PREPARED FOR

Microsoft

Air Quality Assessment

Microsoft Newport Quinn Environmental Permit Assessment – Permit Variation

DATE
11 July 2024

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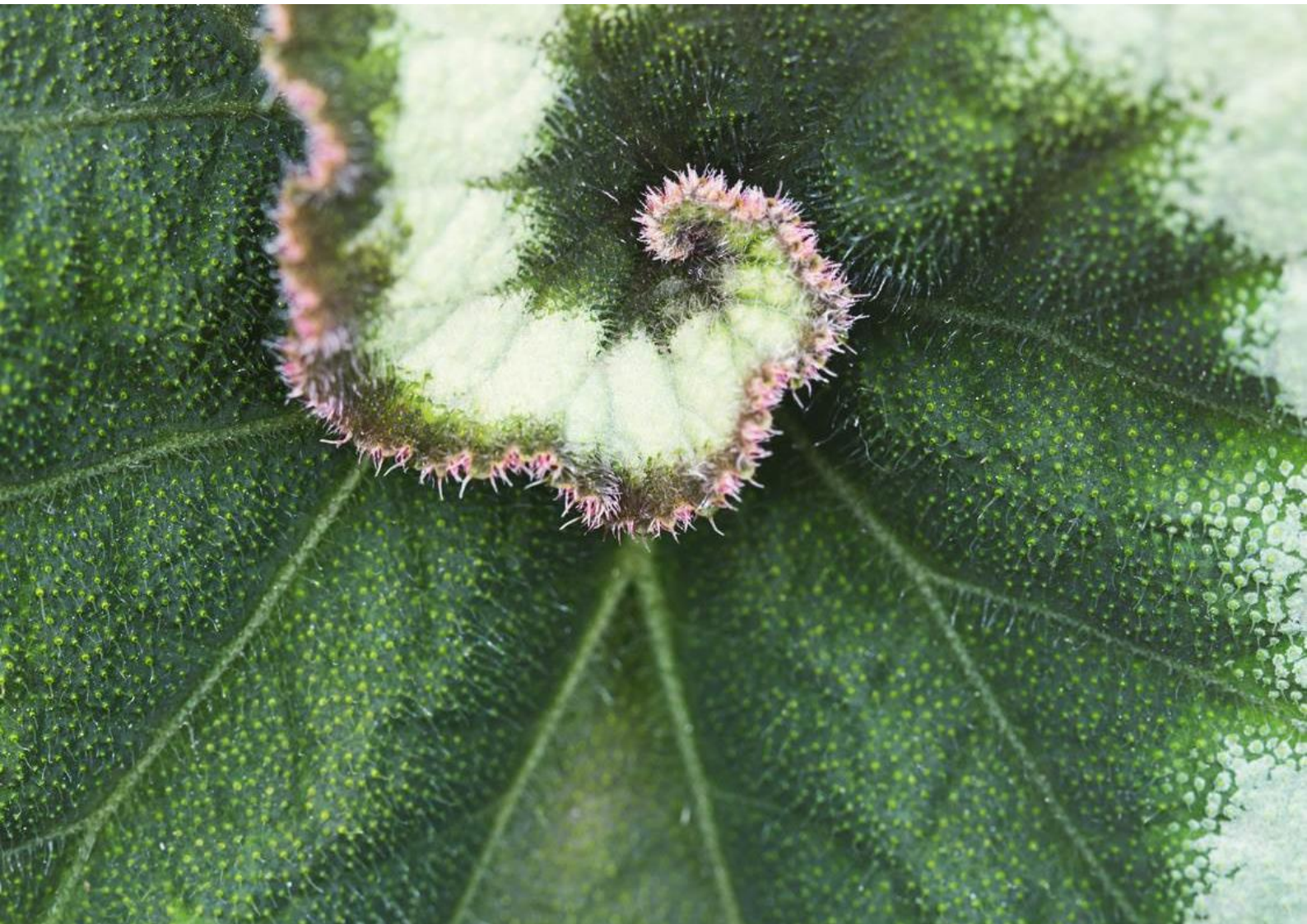
0657169



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SIGNATURE PAGE

Air Quality Assessment

Microsoft Newport Quinn Environmental Permit Assessment – Permit Variation

0657169

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ACRONYMS AND ABBREVIATIONS

Name	Description
AOT	Accumulated Ozone exposure over a Threshold
APIS	Air Pollution Information System
AQIA	Air Quality Impact Assessment
AQS	Air Quality Standard
AQMA	Air Quality Management Area
Breached, breaching, breach	Used when the predicted ambient concentration of a pollutant at a receptor will not comply with the air quality standard. For example, if the 1-hour mean NO_2 standard is predicted to be exceeded 20 times at a receptor, a breach of the NO_2 1-hour mean is therefore predicted as there would be more than the 18 allowed exceedances of this standard.
^oC	Degrees Celsius
CL	Critical Load
DEFRA	Department for Environment, Food & Rural Affairs
EA	Environment Agency
EP	Environmental Permit
EP Regulations	Environmental Permitting (England and Wales) Regulations 2016 (as amended)
ERM	Environmental Resources Management Limited
Microsoft	Microsoft (UK) Limited
Exceeded, exceedance, exceed	Used when a predicted concentration is above an air quality standard threshold. For example, a 1-hour mean NO_2 predicted environmental contribution of 220 µg/m^3 exceeds the 200 µg/m^3 air quality standard.
g/s	Grams per second
K	Degrees Kelvin
Keq/ha/yr	Kiloequivalents per hectare per year
LNR	Local Nature Reserve
LWS	Local Wildlife Site
m/s	Metres per second
m^3/s	Cubic metres per second
mg/m^3	Milligrams per cubic metre
NCC	Newport City Council

Name	Description
NH_3	Ammonia
N/ha/yr	Potential surplus of nitrogen on agricultural land in hectares per year
NIP	Newport Imperial Park
NNR	National Nature Reserve
NO	Nitric Oxide
NO_2	Nitrogen dioxide
NO_x	Oxides of nitrogen (mixture of NO and NO_2)
PC	Process Contribution
PEC	Predicted Environmental Concentration
$PM_{2.5}$	Particulate Matter of diameter below or equal to 2.5 µm
PM_{10}	Particulate Matter of diameter below or equal to 10 µm
SAC	Special Area of Conservation
SO_2	Sulphur dioxide
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
UPS	Uninterrupted Power Supply
$\mu g/m^3$	Micrograms per cubic metre

APPLICATION CHECKLIST

For ease of reference, the table below sets out information required for a permit application in the gov.uk guidance published by the Environment Agency and applicable to Wales titled "Environmental permitting: air dispersion modelling reports" and the corresponding sections in this report.

Requirement	Location in Report
Purpose of the study	Section 1 and Section 3.1
Describe the site	Section 3
Modelled scenarios	Section 3.2
Location map	Appendix A
Surrounding land use map	Appendix A
Relevant environmental standards	Section 4.1
Background level	Section 5
Explain the model	Section 6 and Appendix A
Emission parameters	Section 6.2 and Appendix A
Stack location	Figure 6-1 and Appendix A
Modelled domain and receptors	Section 6.1 and Appendix A
Weather and surface characteristics	Section 6.1 Wind Roses in Appendix A
Terrain and building treatments	Section 6.1 and Appendix A
Special treatments	Section 6.1
Impact Assessment	Section 7
Sensitivity analysis	Not applicable
Isopleths/Contour plots	Appendix B
Model input files	Sent with application electronically

1. INTRODUCTION

The following assessment has been prepared by Environmental Resources Management Limited (ERM) on behalf of Microsoft, based on data on anticipated operations provided to ERM by Microsoft.

Microsoft is planning to build a data centre at the Newport Imperial Park (NIP). This data centre will be subject to Environmental Permit (EP) requirements, due to the proposed use of diesel generators at the data centre for the provision of back-up power in the event of a grid outage. The diesel generators could also be converted to run on Hydrotreated Vegetable Oil (HVO), without engine modification. The proposed thermal capacity of these generators will exceed 50 MWth and therefore operation will require an EP under Schedule 1, Part 2 of The Environmental Permitting (England and Wales) Regulations 2016 (as amended) (EP Regulations).

The air quality impact assessment (AQIA) set out in this report supports the installation of 28 emergency backup generators on site which will be fitted with SCR (Selective Catalytic Reduction) equipment to reduce NO_X emissions. Another three generators have also been included in the model which also have SCRs installed. The assessment uses diesel as the fuel type as a worst-case scenario when considering NO_x emissions.

The main potential environmental impacts from the operation of the diesel generators are emissions to air. As per the Environment Agency (EA) working draft guidance[1] (also applicable to NRW) the most important consideration is the potential to breach the short-term ambient air quality standard (AQS) for hourly mean nitrogen dioxide (NO_2). This standard allows the threshold to be exceeded 18 times in a calendar year before a breach of the standard is recorded. This report presents an assessment of potential impacts to air quality from the NO_X emissions generated by the planned data centre engines.

The impact assessment has been carried out using an air dispersion model to predict the potential impact of the engines' emissions. The model is based on data provided by Microsoft and RED Engineering Design Limited (RED) as well as publicly available environmental data.

Impacts are assessed for:

- Human health – versus short-term and long-term NO_2 and NO standards; and
- Protected conservation areas – versus short-term and long-term NO_X and NH_3 Critical Levels and nitrogen deposition and acid deposition Critical Loads.
- The assessment and report have been prepared following the relevant guidance and published documents:
    - Environment Agency, 2023, *Air emissions risk assessment for your environmental permit*, https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit ;
    - Environment Agency, 2021, *Environmental permitting: air dispersion modelling reports*, https://www.gov.uk/guidance/environmental-permitting-air-dispersion-modelling-reports; and

[1] Data Centre FAQ, 15/11/2022-DRAFT version 21.0 to techUK for discussion

- Environment Agency, 2022, *Data Centre -DRAFT version 21.0*, shared with techUK for discussion.

In the absence of NRW air quality assessment guidance for use in Wales specifically, ERM considers the air quality guidance from the EA as hosted on the gov.uk website to be relevant for this assessment.

In the context of this report, the assessment considers the following definitions:

- Exceeded, exceedance, exceed: Used when a modelled concentration is above an air quality standard threshold. For example, a 1-hour mean NO_2 modelled environmental contribution of 220 µg/m^3 exceeds the 200 µg/m^3 air quality standard;
- Breached, breaching, breach: Used when the modelled ambient concentration of a pollutant at a receptor will not comply with the air quality standard. For example, the 1-hour mean NO_2 standard is predicted to be exceeded 20 times at a receptor, resulting in a breach on account of being more than the 18 allowed exceedances of the standard;

The short-term impacts of PM_{10} [2] have been modelled as part of this assessment. Long-term PM_{10} and $PM_{2.5}$ have not been assessed as the engines only operate for a small number of hours per year and therefore significant impacts are not expected to arise.

For these data centres, sulphur dioxide (SO_2) is not expected to be a material issue since all fuel oil (including HVO, the intended fuel) is specified as ultra-low sulphur. No screening or detailed assessment has thus been undertaken for SO_2.

The SCR system proposed to be fitted on the generators on site will result in some potential ammonia (NH_3) emissions ('slippage') which has also been considered in this assessment.

[2] PM_{10} is the particulate matter in the air with an aerodynamic diameter of 10 µm or less.

2. STRUCTURE OF REPORT

This report details the air quality assessments undertaken for the Project Site:

- Background and Context;
- Legal Framework;
- Air quality background concentrations;
- Assessment Methodology;
- Impact assessment; and
- Conclusions.

3. SUMMARY OF OPERATIONS ASSESSED

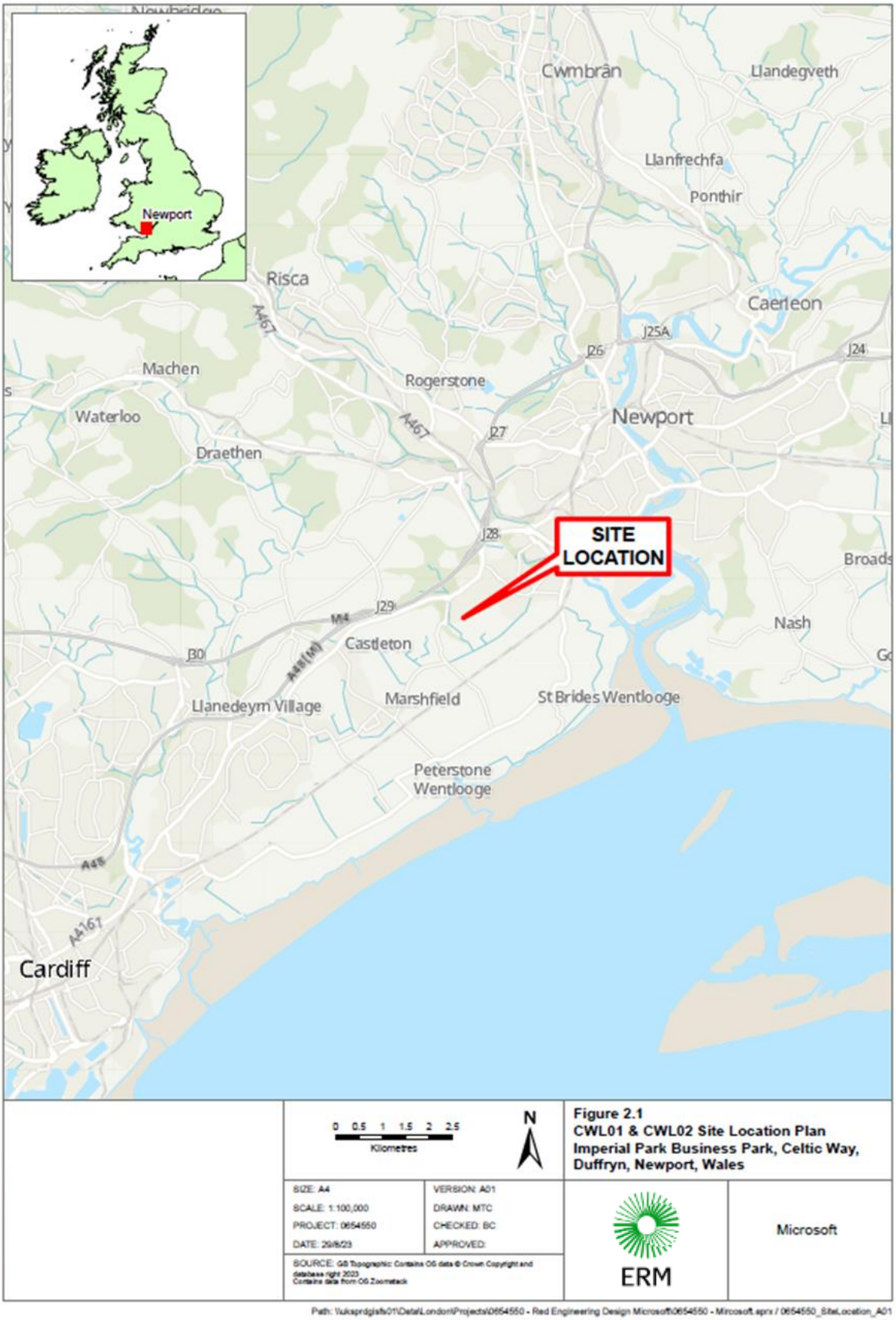
3.1 SITE DEVELOPMENT

Microsoft is proposing to construct and operate a new data centre campus, comprising two data centre buildings CWL01 and CWL02, collectively called the Newport Campus. The Site will be located on the Former Quinn Radiator Manufacturing Site, Imperial Park Business Park, Celtic Way, Duffryn, Newport, NP10 8BE. The two component data centre buildings are warehouse-style constructions, which will each contain data storage, internal and external ancillary equipment, including 28 diesel fuelled back-up generators. The back-up generators provide power to the data centre only in the event of grid supply failure. Microsoft proposes to install 20 generators at the CWL01 data centre and 8 generators are planned to be installed at the CWL02 data centre of the Site.

At the Site there will also be two administrative generators for the provision of emergency back-up generation to fulfil the Site's non-data hall (server room) energy demand and one generator for the provision of emergency back-up generation to power the Site's water treatment plant. The administrative generators and water treatment plant generators will only operate in the event of a loss of power from the mains incoming supply. There will also be two small diesel fuelled fire pumps (one as a standby to the other) that are assumed to have a rated input of <1MWth each.

A map showing a detailed visualisation of the Site is shown in Figure 3-1.

FIGURE 3-1 SITE LOCATION PLAN



3.2 ASSESSMENT SCENARIOS

Generators are normally only operated during routine testing and maintenance. Actual operation of the generators as the primary source of data centre power is uncommon based on the local grid reliability and the Site's power supply design. As noted in the NRW decision notice for an adjacent data centre "The National Grid reliability of the high voltage transmission system to which the data centre is connected is >99.999%."

All generators will be tested regularly to demonstrate that they can fulfil their back-up supply requirements. Microsoft has confirmed that the 28 emergency backup diesel generators, two administrative building generators and one water treatment plant generator will follow the same test regime.

This assessment considers six test scenarios for the generators that will be undertaken at the Newport Site. These being:

- Monthly test – 8 times per year;
- Quarterly test – 3 times per year;
- Annual test – once per year;
- Annual PIT test – once per year;
- USS Switchgear (Quinquennial) test – once every five years; and
- UPM Switchgear (Quinquennial) test – once every five years

The potential impacts of a total power outage has also been assessed with two emergency scenarios in which all of the engines on site are assumed to run for up to 1-hour and 72-hours continuously.

3.3 DESCRIPTION OF GENERATOR ENGINES

3.3.1 GENERATORS

Each new generator set comprises a generator engine and alternator in a combined set. The generators are for backup generation purposes only, i.e. for electrical generation in the event of a failure of the national grid electrical supply.

The site will be served by two incoming power supplies. A day one supply of 13 MVa will be provided by Scottish and Southern Energy (SSE), which will reuse the existing capacity of the 11kV supply, SSE has confirmed that this supply has capacity and will not add any additional pressure onto the local network. The day two supply will be a new supply from National Grid/SSE and fed from the Imperial Park substation. The day two supply will be at the 132 kV level and will provide approximately 92 MVa of capacity to the site. This connection will be a new supply and will be provided at the HV 132 kV level.

The data centres will be protected from short term brown-outs or black-outs by uninterruptable power supplies (UPS). These buffer small fluctuations in electrical supply. If the UPS detects power failure or extended reduced power, some, or all of the generators within the data centre will start automatically to begin generating sufficient electricity to match the load required by the data centre. The UPS can supply power for several minutes but ordinarily the generators would kick in well before this time elapses.

3.3.2 ENGINES OPERATION

Once fully developed, there will be 31 generators installed (including the two admin generators and one water treatment plant generator) at the Newport Site.

The generator engines will not be used to routinely provide power. However, the engines are tested regularly to ensure that they are capable of reliably fulfilling the backup supply requirements and during routine maintenance. All of the different tests and two potential emergency power scenarios have been included in the impact assessment. The modelled scenarios for the assessment are presented in Table 3-1.

TABLE 3-1 TESTING REGIME AND MODELLED SCENARIOS

Regime	Expected Frequency	Representative Duration	Scheduling	Number of generator engines	Load
Testing Regime – All tests					
Monthly Test	Monthly [b]	15-min	Weekdays	All engines individually [a]	No electrical load. Modelled as 30% load on engine
Quarterly Test	Quarterly [c]	30-min	Weekends	All engines individually [a]	70% engine load
Annual	Annually	1 hour	Weekends	All engines individually [a]	100% engine load
PIT Test	Annual	90 min	n/a	All engines individually [a]	Depending on load within associated CELL [d]
USS Switchgear	Quinquennial	90 min	n/a	All [e]	Depending on load within associated CELL/COLO [d]
UPM Switchgear	Quinquennial	90 min	n/a	All [e]	Depending on load within associated CELL/COLO [d]
Emergency power					
Emergency power	Unpredictable	1 hour	Any time	All	60% engine load [f]

Regime	Expected Frequency	Representative Duration	Scheduling	Number of generator engines	Load
Emergency power	Unpredictable	72 hours	Any time	All	60% engine load [f]

[a] Tests occur in sequential hours, not in the same hour.

