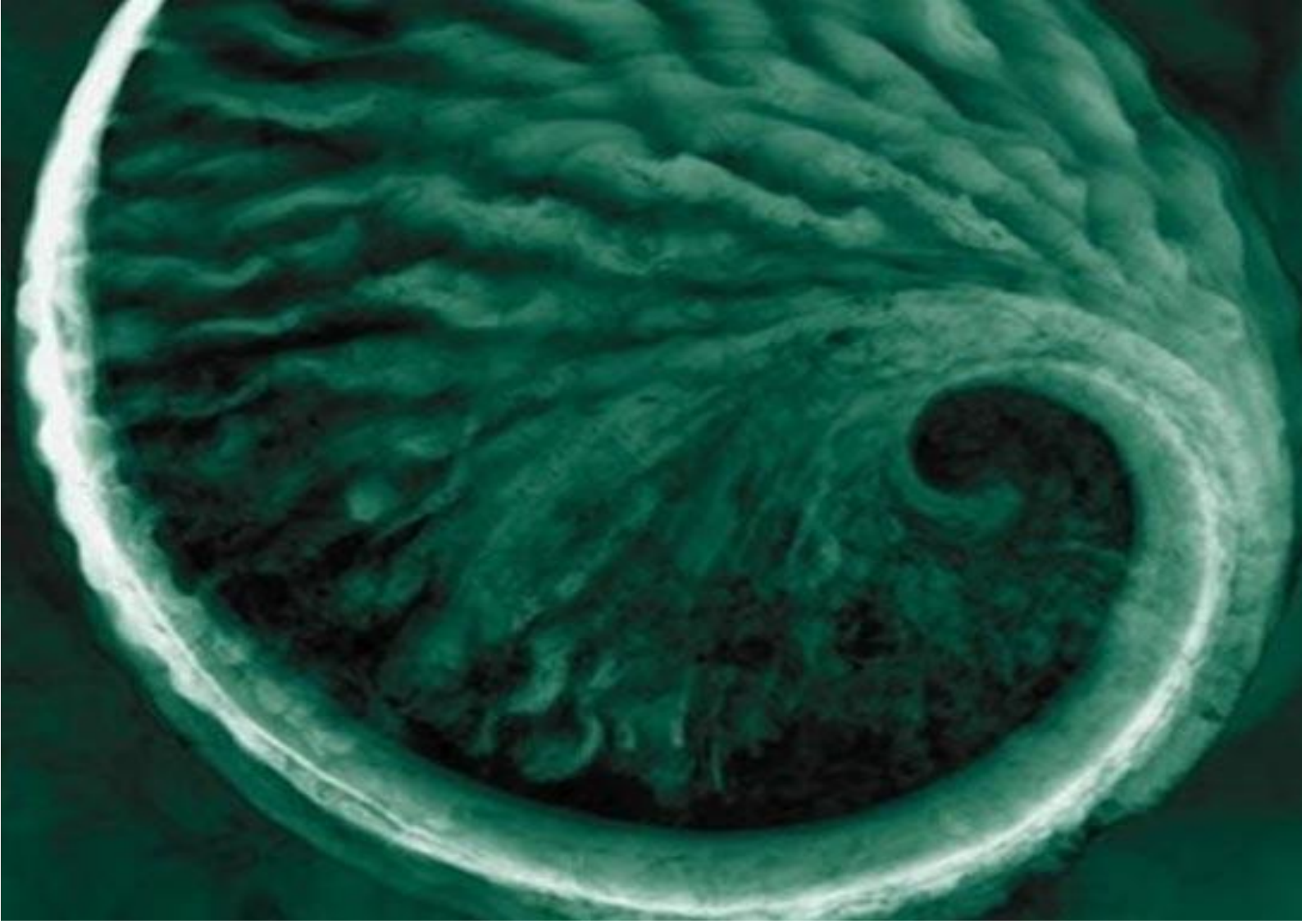

Air Quality Impact Assessment

CWL01 & 02 – Microsoft Ltd

3 November 2023

Project No.: 0657169

The business of sustainability

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Signature Page

3 November 2023

Air Quality Impact Assessment

CWL01 & 02 – Microsoft Ltd

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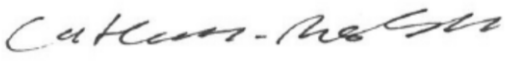

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CONTENTS

List of Tables

List of Figures

Acronyms and Abbreviations

Name	Description
AEGL-1	Acute Exposure Guidelines Level 1
APIS	Air Pollutant Information System
AQIA	Air Quality Impact Assessment
AQMA	Air Quality Management Area
AQS	Air Quality Standard
BAT	Best Available Techniques
CL	Critical Load
EA	Environment Agency
EPR	Environmental Permitting (England and Wales) Regulations 2016
ERM	Environmental Resources Management Limited
FAQ	Frequently Asked Questions
MAGIC	Multi-Agency Geographic Information for the Countryside
NCC	Newport City Council
NH_3	Ammonia
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
NRW	Natural Resource Wales
PC	Process Contribution
PEC	Predicted Environmental Concentration
PM	Particulate Matter
SAC	Special Area of Conservation
SCR	Selective Catalytic Reduction
SCAIL	Simple Calculations of Atmospheric Impact Limits
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
USEPA	US Environmental Protection Agency

1. INTRODUCTION

Microsoft is proposing to construct and operate a data centre on the former Quinn Radiators site in Newport. Continuity of electrical power is critical for the data centre to ensure that there is no data loss. As such, one of the key design elements of the data centre is the provision of back-up power to provide electricity in the event of mains grid failure. Standard data centre design is to provide diesel engine generators.

In order to ensure that the generators will operate correctly, routine testing of engines is undertaken on a periodic basis. This testing encompasses operation of single engines and multiple engines. A previous iteration of the data centre design utilised unabated generators. This update reflects the requirement for NO_x abatement to be fitted, in the form of Selective Catalytic Reduction (SCR).

The operation of these engines, both in testing and in emergency operation, results in emissions to air. Principal emissions of interest are: nitrogen dioxide (NO_2) and particulate matter (as PM_{10} for human health; and oxides of nitrogen (NO_x) for sensitive ecology. In addition, ammonia is also an emission of interest as there is slippage form the SCR used to abate NO_x emissions.

The Quinn site has nearby environmental sensitivities:

- There are nearby residential areas, with a particular focus on the 1-hour NO_2 air quality standard (AQS).
- There are Air Quality Management Areas (AQMAs) within a couple of kilometres to the north, these being declared as the annual mean NO_2 air quality standard is not being met. The focus here will be on the overall long-term increment to NO_2 in the AQMAs as a result of data centre activity.
- There are statutory designated sites within 180 m to the south where the baseline pollution burden is already above the Critical Load[1]. The focus here are NO_x emissions, and ammonia where SCR is used, both in terms of ambient air quality as well as acid deposition and nutrient nitrogen deposition.

[1] Critical Loads are defined as the highest load that will not cause chemical changes leading to long-term harmful effects in the most sensitive ecological systems.

1.1 Regulatory Context

Regulatory Context, NCC Consultation and Permitting Requirements

In recent years, the air quality issues associated with data centres have received more attention from national regulators. The regulators are Natural Resources Wales (NRW), the Environment Agency for England (EA) for operational permitting (Environmental Permitting (England and Wales) Regulations 2016) and local authorities for construction/land-use consenting. This increased profile reflects both the expansion of the number of data centres and also the trend towards generally bigger data centres with the requirement for greater back-up power capacity. Regulatory guidance for data centres is this evolving. As such, the Planning, and the subsequent Environmental Permit, application processes will need to be cognisant of an evolving and changeable regulatory framework.

There have been discussions with Newport City Council (NCC) and NRW have been informed of the project and the current understanding of the projects requirements for an Environmental Permit. Currently, NRW have limited guidance available for data centres, however, decision notices provided by NRW detail the regulatory guidance they consider for BAT.

