Chapter 6

Air Quality

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APPENDICES

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6. Air Quality

6.1 Introduction

6.1.1 This chapter identifies and assesses the preliminary findings of the potential effects that the Project, as described in **Chapter 3: Project and Site Description**, may have on air quality within the study area (detailed in Section 6.4 (c)) and identifies the mitigation measures that will be implemented to prevent or reduce potential adverse air quality effects, where possible.

6.1.2 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).

6.1.3 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.

6.1.4 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 PEIR.

a) Objectives of the assessment

6.1.5 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 (g)(ii)
	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 (d)(ii)
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 Section 6.7 (b), with detail on the Rochdale Envelope being applied on the Project as a whole in Section 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 for England, Scotland,

Wales and Northern Ireland (Ref. 6.2) 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 Air Quality Strategy (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. 6.6) 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 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 6-2 and Table 6-3. It should be noted that while PM_{10} and $PM_{2.5}$ 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

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

Pollutant	Limit Value	Measured as	Date to be achieved[1]
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 (NO_x)	30 µg/m^3 (for the protection of vegetation)	Annual Mean	31.12.2000
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

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

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.

6.3.15 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

6.3.16 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 2010 (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 2010 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.

6.3.17 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.

6.3.18 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.

6.3.19 Critical load 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).

6.3.20 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).

6.3.21 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.

6.3.22 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.

6.3.23 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

6.3.24 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 1 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

6.3.25 The overarching National Policy Statement for Energy (EN-1) (Ref. 6.14), the National Policy Statement for Fossil Fuel Electricity Generating Infrastructure (EN-2) (Ref. 6.15), the National Policy Statement for Gas Supply Infrastructure, Gas and Oil Pipelines (EN-4) (Ref. 6.16), and the 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.

Paragraph 5.2.1 states:

"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."

Paragraph 5.2.2 states that:

"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*."

Paragraph 5.2.7 states:

"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;
- Any potential eutrophication impact."

ii. Planning Policy Wales

6.3.26 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:

"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

6.3.27 City and County Swansea's (CCS's) Unitary Development Plan (UDP) (Ref. 6.19), adopted on 10th November 2008, is the councils most up to date Development Plan that will be used in the determination of planning applications. 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.

6.3.28 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."*

iv. City and County Swansea Air Quality Action Plan

6.3.29 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 2016 (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.

6.3.30 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 Power Generation Plant, 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 NO_x, 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 consideration:

- Operational emissions from the Gas Connection and Electrical Connection;
- Construction and operation traffic emissions; and
- Odour.

i. Traffic Emissions

6.4.4 In order to assess potential traffic impacts during construction, operation, maintenance and decommissioning the EPUK/IAQM Land-Use guidance (Ref. 23) 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 5 m or more and the road is within an AQMA.

6.4.5 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 been scoped out (see Appendix 6.1).

ii. Odour Assessment

6.4.6 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.

b) Consultation

6.4.7 The scope of the assessment has also been informed by ongoing consultation with statutory consultees throughout the design and assessment process, including CCS.

6.4.8 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 6.3 and Section 6.7 (b)

Consultee	Date	Comment	Response
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 (a)
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 contributions/exceedances. The SoS draws attention to the comments of NRW 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 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	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

Consultee	Date	Comment	Response
		within the ES.	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 Appendix 6.2 and in Section 6.7 (b).
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	This has been addressed in Section 6.7 (a)

Consultee	Date	Comment	Response
		and other public rights of way. Consideration should also be given to appropriate mitigation measures and to monitoring dust complaints.	
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.	

c) Study Area

6.4.9 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.

6.4.10 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.

6.4.11 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).

6.4.12 Outside of the study area defined above it is reasonable to conclude that construction impacts will be negligible.

6.4.13 The study area for the assessment of impacts during the operational phase depends on the receptors being considered. For ecological sites the EA guidance 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.

6.4.14 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 and agreed 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

6.4.15 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. 6.24). 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

6.4.16 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 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

6.4.17 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.

6.4.18 A visual representation of the meteorological data used in the assessment is shown in the wind roses presented in Figure 6-1.

iii. Terrain

6.4.19 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

6.4.20 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

6.4.21 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.

6.4.22 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. 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.

6.4.23 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.

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 inlet filter	265551.8	201288.3	27.0	17.8	16.0	124.5
Building 2 - Air inlet ducts	265557.5	201296.5	19.5	15.3	3.92	124.5
Building 3 - Gas turbine compartment	265562.3	201303.5	15.0	13.1	12.8	124.5
Building 4 - Exhaust Diffuser	265569.5	201314.1	11.0	10.0	12.5	124.5
Building 5 - Stack	265576.5	201324.2	14.0	12.0	12.0	124.5

** Indicative dimensions.*

vi. Modelled Domain

6.4.24 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.

6.4.25 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-lasau	266059	200427	9.6	11.6	7.8	239
20	Pant-lasau	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
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

6.4.26 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 Habitat Regulation Assessment (HRA) will accompany **Chapter 8: Ecology** and as such are not repeated within this chapter.

viii. Oxides of nitrogen to nitrogen dioxide conversion

6.4.27 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.