[b] The monthly load bank test is undertaken eight times a year at the Newport Site. Three of the remaining tests are replaced by the quarterly load bank test and the final test is replaced by the annual test.

[c] The quarterly test is undertaken three times a year. The fourth test is replaced by the annual load bank test.

[d] Specific CELL/COLO information was not available for this assessment therefore a worst case scenario of 60% was used for these tests.

[e] Specific groupings of engines were not supplied by the client for this assessment therefore a worst case scenario in which all generators are run together was used for these tests.

[f] It has been assumed that all engines would be running at 60% load in case of emergency. This is a worst-case scenario and in reality, it is expected that only a part of the engines would be running, with others in standby in case of failure.

3.3.3 SCR EMISSIONS

SCR is an emissions abatement system that works to reduce NO_X emissions by combining generator exhaust gases with a reductant (for this application, typically urea, known commercially as 'AdBlue') and passing it over a fixed catalyst bed. A chemical reaction occurs during this process during which oxides of nitrogen react with ammonia forming water and nitrogen. This sometimes results in "ammonia slip" whereby not all of the urea is consumed in the reaction. In an appropriately designed SCR system that is functioning as it should, there should be little if no ammonia slip as it is an undesirable phenomenon which results from too much ammonia being injected to the system.

Selective Catalytic Reduction (SCR) systems will be installed on all 31 generators on the Newport site.

For this assessment, the NO_x reduction from the operation of the SCR has been assumed to be approximately 90%. Ammonia slip was assessed based on NH_3 values supplied by the manufacturer. The SCR systems are expected to require a warm-up period prior to being fully operational. During the warm-up period, NO_x emissions from the generators are assumed to be essentially unabated as the worst case. To consider the operation of the SCRs, models have been set up to approximate the effects of a 7-minute and 12-minute warm-up time for the Colo and Admin/WTU engines respectively. Average NO_x emission rates accounting for the warm-up were developed for each averaging period being assessed (10-minute, 30-minute, 1-hour, 4-hour and 8-hour).

4. LEGAL FRAMEWORK

4.1 AIR QUALITY STANDARDS

The protection of human health and of protected conservation areas from adverse air quality is regulated through the use of Air Quality Standards (AQS) transposed in UK law[3] from EU standards[4] as well as Environmental Assessment Levels (EALs) which are part of UK permitting guidance[5].

The statutory criteria of relevance for this assessment are set out in Table 4-1. As the generator engines are only operated for a few hours per year, only short-term AQS have been scoped in for PM_{10}.

To assist in the assessment of significance of short-term process contributions, Table 4-2 presents acute exposure guideline levels (AEGL) defined by the United States Environmental Protection Agency (EPA).

TABLE 4-1 APPLICABLE AIR QUALITY STANDARDS AND ENVIRONMENTAL ASSESSMENT LEVELS

Applicability	Pollutant	Averaging period	Assessment Criterion (µg/m³)	Percentile
Sensitive Human Receptor	NO_2	1-hour mean, not to be exceeded more than 18 times per year	200	99.79th
		Annual mean	40	N/A
	PM_{10}	24-h mean, not to be exceeded more than 35 times a year	50	90.4th
	NH_3	1-hour mean	2,500	n/a
		Annual mean	180	n/a
	NO	1-hour mean	4,400	n/a
		Annual mean	310	n/a
Sensitive Ecological Receptor	NO_x	24-hour mean	200[a]	100th
		Annual mean	30	N/A
	NH_3	Annual mean	1	n/a

[a] The EA H1 guidance for air emissions risk assessments for environmental permits advises that for detailed assessments where ozone is below the AOT40 critical level and sulphur dioxide is below the lower critical level of 10 µg/m³, a higher AQS of 200 µg/m³ should be used compared to the recommended 75 µg/m³.

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

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

[5] UK government, Air Emissions Risk Assessment for your Environmental Permit, https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit#check-if-you-need-to-do-other-risk-assessments

TABLE 4-2 ACUTE EXPOSURE GUIDELINE LEVELS FOR NO_2

AEGL[a]	10 min (µg/m³)	30 min (µg/m³)	1 hour (µg/m³)	4 hour (µg/m³)	8 hour (µg/m³)
AEGL-1 (non-disabling)	940	940	940	940	940
AEGL-2 (disabling)	38,000	28,000	23,000	15,000	13,000
AEGL-3 (lethal)	64,000	47,000	38,000	26,000	21,000

[a] The AEGL thresholds are sourced from the US Environment Protection Agency (US EPA) and have no regulatory significance in the UK. The modelled results of the air quality assessment are compared against the AEGL thresholds as part of a request by the EA.

Sensitive ecological receptors, nutrient nitrogen, and acid depositions were assessed against site-specific critical loads. These were obtained from the Air Pollution Information System (APIS[6] consulted January 2024) website, based on the site relevant critical loads tool. APIS is an online database detailing critical loads and background concentrations for sensitive ecological sites, developed in partnership by the UK conservation agencies and regulatory agencies, and the Centre for Ecology and Hydrology.

4.2 SIGNIFICANCE OF IMPACT

The impacts of the emissions from the Newport site are assessed based on 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 and ecological receptors are presented in Table 4-3.

TABLE 4-3 SIGNIFICANCE CRITERIA FOR IMPACTS ON RECEPTORS

Site Designation	PC, as % of AQS or CL	PEC, as % of AQS or CL	Significance
Sensitive Human Receptors			
Short Term			
Any sensitive human receptor	<10%		Insignificant
	>10%	<100%	Insignificant
	>10%	>100%	Potentially significant
Long Term			
Any sensitive human receptor	<1%		Insignificant
	>1%	<100%	Insignificant
	>1%	>100%	Potentially significant

[6] UK Air Pollution Information System, www.apis.ac.uk

Site Designation	PC, as % of AQS or CL	PEC, as % of AQS or CL	Significance
Sensitive Ecological Receptors			
Short-term Impact			
Ramsar, SAC, SPA or SSSI	<10%	-	Insignificant
	>10%	-	Potentially significant
AW, LWS, LNR or NNR	<100%	-	Insignificant
	>100%	-	Potentially significant
Long-term Impact			
Ramsar, SAC, SPA or SSSI	<1%	-	Insignificant
	>1%	<70%	Insignificant
	>1%	>70%	Potentially significant
AW, LWS, LNR or NNR	<100%	-	Insignificant
	>100%	-	Potentially significant

If the PEC at specified receptors indicate that the short-term hourly standard for NO_2 has the potential to be breached more than 18 times a year, then the EA guidance on dispersion modelling for oxides of nitrogen assessment from specified generators[7] requests to perform a statistical analysis. The likelihood of actual exceedances is classified as follows:

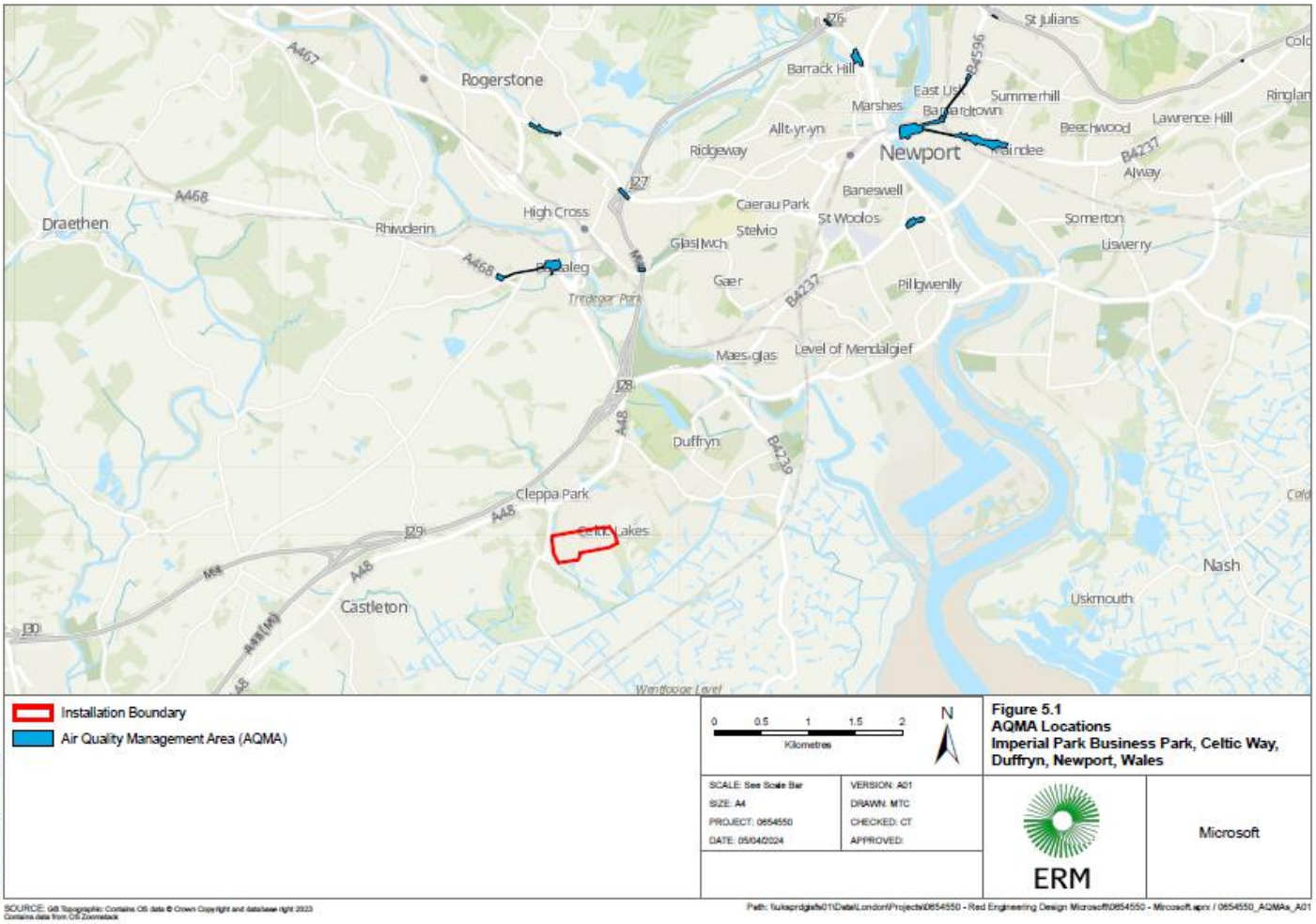
- ≤1%, highly unlikely;
- <5%, unlikely within 20 years of operation; and
- ≥5%, likely potential for significance. In this case, further proposals to reduce the risk of the exceedance are required.

[7] Environment Agency, 2019, Specified generators: dispersion modelling assessment, https://www.gov.uk/guidance/specified-generators-dispersion-modelling-assessment

5. AIR QUALITY BACKGROUND CONCENTRATIONS

Newport City Council (NCC) has declared eleven Air Quality Management Areas (AQMA) related to breaches of the NO_2 annual mean AQS[8]. The nearest AQMAs to the Project Site are the Caerphilly Road AQMA and Glasllwch AQMA which are approximately 2.8km north of the Project Site. The extent of the AQMAs are shown in Figure 5-1.

FIGURE 5-1 LOCATION OF NEAREST AQMAS



Note: Project Site is surrounded by red line boundary. AQMAs are blue areas.

5.1 LOCAL DIFFUSION TUBE MONITORING

During the pre-application discussions with Newport City Council (NCC), for CWL01 & CWL02, NCC indicated the desire to see a baseline air quality survey undertaken in the vicinity of the proposed data centres. ERM conducted a three-month diffusion tube monitoring survey between June 2023 – October 2023 to assess NO_2 and NO_x background levels in the vicinity of the project.

[8] Newport City Council, October 2022, 2022 Air Quality Progress Report, https://www.newport.gov.uk/documents/Transport-and-Streets/Pollution-and-Noise-Control/Newport-APR-2022-Issue-Final-28-12-22-002.pdf

5.1.1 METHODOLOGY AND SCOPE

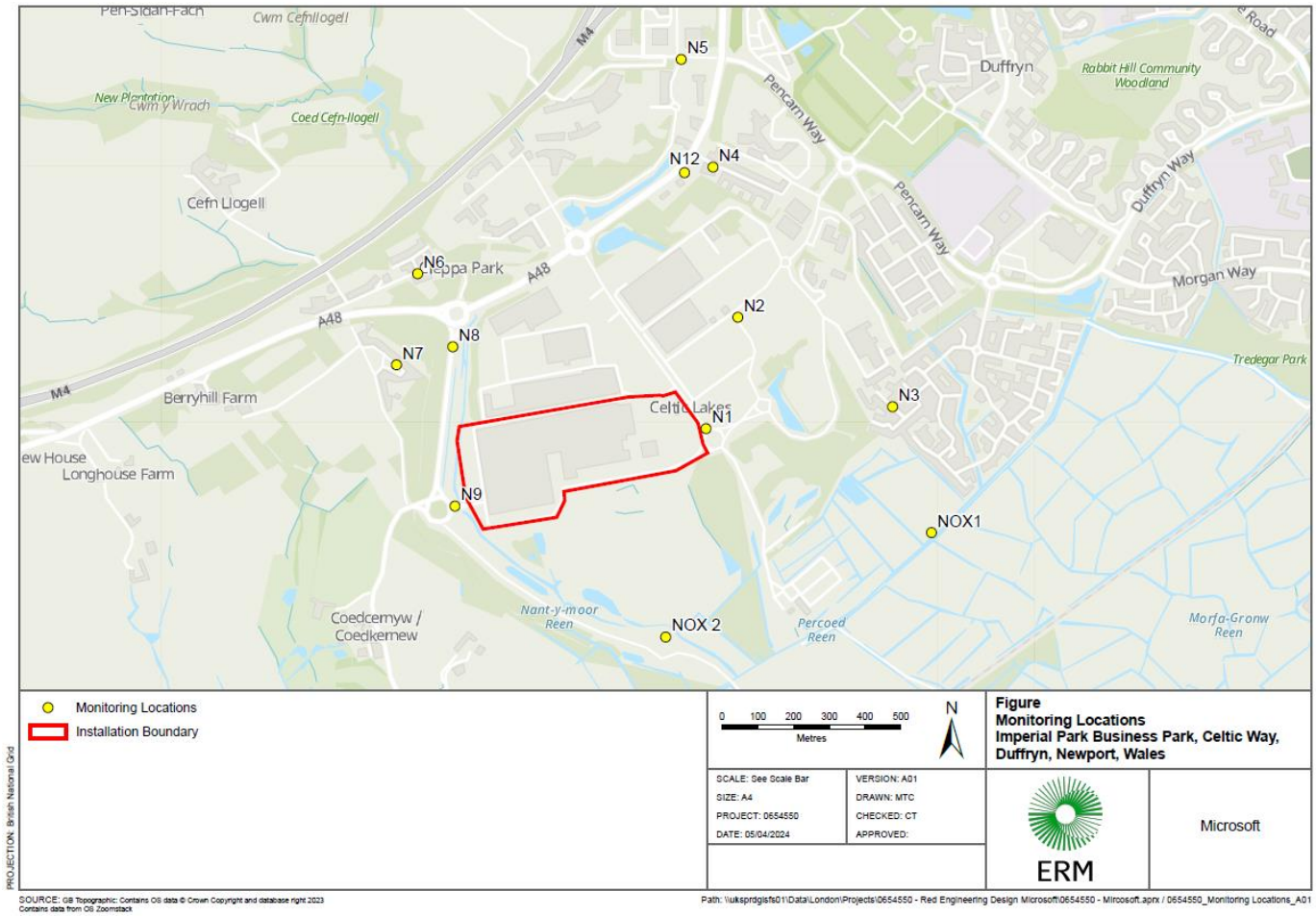
Passive Diffusion Samplers were deployed for a period of one month at a time, and the period mean concentration was determined by analysis of samples in the laboratory. Two diffusion samplers for each site were set up on the initial site visit and changeover per month with a total of 72 diffusion samplers.

Twelve monitoring locations agreed by Newport City Council were used for NO_2 monitoring on human health and for NO_x monitoring on habitats. The coordinates of each sampling point location are set out in Table 5-1 and shown in Figure 5-2.

TABLE 5-1 SAMPLING POINT LOCATIONS (NO_2 AND NO_X)

Sampling point	Easting	Northing
NO_2		
N1	328358	184145
N2	328387	184310
N3	328785	184268
N4	328471	184780
N5	328336	185202
N6	327921	185209
N7	327499	185215
N8	327551	184498
N9	327465	183962
N12	328348	185814
NO_x		
NOx1	328482	183748
NOx2	328193	183621

FIGURE 5-2 SAMPLING POINT LOCATIONS (NO_2 AND NO_X)



5.1.2 MONITORING DATA

The monitoring data over the three-month period measured at the sampling points are set out in Table 5-2. The NO_2 concentrations at all sampling locations over the three months are below the annual mean AQS of 40 µg/m^3. The maximum NO_2 concentration at the sampling location is 24.78 µg/m^3 which is monitored at Site N12, adjacent to the junction of the M4 and A48. The higher values here are likely due to the greater amount of traffic flows compared with other monitoring sites.

The NO_x concentrations measured over the three months are below the 30 µg/m^3 environmental standard. The maximum NO_x concentration at the sampling location is 9.79 µg/m^3 which is monitored at Site NOx2. This value was lower than the concentrations obtained from APIS for habitats assessment therefore APIS values were used as a worst case.

For the purposes of this impact assessment, the maximum NO_2 and NO_x levels are used as a worst-case scenario.

TABLE 5-2 MONITORING DATA OF NO_2 AND NO_X µG/M^3

Sampling Point	Diffusion Tube [1]	27/06/2023 - 02/08/2023	02/08/2023 - 06/09/2023	06/09/2023 - 04/10/2023	Average
N1	**N1_1**	7.69	10.81	14.47	10.99

Sampling Point	Diffusion Tube [1]	27/06/2023 - 02/08/2023	02/08/2023 - 06/09/2023	06/09/2023 - 04/10/2023	Average
N1	**N1_2**	8.00	11.34	14.62	11.32
N2	**N2_1**	*	*	*	-
N2	**N2_2**	*	*	*	-
N3	**N3_1**	3.98	*	11.76	7.87
N3	**N3_2**	*	*	11.45	11.45
N4	**N4_1**	10.56	12.84	15.88	13.09
N4	**N4_2**	10.82	12.61	16.08	13.17
N5	**N5_1**	12.97	14.81	20.15	15.97
N5	**N5_2**	*	15.84	20.45	18.15
N6	**N6_1**	13.45	18.03	17.53	16.34
N6	**N6_2**	8.96	14.45	18.24	13.89
N7	**N7_1**	7.57	10.08	13.20	10.29
N7	**N7_2**	7.61	10.06	12.84	10.17
N8	**N8_1**	13.34	13.17	15.61	14.04
N8	**N8_2**	8.96	12.15	16.58	12.57
N9	**N9_1**	5.98	8.32	10.77	8.36
N9	**N9_2**	6.17	8.27	11.16	8.53
N12	**N12_1**	16.49	19.17	23.51	19.72
N12	**N12_2**	15.63	20.23	24.78	20.21
Average NO_2 µg/m³		**9.89**	**13.26**	**16.06**	**13.07**
Max NO_2 µg/m³		**16.49**	**20.23**	**24.78**	**20.21**
NO_2 AQS µg/m³		40			
NOx1	**NOx1_1**	6.19	8.19	7.81	7.39
NOx1	**NOx1_2**	6.49	7.95	7.51	7.31
NOx2	**NOx2_1**	5.56	6.92	9.07	7.18
NOx2	**NOx2_2**	6.32	8.60	9.79	8.24
Average NO_x µg/m³		**6.14**	**7.92**	**8.54**	**7.53**
Max NO_x µg/m³		**6.49**	**8.60**	**9.79**	**8.24**
NO_x AQS µg/m³		30			

Sampling Point	Diffusion Tube [1]	27/06/2023 - 02/08/2023	02/08/2023 - 06/09/2023	06/09/2023 - 04/10/2023	Average
Note:	* Missing tube or corrupted results				
	[1] Two diffusion tubes were set up for each sampling point				

5.1.3 DEFRA MAPPING DATA AND MONITORING DATA

In addition to the NO_2 and NO_x monitoring data, the baseline air quality information was reviewed from background maps[9] and local monitoring reports[10] for NO, NH_3 and PM_{10}. The DEFRA mapping value obtained for NO_2 was seen to be comparable to the monitoring data and therefore the latter was considered valid for use in this assessment for this pollutant. Baseline pollutant levels are shown in Table 5-3 Narbeth was used as the local monitoring site for NH_3 as it was the closest monitoring location to the Project Site that measured ammonia.