BAT performance for a similar project has been defined by NRW as follows:

- As each individual plant is subject to the Medium Combustion Plant Directive (MCPD), the requirements of the Directive (Schedule 25A of EPR) may be considered minimum standard, noting that exemptions apply for plant operating for a limited number of hours.
- As the most relevant BAT conclusions, NRW may refer to the Large Combustion Plant (LCP) BAT conclusions “for information” if applicable.
- The above is supplemented by any BAT definitions in NRW regulatory guidance:
    - Natural Resources Wales “BAT for [installation] combustion plant outside of the scope of the LCP BREF – Interim Position”, 30th April 2019.
    - Environment agency guide “Data Centre FAQ Headline Approach; Draft Version 8.0 (17/07/17)” – adopted by NRW in the above document.
    - Subsequently, the EA have released further versions of this document, up to Draft Version 21 (15/11/22) – NRW will generally follow updates unless replaced by other NRW guidance or policy.
    - The Industrial Emission Directive (IED) may provide indicative BAT, for example the maximum annual duration of testing operations.
- Article 18 of the IED may require measures “beyond BAT” to be taken if required in order to achieve compliance of air quality standards

NRW through decision notices have confirmed that they will follow Environment Agency for England (EA) guidance. The EA guidance takes the form of a Frequently Asked Questions (FAQ) document, developed in response to the numerous data centres being permitted in England[2].

The points noted below are based on the current EA FAQ guidance and highlight the indicative Best Available Techniques (BAT) expected to be demonstrated as part of a permit application for a new development:

- Diesel engine generators must meet “2G” as a minimum. In practice this is meeting a NO_x emission limit of no more than 2000mg/Nm^3 (@5% oxygen) ±10%.
- As a rule, the AQIA must demonstrate that air quality standards are not exceeded.

[2] EA Data Centre FAQ Headline Approach to data centre operations v21 Nov 2022

- If the NO_2 1 hour air quality standard is potentially exceeded there is a mechanism whereby a statistical analysis can be undertaken to prove that the risk of this occurring in practice is negligible.
- If the NO_2 1 hour air quality standard is potentially exceeded and the statistical analysis suggests that impacts may be significant, a second-tier assessment based on an assessment against the United States Environmental Protection Agency (USEPA) Acute Exposure Guideline Limit (AEGL) thresholds has also been undertaken in some circumstances. This is highly unlikely to be an acceptable threshold for engine testing impacts and/or on a new data centre but may be applicable for emergency operations.
- The EA is advising that it intends to decree that SCR is installed for large aggregated standby generators under the BAT review cycle (i.e. 4-8 years). The latest FAQ states that new generators should as a minimum be SCR. As such the impact of SCR on diesel emissions has been considered for this assessment.

As recognised in the EA FAQ, in London a number of boroughs have begun to set specific Planning Conditions for data centre engine emissions. In ERM's experience this has resulted in Local Authorities with AQMAs setting Planning Conditions for back-up generator engines that require engines meet limits of either 195mg/Nm^3 or 150mg/Nm^3 NO_x necessitating the use of SCR.

1.2 Local Air Quality Management (LAQM)

Part IV of the Environment Act 1995 requires local authorities to periodically 'Review and Assess' the quality of air within their administrative area. The reviews have to consider the present and future air quality and whether any air quality objectives prescribed in regulations are being achieved or are likely to be achieved in the future.

Where any of the prescribed air quality objectives are not likely to be achieved the authority concerned must designate that part an Air Quality Management Area (AQMA).

For each AQMA, the local authority has a duty to draw up an Air Quality Action Plan (AQAP) setting out the measures the authority intends to introduce to deliver improvements in local air quality in pursuit of the air quality objectives. Local authorities are not statutorily obliged to meet the objectives, but they must show that they are working towards them.

The Department of Environment, Food and Rural Affairs (DEFRA) has published technical guidance for use by local authorities in their Review and Assessment work. This guidance referred to in this chapter as LAQM.TG(22), was used where appropriate in the assessment.

1.3 Local Review and Assessment of Air Quality

Newport City Council has investigated air quality within its area as part of its responsibilities under the LAQM regime. There are 11 AQMAs within the council boundary. The closest AQMAs to the Project Site are the Glasllwch AQMA along the M4 and Caerphilly Road which are both approximately 2.8 km north. The extent of the AQMAs are shown in Figure 1.1.

Figure 1.1: Location of nearest AQMAs

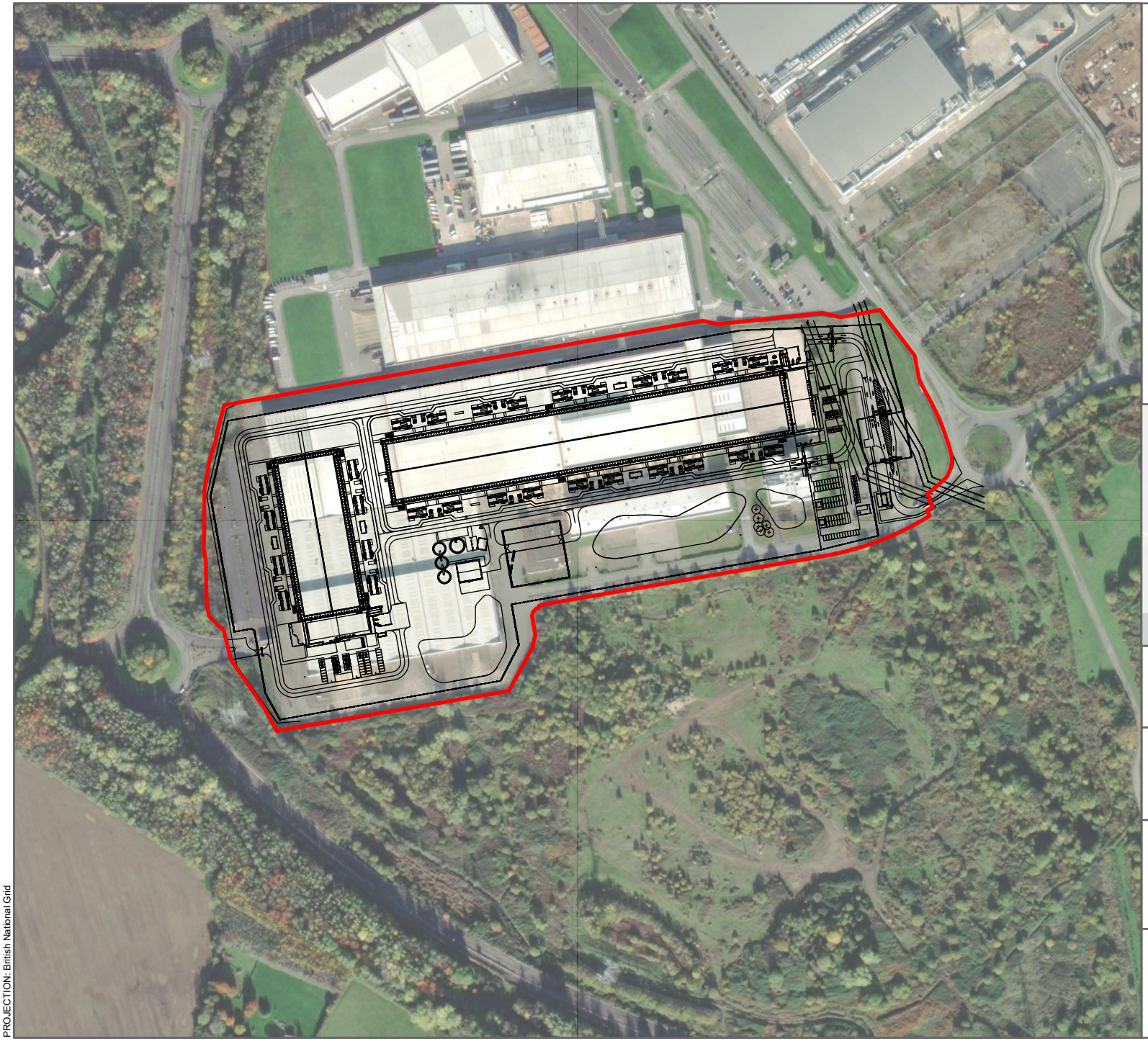
2. SITE DESCRIPTION

2.1 Site Location

The Site is located within the Newport Imperial Park in South Wales, amongst other commercial buildings in the area. This strategic employment area comprises offices, including a serviced research and development centre, small, modern production units, large manufacturing and warehousing operations and Europe's largest Tier 3 Data Centre.Major companies already operating at Imperial Park include Gocompare.com, Vantage, Smiths News, the NHS and Beachcroft.