6.4.28 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. 6.25), 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

6.4.29 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.

6.4.30 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.

6.4.31 Relevant Critical Loads (acid and nitrogen) for each sensitive ecological area are detailed within the HRA which accompanies the **Chapter 8: Ecology** and as such are not repeated within this chapter.

x. Specialised Model Treatments

6.4.32 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

6.4.33 In accordance with PINS Advice Note 9 (Rochdale Envelope) (Ref. 6.26), the assessments presented in this PEIR 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.

6.4.34 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.

6.4.35 The Power Generation Plant 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.

6.4.36 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.

6.4.37 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.

6.4.38 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.

$$\frac{\text{2,250 (maximum hours of operation)}}{\text{8,760 (total hours in a year)}} = 0.257$$

6.4.39 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.

6.4.40 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

6.4.41 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.

6.4.42 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.

6.4.43 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. Note: 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.

6.4.44 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).

6.4.45 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

6.4.46 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).

6.4.47 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. 6.27). 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.

6.4.48 The assessment has been undertaken in accordance with the methodology set out in the IAQM (Ref. 6.28) 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.

6.4.49 For the Project this will include the areas of specific construction associated with the Power Generation Plant 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**.

6.4.50 A qualitative assessment has been undertaken to assess the significance of any effects on sensitive receptors associated with the demolition and construction phase.

6.4.51 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.

6.4.52 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.

6.4.53 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 3.1) and includes measures comprising good site practice to avoid or reduce the potential for dust impacts.

e) Sensitivity

i. Construction Dust

6.4.54 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.

6.4.55 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

6.4.56 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 PM_{10} concentrations be considered. The IAQM Sensitivity Criteria are presented in Table 6-11 to Table 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
	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

6.4.57 While there is no specific guidance as to the specific sensitivity of different receptor types, Defra's LAQM, TG(16) (Ref. 6.29) 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 one hour or longer.	Kerbside sites where the public would not be expected to have regular access.
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

6.4.58 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 m^3; 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 m^3 – 50,000 m^3; Potentially dusty construction material; or Demolition activities 10-20 m above ground level.
	Small	Total building volume <20,000 m^3; 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 m^2; 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 m^2; 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.
	Small	Total site area <2 ,500 m^2; 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.

Activity	Magnitude	Criteria
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

6.4.59 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
	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

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	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

6.4.60 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.

6.4.61 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).

6.4.62 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 significant change.

6.4.63 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.

6.4.64 A significant impact can be anticipated should the assessment conclude unmitigated impacts are of medium or high risk, however, only if suitable mitigation measures not be applied to control dust emissions with even sites where only a low risk of impacts requiring mitigation to ensure that impacts are not significant. 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

6.4.65 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. 6.24) 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 (µg/m^3)	Change in Annual Mean Concentration of NO_2 (µg/m^3) and Percentage (%) as a proportion of the Objective				
	<0.2 µg/m^3 (0%)	0.2-<0.6 µg/m^3 (1-2%)	0.6-<2.2 µg/m^3 (2-5%)	2.2 -<4 µg/m^3 (6% - 10%	>4 µg/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 (µg/m^3)	Predicted Peak 8-Hour Rolling CO Process Contribution (µg/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

6.4.66 The EA's Risk Assessment guidance (Ref. 6.29) 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.

6.4.67 Impacts of the proposed Project have been assessed relative to both the adapted IAQM/EPUK criteria and EA screening criteria.

Ecological Receptors

6.4.68 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".

6.4.69 For Sites of Special Scientific Interest (SSSIs) the assessment needs to determine whether the installation is "likely to damage" the Project Site.

6.4.70 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.

6.4.71 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.

6.4.72 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.

6.4.73 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.

6.4.74 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 and Defra website.

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.

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/m^3) at the Application Site in 2016

Pollutant	Mapped Grid Square		Annual Mean Concentrations (µg/m^3)
	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 ($\mu g/m^3$)

Monitoring Site	Monitored NO_2 Concentration ($\mu g/m^3$)	Mapped Grid Square		Mapped NO_2 Concentration ($\mu g/m^3$)
		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 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 as part of the scoping agreement 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**, 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. Generation Plant Site

6.7.1 The sensitivity of the human receptors to the Generation Plant 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 Generation Plant 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 of the Power Generation Plant. The dust emission potential for construction of the Power Generation Plant is assessed as being large during earthworks due to the scale of the Power Generation Plant Site and the construction of a new Access Road from the Substation to the Generating Equipment Site. Construction emissions are classed as small due to the internal area of the buildings on-site, <25,000 m^3, and the expectation that a number of the buildings/structures will be prefabricated. Emissions from trackout have a large dust magnitude due to the number of vehicles which may be operating at the Power Generation Plant 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 (to the west from the B4489).

Table 6-25: 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

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 Power Generation Plant with no mitigation.

6.7.4 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 imbedded mitigation already proposed, as set out in the Outline CEMP, is taken into account.

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.

6.7.9 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 and once the imbedded mitigation already proposed, as set out in the Outline CEMP, is taken into account.

iii. Electrical Connection

6.7.10 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.