TABLE 5-3 BASELINE AIR QUALITY FROM DEFRA/LOCAL MONITORING SITES

Source	Pollutants Monitored	Baseline Value (µg/m³)	Period
Defra Mapping (2022)	NO_2	16.5	Annual Mean (2022)
	PM_{10}	15.3	
	NO	11.1	
Local Monitoring Site: Narberth (2022)	NH_3	1.97	Annual Mean (2022)

5.1.4 OZONE (AOT40) AND SO_2

The 24-hourly 200 µg/m³ standard for NO_x on designated environmental sites is justified by the levels of ozone and SO_2 in the local area as outlined in Section 4.1. Ozone is not monitored in Newport. The Cwmbran Crownbridge Automatic Urban and Rural Network (AURN) monitoring site was instead used to obtain background ozone. This site is considered the most representative of the project site as it is a similar urban background site and the closest to the project location (approximately 11.5 km north of the Project Site). SO_2 is not monitored in Newport or Cwmbran, and instead, the Cardiff Centre AURN monitoring site was used to obtain background SO_2. The site is in the middle of Cardiff city centre and is located approximately 12 km southwest of the Project Site. Table 5-4 outlines the background ozone and SO_2 levels from the AURN sites.

TABLE 5-4 BACKGROUND OZONE AND SO_2

Source	Threshold	Pollutants Monitored	Monitored Baseline	Notes
Cwmbran Crownbridge automatic	6,000 µg/m³	Ozone	1,228 µg/m³, as the AOT40	AOT40 accumulated hourly value (01

[9] https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018

[10] https://uk-air.defra.gov.uk/networks/site-info?uka_id=UKA00323

Source	Threshold	Pollutants Monitored	Monitored Baseline	Notes
monitoring site				May – 31 July 2023, 08.00:20.00)
Cardiff Centre automatic monitoring site	10 µg/m^3	SO_2	1.35 µg/m^3	Annual mean from 2023

6. ASSESSMENT METHODOLOGY

6.1 MODEL PARAMETERS AND INPUTS

The key elements of the methodology used for carrying out the air dispersion modelling are set out in Table 6-1.

TABLE 6-1 AIR DISPERSION MODEL METHODOLOGY AND PARAMETERS

Parameter	Approach	Notes
Dispersion model	Lakes AERMOD View 11.2.0	
Number of sources	31 spread across two buildings	See Section 6.1 for site layout and Figure 6-1 for source locations. Note: additional fire pump generators were not included in the assessment as data was not available however they would be expected to be small emitters in comparison to other generator engines on site.
Model domain	8km x 8km centred on Site (multi tier grid) (10km x 10 km for habitats analysis).	Impacts from the data centre will typically arise within 1,000m of source, and impacts further afield are unlikely to be significant.
Receptor grid resolution	Multi Tier Grid (8km x 8km) Up to 500m from centre: 20m Up to 4,000m from centre: 50m Habitats Grid (10km x 10km) Up to 500m from centre 20m Up to 4,000 from centre 50m Up to 10,000 from centre 100m	Stack heights are 14 m for all Newport site generators.
Discrete sensitive receptors	24	Detailed information in Section 6.3.1
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 included.
Surface Characteristics	Albedo: 0.222 Bowen Ratio: 1.45 Surface Roughness: 1.00	As provided with met data
Meteorological data	Cardiff Airport, 5 years	Hour-sequential data. Wind roses are presented in *Appendix A*.

Parameter	Approach	Notes
NO_x to NO_2 conversion ratio	Short-term concentrations: <500m from source 15% >500m from source 35% Long-term concentrations: 70%	The Environment Agency[a] states that a short-term conversion ratio of 15% is reasonable within 500 m of a source. For distances of >500 m ratios are taken from other Environment Agency guidance[b].
Averaging period conversion rates	1-hour maximum NO_x concentration to 10-minute maximum NO_x concentration factor: 1.431 1-hour maximum NO_x concentration to 30-minute maximum NO_x concentration factor: 1.149	AERMOD does not allow for modelling shorter averaging periods than 1 hour. To estimate maximum NO_2 concentrations for comparison against the 10-minute and 30-minute AEGLs, the power law was used to calculate a factor. These factors were applied to the predicted maximum 1-hour NO_2 concentration to determine a predicted maximum 10-minute and 30-minute NO_2 concentration.
NO_x to NO conversion ratio	Short-term concentrations: <500m from source 85% >500m from source 65% Long-term concentrations: 30%	Based on the guidance for NO_x to NO_2 outlined above.

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

c) Environment Agency, 2018, *Guidance on dispersion modelling for oxides of nitrogen assessment from specified generators*, https://consult.environment-agency.gov.uk/psc/mcp-and-sg-regulations/supporting_documents/Specified%20Generators%20Modelling%20GuidanceINTERIM%20FINAL.pdf

6.2 EMISSION PARAMETERS

The modelled emission parameters for each source are presented in Table 6-2. Maps showing the proposed stack locations are presented in Figure 6-1.

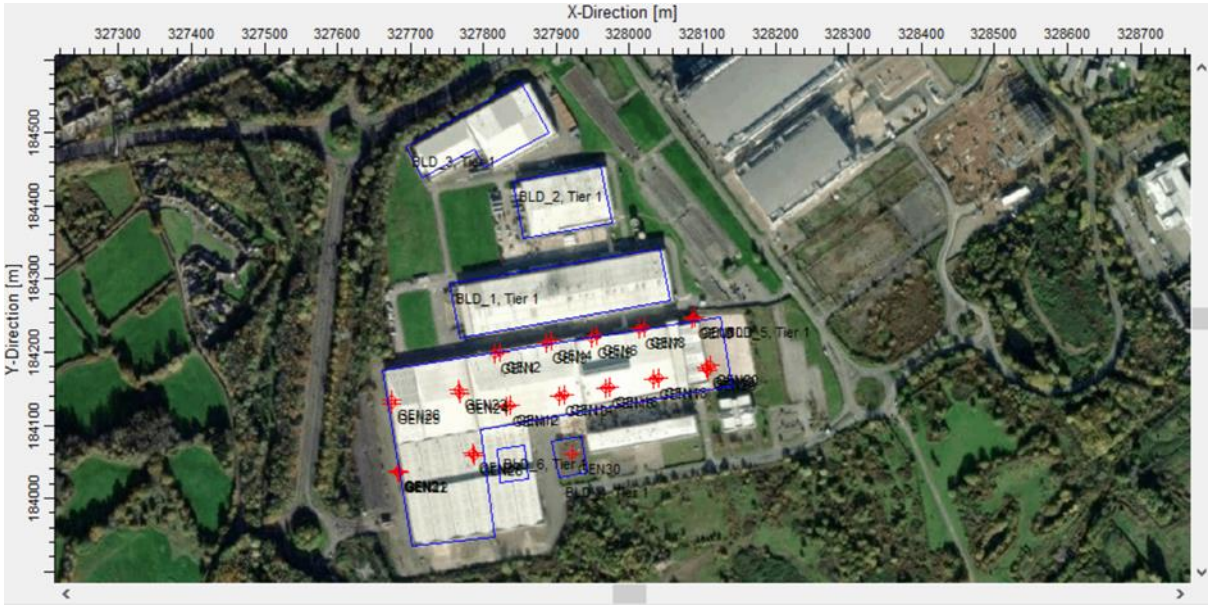
TABLE 6-2 MODELLED EMISSIONS PARAMETERS

	Generator		
Type of Gen	Colo	Admin	Water Treatment Unit
No of Gens	CWL01: 20 CWL02: 8	CWL01: 1 CWL02: 1	1
Generator Engine Make/Model	CAT C175-20	CAT C18	Cat C13
Stack Orientation	Vertical	Vertical	Vertical
Stack Height above ground level (m)	14	14	14
Flue Diameter (m)	0.6	0.6	0.6
Emission Velocity (m/s)	41.5	25.6	12.2
Nominal Flow Rate (m^3/s)	4.01	1.085	0.481
Actual Flow Rate (m^3/s)	11.74	3.215	1.535
Emission Temperature (K)	733.85	737.75	789.85
NO_x Concentration[a] (mg/m^3, 100% load) (no SCR)	2861	3543	1981.8
NO_x Emission Rate (g/s, 100% load)	11.5	3.84	0.954
NO_x Concentration[a] (mg/m^3, 100% load) (SCR-abated) [1 hour]	286.1	354.3	198.1
NO_x Emission Rate (g/s, 100% load) (SCR-abated) [1 hour]	2.349[b]	1.076[c]	0.267[c]
NO_x Emission Rate (g/s, 100% load) (SCR-abated) [10 minutes]	8.365[b]	3.844[c]	0.954[c]
NO_x Emission Rate (g/s, 100% load) (SCR-abated) [30 minutes]	3.552[b]	1.768[c]	0.439[c]
NO_x Emission Rate (g/s, 100% load) (SCR-abated) [4 hour]	1.447[b]	0.557[c]	0.138[c]
NO_x Emission Rate (g/s, 100% load) (SCR-abated) [8 hour]	1.296[b]	0.471[c]	0.117[c]
PM_{10} Concentration[a] (mg/m^3, 100% load)	6.5	23.2	8.9
PM_{10} Emission Rate (g/s, 100% load)	0.026	0.025	0.0043

	Generator		
NH_3 Concentration[a] (mg/m^3, 100% load) (SCR)	5	5	5
NH_3 Emission Rate (g/s, 100% load)	0.020	0.00543	0.00241

[a] Concentrations were supplied by the client, presented at 5% O_2 content
[b] Emission rate calculated from unabated and SCR-abated NO_x concentrations on an averaging time basis and taking into account of 7-minute warm-up time for SCR.
[c] Emission rate calculated from unabated and SCR-abated NO_x concentrations on an averaging time basis and taking into account of 12-minute warm-up time for SCR.

FIGURE 6-1 SITE LAYOUT – EMISSION SOURCES



6.3 RECEPTORS PARAMETERS

6.3.1 HUMAN RECEPTORS

Following EA guidance[11], an impact assessment was carried out for the grid which includes discrete potential sensitive receptor locations at which the public could be expected to be present for one hour, including the closest identified residential receptors. Table 6-3 presents the selected receptors and Figure 6.2 their location.

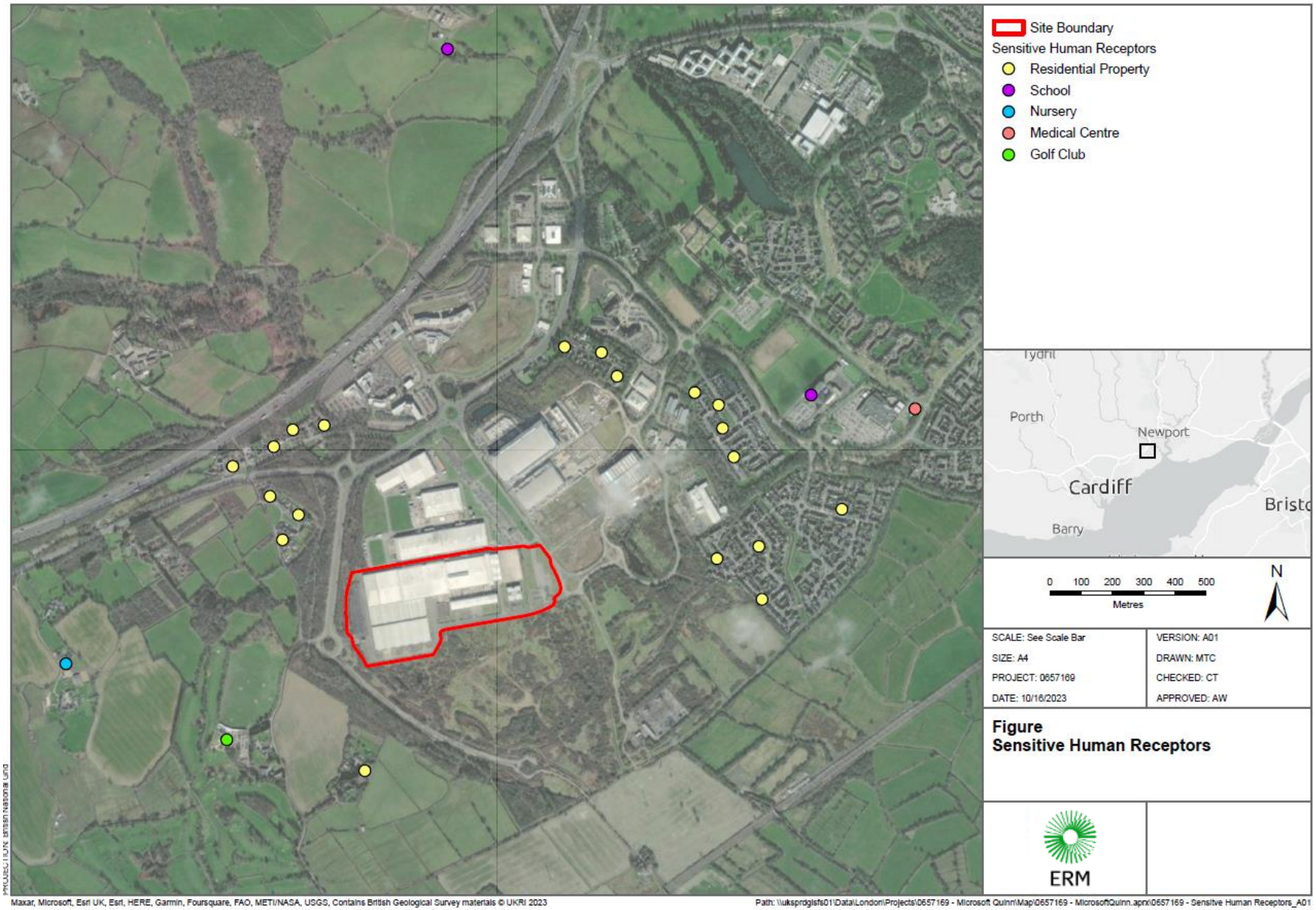
[11] Environment Agency, 2018, Guidance on dispersion modelling for oxides of nitrogen assessment from specified generators, https://consult.environment-agency.gov.uk/psc/mcp-and-sg-regulations/supporting_documents/Specified%20Generators%20Modelling%20GuidanceINTERIM%20FINAL.pdf

TABLE 6-3 MODELLED SENSITIVE POTENTIAL RECEPTORS

Receptor name	Type of receptor	X,Y coordinates	Approximate distance from the CWL01 & CWL02 generators (km)
Residential properties 1	Residential	327665, 183549	0.60
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	0.70
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

Receptor name	Type of receptor	X,Y coordinates	Approximate distance from the CWL01 & CWL02 generators (km)
St Brides Medical Centre	Medical Centre	329423, 184706	1.62
Residential properties 16	Residential	328790, 184227	0.90
Residential properties 17	Residential	328934, 184097	1.06
Residential properties 18	Residential	328924, 184266	1.04
Residential properties 19	Residential	329189, 184385	1.33

FIGURE 6.2 SITE LOCATION IN RELATION TO HUMAN RECEPTORS



6.3.2 ECOLOGICAL RECEPTORS

As per EA guidance[12], protected conservation areas within 10 km of the Newport site for SACs, SPAs and Ramsar sites and within 2 km for LNRs, NNRs and SSSIs were included in the impact assessment. Using the website MAGIC[13] , and SCAIL tool[14] the following sites have been included in the assessment (Table 6-4)

TABLE 6-4 MODELLED SENSITIVE POTENTIAL RECEPTORS

Name of Site	Type	Distance to Site
Argloddiau Cronfeyedd Dwr Llanisien a Llys-Faen / Llanishen and Lisvane Reservoir Embankments	SSSI	~9km west
Coed-y-Darren	SSSI	~8.9km northwest
Lisvane Reservoir	SSSI	~9km west
Gwlyptiroedd Casnewydd / Newport Wetlands	SSSI	~4.5km southeast
Henllys Bog	SSSI	~8.7km north
Gwent Levels - St. Brides	SSSI	~300m south
Gwent Levels - Whitson	SSSI	~9km east
Gwent Levels - Nash and Goldcliff	SSSI	~6km east
Rhymney River Section	SSSI	~8.3km southwest
Rumney Quarry	SSSI	~8.1km southwest
Severn Estuary	SSSI, SAC, SPA	~3.2km southeast
Ruperra Castle and Woodlands	SSSI	~5,5km northwest
River Usk (Lower Usk) / Afon Wysg (Wysg Isaf)	SSSI, SAC	~3.6km east
Penylan Quarry	SSSI	~9.5km southwest
Plas Machen Wood	SSSI	~5km northwest
Gwent Levels - Rumney and Peterstone	SSSI	~2.5km southwest

Note: The Dan y Graig Quarry, Risca SSSI (located ~7.9km north west of the Project Site) was not included in the assessment as it is considered a geological site and does not have associated critical loads (as per APIS).

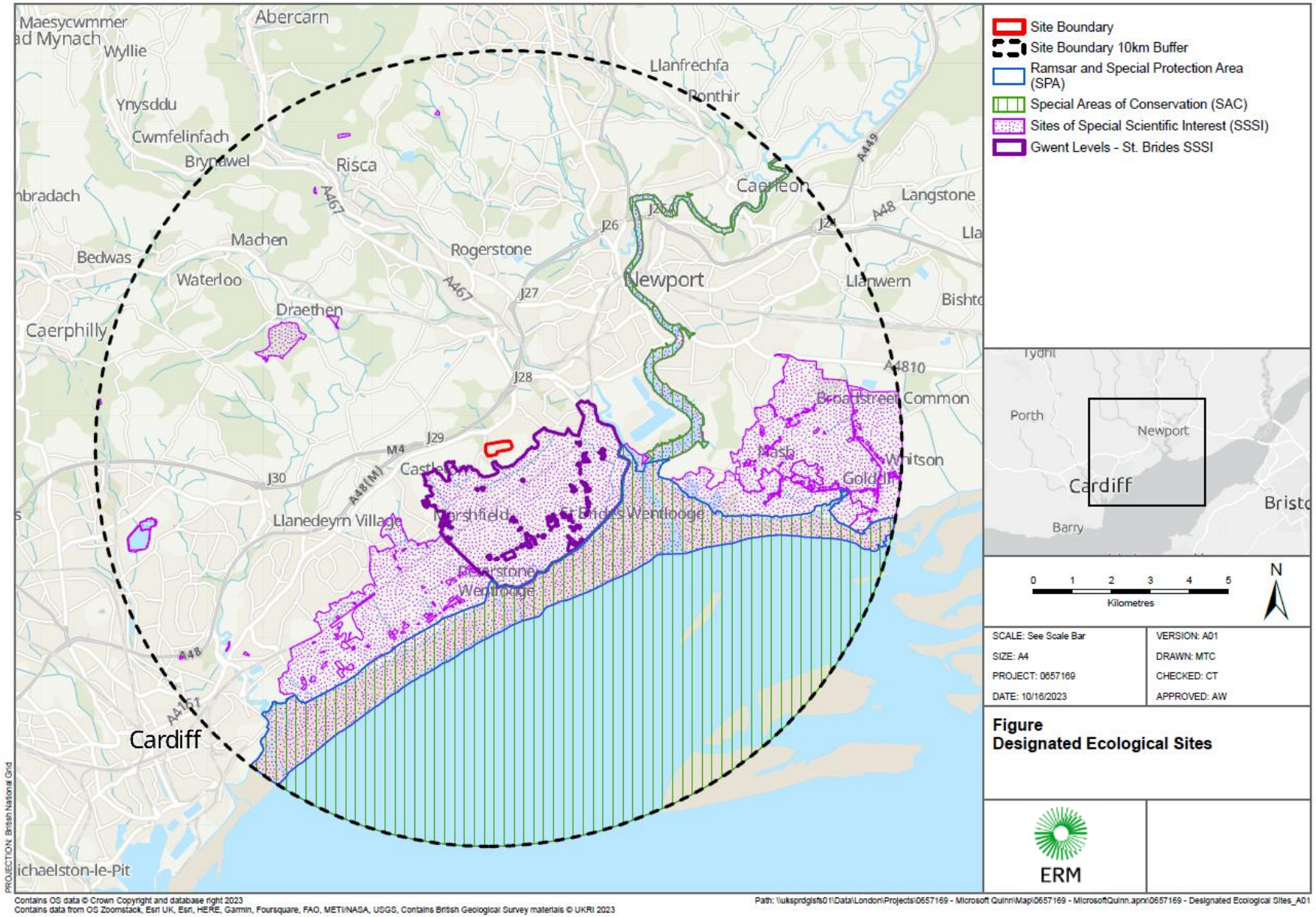
Their location is presented in Figure 6.3.