The terrain in the area is flat with no steep slopes in close vicinity of the Site.

The data centre will comprise of two warehouse-style buildings containing the data storage equipment. These will be named CWL01 and CWL02 respectively. Their location is provided in the figure below:



Site Boundary

0 50 100 150 200 250

Metres

N

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Figure 2.1
New Site Layout

ERM

PROJECTION: British National Grid

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2.2 Sensitive Human Receptors

Error! Reference source not found.Sensitive human health receptors have been identified in the vicinity of the site and are summarised in Table 2.1Error! Reference source not found. below.

Table 2.1: Nearest Identified Sensitive Human Potential Receptors

Receptor name	Type of receptor	X,Y coordinates	Approximate distance from the CWL01 & CWL02 generators (km)
Residential properties 1	Residential	327665, 183549	0.6
The Parc Golf Club	Golf Club	327224, 183648	0.83
Alan's Jungle Plants	Nursery	326710, 183891	1.21
Greenfields High School	School	327929, 185856	1.68
Residential properties 2	Residential	327362, 184426	0.58
Residential properties 3	Residential	327453, 184367	0.48
Residential properties 4	Residential	327402, 184287	0.46
Residential properties 5	Residential	327243, 184522	0.7
Residential properties 6	Residential	327374, 184585	0.63
Residential properties 7	Residential	327435, 184639	0.61
Residential properties 8	Residential	327535, 184653	0.56
Residential properties 9	Residential	328303, 184904	0.81
Residential properties 10	Residential	328421, 184886	0.85
Residential properties 11	Residential	328471, 184810	0.83
Residential properties 12	Residential	328719, 184758	0.99
Residential properties 13	Residential	328795, 184718	1.04
Residential properties 14	Residential	328808, 184644	1.02
Residential properties 15	Residential	328844, 184552	1.03
St Joseph's Roman Catholic High School	School	329091, 184750	1.32
St Brides Medical Centre	Medical Centre	329423, 184706	1.62
Residential properties 16	Residential	328790, 184227	0.9
Residential properties 17	Residential	328934, 184097	1.06
Residential properties 18	Residential	328924, 184266	1.04
Residential properties 19	Residential	329189, 184385	1.33

2.2.1 Ecology

The ecological designated sites listed in Table 2.2 are within 10 km of the Site (from MAGIC website[3] and SCAIL tool[4]). Sites which are italicised are within 10 km but were not assessed while site listed in green was assessed in this AQIA.

Table 2.2: Nearby Ecological Designated Sites

[3] https://magic.defra.gov.uk/MagicMap.aspx
[4] https://www.scail.ceh.ac.uk/cgi-bin/combustion/input.pl?action=load&session=595185997

Name of Site	Type
Coed-y-Darren	*SSSI*
Gwent Levels – Nash and Goldcliff	*SSSI*
Severn Estuary (Wales)	*SPA,SAC,SSSI*
Llanishen and Lisvane Reservoir Embankments	*SSSI*
Dan y Graig Quarry, Risca	*SSSI*
Gwent Levels – St. Brides	SSSI
Gwent Levels – Rumney and Peterstone	*SSSI*
Gwent Levels – Whitson	*SSSI*
Gwlyptiroedd Casnewydd / Newport Wetlands	*SSSI*
Henllys Bog	*SSSI*
Lisvane Reservoir	*SSSI*
Rhymney River Section	*SSSI*
Rumney Quarry	*SSSI*
Ruperra Castle and Woodlands	*SSSI*
River Usk (Lower Usk) / Afon Wysg (Wysg Isaf)	*SAC, SSSI*
Penylan Quarry	*SSSI*
Plas Machen Wood	*SSSI*

The assessment was focused on Gwent Levels – St Brides SSSI, which was the closest to the site at approximately 240m from the emissions stacks and therefore would be assumed to show the greatest impacts.

2.3 Engines Operation

The data centre will have 31 diesel backup generators which will be installed to provide emergency power in the event of a grid supply failure. These engines will not be used to routinely provide power to CWL01 and CWL02. They will nevertheless be tested regularly to ensure that they are capable of reliably fulfilling the backup supply requirements. The engines will be tested separately using three types of tests. All the different tests and potential emergency power scenarios have been included in the impact assessment. The modelled scenarios for the assessment are presented in Table 2.3.

Table 2.3: Modelled Engine Operations

Regime	Frequency	Duration	Scheduling	Number of engines	Load
Testing Regime – All three tests					
Monthly Test	Two months on, one month off (8 times per year)	20 min (15-min run, 5 min cooldown)	Unknown	One engine after the other	No electrical load. Modelled as 30% load on engine

Quarterly Test	Quarterly[a]	35 min (30min run, 5 min cooldown)	Unknown	One engine after the other	70% engine load
Annual Test	Annually	65 min (1 hour run, 5 min cooldown)	Unknown	One engine after the other	100% engine load
Additional generator running considerations					
PIT Test	Annually	95 min (90 min run, 5 min cooldown)	Unknown	One engine after the other	Unknown at this stage
USS Switchgear Test	Quinquennial	95 min (90 min run, 5 min cooldown)	Unknown	Multiple Engines	Unknown at this stage
USS Switchgear Test	Quinquennial	95 min (90 min run, 5 min cooldown)	Unknown	Multiple Engines	Unknown at this stage
Emergency power					
Emergency power	Unpredictable	1 hour	Any time	All 31 engines	60% engine load [c]

[a] *The quarterly test is undertaken three times. The fourth test is replaced by the annual load bank test*.
[c] *It has been assumed that all engines would be running at 60% load in case of emergency. It is expected that only a part of the engines would be running, with others in standby in case of failure.*

Site Boundary

Sensitive Human Receptors

- Residential Property
- School
- Nursery
- Medical Centre
- Golf Club

0 100 200 300 400 500

Metres

N

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DATE: 10/16/2023	APPROVED: AW