6.7.11 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.

6.7.12 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

6.7.13 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.

6.7.14 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

6.7.15 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.

6.7.16 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

6.7.17 In this section, the modelled contributions of the Power Generation Plant 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.

6.7.18 For comparison with the air quality objectives, all hourly concentrations of NO_2 are presented as the 99.79th percentile of hourly mean concentrations. This represents the 19th highest hourly concentration in the year which takes into account the 18 exceedances of the standard allowed under EU and UK regulations.

6.7.19 Furthermore, the model results are presented as the contribution of the Generating Equipment Plant 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 operating at full load limited to the maximum annual operations of 2,250 hours.

6.7.20 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 (see Figure 6.3 for illustrated Receptor Location). 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

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

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?
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
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

6.7.21 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 are included.

6.7.22 Table 6-30 presents the maximum predicted 99.79^{th} 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 (see Figure 6.3 for illustrated Receptor Location).

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

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	4.8	2.4%	Yes
1	3.1	1.5%	Negligible	3.4	1.7%	Yes
2	2.2	1.1%	Negligible	2.5	1.3%	Yes
3	1.9	0.9%	Negligible	2.2	1.1%	Yes
4	2.4	1.2%	Negligible	2.8	1.4%	Yes
5	2.2	1.1%	Negligible	2.6	1.3%	Yes
6	3.9	1.9%	Negligible	4.3	2.1%	Yes
7	3.5	1.8%	Negligible	3.9	2.0%	Yes
8	2.3	1.1%	Negligible	2.6	1.3%	Yes
9	1.4	0.7%	Negligible	1.9	0.9%	Yes
10	0.3	0.1%	Negligible	0.7	0.3%	Yes
11	2.8	1.4%	Negligible	3.2	1.6%	Yes
12	2.7	1.4%	Negligible	3.0	1.5%	Yes
13	2.1	1.0%	Negligible	2.4	1.2%	Yes
14	1.7	0.8%	Negligible	2.0	1.0%	Yes
15	1.3	0.6%	Negligible	1.6	0.8%	Yes
16	1.4	0.7%	Negligible	1.7	0.9%	Yes
17	1.5	0.7%	Negligible	1.8	0.9%	Yes
18	1.6	0.8%	Negligible	2.1	1.0%	Yes
19	1.4	0.7%	Negligible	1.9	1.0%	Yes
20	1.1	0.6%	Negligible	1.5	0.8%	Yes
21	0.1	0.1%	Negligible	0.8	0.4%	Yes
22	0.4	0.2%	Negligible	1.1	0.5%	Yes
23	1.0	0.5%	Negligible	1.7	0.9%	Yes
24	1.0	0.5%	Negligible	1.3	0.7%	Yes
25	1.6	0.8%	Negligible	1.9	1.0%	Yes
26	1.7	0.8%	Negligible	2.0	1.0%	Yes
27	2.0	1.0%	Negligible	2.4	1.2%	Yes
28	1.9	0.9%	Negligible	2.3	1.1%	Yes

6.7.23 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 are included.

6.7.24 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 (see Figure 6.3 for illustrated Receptor Location).

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

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

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
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

6.7.25 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 $\mu g/m^3$ 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 6-31 also presents the PEC to illustrated total PECs are also well below the AQS objective even once the contributions from the Power Generation Plant are included.

6.7.26 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.

6.7.27 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.

6.7.28 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 location. 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.

6.7.29 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

6.7.30 The HRA has concluded that no likely significant effects are predicted to occur from the Project.

c) Decommissioning

6.7.31 The sensitivity of the human receptors to the Power Generation Plant 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.

6.7.32 The decommissioning phase will involve the demolition of the Generating Equipment and removal or hardstanding and restoration of the site to its pre-development condition. There is no construction associated with the restoration phase. The emission potential for demolition of the Power Generation Plant is assessed as being large small due to the internal area of the buildings on-site, <25,000 m3, and the expectation that a number of the buildings/structures will be prefabricated and of metal construction rather than cement. Emission during earthworks are anticipated to be large due to the size of the Power Generation Plant site and the need to restore the Access Road from the Substation to the Generating Equipment Site, however, it is anticipated 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 Power Generation Plant Site.

6.7.33 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	Small	Negligible	Negligible	Negligible
Earthworks	Large	Low	Low	Low
Construction	N/A	N/A	N/A	N/A
Trackout	Large	Low	Low	Low

6.7.34 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 restoration phase of the Power Generation Plant with no mitigation. Table 6-32 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 imbedded mitigation already proposed, as set out in the CEMP, is taken into account.

6.8 Mitigation and Monitoring

6.8.1 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/Decommissioning

6.8.2 The construction dust assessment concluded that nuisance dust, human health impacts and ecological impacts will be negligible to low. 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.

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
Power Generation Plant					
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 Power Generation Plant, Gas Connection and Electrical Connection upon receptors to air quality are limited to those assets listed in Table 6-33 and Table 6-34, and as such no significant impacts are predicted from the Project.

6.10 Cumulative and In-Combination Effects

a) Construction/Decommissioning

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.

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