[12] Environment Agency, 2016, *Air Emissions Risk Assessment for your Environmental Permit*, http://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit

[13] Natural England, 2018, MAGIC interactive map, https://magic.defra.gov.uk/MagicMap.aspx

[14] https://www.scail.ceh.ac.uk/cgibin/combustion/input.pl?action=load&session=595185997

FIGURE 6.3 SITE LOCATION IN RELATION TO ECOLOGICAL SITES



7. IMPACT ASSESSMENT

7.1 INTRODUCTION

The assessment considers the potential impact of the following routine operations:

- Monthly test;
- Quarterly test;
- Annual test;
- Annual PIT test; and
- Quinquennial tests (USS Switchgear and UPM Switchgear).

In addition, the potential impacts of emergency power generation are assessed, noting the likely rarity of these events. A screening assessment was undertaken for PM_{10} in Section 7.2. A detailed assessment was undertaken in Section 7.3 for NO_2, NO_x, NO and NH_3 for human health and habitats respectively.

7.2 PM_{10} SCREENING

A screening exercise using modelled data has been undertaken on the basis that the Newport site is running all the engines at the same time at 100% load. This in practice is not how the testing regime is scheduled. This is also an unlikely case for an emergency scenario as not all engines would be expected to run for the whole 8-hours. The results of the modelling for this worst-case scenario are presented in Table 7-1 short-term background concentration for PM_{10} of 30.5 µg/m^3 was used, based on the long-term background presented in Table 5-2.

TABLE 7-1 MODELLED 24-HOUR MEAN CONCENTRATIONS FOR PM_{10} SCREENING BASED ON 8-HOUR OF OPERATIONS, ALL ENGINES, 100% LOAD

Particulates (PM^{10}) Concentration (µg/m^3), Maximum at any of the Specified Receptors					
24-hour maximum (100th %ile)			24-hour 36th highest hour (90.4th %ile)		
PC	PEC	PEC as % of AQS	PC	PEC	PEC as % of AQS
16.1	46.6	93.3%	9.85	40.4	80.8%

[a] *All engines running at 100% load for 8 hours*

The modelling results for the screening exercise presented in Table 7-1 show that the AQS is not expected to be exceeded even in this worst case. On this basis, the current testing regime is not expected to result in the AQS being exceeded. No further detailed assessment of PM_{10} for each test undertaken or emergency power operations has therefore been performed.

A contour plot of the 36th highest 24-hour mean is presented in Appendix B.

7.3 DETAILED ASSESSMENT OF NO_2, NO_X, NO AND NH_3

7.3.1 TESTING REGIME

7.3.1.1 OVERVIEW

The impact assessment considers the potential for the 1-hour NO_2 AQS of 200 µg/m^3, the acute exposure guideline levels (AEGLs) and the 1-hour NO and NH_3 EALs to be exceeded at receptors, due to engine emissions. This requires consideration of the baseline. In this case the short-term baseline, based on the long-term background presented in Section 5, is 49.6 µg/m^3. As such, for NO_2 the Process Contribution (PC) at a receptor must be greater than 150.4 µg/m^3 NO_2 for the Predicted Environmental Concentrations (PEC) to exceed the 1-hour NO_2 standard which is the most stringent standard.

The modelled PCs and PECs for each of the three tests are set out below.

7.3.1.2 MONTHLY TEST

As described in Section 3.3.2, a monthly test is undertaken as follows:

- The test occurs once per month;
- Running one generator at a time for approximately 15 minutes (15 min run, 5 min cooldown);
- No electrical load corresponding to load and NO_x emissions 30% of maximum; and
- Each data centre is tested for a maximum of 2 hours and 40 minutes per year.

The predicted maximum concentrations in the entire model domain (including areas containing indicative sensitive receptors) resulting from emissions of any of the engines are presented in Table 7-2.

TABLE 7-2 PREDICTED HOURLY CONCENTRATIONS FOR MONTHLY TEST

Period	AQS/ EAL/ AEGL (µg/m³)		Baseline (µg/m³)	PC (µg/m³)	PEC (µg/m³)	PC as % of AQS/ EAL/ AEGL (%)	PEC as % of AQS/ EAL/ AEGL (%)
NO 1-hour Maximum	EAL	4,400	11.1	5.88	17.0	0.13%	0.4%
NO_2 1-hour maximum	1-hour maximum	200	49.6	1.76	51.3	0.88%	26%
	1-hour 19th highest hour (99.79th %ile)	200		1.25	50.8	0.63%	25%
NO_2 10-minute maximum	AEGL-1	940	49.6	8.96	58.5	0.95%	6%
	AEGL-2	38,000				0.0236%	0.15%
	AEGL-3	64,000				0.0140%	0.09%
NO_2 30-minute maximum	AEGL-1	940	49.6	3.06	52.6	0.33%	5.60%
	AEGL-2	28,000				0.0109%	0.19%
	AEGL-3	47,000				0.0065%	0.11%
NO_2 1-hour maximum	AEGL-1	940	49.6	1.76	51.3	0.19%	5.46%
	AEGL-2	23,000				0.008%	0.22%
	AEGL-3	38,000				0.005%	0.14%
NO_2 4-hour maximum	AEGL-1	940	49.6	0.16	49.7	0.02%	5.29%
	AEGL-2	15,000				0.001%	0.33%
	AEGL-3	23,000				0.001%	0.22%
NO_2 8-hour maximum	AEGL-1	940	49.6	0.05	49.6	0.0056%	5.28%
	AEGL-2	13,000				0.0004%	0.38%
	AEGL-3	21,000				0.0002%	0.24%
NH_3 1-hour maximum	EAL	2,500	3.9	0.09	4.0	0.0036%	0.2%

The results presented in Table 7-2 predict no exceedances for any AQS or AEGL as a result of the monthly test.

7.3.1.3 QUARTERLY TEST

As described in Section 3.3.2, the quarterly test is undertaken as follows:

- The test occurs once per quarter (three times per year);
- To be undertaken three times a year, during months where the monthly and annual tests do not take place;
- All generators will be run independently for approximately 30 minutes (30min run, 5min cooldown) at 70% load.

Contour plots for the 1-hour maximum are presented in *Appendix B*.

The predicted maximum concentrations in the entire model domain (including areas containing indicative sensitive receptors) resulting from emissions of any of the engines are presented in Table 7-3.

TABLE 7-3 PREDICTED HOURLY CONCENTRATIONS FOR QUARTERLY TEST

Period	AQS/ EAL/ AEGL (µg/m³)		Baseline (µg/m³)	PC (µg/m³)	PEC (µg/m³)	PC as % of AQS/ EAL/ AEGL (%)	PEC as % of AQS/ EAL/ AEGL (%)
NO 1-hour maximum	EAL	4,400	11.1	27.4	38.6	0.6%	0.9%
NO_2 1-hour maximum	1-hour maximum	200	49.6	8.21	57.8	4.10%	29%
	1-hour 19th highest hour (99.79th %ile)	200		5.85	55.4	2.93%	28%
NO_2 10-minute maximum	AEGL-1	940	49.6	41.8	91.4	4.45%	10%
	AEGL-2	38,000				0.11%	0.24%
	AEGL-3	64,000				0.07%	0.14%
NO_2 30-minute maximum	AEGL-1	940	49.6	14.3	63.9	1.52%	6.79%
	AEGL-2	28,000				0.05%	0.23%
	AEGL-3	47,000				0.03%	0.14%
NO_2 1-hour maximum	AEGL-1	940	49.6	8.21	57.8	0.87%	6.15%
	AEGL-2	23,000				0.036%	0.25%
	AEGL-3	38,000				0.022%	0.15%
NO_2 4-hour maximum	AEGL-1	940	49.6	0.73	50.3	0.08%	5.35%
	AEGL-2	15,000				0.005%	0.34%
	AEGL-3	23,000				0.003%	0.22%
NO_2 8-hour maximum	AEGL-1	940	49.6	0.24	49.8	0.03%	5.30%
	AEGL-2	13,000				0.002%	0.38%
	AEGL-3	21,000				0.001%	0.24%
NH_3 1-hour maximum	EAL	2,500	3.9	0.41	4.4	0.017%	0.2%

The results presented in Table 7-3 predict no exceedances for any AQS or AEGL as a result of the quarterly test.

7.3.1.4 ANNUAL TESTS

As described in Section 3.3.2, the annual tests are undertaken as follows:

- Annual Test and Annual PIT Test both occur once per year;
- For each test all generators are run individually. The Annual Test is run for 65 minutes (60 min run and 5 min cooldown). The Annual PIT test is run for 95 minutes (90 min run and 5min cooldown);
- Both tests are run at 100% (note: the load for the PIT test was not given and was assumed to be 100% as a worst-case scenario);
- Electrical load corresponding to load and NO_x emissions 60% of maximum.

Contour plots for the 1-hour maximum have also been created and are presented in *Appendix B.*

The predicted maximum concentrations in the entire model domain (including areas containing indicative sensitive receptors) resulting from emissions of any of the engines as part of the annual tests are presented in Table 7-4.

TABLE 7-4 PREDICTED HOURLY CONCENTRATIONS FOR ANNUAL TESTS

Period	AQS/ EAL/ AEGL (µg/m³)		Baseline (µg/m³)	PC (µg/m³)	PEC (µg/m³)	PC as % of AQS/ EAL/ AEGL (%)	PEC as % of AQS/ EAL/ AEGL (%)
Annual Test							
NO 1-hour maximum	EAL	4,400	11.1	78.4	89.5	1.8%	2.0%
NO_2 1-hour maximum	1-hour maximum	200	49.6	23.5	73.0	11.73%	37%
	1-hour 19th highest hour (99.79th %ile)	200		16.7	66.3	8.36%	33%
NO_2 10-minute maximum	AEGL-1	940	49.6	120	169	12.7%	18%
	AEGL-2	38,000				0.31%	0.44%
	AEGL-3	64,000				0.19%	0.26%
NO_2 30-minute maximum	AEGL-1	940	49.6	40.9	90.4	4.35%	9.62%
	AEGL-2	28,000				0.15%	0.32%
	AEGL-3	47,000				0.09%	0.19%
NO_2 1-hour maximum	AEGL-1	940	49.6	23.5	73.0	2.50%	7.77%
	AEGL-2	23,000				0.102%	0.32%
	AEGL-3	38,000				0.062%	0.19%
NO_2 4-hour maximum	AEGL-1	940	49.6	2.08	51.6	0.22%	5.49%
	AEGL-2	15,000				0.014%	0.34%
	AEGL-3	23,000				0.009%	0.22%

Period	AQS/ EAL/ AEGL (µg/m³)		Baseline (µg/m³)	PC (µg/m³)	PEC (µg/m³)	PC as % of AQS/ EAL/ AEGL (%)	PEC as % of AQS/ EAL/ AEGL (%)
NO_2 8-hour maximum	AEGL-1	940	49.6	0.70	50.3	0.07%	5.35%
	AEGL-2	13,000				0.005%	0.39%
	AEGL-3	21,000				0.003%	0.24%
NH_3 1-hour maximum	EAL	2,500	3.9	1.18	5.1	0.047%	0.2%
Annual PIT Test							
NO 1-hour maximum	EAL	4,400	11.1	47.1	58.2	1.1%	1.3%
NO_2 1-hour maximum	1-hour maximum	200	49.6	14.1	63.6	7.04%	32%
	1-hour 19th highest hour (99.79th %ile)	200		10.0	59.6	5.01%	30%
NO_2 10-minute maximum	AEGL-1	940	49.6	71.7	121	7.63%	13%
	AEGL-2	38,000				0.19%	0.32%
	AEGL-3	64,000				0.11%	0.19%
NO_2 30-minute maximum	AEGL-1	940	49.6	24.5	74.1	2.61%	7.88%
	AEGL-2	28,000				0.09%	0.26%
	AEGL-3	47,000				0.05%	0.16%
NO_2 1-hour maximum	AEGL-1	940	49.6	14.1	63.6	1.50%	6.77%
	AEGL-2	23,000				0.061%	0.28%
	AEGL-3	38,000				0.037%	0.17%
NO_2 4-hour maximum	AEGL-1	940	49.6	1.87	51.4	0.20%	5.47%
	AEGL-2	15,000				0.012%	0.34%
	AEGL-3	23,000				0.008%	0.22%
NO_2 8-hour maximum	AEGL-1	940	49.6	0.63	50.2	0.07%	5.34%
	AEGL-2	13,000				0.005%	0.39%
	AEGL-3	21,000				0.003%	0.24%
NH_3 1-hour maximum	EAL	2,500	3.9	0.71	4.6	0.028%	0.2%

The results presented in Table 7-4 predict no exceedances for any AQS or AEGL from the Annual Test and the Annual PIT Test.

7.3.1.5 QUINQUENNIAL TESTS

As described in Section 3.3.2, the quinquennial tests are undertaken as follows:

- There are two quinquennial tests: USS Switchgear and UPM Switchgear. These both occur once every five years with a 90-minute run time and 5-minute cooldown;
- Each tests involve running each generator as part of a grouping. As these groupings were not known the modelling was completed assuming all generators were running at the same time as a worst-case scenario i.e. 31 generators running for 90 minutes;
- Both quinquennial tests were assumed to run at 60% load as a worst-case scenario as electrical load was not supplied.

The predicted maximum concentrations in the entire model domain (including areas containing indicative sensitive receptors) resulting from emissions of any of the engines as part of the quinquennial tests are presented in Table 7-5.

TABLE 7-5 PREDICTED HOURLY CONCENTRATIONS FOR QUINQUENNIAL TESTS

Period	AQS/ EAL/ AEGL (µg/m³)		Baseline (µg/m³)	PC (µg/m³)	PEC (µg/m³)	PC as % of AQS/ EAL/ AEGL (%)	PEC as % of AQS/ EAL/ AEGL (%)
NO 1-hour maximum	EAL	4,400	11.1	1458	1470	33.1%	33.4%
NO_2 1-hour maximum	1-hour maximum	200	49.6	436	486	218%	243%
	1-hour 19th highest hour (99.79th %ile)	200		311	360	155%	180%
NO_2 10-minute maximum	AEGL-1	940	49.6	2223	2273	237%	242%
	AEGL-2	38,000				5.85%	5.98%
	AEGL-3	64,000				3.47%	3.55%
NO_2 30-minute maximum	AEGL-1	940	49.6	760	810	80.9%	86.1%
	AEGL-2	28,000				2.71%	2.89%
	AEGL-3	47,000				1.62%	1.72%
NO_2 1-hour maximum	AEGL-1	940	49.6	436	486	46.4%	51.7%
	AEGL-2	23,000				1.90%	2.11%
	AEGL-3	38,000				1.2%	1.28%
NO_2 4-hour maximum	AEGL-1	940	49.6	3.12	52.7	0.33%	5.60%
	AEGL-2	15,000				0.021%	0.35%
	AEGL-3	23,000				0.014%	0.23%
NO_2 8-hour maximum	AEGL-1	940	49.6	1.05	50.6	0.11%	5.38%
	AEGL-2	13,000				0.008%	0.39%
	AEGL-3	21,000				0.005%	0.24%

Period	AQS/ EAL/ AEGL (µg/m³)		Baseline (µg/m³)	PC (µg/m³)	PEC (µg/m³)	PC as % of AQS/ EAL/ AEGL (%)	PEC as % of AQS/ EAL/ AEGL (%)
NH_3 1-hour maximum	EAL	2,500	3.9	22.04	26	0.882%	1.0%

The results presented in Table 7-5 predict exceedances for the 1-hour AQS and the 10-minute AEGL-1 as a result of each quinquennial test. It is noted that the quinquennial tests are based on a worst-case scenario (all engines running together) when in reality these engines would likely be grouped into smaller cells and thereby resulting in lower emissions.

The quinquennial tests each only occur for 90 minutes every five years therefore it is impossible for this test alone to breach the standard 19 times in a year. In addition, the model takes into account the worst-case meteorological year and the likelihood of the quinquennial test coinciding with the worst-case meteorological conditions and impacting the sensitive receptors within a specific 10-minute period is highly unlikely. Ambient monitoring is recommended to take place during the test to verify that the AEGL-1 threshold is not exceeded at the Site.

7.3.1.6 IMPACT OF TESTING REGIME ON THE NO_2, NO AND NH_3 ANNUAL MEAN STANDARDS

The potential to exceed the annual mean NO_2, NO and NH_3 standards due to the proposed site testing regime (outlined in Section 3.3.2) has been evaluated based upon the anticipated total cumulative impacts of all potential tests.

The resulting expected annual mean concentrations are presented in Table 7-6.

TABLE 7-6 MODELLED ANNUAL MEAN CONCENTRATIONS FOR THE TESTING REGIME

Pollutant	AQS/EAL (µg/m³)		Baseline (µg/m³)	PC (µg/m³)	PC as % of AQS	PEC (µg/m³)	PEC as % of AQS
NO	Annual Mean	310	5.55	0.021	0.007%	5.6	0.018%
NO_2	Annual Mean	40	24.8	0.0758	0.190%	25	62%
NH_3	Annual Mean	180	2.0	0.000918	0.0005%	2.0	1%

The modelled results are that the air quality impacts of the planned testing are expected to be insignificant.

7.3.1.7 ASSESSMENT OF POTENTIAL IMPACTS ON PROTECTED CONSERVATION AREAS

The potential impact of NO_x emissions from the testing regime on the surrounding protected conservation areas has been assessed based upon the anticipated total cumulative impacts of all tests undertaken as described above.

The results for annual mean NO_x are presented in Table 7-7.

The results presented in Table 7-7 predict that the anticipated impacts of the testing regime on annual mean NO_x concentrations are insignificant.