Figure 2.2
Sensitive Human Receptors

ERM

PROJECTION: British National Grid

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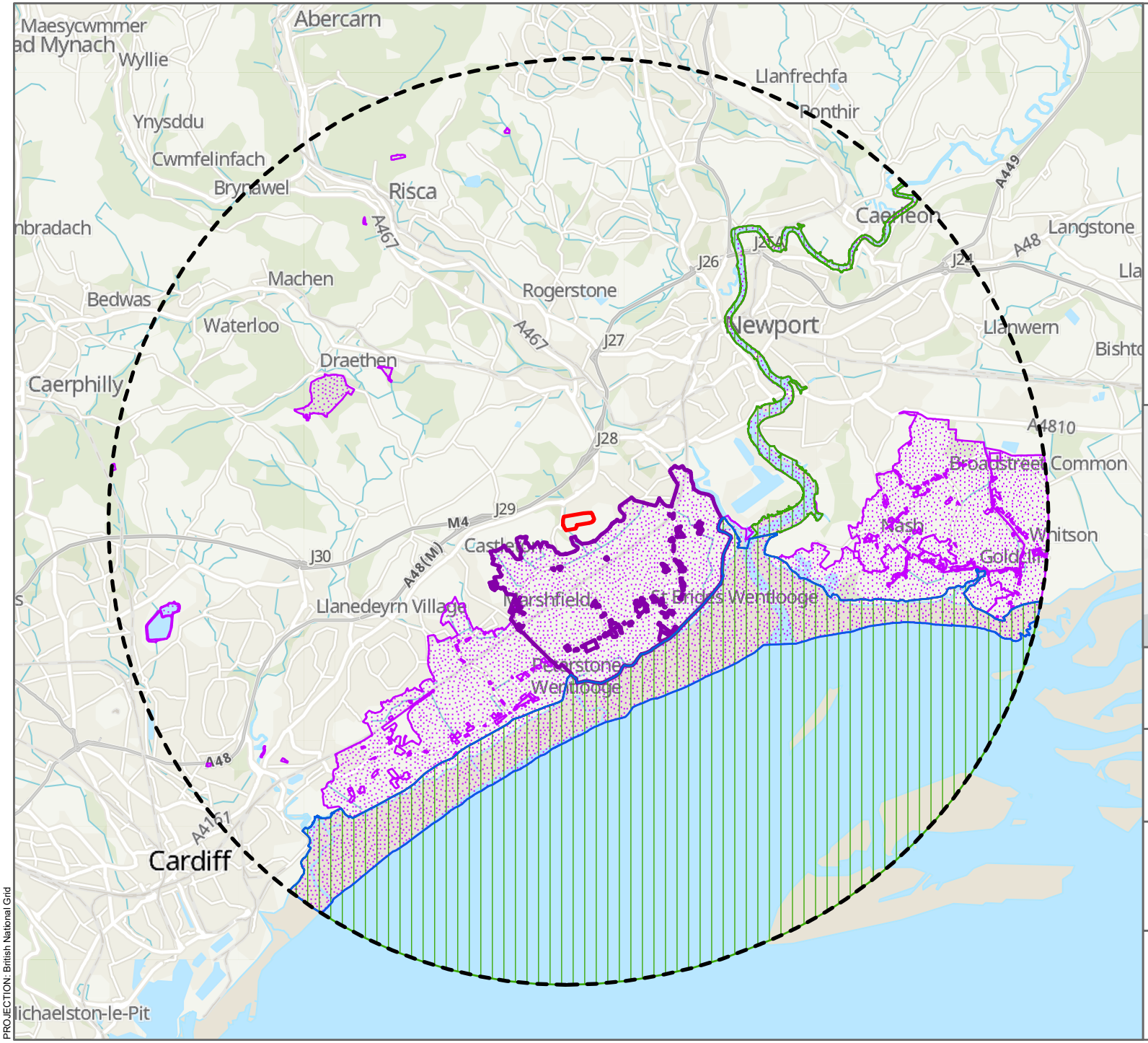

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3. LEGAL FRAMEWORK AND METHODOLOGY

3.1 Impact on Human Health

3.1.1 Applicable Air Quality Standards

The protection of human health from adverse air quality is regulated through the use of Air Quality Standards (AQS) imposed in UK law[5] transposed from EU standards[6].

The statutory criteria of relevance for this assessment are set out in Table 3.1.

Table 3.1: Applicable Air Quality Standards

Applicability	Pollutant	Averaging period	Assessment Criterion (µg/m^3)	Percentile
Sensitive Human Receptor	NH_3	1 hour mean	2500	n/a
		Annual, mean	180	n/a
	PM_{10}	Annual, mean (UK)	40	n/a
		24 hour, <35 exceedances yearly	50	90.4th
	NO_2	Annual, mean	40	n/a
		1-hour, <19 exceedances yearly	200	99.79th
		1 hour Max (AEGL-1)	940	n/a

n/a = not applicable

3.1.2 Significance of Impact

The impacts of the emissions from the existing Installation are assessed on the basis of the:

- Process Contribution (PC); and
- Predicted Environmental Concentration (PEC), the PEC being the Process Contribution (PC) added to the baseline.

The criteria for significance of the impact on sensitive human receptors are presented in Table 3.2

Table 3.2: Significance Criteria for Impacts on Receptors

Receptor	PC, as % of AQS or CL	PEC, as % of AQS or CL	Significance
Sensitive Human Receptors			
Short-term Impact			
Any sensitive human receptor	<10%	-	Insignificant
	>10%	na	Significant

[5] The Air Quality Standards Regulations 2010 Statutory Instrument 2008/301, http://www.legislation.gov.uk/uksi/2010/1001/contents/made

[6] European Union Air Quality Standards, http://ec.europa.eu/environment/air/quality/standards.htm

Receptor	PC, as % of AQS or CL	PEC, as % of AQS or CL	Significance
Long-term Impact			
Any sensitive human receptor	<1%	-	Insignificant
	>1%	<70%	Significant, but acceptable
	>1%	>70%	Significant

3.2 Impact on Designated Sites

3.2.1 Critical Loads and Levels

The critical loads[7] and critical levels[8] for each habitat type were obtained from APIS and used as tools to assess the potential for effects of air pollutants on habitats. The critical load refers to the quantity of pollutant deposited from air to the ground, while the critical level is the gaseous concentration of a pollutant in the air.

Effects resulting from nitrogen and acid deposition will be assessed on a habitat and species-specific approach against critical loads listed in APIS. These specific loads will be provided in the relevant tables in the Results section. In most cases the worst case scenario will be used.

Critical levels (for the effects of NO_x) will be assessed against environmental standards that apply either across all habitat types (for NO_x) as set out in Table 3.3.

Table 3.3: Relevant Environmental Standards

Substance	Emission period	Target (mean)
Nitrogen oxides (NO_x)	Annual	30 µg/m^3
	Daily (24hr mean)	200 µg/m^3

3.2.2 Screening Methodology

The significance framework for ecological assessment is set out in the table below.

Table 3.4: Assessment Criteria for Habitats and Species for National Sites

Criterion	Assessment
Long Term / Short Term	
PC < 1% of CL (long) and / or PC <10% of CL (short) Or PC > 1% of CL (long) and / or >10% of CL (short) but PEC < 70% of CL	Insignificant contribution and no further assessment required. Considered in the assessment to have no likely significant effect.

[7] Critical Loads are defined as: *"a quantitative estimate of exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge"* (http://www.apis.ac.uk/critical-loads-and-critical-levels-guide-data-provided-apis - accessed 30 August 2021)

[8] Critical levels are defined as *"concentrations of pollutants in the atmosphere above which direct adverse effects on receptors, such as human beings, plants, ecosystems or materials, may occur according to present knowledge"*. (http://www.apis.ac.uk/critical-loads-and-critical-levels-guide-data-provided-apis - accessed 30 August 2021)

PC > 1% of CL (long) and / or >10% of CL (short) and PEC > 70% of CL	Cannot be considered as an insignificant contribution. Further assessment is required to determine the effects on habitats and species and whether, or not, they are likely to have an adverse effect on the integrity of a designated site.

For local sites, impacts are deemed insignificant if PC<100% of CL (short and long term).

The levels and loads of air emissions at habitats in the nearest SSSI to the Site (Gwent Levels – St Brides) were predicted by the air dispersion modelling. Details about the model and its input data can be found in *Section* ***Error! Reference source not found.***.

To assess the likely effects on designated sites, the methods listed below will be used:

- Habitats that were not sensitive to the specific air emissions assessed will be scoped out;
- In terms of nitrogen and acid deposition, the deposition velocity of grassland is used, in combination with the critical load for the most sensitive habitat at a designated site in the UK (as identified on APIS) will be used for all sites as a first step to assess for potential effects. If the effects on this habitat type are found to be insignificant, it will be assumed that effects on other qualifying features (with less stringent critical loads) will also be insignificant;
- Appropriate critical loads will be derived using the following approach:
  - Where not specified, the relevant habitat type is identified based on information in the SSSI citations and site condition table information;
  - The 'Search by Location' facility for that habitat type on APIS is used to derive location-specific proxy critical loads;
  - Where faunal species are listed with no critical loads, the effects on the habitat type that supported them will be assessed. If that habitat is not affected, then it will be assumed that the faunal species will not be affected either.

3.2.3 Construction Dust

The dust assessment is based on a screening methodology provided by IAQM[9]. The method considers impacts on human receptors and ecological receptors. Factors defining the sensitivity of a receptor are presented in Table 3.5.

