS Advice Note 17 (Ref 17.4) outlines that a cumulative assessment should be undertaken on a more qualitative basis if the status of knowledge is insufficient. As there are very limited details about the scale and nature of the proposed developments on which to form a robust basis for assessment, this has been the basis of scoping out these developments.
- The Brynwhilach Solar Park (2014/1022) is already constructed and complete. The potential cumulative effects are limited to landscape and visual during the operation of both this Solar Park and the Project, and this is discussed within paragraphs 12.10.22 to 12.10.32 of **Chapter 12: Landscape & Visual.**
- The Felindre Business Park is currently under construction (planning reference 2006/0773) with a second application (planning reference 2013/1835) approved but not yet implemented for the Felindre Park and Share Facility. The potential cumulative effects relate principally to traffic and transport on the B4489 during the operational phase of the Business Park and construction traffic for the Project, and landscape and visual effects, however there are no shared receptors. The cumulative effects relating specifically to landscape and visual and traffic and transport are discussed within **Chapter 12: Landscape & Visual** and **Chapter 13: Traffic, Transport & Access.**

17.7.6 To summarise, the Landscape Character around the Project Site and visual amenity viewpoints 9 and 15 are expected to experience cumulative effects during the construction phase of the Project due to views containing construction equipment, lighting and construction activities. This is expected to result in Minor adverse effects, which is not significant. During operation, both developments would experience cumulative effects due to changes in landscape character, landform and presence. However these are also considered to be **Minor adverse**, and therefore **not significant.**

17.7.7 The cumulative assessment for the individual Project components/full Project has identified that there will be no change in the significance of effects relating to the pedestrian experience (severance, pedestrian amenity, pedestrian delay, fear and intimidation). The residual cumulative effect will be **Minor** to **Moderate adverse.** Therefore, no mitigation is considered to be required.

17.7.8 In respect of driver delay, it has been identified that will be a change in the significance of effect, primarily during the AM peak hour. The residual cumulative effects will be the same for the individual Project components/full Project. During the AM peak hour, the residual cumulative effect will be **Minor adverse** on the B4489 (North), M4 eastbound and westbound off-slips, Pant Lasau Road and the A48 (Southwest), and **Major adverse** on the B4489 (South). During the PM peak hour, the residual cumulative effect will be **Minor adverse** on the A48 (Southeast) and **Major adverse** on Pant Lasau Road.

17.7.9 As detailed within the cumulative assessment of Chapters 6 to14, no other projects were considered to have potential to cause cumulative effects with the Project either in terms of shared receptors, shared access routes or simultaneous construction or operational phases. Therefore, it is unlikely that there will be any inter-project effects from other Projects in Table 4-6 and so effects are considered to be **not significant**.

17.8 Summary

17.8.1 The assessment of intra-effects of the Project on shared receptors has concluded that the effects are **Minor adverse**, and therefore are **not significant**.

17.8.2 The assessment of inter-project effects have been described, summarised and assessed in this chapter. It is concluded that the cumulative effects on shared receptors from individual topics and also cumulatively with the Project and other proposed developments are mostly **Minor adverse** effects, with the exception of cumulative effects relating to driver delay as these are considered to be at worse **Major adverse**, which is **considered significant**. However as these effects are temporary during construction, no further mitigation is required, and they do not add to the overall significance of the effects of the Project.

17.9 References

Ref. 17.1 Department of Energy and Climate Change. (2011). Overarching National Policy Statement for Energy (EN-1).[Online]. Available: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/47854/1938-overarching-nps-for-energy-en1.pdf [Accessed: 26/10/17].

Ref. 17.2 The Planning Inspectorate. (2012). Advice Note Nine: Rochdale Envelope. Version 2. [Online]. Available: https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2013/05/Advice-note-9.-Rochdale-envelope-web.pdf [Accessed: 30/10/17].

Ref. 17.3 Department for Communities and Local Government. (2015). Planning Act 2008: Guidance on the Pre-Application Process. [Online]. Available: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/418009/150326_Pre-Application_Guidan\ce.pdf [Accessed: 31/10/17].

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[Accessed: 19/12/17].