TABLE 7-7 MODELLED NO_X ANNUAL MEAN CONCENTRATIONS (µG/M^3)

Site	PC	PC as % of AQS	Background	PEC	PEC as % of AQS	Significance
Argloddiau Cronfeyedd Dwr Llanisien a Llys-Faen / Llanishen and Lisvane Reservoir Embankments SSSI	0.000148	<1%	15.7	15.7	52%	Insignificant
Coed-y-Darren SSSI	0.0000735	<1%	9.05	9.05	30%	Insignificant
Lisvane Reservoir SSSI	0.000151	<1%	15.7	15.7	52%	Insignificant
Gwlyptiroedd Casnewydd / Newport Wetlands SSSI	0.000630	<1%	11.3	11.3	38%	Insignificant
Henllys Bog SSSI	0.0000944	<1%	9.18	9.18	31%	Insignificant
Gwent Levels - St. Brides SSSI	0.01	<1%	18.4	18.4	61%	Insignificant
Gwent Levels - Whitson SSSI	0.000234	<1%	9.83	9.83	33%	Insignificant
Gwent Levels - Nash and Goldcliff SSSI	0.000399	<1%	14.8	14.8	49%	Insignificant
Rhymney River Section SSSI	0.000167	<1%	22.2	22.2	74%	Insignificant
Rumney Quarry SSSI	0.000144	<1%	19.3	19.3	64%	Insignificant
Severn Estuary SSSI	0.00102	<1%	26.1	26.1	87%	Insignificant
Ruperra Castle and Woodlands SSSI	0.000188	<1%	10.2	10.2	34%	Insignificant
River Usk (Lower Usk) / Afon Wysg (Wysg Isaf) SSSI	0.000807	<1%	22.0	22.0	73%	Insignificant
Penylan Quarry SSSI	0.000144	<1%	22.1	22.1	74%	Insignificant
Plas Machen Wood SSSI	0.000191	<1%	10.2	10.2	34%	Insignificant
Gwent Levels - Rumney and Peterstone SSSI	0.000542	<1%	18.6	18.6	62%	Insignificant
Severn Estuary SAC	0.00102	<1%	26.1	26.1	87%	Insignificant
River Usk (Lower Usk) / Afon Wysg (Wysg Isaf) SAC	0.000746	<1%	22.0	22.0	73%	Insignificant
Severn Estuary SPA	0.00102	<1%	26.1	26.1	87%	Insignificant

Environment Agency guidance in *Air emissions risk assessment for your environmental permit* states that there is no need to calculate PEC for local nature sites.

The results presented in Table 7-8 show that the predicted impacts of the testing regime on 24-hour mean NO_x concentrations from the generators are all insignificant with the exception at Gwent Levels – St Brides SSSI which shows a potentially significant effect according to the IAQM significance criteria.

TABLE 7-8 MODELLED NO_X 24-HOUR MEAN CONCENTRATIONS ($\mu G/M^3$)

Site	PC	PC as % of AQS	Background	PEC	PEC as % of AQS	Significance
Argloddiau Cronfeyedd Dwr Llanisien a Llys-Faen / Llanishen and Lisvane Reservoir Embankments SSSI	4.47	2.2%	31.4	33.9	18%	Insignificant
Coed-y-Darren SSSI	2.63	1.3%	18.1	20.7	10%	Insignificant
Lisvane Reservoir SSSI	4.49	2.2%	31.4	35.9	18%	Insignificant
Gwlyptiroedd Casnewydd / Newport Wetlands SSSI	6.57	3.3%	22.6	29.2	15%	Insignificant
Henllys Bog SSSI	3.17	1.6%	18.4	21.5	11%	Insignificant
Gwent Levels - St. Brides SSSI	124	62%	36.8	161	80%	Potentially significant
Gwent Levels - Whitson SSSI	4.69	2.3%	19.7	24.4	12%	Insignificant
Gwent Levels - Nash and Goldcliff SSSI	5.94	3.5%	29.6	36.5	18%	Insignificant
Rhymney River Section SSSI	4.85	3.0%	44.4	50.3	25%	Insignificant
Rumney Quarry SSSI	14.0	2.4%	38.6	43.5	22%	Insignificant
Severn Estuary SSSI	7.28	7%	52.2	66.1	33%	Insignificant
Ruperra Castle and Woodlands SSSI	9.11	3.6%	20.5	27.8	14%	Insignificant
River Usk (Lower Usk) / Afon Wysg (Wysg Isaf) SSSI	4.85	4.6%	43.9	53.0	27%	Insignificant
Penylan Quarry SSSI	5.33	2.4%	44.1	49.0	24%	Insignificant
Plas Machen Wood SSSI	12.3	2.7%	20.4	25.7	13%	Insignificant
Gwent Levels - Rumney and Peterstone SSSI	14.0	6.1%	37.3	49.6	25%	Insignificant
Severn Estuary SAC	9.04	7%	52.2	66.1	33%	Insignificant
River Usk (Lower Usk) / Afon Wysg (Wysg Isaf) SAC	14.0	4.5%	43.9	53.0	26%	Insignificant
Severn Estuary SPA	5.94	7%	52.2	66.1	33%	Insignificant

Environment Agency guidance in *Air emissions risk assessment for your environmental permit* states that there is no need to calculate PEC for local nature sites and short-term targets, such as 24-hour mean.

The results presented in Table 7-9 show that the predicted impacts of the testing regime on annual mean NH_3 concentrations from the generators are all insignificant.

TABLE 7-9 MODELLED NH_3 ANNUAL MEAN CONCENTRATIONS (µG/M^3)

Site	PC	PC as % of AQS	Background	PEC	PEC as % of AQS	Significance
Argloddiau Cronfeyedd Dwr Llanisien a Llys-Faen / Llanishen and Lisvane Reservoir Embankments SSSI	$1.24x10^{-6}$	<1%	1.45	1.45	145%	Insignificant
Coed-y-Darren SSSI	$6.14x10^{-7}$	<1%	1.10	1.10	110%	Insignificant
Lisvane Reservoir SSSI	$1.27x10^{-6}$	<1%	1.43	1.43	143%	Insignificant
Gwlyptiroedd Casnewydd / Newport Wetlands SSSI	$5.28x10^{-6}$	<1%	1.45	1.45	145%	Insignificant
Henllys Bog SSSI	$7.91x10^{-7}$	<1%	1.23	1.23	123%	Insignificant
Gwent Levels - St. Brides SSSI	0.0000838	<1%	1.82	1.82	182%	Insignificant
Gwent Levels - Whitson SSSI	$1.97x10^{-6}$	<1%	1.86	1.86	186%	Insignificant
Gwent Levels - Nash and Goldcliff SSSI	$3.35x10^{-6}$	<1%	1.53	1.53	153%	Insignificant
Rhymney River Section SSSI	$1.40x10^{-6}$	<1%	1.41	1.41	141%	Insignificant
Rumney Quarry SSSI	$1.21x10^{-6}$	<1%	1.36	1.36	136%	Insignificant
Severn Estuary SSSI	$8.53x10^{-6}$	<1%	1.66	1.66	166%	Insignificant
Ruperra Castle and Woodlands SSSI	$1.58x10^{-6}$	<1%	1.26	1.26	126%	Insignificant
River Usk (Lower Usk) / Afon Wysg (Wysg Isaf) SSSI	$6.77x10^{-6}$	<1%	2.44	2.44	244%	Insignificant
Penylan Quarry SSSI	$1.21x10^{-6}$	<1%	1.46	1.46	146%	Insignificant
Plas Machen Wood SSSI	$1.60x10^{-6}$	<1%	1.23	1.23	123%	Insignificant
Gwent Levels - Rumney and Peterstone SSSI	$4.52x10^{-6}$	<1%	1.48	1.48	148%	Insignificant
Severn Estuary SAC	$8.53x10^{-6}$	<1%	2.39	2.39	239%	Insignificant
River Usk (Lower Usk) / Afon Wysg (Wysg Isaf) SAC	$6.26x10^{-6}$	<1%	2.44	2.44	244%	Insignificant
Severn Estuary SPA	$8.53x10^{-6}$	<1%	2.58	2.58	258%	Insignificant

The nitrogen deposition and acid deposition were calculated using AQTAG06 guidance[15], based on the annual mean NO_x concentrations presented in Table 7-7. The results are presented in Table 7-10 and Table 7-11.

All the potential impacts from the testing regime on protected conservation areas are predicted to be insignificant.

Note: The Dan y Graig Quarry Risca SSSI was considered a geological site and did not have a critical load so was not included in the assessment. All other sites that did not have critical load data available on APIS a worst-case critical load of 3 was assigned for nutrient nitrogen.

[15] 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

TABLE 7-10 MODELLED NUTRIENT NITROGEN DEPOSITION (KGN/HA/YR)

Site	Minimum Critical Load	PC	PC as % of CL	Background	PEC	PEC as % of CL	Significance
Argloddiau Cronfeyedd Dwr Llanisien a Llys-Faen / Llanishen and Lisvane Reservoir Embankments SSSI	3*	$3.95x10^{-5}$	<1%	9.94	9.94	331%	Insignificant
Coed-y-Darren SSSI	3*	$1.96x10^{-5}$	<1%	16.1	16.1	537%	Insignificant
Lisvane Reservoir SSSI	10	$4.04x10^{-5}$	<1%	9.94	9.94	99%	Insignificant
Gwlyptiroedd Casnewydd / Newport Wetlands SSSI	10	$9.08x10^{-5}$	<1%	7.98	7.98	80%	Insignificant
Henllys Bog SSSI	3*	$2.5x10^{-5}$	<1%	13.3	13.3	442%	Insignificant
Gwent Levels – St. Brides SSSI	3	0.00144	<1%	8.71	8.71	290%	Insignificant
Gwent Levels – Whitson SSSI	10	$3.38x10^{-5}$	<1%	7.40	7.40	74%	Insignificant
Gwent Levels – Nash and Goldcliff SSSI	10	$5.76x10^{-5}$	<1%	7.69	7.69	77%	Insignificant
Rhymney River Section SSSI	3*	$4.45x10^{-5}$	<1%	8.52	8.52	284%	Insignificant
Rumney Quarry SSSI	3*	$3.85x10^{-5}$	<1%	8.24	8.24	275%	Insignificant
Severn Estuary SSSI	10	$1.44x10^{-4}$	<1%	10.2	10.16	102%	Insignificant

Site	Minimum Critical Load	PC	PC as % of CL	Background	PEC	PEC as % of CL	Significance
Ruperra Castle and Woodlands SSSI	10	$5.01x10^{-5}$	<1%	13.0	13.0	130%	Insignificant
River Usk (Lower Usk) / Afon Wysg (Wysg Isaf) SSSI	3*	$2.15x10^{-4}$	<1%	15.9	15.9	530%	Insignificant
Penylan Quarry SSSI	3*	$3.85x10^{-5}$	<1%	8.77	8.77	292%	Insignificant
Plas Machen Wood SSSI	3*	$5.09x10^{-5}$	<1%	12.6	12.6	419%	Insignificant
Gwent Levels – Rumney and Peterstone SSSI	3*	$1.44x10^{-4}$	<1%	8.32	8.32	277%	Insignificant
Severn Estuary SAC	10	$2.72x10^{-4}$	<1%	12.8	12.8	128%	Insignificant
River Usk (Lower Usk) / Afon Wysg (Wysg Isaf) SAC	5	$1.99x10^{-4}$	<1%	24.0	24.0	481%	Insignificant
Severn Estuary SPA	10	$2.72x10^{-4}$	<1%	12.8	12.8	128%	Insignificant

(*) A minimum critical load of 3 was used for sites with no specific critical load as a worst-case scenario.

TABLE 7-11 MODELLED ACID DEPOSITION (KEQ/HA/YR)

Site	Minimum Critical Load	PC	PC as % of CL	Background	PEC as % of CL	Significance
Argloddiau Cronfeyedd Dwr Llanisien a Llys-Faen / Llanishen and Lisvane Reservoir Embankments SSSI	n/a	$2.83x10^{-6}$	N/A	S:N/A N:N/A	N/A	Insignificant
Coed-y-Darren SSSI	n/a	$1.5x10^{-6}$	N/A	S:N/A N:N/A	N/A	Insignificant
Lisvane Reservoir SSSI	n/a	$4.87x10^{-5}$	N/A	S:0.306 N:0.713	N/A	Insignificant
Gwlyptiroedd Casnewydd / Newport Wetlands SSSI	CLmaxS: 4 CLminN: 1.071 CLmaxN: 5.071	$5.25 x10^{-6}$	<1%	S:0.154 N:0.879	4%	Insignificant
Henllys Bog SSSI	n/a	$3.21 x10^{-6}$	N/A	S:N/A N:N/A	N/A	Insignificant
Gwent Levels - St. Brides SSSI	CLmaxS: 0.28 CLminN: 0.321 CLmaxN: 0.601	$7.24x10^{-5}$	<1%	S:0.218 N:0.622	140%	Insignificant
Gwent Levels - Whitson SSSI	CLmaxS: 4 CLminN: 1.071 CLmaxN: 5.071	$2.13x10^{-6}$	<1%	S:0.134 N:0.937	3%	Insignificant
Gwent Levels - Nash and Goldcliff SSSI	CLmaxS: 4 CLminN: 1.071 CLmaxN: 5.071	$6.02 x10^{-6}$	<1%	S:0.159 N:0.947	4%	Insignificant
Rhymney River Section SSSI	n/a	$3.27 x10^{-6}$	N/A	S:N/A N:N/A	N/A	Insignificant
Rumney Quarry SSSI	n/a	$5.83 x10^{-6}$	n/a	S:N/A N:N/A	n/a	Insignificant
Severn Estuary SSSI	CLmaxS: 4 CLminN: 0.856	$7.76 x10^{-6}$	<1%	S:0.272 N:1.056	27%	Insignificant

Site	Minimum Critical Load	PC	PC as % of CL	Background	PEC as % of CL	Significance
	CLmaxN: 4.586					
Ruperra Castle and Woodlands SSSI	CLmaxS: 1.372 CLminN: 0.142 CLmaxN: 1.514	3.59×10^{-6}	<1%	S:0.272 N:1.633	126%	Insignificant
River Usk (Lower Usk) / Afon Wysg (Wysg Isaf) SSSI	n/a	1.41×10^{-5}	n/a	S:0.241 N:1.135	n/a	Insignificant
Penylan Quarry SSSI	n/a	6.81×10^{-6}	n/a	S:N/A N:N/A	n/a	Insignificant
Plas Machen Wood SSSI	n/a	6.21×10^{-6}	n/a	S:N/A N:N/A	n/a	Insignificant
Gwent Levels - Rumney and Peterstone SSSI	n/a	1.25×10^{-5}	n/a	S:0.254 N:0.606	n/a	Insignificant
Severn Estuary SAC	n/a	2.44×10^{-5}	n/a	S:0.292 N:0.97	n/a	Insignificant
River Usk (Lower Usk) / Afon Wysg (Wysg Isaf) SAC	CLmaxS: 0.28 CLminN: 0.321 CLmaxN: 0.601	1.27×10^{-5}	<1%	S:0.301 N:2.581	480%	Insignificant
Severn Estuary SPA	n/a	4.06×10^{-5}	n/a	S:N/A N:N/A	n/a	Insignificant

n/a – critical loads were not available for these specific sites.

7.3.1.8 SUMMARY TESTING REGIME

- Monthly test results suggest a NO_2 PEC <200 µg/m^3 at all receptors and no exceedances of the AEGLs, and therefore need not be considered further. NH_3 and NO PECs also showed no exceedances of the applicable standards;
- Quarterly test results suggest a NO_2 PEC <200 µg/m^3 at all receptors and no exceedances of the AEGLs, and therefore need not be considered further. NH_3 and NO PECs also showed no exceedances of the applicable standards;
- Annual tests results suggest a NO_2 PEC <200 µg/m^3 at all receptors and no exceedances of the AEGLs, and therefore need not be considered further. NH_3 and NO PECs also showed no exceedances of the applicable standards;
- Quinquennial tests results suggest a NO_2 PEC >200 µg/m^3 at a number of receptors. NH_3 and NO PECs also showed no exceedances of the applicable standards. The 10-minute AEGL is also expected to be exceeded but not the 30-minute, 1-hour, 4-hour and 8-hour AEGLs. Due to the fact these tests occur once every five years and the results are based on worst-case weather conditions and engine grouping it is unlikely that this would be significant.

For the potential impacts on protected conservation areas:

- The NOx PC is not predicted to have potentially significant impacts for 24-hour maximum Critical Level at any sites other than Gwent Levels: St Brides SSSI. As above this relies on worst case assumptions; and
- The NO_x and the NH_3 PC are not predicted to be >1% of the annual mean Critical Level at any sites.

7.3.2 EMERGENCY OPERATION

7.3.2.1 INTRODUCTION

As described in Table 3-1, two emergency power scenarios have been modelled. For both scenarios all of the engines on site are assumed to run together at 60% load. The assumed outage durations are 1 hour and 72 hours (ERM has modelled a 72-hour outage to ensure consistency with the EA). An outage duration utilising all the Site's engines for 1 hour or longer is expected to be a highly unlikely scenario in practice as not all the engines would be running the whole time as installed generating capacity intentionally exceeds expected site demand. In addition, is noted in the NRW decision notice for an adjacent data centre that "The National Grid reliability of the high voltage transmission system to which the data centre is connected is >99.999%".

EMERGENCY OUTAGE SCENARIO – 1 HOUR

The modelled maximum concentrations at the indicative sensitive receptors in the vicinity of the Site are presented in Table 7-12. Contour plots of the maximum predicted NO_2 concentrations from the 1-hour outage scenario can be found in *Appendix A.*

TABLE 7-12 PREDICTED MODELLED CONCENTRATIONS FOR THE 1-HOUR EMERGENCY OUTAGE SCENARIO

Period	AQS/ EAL/ AEGL (µg/m³)		Baseline (µg/m³)	PC (µg/m³)	PEC (µg/m³)	PC as % of AQS/ EAL/ AEGL (%)	PEC as % of AQS/ EAL/ AEGL (%)
NO 1-hour maximum	EAL	4,400	11.1	1458	1470	33.1%	33.4%
NO annual mean	EAL	310	5.6	0.0066	5.6	0.002%	1.8%
NO_2 annual-mean	AQS	40	24.8	0.0238	24.8	0.059%	62%
NO_2 1-hour maximum	1-hour maximum	200	49.6	436	486	218%	243%
	1-hour 19th highest hour (99.79th %ile)	200		311	360	155%	180%
NO_2 10-minute maximum	AEGL-1	940	49.6	1554	1603	165%	171%
	AEGL-2	38,000				4.09%	4.22%
	AEGL-3	64,000				2.43%	2.51%
NO_2 30-minute maximum	AEGL-1	940	49.6	662	711	70.4%	75.7%
	AEGL-2	28,000				2.36%	2.54%
	AEGL-3	47,000				1.41%	1.51%
NO_2 1-hour maximum	AEGL-1	940	49.6	436	486	46.4%	51.7%
	AEGL-2	23,000				1.897%	2.11%
	AEGL-3	38,000				1.148%	1.28%
NO_2 4-hour maximum	AEGL-1	940	49.6	38.7	88.2	4.11%	9.39%
	AEGL-2	15,000				0.258%	0.59%
	AEGL-3	23,000				0.168%	0.38%
NO_2 8-hour maximum	AEGL-1	940	49.6	13.0	62.6	1.38%	6.65%
	AEGL-2	13,000				0.100%	0.48%

Period	AQS/ EAL/ AEGL (µg/m³)		Baseline (µg/m³)	PC (µg/m³)	PEC (µg/m³)	PC as % of AQS/ EAL/ AEGL (%)	PEC as % of AQS/ EAL/ AEGL (%)
	AEGL-3	21,000				0.062%	0.30%
NH_3 1-hour maximum	EAL	2,500	3.9	22.0	26	0.9%	1.0%

The results presented in Table 7-12 show that in the case of an emergency outage for 1 hour, the NO_2 1-hour air quality standard of 200 µg/m^3 is predicted to be exceeded. The AEGL-1 (non-disabling) threshold is predicted to be exceeded for the 10-minute values. The 30-minute, 1-hour, 4-hour and 8-hour AEGLs are not predicted to be exceeded.

The model takes into account the worst-case meteorological year and the likelihood of emergency running coinciding with the worst-case meteorological conditions and impacting the sensitive receptors within a specific 10-minute period is highly unlikely.

In addition, no exceedances of the annual mean AQS for NO_2 or the EALs for NO and NH_3 are expected on the basis of this assessment.