Table 3.5: Factors Defining the Sensitivity of a Receptor

Sensitivity	Human (Health)	Human (Dust soiling)	Ecological
High	Locations where members of the public are exposed over a time period relevant to the air quality objectives for PM_{10} (a) Examples include residential dwellings, hospitals, schools and residential care homes.	Regular exposure. High level of amenity expected. Appearance, aesthetics or value of the property would be affected by dust soiling. Examples include residential dwellings, museums, medium and long-term car parks and car showrooms.	Nationally or Internationally designated site with dust sensitive features (b) Locations with vascular plant species (c)
Medium	Locations where workers are exposed over a time period	Short term exposure. Moderate level of amenity expected.	Nationally designated site with dust sensitive features (b)

[9] https://iaqm.co.uk/wp-content/uploads/2013/02/Construction-dust-2023-BG-v6-amendments.pdf

Sensitivity	Human (Health)	Human (Dust soiling)	Ecological
	relevant to the air quality objectives for PM_{10} (a) Examples include office and shop workers (d)	Possible diminished appearance or aesthetics of property due to dust soiling. Examples include parks and places of work.	Nationally designed sites with a particularly important plant species where dust sensitivity is unknown.
Low	Transient human exposure. Examples include public footpaths, playing fields, parks and shopping streets.	Transient exposure. Enjoyment of amenity not expected. Appearance and aesthetics of property unaffected. Examples include playing fields, farmland (e), footpaths, short-term car parks and roads.	Locally designated site with dust sensitive features (b)

(a) In the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day.

(b) Ecosystems that are particularly sensitive to dust deposition include lichens and acid heathland (for alkaline dust, such as concrete).

(c) Cheffing C. M. & Farrell L. (Editors) (2005), The Vascular Plant. Red Data List for Great Britain, Joint Nature Conservation Committee.

(d) Does not include workers exposure to PM_{10} as protection is covered by Health and Safety at Work legislation.

(e) Except commercially sensitive horticulture

The sensitivity of a receptor will also depend on a number of additional factors including any history of dust generating activities in the area, likely cumulative dust impacts from nearby construction sites, any pre-existing screening such as trees or buildings that would limit dust transport from a site and the likely duration of the impacts. In addition, the influence of the prevailing wind direction and local topography may be of relevance when determining the sensitivity of a receptor.

The sensitivity of the area to health impacts is dependent on the number of receptors within each sensitivity class and their distance from the source. In addition, human health impacts are dependent on the existing PM_{10} concentrations in the area. Table 3.6 summarises the criteria for determining the overall sensitivity of the area to human health impacts and Table 3.7 summarises the ecological sensitivities.

Table 3.6: Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM10 (ug/m3)	Number of Receptors	Distance from the source				
			<20m	<50m	<100m	<200m	<350m
High	>32	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	-	>10	High	Medium	Low	Low	Low
	-	1-10	Medium	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

Table 3.7: Sensitivity of the Area to Ecological Impacts

Receptor Sensitivity	Distance from the Source	
	<20m	**<50m**
High	High	Medium
Medium	Medium	Low
Low	Low	Low

In principle, dust emissions can be mitigated to the point that effects impact are negligible[10] . The IAQM sets out a methodology for assessing the risk of significant impact effects associated with dust emissions, and the level of mitigation required to render impacts on air quality negligible and effects on receptors not significant. This methodology has been utilised to identify the dust mitigation required. This approach divides construction activities into the following dust emission sources:

- demolition;
- earthworks;
- construction; and
- trackout (this is where mud and debris from a building site adhering to vehicles are deposited onto public highways).

The risk of dust effects (low, medium or high) is determined by the scale (magnitude) and nature of the works and the proximity of sensitive human and ecological receptors. The IAQM guidance recommends that an assessment be undertaken where there are sensitive human receptors:

- within 350 m of the Site boundary; or
- within 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the Site entrance(s).

An assessment should also be carried out where there are dust-sensitive ecological receptors:

- within 50 m of the Site boundary; or
- within 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the Site entrance(s).

The magnitude of the dust impacts for each source is classified as small, medium or large depending on the scale of the proposed works. Table 3.8 summarises the IAQM criteria to determine the magnitude of dust emissions. These criteria are used in combination with site-specific information and professional judgement.

[10] IAQM (2023) Guidance on the assessment of dust from demolition and construction

Table 3.8: Dust Criteria

Source	Large	Medium	Small
Demolition	Total building volume >75,000 m^3 Potentially dusty Material (e.g. concrete) Onsite crushing and Screening Demolition activities >12 m above ground level.	Total building volume 12,000-75,000 m^3 Potentially dusty material Demolition activities 6-12 m above ground level.	Total building volume <12,000 m^3 Construction material with low potential for dust release Demolition activities <6 m above ground level Demolition during wetter months
Earthworks	Total site area >110,000 m^2 Potentially dusty soil type (e.g. clay) >10 heavy earth moving vehicles active at any one time Formation of bunds > 6 m in height	Total site area 18,000-110,000 m^2 Moderately dusty soil type (e.g. silt) 5 – 10 heavy earth moving vehicles active at any one time Formation of bunds 3-6 m in height	Total site area <18,000 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
Construction	Total building volume >75,000 m^3 Onsite concrete batching Sandblasting	Total building volume 12,000 – 75,000 m^3 Potentially dusty construction material (e.g. concrete) Onsite concrete batching	Total building volume <12,000 m^3 Material with low potential for dust release (e.g. metal cladding or timber)
Trackout	>50 HGV movements in any one day (a) Potentially dusty surface material (e.g. high clay content) Unpaved road length >100 m	10 – 50 HGV movements in any one day (a) Moderately dusty surface material (e.g. silt) Unpaved road length 50 – 100 m	< 10 HGV movements in any one day (a) Surface material with low potential for dust release Unpaved road length <50 m

(a) HGV movements refer to outward trips (leaving the site) by vehicles of over 3.5 tonnes

4. BASELINE

4.1 Baseline Data

Baseline air quality information was reviewed from both background maps published by Defra and local monitoring reports published by Newport City Council. Based on the location of the site it was decided that the values from the Defra Background mapping were the most representative for the Project (see Table 4.1).

Table 4.1: Baseline Air Quality

Source	Pollutants Monitored	Baseline Value ($\mu g/m^3$)	Period
Defra Mapping (2022)	NO_2	16.5	Annual Mean (2022)
	PM_{10}	15.3	
	NH_3	1.97	

5. AIR QUALITY IMPACT ASSESSMENT

The AQIA is structured to assess whether the design including SCRs attached to the diesel generators may potentially result in unacceptable impacts to air quality.

The focus for this initial assessment is the health of local human and ecological receptors, with the key consideration being whether the routine testing and emergency operations of the data centre could lead to the 1-hour NO_2 air quality standard being exceeded. The main air quality standard of interest is the NO_2 air quality standard of 200µg/m^3, as the 99.79th percentile, this being that the threshold value is allowed to be exceeded 18 times in a year before the standard is deemed to have been breached.

The key elements of the methodology used for carrying out the air dispersion modelling are set out in Table 5.1.

Table 5.1: Model Inputs

Parameter	Approach	Notes
Dispersion model	Lakes AERMOD View 9.6.5	-
Number of sources	31 spread across two buildings	See Section 2 for site layout and Figure 5.1 for source locations
Model domain	8km x 8km centred on Site (multi tier grid)	Impacts from the data centre will typically arise within 1000m of source, and impacts further afield are unlikely to be significant
Receptor grid resolution	Multi Tier Grid Up to 500m from centre: 20m Up to 4000m from centre: 50m	
Buildings	6 buildings, on Site or in Newport Imperial Park	All buildings that are greater than one third of the stack height, within five stack heights of the stack, are included. Buildings dimensions and location presented in *Appendix A*.
Terrain	Not required	There is no sustained gradients of >1:10 in the vicinity of the Site, and therefore terrain was not required
Surface Characteristics	Albedo: 0.222 Bowen Ratio: 1.45 Surface Roughness: 1.00	
Meteorological data	Cardiff Airport, 5 years	Hour-sequential data. Wind roses are presented in *Appendix A*.
NO_x to NO_2 conversion ratio	- Short-term concentrations: 15% up to 500m from sources; 35% anywhere else. - Long-term concentrations: 70% everywhere	The Environment Agency[a] states that a short-term conversion ratio of 15% is reasonable within 500m of a source. For distances of >500m ratios are taken from another Environment Agency guidance[b].