EMERGENCY OUTAGE SCENARIO – 72 HOURS

The predicted maximum concentrations at any of the indicative sensitive receptors in the vicinity of the Site are presented in Table 7-13. Contour plots of the maximum predicted NO_2 concentrations from the 72-hour outage scenario can be found in *Appendix A.*

TABLE 7-13 PREDICTED MODELLED CONCENTRATIONS FOR THE 72-HOUR EMERGENCY OUTAGE SCENARIO

Period	AQS/ EAL/ AEGL (µg/m³)		Baseline (µg/m³)	PC (µg/m³)	PEC (µg/m³)	PC as % of AQS/ EAL/ AEGL (%)	PEC as % of AQS/ EAL/ AEGL (%)
NO 1-hour maximum	EAL	4,400	11.1	1458	1470	33.1%	33.4%
NO annual mean	EAL	310	5.55	0.48	6.0	0.154%	1.9%
NO_2 annual-mean	AQS	40	24.8	1.71	26.5	4.28%	66%
NO_2 1-hour maximum	1-hour maximum	200	49.6	436	486	218%	243%
	1-hour 19th highest hour (99.79th %ile)	200		311	360	155%	180%
NO_2 10-minute maximum	AEGL-1	940	49.6	1554	1603	165%	171%
	AEGL-2	38,000				4.09%	4.22%
	AEGL-3	64,000				2.43%	2.51%
NO_2 30-minute maximum	AEGL-1	940	49.6	662	711	70.4%	75.7%
	AEGL-2	28,000				2.36%	2.54%
	AEGL-3	47,000				1.41%	1.51%
NO_2 1-hour maximum	AEGL-1	940	49.6	436	486	46.4%	51.7%
	AEGL-2	23,000				1.91%	2.11%
	AEGL-3	38,000				1.15%	1.28%
NO_2 4-hour maximum	AEGL-1	940	49.6	155	204	16.5%	21.7%
	AEGL-2	15,000				1.03%	1.36%
	AEGL-3	23,000				0.67%	0.89%
NO_2 8-hour maximum	AEGL-1	940	49.6	104	154	11.1%	16.3%
	AEGL-2	13,000				0.8%	1.18%

Period	AQS/ EAL/ AEGL (µg/m³)		Baseline (µg/m³)	PC (µg/m³)	PEC (µg/m³)	PC as % of AQS/ EAL/ AEGL (%)	PEC as % of AQS/ EAL/ AEGL (%)
	AEGL-3	21,000				0.50%	0.73%
NH_3 1-hour maximum	EAL	2,500	3.9	22.0	26	0.9%	1.0%

The results presented in Table 7-13 show that in the highly unlikely case of a whole Site emergency outage for 72 hours, the NO_2 1-hour air quality standard of 200 µg/m^3 is predicted to be exceeded (99% PEC). The AEGL-1 (non-disabling) threshold is predicted to be exceeded for the 10-minute AEGL. It is not likely to exceeded for any of the 30-minute, 1-hour, 4-hour and 8-hour AEGLs.

The model takes into account the worst-case meteorological year. The likelihood of emergency running coinciding with the worst-case meteorological conditions and impacting the sensitive receptors within a specific 10-minute period is highly unlikely.

In addition, no exceedances of the annual mean AQS for NO_2 or the EALs for NO and NH_3 are expected on the basis of this assessment.

IMPACT OF EMERGENCY OUTAGE ON HOURLY NO_2 STANDARD

The results at indicative sensitive receptors, as presented above predict that the:

- 1-hour emergency outage scenario is predicted to lead to NO_2 PECs which exceed the 200 µg/m^3 standard once a year;
- 72-hour emergency outage scenario is predicted to lead to NO_2 PECs which exceed the 200 µg/m^3 hourly standard 72 times a year.

A statistical analysis of the likelihood of the 1-hour and 72-hour emergency outage scenarios leading to a breach of the 1-hour NO_2 AQS has not been performed as such a scenario would require to occur 19 or more times, whereas no such event is likely to occur during the Site's operation based on ERM's experience of other data centre providers. The likelihood of an emergency outage of up to 72-hours is considered very unlikely. The annual AQS for NO_2 did not require statistical testing as the AQS was not predicted to be breached.

7.3.2.2 IMPACTS OF EMERGENCY OPERATION ON PROTECTED CONSERVATION AREAS – 1-HOUR OUTAGE SCENARIO

The potential impact on the surrounding protected conservation areas from modelled NO_x and NH_3 emissions in an emergency scenario has been assessed, assuming 1-hour and 72-hours of operations. The resulting potential NO_x and NH_3 ambient concentrations, nutrient nitrogen deposition and acid deposition have been modelled and are presented in Table 7-14 to Table 7-16. They were assessed against the standards and critical loads presented in Section 4.1 The criteria outlined in Section 4.2 were used to determine the significance of the impact.

The results for the annual mean NO_x concentrations are presented in Table 7-14.

TABLE 7-14 NO_X ANNUAL MEAN CONCENTRATIONS (µG/M^3)

Site	Emergency Operation Length	AQS	PC	PC as % of AQS	Background	PEC	PEC as % of AQS	Significance
Argloddiau Cronfeyedd Dwr Llanisien a Llys-Faen / Llanishen and Lisvane Reservoir Embankments (SSSI)	1hr	30	$6.90x10^{-5}$	0.0002%	15.7	15.7	52%	Insignificant
	72hr	30	$4.93x10^{-3}$	0.017%		15.7	52%	Insignificant
Coed-y-Darren (SSSI)	1hr	30	$3.42x10^{-5}$	0.0001%	9.05	9.05	30%	Insignificant
	72hr	30	$2.43x10^{-3}$	0.008%		9.06	30%	Insignificant
Lisvane Reservoir (SSSI)	1hr	30	$7.04x10^{-5}$	0.0002%	15.7	15.7	52%	Insignificant
	72hr	30	$5.07x10^{-3}$	0.017%		15.7	52%	Insignificant
Gwlyptiroedd Casnewydd / Newport Wetlands (SSSI)	1hr	30	$2.93x10^{-4}$	0.001%	11.3	11.3	38%	Insignificant
	72hr	30	0.021	0.07%		11.3	38%	Insignificant
Henllys Bog (SSSI)	1hr	30	$4.39x10^{-5}$	0.0001%	9.18	9.18	31%	Insignificant
	72hr	30	$3.16x10^{-3}$	0.011%		9.18	31%	Insignificant
Gwent Levels - St. Brides (SSSI)	1hr	30	$4.65x10^{-3}$	0.016%	18.4	18.4	61%	Insignificant
	72hr	30	0.335	1.12%		18.7	62%	Insignificant
Gwent Levels - Whitson (SSSI)	1hr	30	$1.09x10^{-4}$	0.0004%	9.83	9.83	33%	Insignificant

Site	Emergency Operation Length	AQS	PC	PC as % of AQS	Background	PEC	PEC as % of AQS	Significance
	72hr	30	$7.84x10^{-3}$	0.026%		9.83	33%	Insignificant
Gwent Levels - Nash and Goldcliff (SSSI)	1hr	30	$1.85x10^{-4}$	0.0006%	14.8	14.8	49%	Insignificant
	72hr	30	$1.34x10^{-2}$	0.045%		14.8	49%	Insignificant
Rhymney River Section (SSSI)	1hr	30	7.7610^{-5}	0.0003%	22.2	22.2	74%	Insignificant
	72hr	30	$5.58x10^{-3}$	0.019%		22.2	74%	Insignificant
Rumney Quarry (SSSI)	1hr	30	6.7110^{-5}	0.0002%	19.3	19.3	64%	Insignificant
	72hr	30	$4.83x10^{-3}$	0.016%		19.3	64%	Insignificant
Severn Estuary (SSSI)	1hr	30	$4.73x10^{-4}$	0.002%	26.1	26.1	87%	Insignificant
	72hr	30	0.0341	0.114%		26.1	87%	Insignificant
Ruperra Castle and Woodlands (SSSI)	1hr	30	$8.75x10^{-5}$	0.0003%	10.2	10.2	34%	Insignificant
	72hr	30	$6.29x10^{-3}$	0.021%		10.3	34%	Insignificant
River Usk (Lower Usk) / Afon Wysg (Wysg Isaf) (SSSI)	1hr	30	$3.75x10^{-4}$	0.001%	22.0	22.0	73%	Insignificant
	72hr	30	0.027	0.09%		22.0	73%	Insignificant
Penylan Quarry (SSSI)	1hr	30	$6.71x10^{-5}$	0.0002%	22.1	22.1	74%	Insignificant
	72hr	30	$4.83x10^{-3}$	0.016%		22.1	74%	Insignificant

Site	Emergency Operation Length	AQS	PC	PC as % of AQS	Background	PEC	PEC as % of AQS	Significance
Plas Machen Wood (SSSI)	1hr	30	$8.86x10^{-5}$	0.0003%	10.2	10.2	34%	Insignificant
	72hr	30	$6.38x10^{-3}$	0.021%		10.2	34%	Insignificant
Gwent Levels - Rumney and Peterstone (SSSI)	1hr	30	$2.52x10^{-4}$	0.0008%	18.6	18.6	62%	Insignificant
	72hr	30	$1.81x10^{-2}$	0.06%		18.7	62%	Insignificant
Severn Estuary (SAC)	1hr	30	$4.73x10^{-4}$	0.002%	26.1	26.1	87%	Insignificant
	72hr	30	0.341	0.114%		26.1	87%	Insignificant
River Usk (Lower Usk) / Afon Wysg (Wysg Isaf) (SAC)	1hr	30	$3.47x10^{-4}$	0.001%	22.0	22.0	73%	Insignificant
	72hr	30	0.0250	0.083%		22.0	73%	Insignificant
Severn Estuary (SPA)	1hr	30	$4.73x10^{-4}$	0.002%	26.1	26.1	87%	Insignificant
	72hr	30	0.0341	0.114%		26.1	87%	Insignificant

The Environment Agency guidance on Air emissions risk assessment for your environmental permit states that there is no need to calculate PEC for local nature sites.

The results for the 24-hour mean NO_x concentrations are presented in Table 7-15.

TABLE 7-15 NO_X 24-HOUR MEAN CONCENTRATIONS (µG/M^3)

Site	Emergency Operation Length	AQS	PC	PC as % of AQS	Background	PEC	PEC as % of AQS	Significance
Argloddiau Cronfeyedd Dwr Llanisien a Llys-Faen / Llanishen and Lisvane Reservoir Embankments (SSSI)	1hr	200	0.45	0.22%	31.4	31.9	16%	Insignificant
	72hr	200	10.7	5.4%		42.2	21%	Insignificant
Coed-y-Darren (SSSI)	1hr	200	0.26	0.1%	18.1	18.4	9.2%	Insignificant
	72hr	200	6.32	3.2%		24.4	12%	Insignificant
Lisvane Reservoir (SSSI)	1hr	200	0.45	0.22%	31.4	31.9	16%	Insignificant
	72hr	200	10.8	5.4%		42.2	21%	Insignificant
Gwlyptiroedd Casnewydd / Newport Wetlands (SSSI)	1hr	200	0.66	0.33%	22.6	23.3	12%	Insignificant
	72hr	200	15.8	7.9%		38.4	19%	Insignificant
Henllys Bog (SSSI)	1hr	200	0.32	0.16%	18.4	18.7	9.3%	Insignificant
	72hr	200	7.6	3.8%		26.0	13%	Insignificant
Gwent Levels - St. Brides (SSSI)	1hr	200	12.4	6.21%	36.8	49.1	25%	Insignificant
	72hr	200	298	149%		335	167%	Significant
Gwent Levels - Whitson (SSSI)	1hr	200	0.47	0.23%	19.7	20.1	10%	Insignificant
	72hr	200	11.3	5.6%		31.0	15%	Insignificant
Gwent Levels - Nash and Goldcliff (SSSI)	1hr	200	0.69	0.35%	29.6	30.3	15%	Insignificant
	72hr	200	16.7	8.3%		46.2	23%	Insignificant
Rhymney River Section (SSSI)	1hr	200	0.59	0.3%	44.4	44.9	22%	Insignificant
	72hr	200	14.3	7.1%		58.6	29%	Insignificant
Rumney Quarry (SSSI)	1hr	200	0.48	0.24%	38.6	39.1	20%	Insignificant
	72hr	200	11.6	5.8%		50.2	25%	Insignificant

Site	Emergency Operation Length	AQS	PC	PC as % of AQS	Background	PEC	PEC as % of AQS	Significance
Severn Estuary (SSSI)	1hr	200	1.40	0.7%	52.2	53.6	27%	Insignificant
	72hr	200	33.5	17.0%		85.6	43%	Potentially Significant
Ruperra Castle and Woodlands (SSSI)	1hr	200	0.73	0.36%	20.5	21.2	11%	Insignificant
	72hr	200	17.5	8.7%		38.0	19%	Insignificant
River Usk (Lower Usk) / Afon Wysg (Wysg Isaf) (SSSI)	1hr	200	0.91	0.46%	43.9	44.8	22%	Insignificant
	72hr	200	21.9	10.9%		65.8	33%	Potentially Significant
Penylan Quarry (SSSI)	1hr	200	0.48	0.24%	44.1	44.6	22%	Insignificant
	72hr	200	11.6	5.8%		55.8	28%	Insignificant
Plas Machen Wood (SSSI)	1hr	200	0.53	0.27%	20.4	20.9	10%	Insignificant
	72hr	200	12.8	6.4%		33.2	17%	Insignificant
Gwent Levels - Rumney and Peterstone (SSSI)	1hr	200	1.23	0.61%	37.3	38.5	19%	Insignificant
	72hr	200	29.5	14.8%		66.8	33%	Potentially Significant
Severn Estuary (SAC)	1hr	200	1.40	0.7%	52.2	53.6	27%	Insignificant
	72hr	200	33.5	17.0%		85.7	43%	Potentially Significant
River Usk (Lower Usk) / Afon Wysg (Wysg Isaf) (SAC)	1hr	200	0.9	0.45%	43.9	44.8	22%	Insignificant
	72hr	200	21.7	10.8%		65.6	33%	Potentially Significant
Severn Estuary (SPA)	1hr	200	1.40	0.7%	52.2	53.6	27%	Insignificant
	72hr	200	33.5	17.0%		85.6	43%	Potentially Significant

Environment Agency guidance in *Air emissions risk assessment for your environmental permit* states that there is no need to calculate PEC for local nature sites and short-term targets, such as 24-hour mean.

The results for the annual mean NH_3 concentrations are presented in Table 7-16.

TABLE 7-16 NH_3 ANNUAL MEAN CONCENTRATIONS (µG/M^3)

Site	Emergency Operation Length	AQS	PC	PC as % of AQS	Background	PEC	PEC as % of AQS	Significance
Argloddiau Cronfeyedd Dwr Llanisien a Llys-Faen / Llanishen and Lisvane Reservoir Embankments (SSSI)	1hr	1	$5.77x10^{-7}$	0.0001%	1.45	1.45	145%	Insignificant
	72hr	1	$4.16x10^{-5}$	0.004%		1.45	145%	Insignificant
Coed-y-Darren (SSSI)	1hr	1	$2.86x10^{-7}$	0.00003%	1.10	1.10	110%	Insignificant
	72hr	1	$2.06x10^{-5}$	0.002%		1.10	110%	Insignificant
Lisvane Reservoir (SSSI)	1hr	1	$5.9x10^{-7}$	0.0001%	1.43	1.43	143%	Insignificant
	72hr	1	$4.25x10^{-5}$	0.004%		1.43	143%	Insignificant
Gwlyptiroedd Casnewydd / Newport Wetlands (SSSI)	1hr	1	$2.46x10^{-6}$	0.0002%	1.45	1.45	145%	Insignificant
	72hr	1	$1.77x10^{-4}$	0.017%		1.45	145%	Insignificant
Henllys Bog (SSSI)	1hr	1	$3.68x10^{-7}$	0.00004%	1.23	1.23	123%	Insignificant
	72hr	1	$2.65x10^{-5}$	0.003%		1.23	123%	Insignificant
Gwent Levels - St. Brides (SSSI)	1hr	1	$3.9x10^{-5}$	0.0038%	1.82	1.82	182%	Insignificant
	72hr	1	$2.81x10^{-3}$	0.28%		1.82	182%	Potentially Significant

Site	Emergency Operation Length	AQS	PC	PC as % of AQS	Background	PEC	PEC as % of AQS	Significance
Gwent Levels - Whitson (SSSI)	1hr	1	$9.14x10^{-7}$	0.0001%	1.86	1.86	186%	Insignificant
	72hr	1	$6.58x10^{-5}$	0.006%		1.86	186%	Insignificant
Gwent Levels - Nash and Goldcliff (SSSI)	1hr	1	$1.56x10^{-6}$	0.0002%	1.53	1.53	153%	Insignificant
	72hr	1	$1.12x10^{-4}$	0.011%		1.53	153%	Insignificant
Rhymney River Section (SSSI)	1hr	1	$6.49x10^{-7}$	0.0001%	1.41	1.41	141%	Insignificant
	72hr	1	$4.68x10^{-5}$	0.005%		1.41	141%	Insignificant
Rumney Quarry (SSSI)	1hr	1	$5.62x10^{-7}$	0.0001%	1.36	1.36	136%	Insignificant
	72hr	1	$4.05x10^{-5}$	0.004%		1.36	136%	Insignificant
Severn Estuary (SSSI)	1hr	1	$3.97x10^{-6}$	0.0004%	1.66	1.66	166%	Insignificant
	72hr	1	$2.86x10^{-4}$	0.028%		1.66	166^	Insignificant
Ruperra Castle and Woodlands (SSSI)	1hr	1	$7.33x10^{-7}$	0.0001%	1.26	1.26	126%	Insignificant
	72hr	1	$5.28x10^{-5}$	0.005%		1.26	126%	Insignificant
River Usk (Lower Usk) / Afon Wysg (Wysg Isaf) (SSSI)	1hr	1	$3.15x10^{-6}$	0.0003%	2.44	2.44	244%	Insignificant

Site	Emergency Operation Length	AQS	PC	PC as % of AQS	Background	PEC	PEC as % of AQS	Significance
	72hr	1	$2.27x10^{-4}$	0.022%		2.44	244%	Insignificant
Penylan Quarry (SSSI)	1hr	1	$5.62x10^{-7}$	0.0001%	1.46	1.46	146%	Insignificant
	72hr	1	$4.05x10^{-5}$	0.004%		1.46	146%	Insignificant
Plas Machen Wood (SSSI)	1hr	1	$7.43x10^{-7}$	0.0001%	1.23	1.23	123%	Insignificant
	72hr	1	$5.35x10^{-5}$	0.005%		1.23	123%	Insignificant
Gwent Levels - Rumney and Peterstone (SSSI)	1hr	1	$2.1x10^{-6}$	0.0002%	1.48	1.48	148%	Insignificant
	72hr	1	$1.51x10^{-4}$	0.015%		1.48	148%	Insignificant
Severn Estuary (SAC)	1hr	1	$3.97x10^{-6}$	0.0004%	2.39	2.39	239%	Insignificant
	72hr	1	$2.86x10^{-4}$	0.028%		2.39	239%	Insignificant
River Usk (Lower Usk) / Afon Wysg (Wysg Isaf) (SAC)	1hr	1	$2.91x10^{-6}$	0.0003%	2.44	2.44	244%	Insignificant
	72hr	1	$2.1x10^{-4}$	0.021%		2.44	244%	Insignificant
Severn Estuary (SPA)	1hr	1	$3.97x10^{-6}$	0.0004%	2.58	2.58	258%	Insignificant
	72hr	1	$2.86x10^{-4}$	0.028%		2.58	258%	Insignificant

Environment Agency guidance in *Air emissions risk assessment for your environmental permit* states that there is no need to calculate PEC for local nature sites and short-term targets, such as 24-hour mean.

The modelling results presented in Table 7-14, Table 7-15 and Table 7-16 show that in the case of the site needing emergency power for either 1-hour or 72-hours continuously, both the annual and 24-hour mean NO_x and annual mean NH_3 concentrations are all expected to be insignificant with the exception of the 24-hour NO_x concentration at Gwent Levels: St Brides SSSI, Severn Estuary SSSI, SAC and SPA, River Usk (Lower Usk) / Afon Wysg (Wysg Isaf) SSSI and SAC and Gwent Levels - Rumney and Peterstone SSSI which show a potentially significant effect upon 72-hours operation.

The potential nitrogen deposition and acid deposition from 1-hour and 72-hour emergency scenarios were calculated using AQTAG06 guidance, based on the annual mean NO_x concentrations presented in Table 7-14. The results are presented in Table 7-17 and Table 7-18. The modelling results show nutrient nitrogen and acid deposition impacts that are expected to be insignificant with the except of nutrient nitrogen deposition at Gwent Levels: St Brides SSSI which shows a potentially significant effect upon 72-hours operation. The 72-hour emergency scenario is unlikely to occur in reality as the national grid power cuts are rarely of that length and scale. As noted in the NRW decision notice for an adjacent data centre, National Grid power supply failure is considered an extremely low probability occurrence, with a 2 hour outage described as a 1 in 20 year event and longer outages even less likely. Impacts relating to ambient air quality as well as nitrogen and acid deposition can therefore be considered as insignificant in this regard.

TABLE 7-17 NUTRIENT NITROGEN DEPOSITION (KGN/HA/YR) – 1HR AND 72HR EMERGENCY SCENARIOS

Site	Minimum Critical Load	Background	1-hour Emergency Scenario					72-hour Emergency Scenario				
			PC	PC as % of CL	PEC	PEC as % of CL	Significance	PC	PC as % of CL	PEC	PEC as % of CL	Significance
Argloddiau Cronfeyedd Dwr Llanisien a Llys-Faen / Llanishen and Lisvane Reservoir Embankments SSSI	3*	9.94	$1.84x10^{-5}$	<1%	9.94	331%	Insignificant	$1.32x10^{-3}$	<1%	9.94	331%	Insignificant
Coed-y-Darren SSSI	3*	16.1	$9.11x10^{-6}$	<1%	16.1	537%	Insignificant	$6.56x10^{-4}$	<1%	16.1	537%	Insignificant
Lisvane Reservoir SSSI	10	9.94	$1.88x10^{-5}$	<1%	9.94	99%	Insignificant	$1.35x10^{-3}$	<1%	9.94	99%	Insignificant
Gwlyptiroedd Casnewydd / Newport Wetlands SSSI	10	7.98	$4.22x10^{-5}$	<1%	7.98	80%	Insignificant	$3.04x10^{-3}$	<1%	7.99	80%	Insignificant
Henllys Bog SSSI	3*	13.3	$1.17x10^{-5}$	<1%	13.3	442%	Insignificant	$8.43x10^{-4}$	<1%	13.3	442%	Insignificant
Gwent Levels - St. Brides SSSI	3*	8.71	$6.71x10^{-4}$	<1%	8.71	290%	Insignificant	$4.83x10^{-2}$	1.01%	8.71	291%	Potentially Significant
Gwent Levels - Whitson SSSI	10	7.40	$1.57x10^{-5}$	<1%	7.40	74%	Insignificant	$1.13x10^{-3}$	<1%	7.40	74%	Insignificant
Gwent Levels - Nash and Goldcliff SSSI	10	7.69	$2.67x10^{-5}$	<1%	7.69	77%	Insignificant	$1.93x10^{-3}$	<1%	7.69	77%	Insignificant

Site	Minimum Critical Load	Background	1-hour Emergency Scenario					72-hour Emergency Scenario				
			PC	PC as % of CL	PEC	PEC as % of CL	Significance	PC	PC as % of CL	PEC	PEC as % of CL	Significance
Rhymney River Section SSSI	3*	8.52	$2.07x10^{-5}$	<1%	8.52	284%	Insignificant	$1.49x10^{-3}$	<1%	8.52	284%	Insignificant
Rumney Quarry SSSI	3*	8.24	$1.79x10^{-5}$	<1%	8.24	275%	Insignificant	$1.29x10^{-3}$	<1%	8.24	275%	Insignificant
Severn Estuary SSSI	10	10.2	$6.83x10^{-5}$	<1%	10.2	102%	Insignificant	$4.92x10^{-3}$	<1%	10.2	102%	Insignificant
Ruperra Castle and Woodlands SSSI	10	13.0	$2.33x10^{-5}$	<1%	13.0	130%	Insignificant	$1.68x10^{-3}$	<1%	13.0	130%	Insignificant
River Usk (Lower Usk) / Afon Wysg (Wysg Isaf) SSSI	3*	15.9	$1.00x10^{-4}$	<1%	15.9	530%	Insignificant	$7.21x10^{-3}$	<1%	15.9	530%	Insignificant
Penylan Quarry SSSI	3*	8.77	$1.79x10^{-5}$	<1%	8.77	292%	Insignificant	$1.29x10^{-3}$	<1%	8.77	292%	Insignificant
Plas Machen Wood SSSI	3*	12.6	$2.36x10^{-5}$	<1%	12.6	419%	Insignificant	$1.70x10^{-3}$	<1%	12.6	419%	Insignificant
Gwent Levels - Rumney and Peterstone SSSI	3*	8.32	$6.71x10^{-5}$	<1%	8.32	277%	Insignificant	$4.83x10^{-3}$	<1%	8.32	277%	Insignificant
Severn Estuary SAC	10	12.8	$1.26x10^{-4}$	<1%	12.8	128%	Insignificant	$9.09x10^{-3}$	<1%	12.8	128%	Insignificant
River Usk (Lower Usk) / Afon Wysg	5	24.0	$9.26x10^{-5}$	<1%	24.0	481%	Insignificant	$6.67x10^{-3}$	<1%	24.0	481%	Insignificant

Site	Minimum Critical Load	Background	1-hour Emergency Scenario					72-hour Emergency Scenario				
			PC	PC as % of CL	PEC	PEC as % of CL	Significance	PC	PC as % of CL	PEC	PEC as % of CL	Significance
(Wysg Isaf) SAC												
Severn Estuary SPA	10	12.8	$1.26x10^{-4}$	<1%	12.8	128%	Insignificant	$9.09x10^{-3}$	<1%	12.8	128%	Insignificant

(*) A minimum critical load of 3 was used for sites with no specific critical load as a worst case scenario.

TABLE 7-18 ACID DEPOSITION (KEQ/HA/YR)

Site	Minimum Critical Load	Background	1-hour Emergency Scenario				72-hour Emergency Scenario			
			PC (N total)	PC as % of CL	PEC as % of CL	Significance	PC	PC as % of CL	PEC as % of CL	Significance
Argloddiau Cronfeyedd Dwr Llanisien a Llys-Faen / Llanishen and Lisvane Reservoir Embankments SSSI	n/a	n/a	$1.31x10^{-6}$	<1%	n/a	Insignificant	$9.44x10^{-5}$	<1%	n/a	Insignificant
Coed-y-Darren SSSI	n/a	n/a	$6.5x10^{-7}$	<1%	n/a	Insignificant	$4.68 x10^{-5}$	<1%	n/a	Insignificant
Lisvane Reservoir SSSI	n/a	S:0.306 N:0.713	$1.34x10^{-6}$	<1%	n/a	Insignificant	$9.64x10^{-5}$	<1%	n/a	Insignificant
Gwlyptiroedd Casnewydd / Newport Wetlands SSSI	CLmaxS: 4 CLminN: 1.071 CLmaxN: 5.071	S:0.154 N:0.879	$3.01x10^{-6}$	<1%	4%	Insignificant	$2.17x10^{-4}$	<1%	4%	Insignificant

Site	Minimum Critical Load	Background	1-hour Emergency Scenario				72-hour Emergency Scenario			
			PC (N total)	PC as % of CL	PEC as % of CL	Significance	PC	PC as % of CL	PEC as % of CL	Significance
Henllys Bog SSSI	n/a	n/a	$8.34x10^{-7}$	<1%	n/a	Insignificant	$6.01 x10^{-5}$	<1%	n/a	Insignificant
Gwent Levels - St. Brides SSSI	CLmaxS: 0.28 CLminN: 0.321 CLmaxN: 0.601	S:0.218 N:0.622	$4.78x10^{-5}$	<1%	140%	Insignificant	$3.44 x10^{-3}$	<1%	140%	Insignificant
Gwent Levels - Whitson SSSI	CLmaxS: 4 CLminN: 1.071 CLmaxN: 5.071	S:0.134 N:0.937	$1.12x10^{-6}$	<1%	3%	Insignificant	$8.07x10^{-5}$	<1%	3%	Insignificant
Gwent Levels - Nash and Goldcliff SSSI	CLmaxS: 4 CLminN: 1.071 CLmaxN: 5.071	S:0.159 N:0.947	$1.91x10^{-6}$	<1%	4%	Insignificant	$1.37x10^{-4}$	<1%	4%	Insignificant
Rhymney River Section SSSI	n/a	n/a	$1.47x10^{-6}$	<1%	n/a	Insignificant	$1.06x10^{-4}$	<1%	n/a	Insignificant
Rumney Quarry SSSI	n/a	n/a	$1.28x10^{-6}$	<1%	n/a	Insignificant	$9.18x10^{-5}$	<1%	n/a	Insignificant
Severn Estuary SSSI	CLmaxS: 4 CLminN: 0.856 CLmaxN: 4.586	S:0.272 N:1.056	$4.87x10^{-6}$	<1%	27%	Insignificant	$3.5x10^{-4}$	<1%	27%	Insignificant
Ruperra Castle and Woodlands SSSI	CLmaxS: 1.372	S:0.272 N:1.633	$1.66x10^{-6}$	<1%	126%	Insignificant	$1.21x10^{-4}$	<1%	126%	Insignificant

Site	Minimum Critical Load	Background	1-hour Emergency Scenario				72-hour Emergency Scenario			
			PC (N total)	PC as % of CL	PEC as % of CL	Significance	PC	PC as % of CL	PEC as % of CL	Significance
	CLminN: 0.142 CLmaxN: 1.514									
River Usk (Lower Usk) / Afon Wysg (Wysg Isaf) SSSI	n/a	S:0.241 N:1.135	$7.14x10^{-6}$	<1%	n/a	Insignificant	$3.44x10^{-4}$	<1%	n/a	Insignificant
Penylan Quarry SSSI	n/a	n/a	$1.28x10^{-6}$	<1%	n/a	Insignificant	$6.48x10^{-4}$	<1%	n/a	Insignificant
Plas Machen Wood SSSI	n/a	n/a	$1.69x10^{-6}$	<1%	n/a	Insignificant	$4.75x10^{-4}$	<1%	n/a	Insignificant
Gwent Levels – Rumney and Peterstone SSSI	n/a	S:0.254 N:0.606	$4.78x10^{-6}$	<1%	n/a	Insignificant	$6.48x10^{-4}$	<1%	n/a	Insignificant
Severn Estuary SAC	n/a	S:0.292 N:0.97	$9.0x10^{-6}$	<1%	n/a	Insignificant	$4.75x10^{-4}$	<1%	n/a	Insignificant
River Usk (Lower Usk) / Afon Wysg (Wysg Isaf) SAC	CLmaxS: 0.28 CLminN: 0.321 CLmaxN: 0.601	S:0.301 N:2.581	$6.6x10^{-6}$	<1%	480%	Insignificant	$6.48x10^{-4}$	<1%	480%	Insignificant
Severn Estuary SPA	n/a	n/a	$9.0x10^{-6}$	<1%	n/a	Insignificant	$1.37x10^{-4}$	<1%	n/a	Insignificant

n/a – critical loads were not available for these specific sites

7.3.2.3 SUMMARY EMERGENCY POWER

- In case of emergency power being required for an hour or 72 hours for the site, the hourly AQS for NO_2 of 200 µg/m^3 could potentially be exceeded along with the 10-min AEGL-1. The AEGL standards for 30-min, 1-hour, 4-hour or 8-hour are not expected to be exceeded for either emergency scenario. The EALs for NO and NH_3 are also not expected to be exceeded;
- In case of emergency power being required for an hour or 72 hours for the site, the hourly AQS for NO_x of 30 µg/m^3 or the 24-hour standard of 200 µg/m^3 are not expected to be exceeded at a number of the assessed ecological sites. Gwent Levels: St Brides SSSI, Severn Estuary SSSI, SAC and SPA, River Usk (Lower Usk) / Afon Wysg (Wysg Isaf) SSSI and SAC and Gwent Levels - Rumney and Peterstone SSSI are seen to have potentially significant effects during an emergency 72-hour scenario for ambient NO_x and nitrogen deposition;
- No significant long-term impacts on human health (by comparison with the NO_2 annual mean standard) or protected conservation areas are modelled;
- The modelled scenario assumed that all the data centres would be running all of their engines at 60% load at the same time. In practice, in an emergency power event, some engines would likely not be operated, or only operated for start-up, as data centres are designed with more generators than is actually required, to cover a possible engine failure. In addition, emergency power scenarios are considered unlikely events; and
- Breaching the hourly NO_2 standard or the hourly NO_x standard because of emergency power operation is therefore considered unlikely.

7.3.3 CUMULATIVE IMPACTS

In the vicinity of the Project there are other sources of pollutant emissions which could contribute to a possible cumulative effect in the area. The pollutants of relevance are NH_3, NO_x and by association NO_2; these being emitted from a range of sources including other data centres in the area.

For NO_2 impacts on human receptors from the Site, the PEC for the full testing regime is 62% of the annual standard. There remains some 'headroom' for further projects and future development in the area. Gwent Levels St Brides SSSI is the nearest and most impacted designated ecological receptor. However, for this site there is some 'headroom' in terms of impacts due to the PC for the 24-hour averaging period for NO_x being 62% of the standard and the NH_3 annual mean being <1% of the standard. In addition, the AQ modelling was based on a worst-case scenario of diesel usage; the generators to be used on site have the capacity to be run on HVO fuel with lower emissions.

It is noted that there are three other data centres (planning apps: 07/1533, 20/0039, 20/1176) and manufacturing, research and development facility (21/0988) located in the immediate vicinity of the Site (as outlined in the Design Access Statement and Planning Statement). These sites are also associated with potential impacts on air quality at receptors in the vicinity. The type of impacts from other data centres in the area would be similar to this planned Site, with impacts on air quality coming from emergency generator testing and usage. These impacts are to be managed or mitigated to acceptable levels by the operators of these

projects. A quantitative cumulative impacts assessment has not been conducted in this report as detailed data was not available in the public domain.

In terms of overlapping operations, of greatest concern are emissions arising during a power outage that affects all of the data centres simultaneously. The probability of such an event taking place is extremely small, given the reliability of the grid connection, and built in measures to minimise the risk of outages occurring such as multiple grid connections.

In addition to multiple grid connections, best practice design (e.g. SCR and optimal stack design) has already been taken into consideration for this development. The draft Air Quality Management Plan also addressed the risk of cumulative impacts arising during emergency operations, by taking into account the potential influence of offsite emission sources.

It is also noted that the testing of generators at the same time as other data centres in the area may also lead to a cumulative effect. To minimise any impact cumulative impacts in the area, Microsoft are confident that a workable solution exists and will use best endeavours to collaborate with other operators in immediate vicinity.

The collaborative approach between the Site operators and other local data centres will aim to ensure that generator testing does not occur simultaneously where possible and communication should be maintained if and when unplanned generator usage is taking place.

This collaborative approach would include an AQ monitoring strategy and continued AQ monitoring around the site.

8. CONCLUSION

8.1 TESTING REGIME – NO_X, NO_2, NO AND NH_3

Based on the air quality impact assessment performed, the testing regime. other than the Quinquennial tests ,for the generators at the Microsoft Newport Quinn data centre at Newport Imperial Park is not expected to result in a significant adverse impact on air quality.

8.2 EMERGENCY OPERATION – NO_X, NO_2, NO AND NH_3

Two emergency power generation scenarios were also modelled. In this case, exceedance of the hourly NO_2 standard for human health is not expected. There was only one modelled exceedance of the 24-hour NO_x standard (Gwent Levels: St Brides SSSI). There were no other modelled exceedances at the other identified sensitive habitat areas.

Severn Estuary SSSI, SAC and SPA, River Usk (Lower Usk) / Afon Wysg (Wysg Isaf) SSSI and SAC and Gwent Levels - Rumney and Peterstone SSSI also showed a potentially significant effect for 24-hour NO_x impacts and Gwent Levels: St Brides SSSI showed a potentially significant effect for nutrient nitrogen deposition during the 72-hour emergency scenario.

The modelled emergency scenarios are expected to be unlikely to arise in practice. Total outage time up to 72 hours a year is even less likely as National Grid power cuts are rarely of that length and scale and therefore the risk of breaching the 1-hour NO_2 AQS is considered low. The likelihood of an outage occurring for a sufficient amount of time to breach the NO_x 24-hour standard at habitats is also considered low. This was the conclusion NRW itself reached in its decision document for the nearby Vantage data centre. As a result, the potential for significant impacts from emergency operations at the site is considered unlikely.

8.3 PM_{10} AND SO_2

It was also found that the PM_{10} emissions from the engines are not expected to breach the AQS for PM_{10}. SO_2 emissions were not assessed as the data centres use ultra-low-sulphur diesel.

APPENDIX A MODEL PARAMETERS

A.1 MODELLED BUILDINGS DATA

The location of the modelled buildings is presented in FIGURE A 1(blue boundaries), while their heights are listed in Table A 1.

FIGURE A 1 LOCATION OF MODELLED BUILDINGS

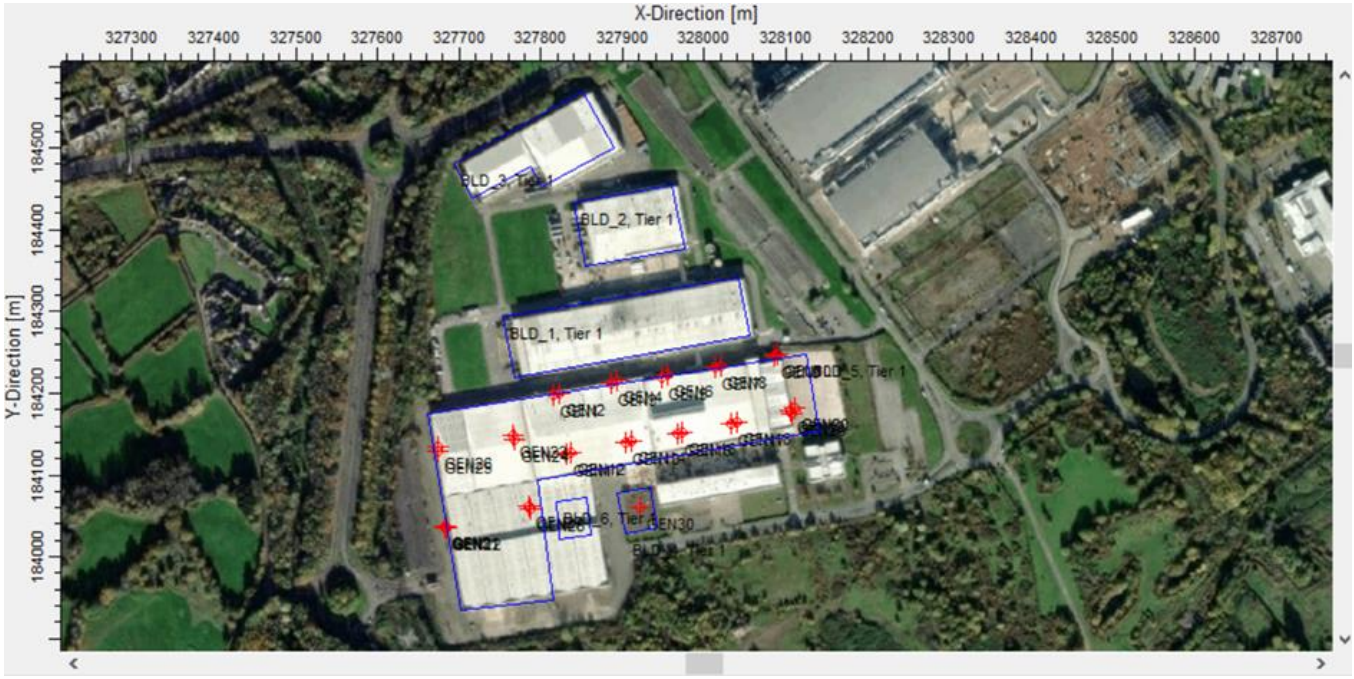


TABLE A 1 HEIGHT OF MODELLED BUILDINGS

Building	Height above ground level (m)
Building 1	12
Building 2	12
Building 3	12
Building 4	11
Building 5	11
Building 6	11