[a] *Environment Agency AQMAU, 2016, Diesel generator short term NO_2 impact assessment, https://consult.defra.gov.uk/airquality/medium-combustion-plant-and-controls-on-generators/supporting_documents/Generator%20EA%20air%20dispersion%20modelling%20report.pdf*

[b] *Environment Agency, 2007, Review of methods for NO to NO_2 conversion in plumes at short ranges, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/290985/scho0907bnhi-e-e.pdf*

5.1 Emissions Parameters

The emissions parameters for each modelled source are presented in Table 5.2. A map showing stack locations is presented in Figure 5.1. There are three types of generator modelled in this assessment spread across CWL01 and CWL02. Each of these generators have SCR installed.

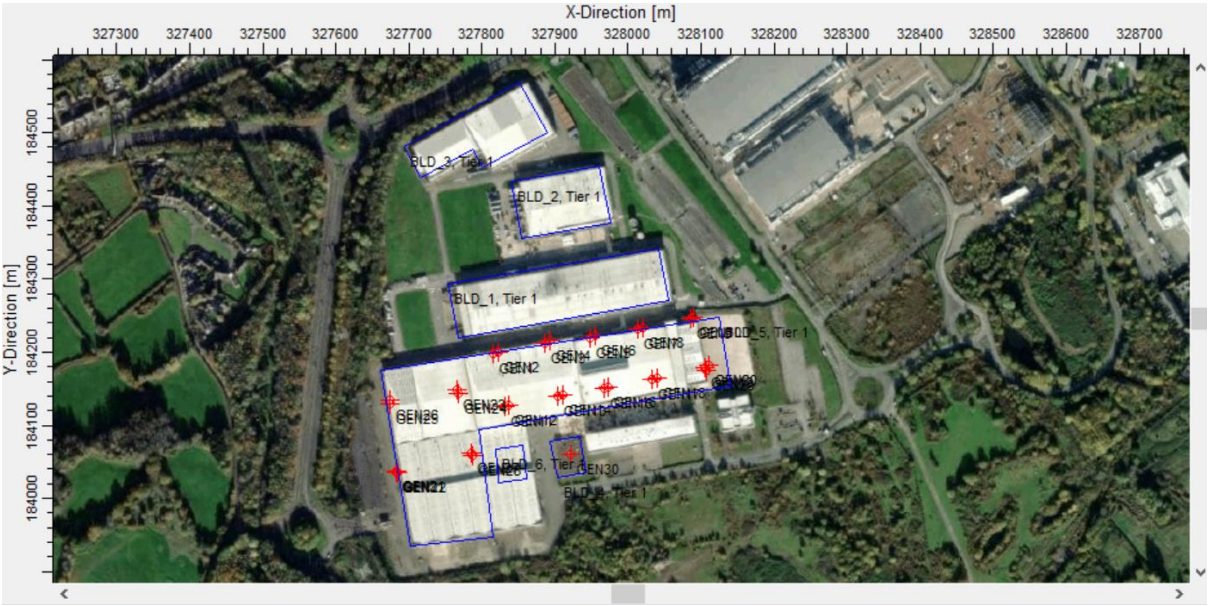
Table 5.2: Modelled Emissions Parameters

Parameter	Generator		
Type of Gen	Colo	Admin	Water Treatment Unit
No of gens	CWL01: 20 CWL02: 8	CWL01: 1 CWL02: 1	1
Engine Make/Model	CAT C175-20	CAT C18	C13
Stack Orientation	Vertical	Vertical	Vertical
Stack Height (m)	14	14	14
Flue Diameter (m)	0.6	0.4	0.4
Emission Velocity (m/s)	39.3	39.3	85.2
Nominal Flow Rate (m^3/s)	4.01	0.495	0.322
Actual Flow Rate (m^3/s)	11.74	1.709	1.043
Emission Temperature (°C)	460.7	571.1	529.2
NO_x Concentration[a] (mg/m^3, 100% load)	286.1	376.5	294.9
NO_x Emission Rate (g/s, 100% load)	1.15	0.186	0.0949
PM_{10} Concentration[a] (mg/m^3, 100% load)	6.5	9.1	9.1
PM_{10} Emission Rate (g/s, 100% load)	0.026	0.0045	0.0029
NH_3 Concentration[a] (mg/m^3, 100% load)	5	5	5
NH_3 Emission Rate (g/s, 100% load)	0.020	0.00248	0.00161

[a] Concentrations were supplied by the client, presented at 5% O_2 content.

Figure 5.1 shows the general site layout, with the position of the generator release points in relation to the existing buildings on site.

Figure 5.1: Site Layout – Emissions Sources



6. IMPACT ASSESSMENT

6.1 Construction Dust

The dust impact assessment concluded that the impacts are such that the construction activity for the Proposed Development is classified as 'high risk' of causing dust nuisance due to demolition, earthworks, construction and trackout. Therefore, mitigation measures applicable to 'high risk' sites are required to be implemented in order to render the residual effects as negligible, or at worst, not significant.

6.1.1 Mitigation

Mitigation suitable for this site is outlined in Table 6.1. These are derived from IAQM guidance[11] and are set out in the mitigation section below which will also be picked up by both the demolition and construction contractors.

Table 6.1: Construction Dust Mitigation

Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
Display the head or regional office contact information.
Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk, and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site. The DMP may include monitoring of dust deposition, dust flux, realtime PM_{10} continuous monitoring and/or visual inspections.
Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
Make the complaints log available to the local authority when asked.
Record any exceptional incidents that cause dust and/or gaseous emissions, either on- or offsite, and the action taken to resolve the situation in the log book.
Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100 m of site boundary, with cleaning to be provided if necessary.
Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked.
Increase the frequency of site inspections by the person accountable for air quality and dust issues onsite when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.
Keep site fencing, barriers and scaffolding clean using wet methods.
Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.
Cover, seed or fence stockpiles to prevent wind whipping.
Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).
Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.

[11] IAQM (2023) Guidance on the assessment of dust from demolition and construction

Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
Use enclosed chutes and conveyors and covered skips.
Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
Ensure equipment is readily available onsite to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.
Avoid bonfires and burning of waste materials.
Demolition
Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).
Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition, high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.
Avoid explosive blasting, using appropriate manual or mechanical alternatives.
Bag and remove any biological debris or damp down such material before demolition.
Earthworks
Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.
Use Hessian, mulches or tackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.
Only remove the cover in small areas during work and not all at once.
Construction
Avoid scabbling (roughening of concrete surfaces) if possible.
Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.
For smaller supplies of fine powder materials, ensure bags are sealed after use and stored appropriately to prevent dust.
Trackout
Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.
Avoid dry sweeping of large areas.
Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonable practicable.
Record all inspections of haul routes and any subsequent action in a site log book.
Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).
Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.
Access gates to be located at least 10 m from receptors where possible.

6.2 Human Receptors

The results for the impact assessment for NO_2 shows the following (Table 6.2):

- As per the Monthly, Quarterly and Annual tests. Individual generators have a minimal impact on air quality. As the short term impacts are <10% of the air quality standard this would likely be considered an insignificant impact under the Planning and Permitting regimes.
- When considering all the testing hours across the year against the NO_2 annual standard the AQS is not breached. Note, this also includes impacts from the 5-year USS Switchgear test.
- Emergency running all of the individual generators together at 60% load indicated a potential significant effect despite the PEC not exceeding the 1-hour standard. However, the likelihood of an emergency running scenario lasting for more than 18 hours is minimal and therefore it is very unlikely that the air quality standard would be breached. In addition, the AEGL-1 human health standard which is based on the NO_2 1-hour maximum value is not breached.
- The impact assessment considers the activities in the Quinn site in isolation. A collaborative approach with other data centres in the vicinity of the Proposed Development would be required to ensure in-combination effects with the operation of other generators is considered.

Table 6.2: NO_2 Results Human Receptors

Test	Averaging Period	AQS	Baseline	PC	PC /AQS	PEC (PC +baseline)	PEC/AQS
		µg/m³	µg/m³	µg/m³	%	µg/m³	%
1 Generator							
Monthly Test (15 mins at no load)	1 hour (99.79)	200	33.1	0.60	0.30%	33.7	16.9%
Quarterly Test (30 mins at 70% load)	1 hour (99.79)	200	33.1	2.78	1.4%	35.9	17.9%
Annual Test (60 mins at 100% load)	1 hour (99.79)	200	33.1	7.96	4.0%	41.1	20.5%
Quinquennial test (60 mins at 60% load)	1 hour (99.79)	200	33.1	148	74%	181	91%
Quinquennial test (60 mins at 60% load)	1 hour Max	940	33.1	209	22.3%	242	25.8%
Emergency running							
60 mins at 60% load	1 hour (99.79)	200	33.1	148	74%	181	91%
60 mins at 60% load	1 hour Max	940	33.1	209	22%	242	26%
All generators testing (including Monthly, Quarterly, Annual, PIT test and Quinquennial USS Switchgear testing).							
All Tests	Annual	40	16.5	0.0658	0.164%	17	42%

For PM_{10} and NH_3 impacts on human health receptors, all of the generators running at the same at 100% load was considered as a worst case scenario (Table 6.3).

- The air quality standard is not breached for any of pollutants or averaging periods.

NH_3 is known to be key byproduct when SCR is used as an abatement technology however these results show that neither the short or long term standards are breached on this project when the technology is applied.

Table 6.3: PM_{10} and NH_3 Results Human Receptors

Test	Averaging Period	AQS	Baseline	PC	PC /AQS	PEC (PC +baseline)	PEC/AQS
		µg/m³	µg/m³	µg/m³	%	µg/m³	%
PM_{10}	Annual mean	40	15.3	0.0039	0.01%	15.28	38%
PM_{10}	24 hour max	50	30.5	2.37	4.73%	32.9	65.8%
NH_3	Annual mean	180	1.97	0.0030	0.00167%	1.97	1.095%
NH_3	1 hour	2500	3.9	2.84	0.11%	6.8	0.3%

6.3 Ecological Receptors

For impacts on ecological receptors the nearest designated ecological site to the emissions sources was considered as a worst case scenario. For this purpose, the impacts on Gwent Levels – St Brides SSSI (which is 240m from the nearest emission source) were assessed. The impacts of NO_x and NH_3 were assessed as well as Nitrogen and Acid Deposition on the site.

6.3.1 Ambient

The results in Table 6.4 show that:

- Ambient impacts from the Project on the Gwent Levels – St Brides SSSI are not significant for NO_x and NH_3 when considering all testing hours over the year against the respective annual means for each pollutant.
- For the 24-hour average a high PEC for NOx was noted when considering all engines running however upon consideration of 6 engines running per day there was non-significant effect. This latter scenario is a more likely when considering how data centre testing regimes would impact on receptors.

Table 6.4: Ecological Impacts Ambient NO_x and NH_3 – Gwent Levels – St Brides SSSI

Pollutant	Averaging Period	EAL	PC	PC as % of EAL	Background	PEC	PEC % of EAL
		µg/m³	µg/m³		µg/m³	%	µg/m³
NOx	Annual mean (all tests)	30	0.0276	0.0920%	18.4	18.4	61%
NOx	24-hour average	200	10.2	5%	36.758	47.0	23%

	(6 engines per day)						
NOx	24-hour average (all engines)	200	61.2	31%	36.8	97.9	49%
NH_3	Annual mean (all tests)	1	0.000478	0.0478%	1.61	1.61	161%

6.3.2 Nitrogen and Acid Deposition

The nitrogen deposition and acid deposition were calculated using AQTAG06 guidance[12], based on the annual mean NO_x and NH_3 concentrations and 24-hour NO_x presented in Table 6.5 and Table 6.6. No significant effects were noted for either nitrogen deposition and acid deposition for the Gwent Levels – St Brides SSSI site. Due to close proximity of this designated site to the Project it is assumed to show the worst case impacts and therefore nitrogen and acid deposition would show no significant effects at other designated sites

Table 6.5: Ecological Impacts Nitrogen Deposition - Gwent Levels – St Brides SSSI

Habitat Type	Minimum Critical Load	NO2 Deposition (KhN/ha/yr)	NH3 Deposition (KgN/ha/yr)	Nitrogen Dep (KgN/ha/yr)	Background Deposition	PEC as %CL Min	Nitrogen Dep as %CLMin
Grassland	3	0.00278	0.00248	0.00527	8.705	290%	0.18%

Table 6.6: Ecological Impacts Acid Deposition - Gwent Levels – St Brides SSSI

Habitat Type	Critical Load Low range (kew/ha/yr)	Baseline (keq/ha/yr)	N NO2	N NH3	N Total	PC as %CL Total	PEC as % CL Total
Grassland	CLMaxS: 0.141 CLminN: 0.321 CLmaxN: 0.462	S: 0.141 N: 0.321	0.000198	0.000177	0.000375	0.1%	100.1%

[12] Habitats Directive, 2014, AQTAG06 Technical guidance on detailed modelling approach for an appropriate assessment for emissions to air, http://bailey.persona-pi.com/Public-Inquiries/A465-English/8%20Air%20Quality/8.2.2%20-%20AQTAG06_Technical%20Guidance%20Assessment%20emissions%20to%20air%20Mar2014.pdf

7. CONCLUSION

The impacts from the diesel generator testing regime of the proposed data centre at Newport Imperial Park were modelled and assessed.

It was found that:

- The testing regime of the Site does not have any significant effects on the annual mean NO_2 standard or the 1 hour (99.79) standard.
- The testing regime of the Site does not have any significant effects on the annual mean NO_x, 24-hour NO_x, nitrogen deposition and acid deposition standards for the closest protected conservation area: Gwent Levels – St Brides SSSI.

An emergency power generation scenario with all the Site's generators running at the same time for an hour at 60% load was also assessed. In this case, whilst there was a significant effect, the NO_2 standard was not breached. In addition the 24-hour NOx standard for the closest protected conservation area was not breached despite showing a significant effect.

It was also found that in an emergency scenario the PM_{10} and NH_3 emissions from the engines do not have the potential to breach the hourly, 24-hourly and annual mean air quality standards for these pollutants.

Construction dust impacts are predicted to be negligible, or at worst minor, and therefore not significant, with the correct implementation of the recommended mitigation.

APPENDIX A MODEL PARAMETERS

A.1 Modelled Buildings Data

The location of the modelled buildings is presented in *Figure A.1*, while their dimensions are listed in *Table A.1*.

Table A.1: Height of Modelled Buildings

Building	Height (m)	Tier Corners
Building 1	12	327754, 184293 328042, 184342 328056, 184270 327768, 184220
Building 2	12	327841, 184434 327960, 184455 327977, 184376 327855, 184356
Building 3	12	327693, 184481 327851, 184570 327889, 184500 327802, 184452 327802, 184477 327717, 184438
Building 4	11	327903, 184029 327894, 184078 327934, 184085 327942, 184036
Building 5	11	328125, 184248 327662, 184175 327702, 183935 327815, 183948 327796, 184093 328141, 184154
Building 6	11	327819, 184068 327823, 184022 327861, 184026 327856, 184073

Building heights and dimensions estimated from mapping

Figure A.1: Modelled Buildings

A.2 Cardiff Airport 2017-2021 Wind Roses

The Cardiff Airport wind roses for years 2017 to 2021 are presented in *Figures A.2 to A.6.*