A.2 CARDIFF AIRPORT 2017-2021 WIND ROSES

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

FIGURE A 2 CARDIFF AIRPORT WIND ROSE - 2017

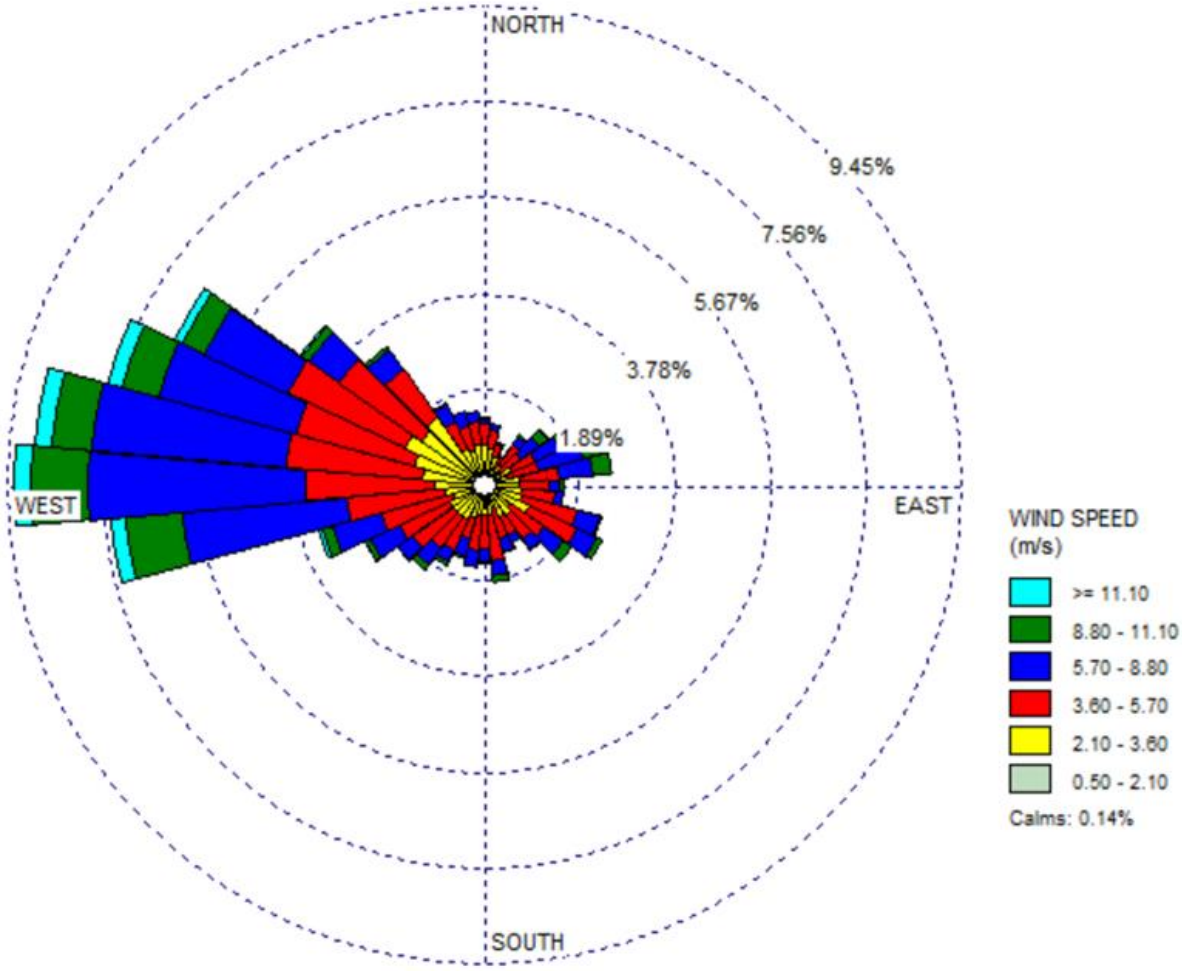


FIGURE A 3 CARDIFF AIRPORT WIND ROSE - 2018

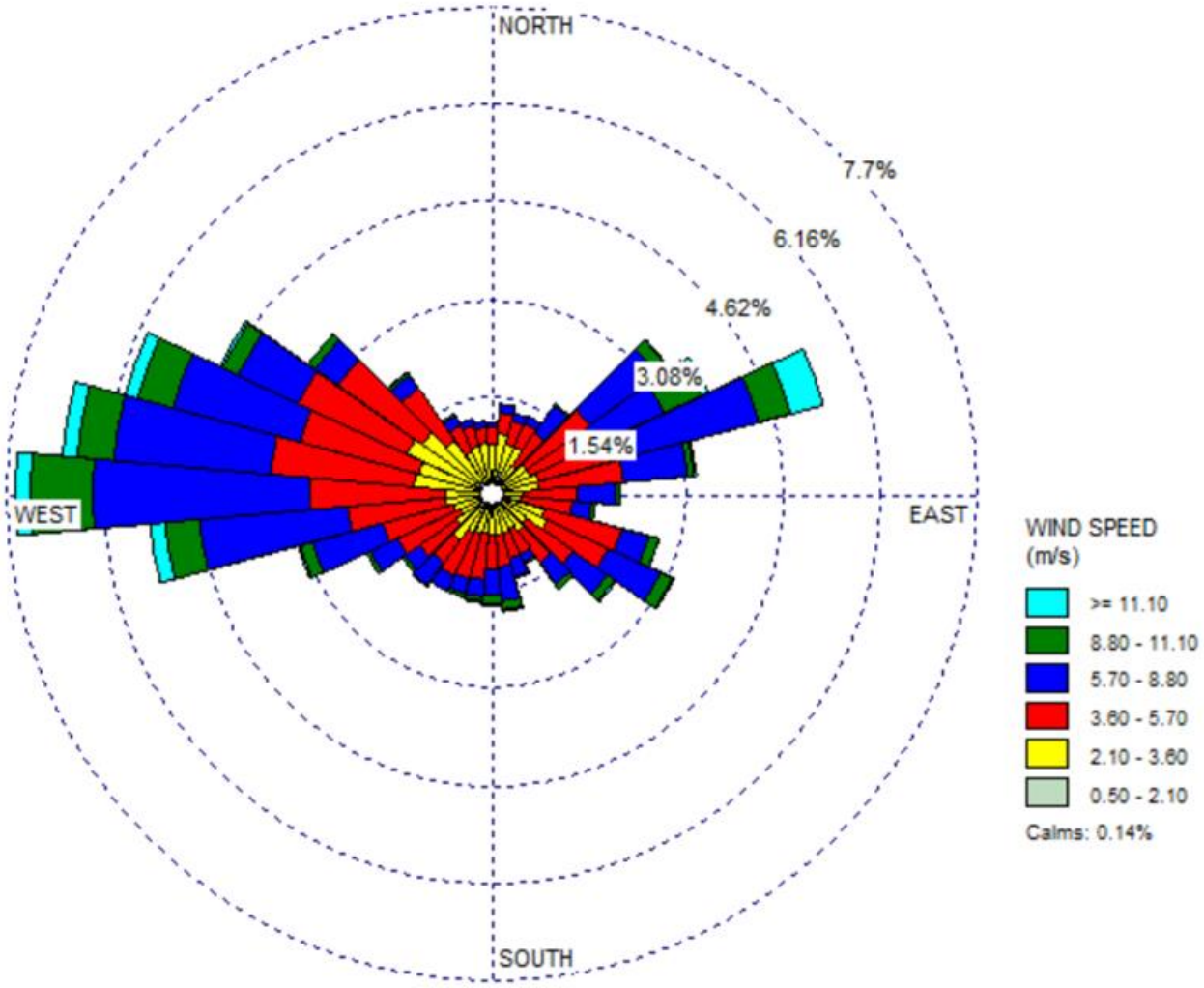


FIGURE A 4 CARDIFF AIRPORT WIND ROSE – 2019

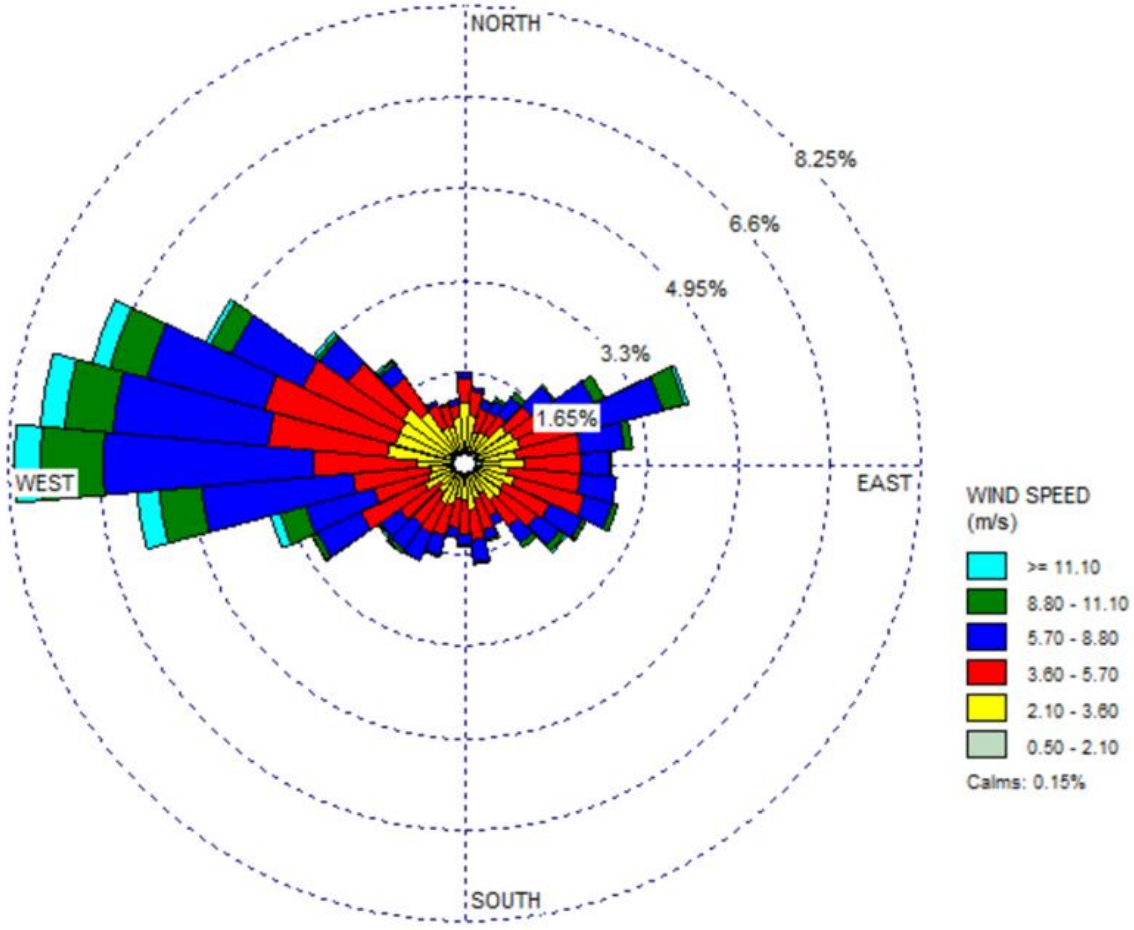


FIGURE A 5 CARDIFF AIRPORT WIND ROSE - 2020

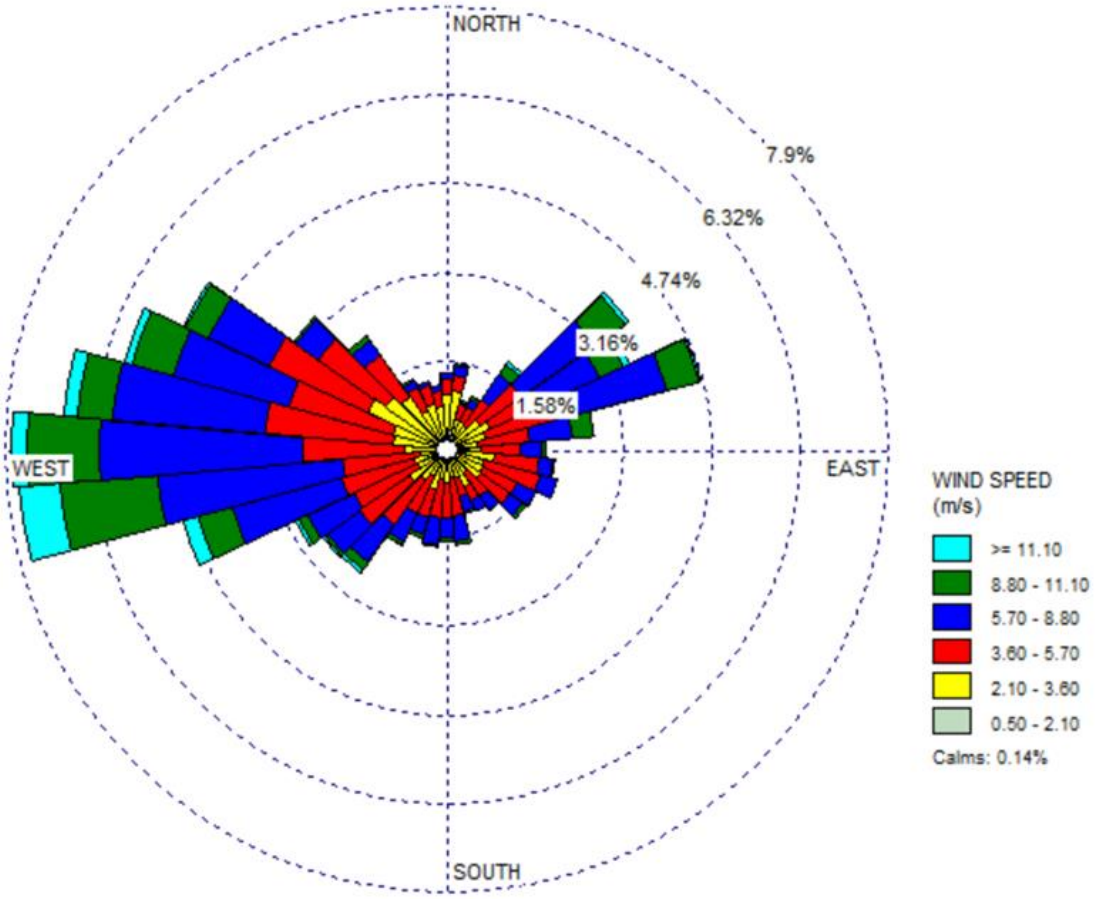
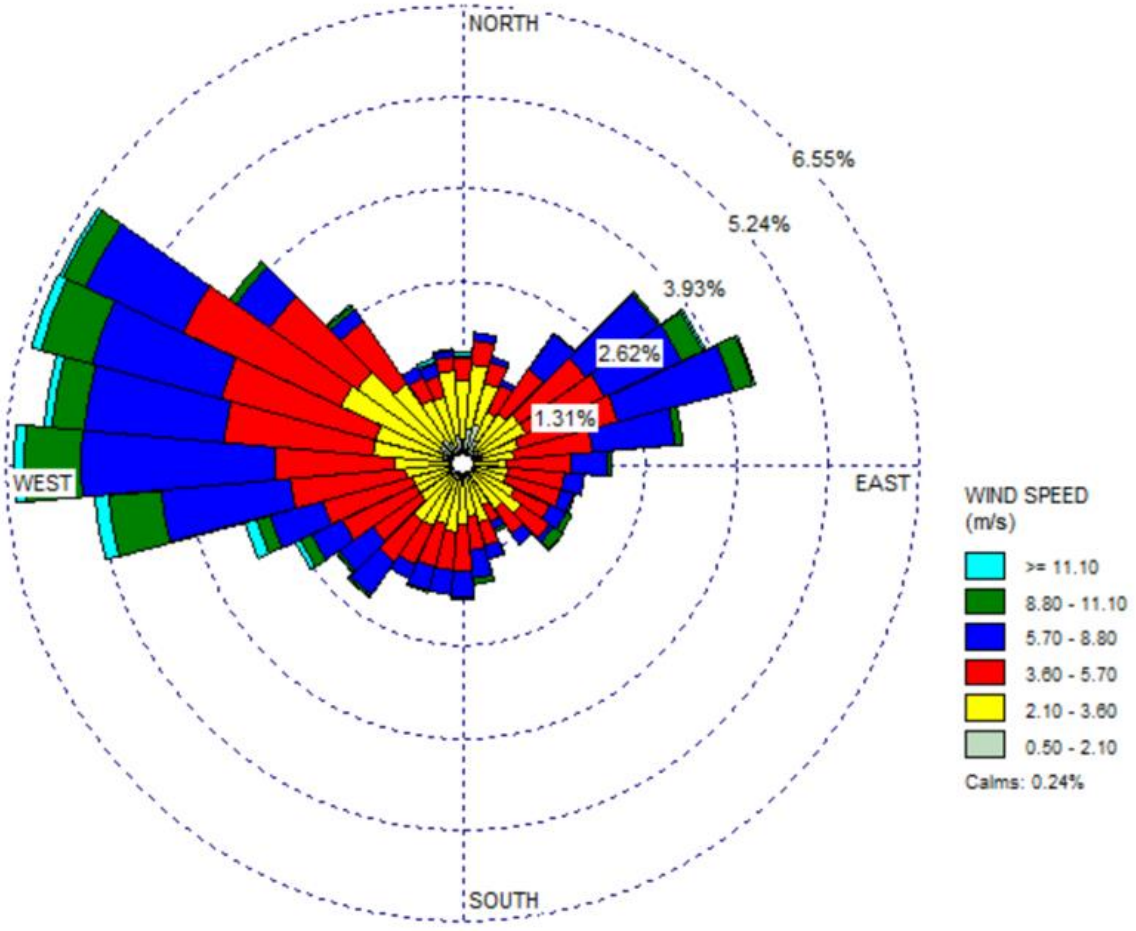


FIGURE A 6 CARDIFF AIRPORT WIND ROSE – 2021



A.3 EMISSION POINTS LOCATION

Table A.2 presents the coordinates used for each stack in the air dispersion model.

TABLE A 2 COORDINATES OF MODELLED STACKS

Emission Point	X (National Grid)	Y (National Grid)
GEN1	327816.00	184198.00
GEN2	327822.00	184200.00
GEN3	327886.00	184212.00
GEN4	327893.00	184215.00
GEN5	327948.00	184219.00
GEN6	327955.00	184222.00
GEN7	328013.00	184232.00
GEN8	328020.00	184233.00
GEN9	328085.00	184245.00
GEN10	328089.00	184248.00
GEN11	327831.00	184126.00
GEN12	327837.00	184128.00
GEN13	327904.00	184139.00
GEN14	327910.00	184141.00
GEN15	327968.00	184151.00
GEN16	327973.00	184153.00
GEN17	328032.00	184163.00
GEN18	328039.00	184165.00
GEN19	328106.00	184179.00
GEN20	328111.00	184182.00
GEN21	327683.00	184038.00
GEN22	327684.00	184035.00
GEN23	327766.00	184149.00
GEN24	327768.00	184144.00
GEN25	327674.00	184129.00
GEN26	327674.00	184134.00
GEN27	327785.00	184062.00
GEN28	327787.00	184059.00
GEN29 (CWL01 Admin)	328107.00	184175.00

Emission Point	X (National Grid)	Y (National Grid)
GEN30 (Water Plant)	327921.00	184060.00
GEN31 (CWL02 Admin)	327683.00	184036.00

APPENDIX B CONTOUR PLOTS

ERM HAS OVER 160 OFFICES ACROSS THE FOLLOWING COUNTRIES AND TERRITORIES WORLDWIDE

Argentina
Australia
Belgium
Brazil
Canada
China
Colombia
France
Germany
Ghana
Guyana
Hong Kong
India
Indonesia
Ireland
Italy
Japan
Kazakhstan
Kenya
Malaysia
Mexico
Mozambique
The Netherlands
New Zealand
Peru
Poland
Portugal
Romania
Senegal
Singapore
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Spain
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Taiwan
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