Figure A.2: Cardiff Airport Wind Rose - 2017

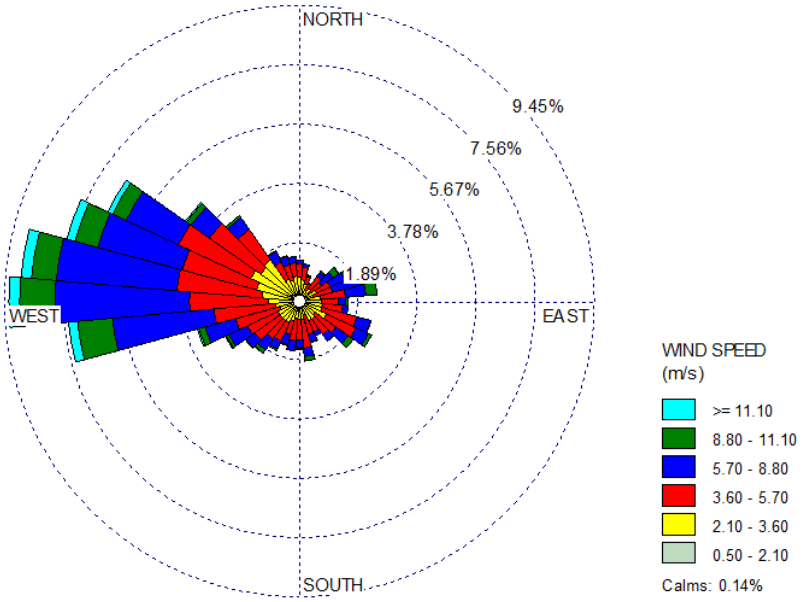


Figure A.3: Cardiff Airport Wind Rose - 2018

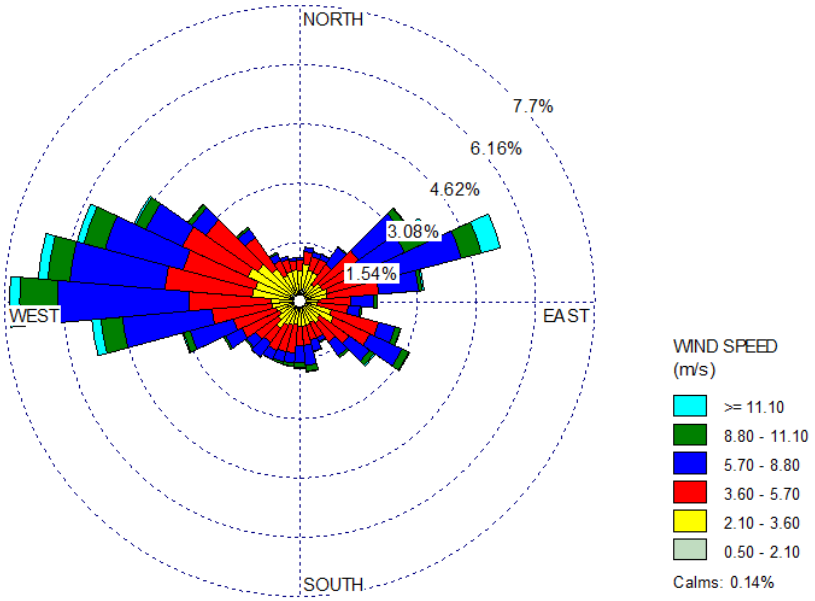


Figure A.4: Cardiff Airport Wind Rose – 2019

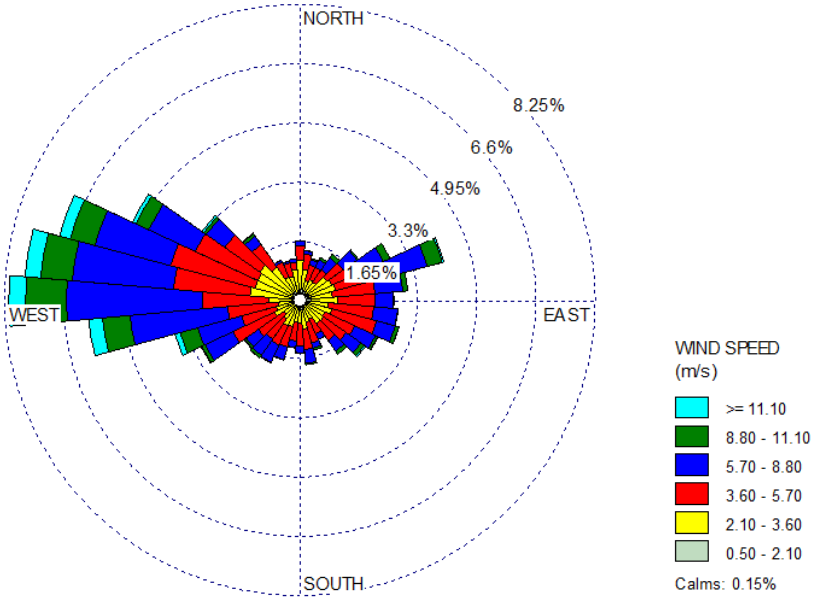


Figure A.5: Cardiff Airport Wind Rose - 2020

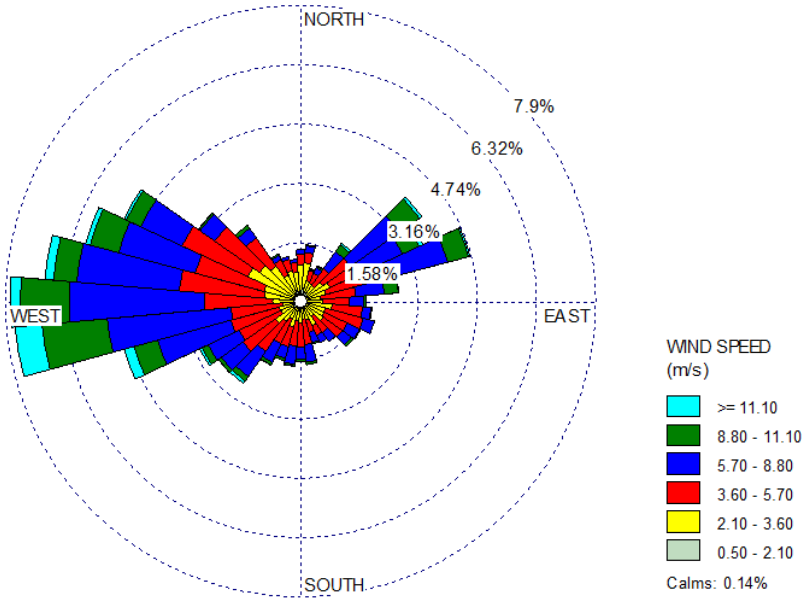
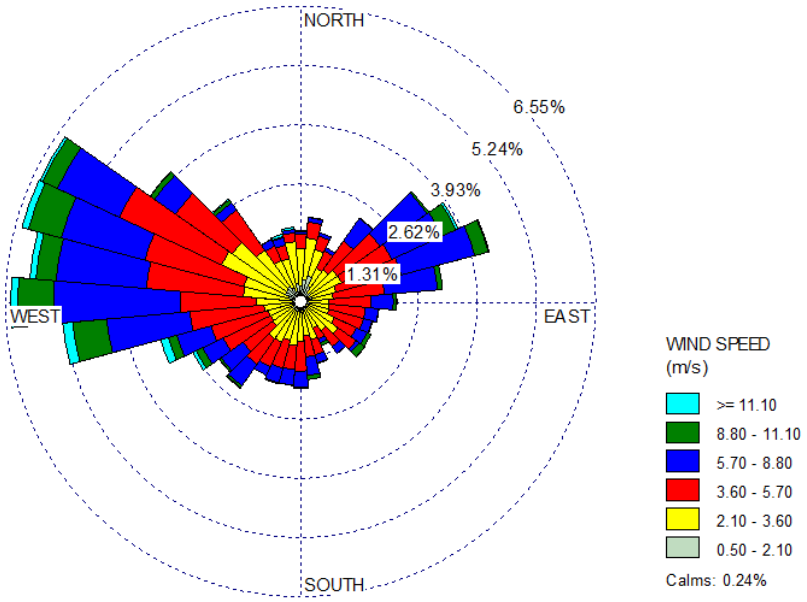


Figure A.6: Cardiff Airport Wind Rose – 2021



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