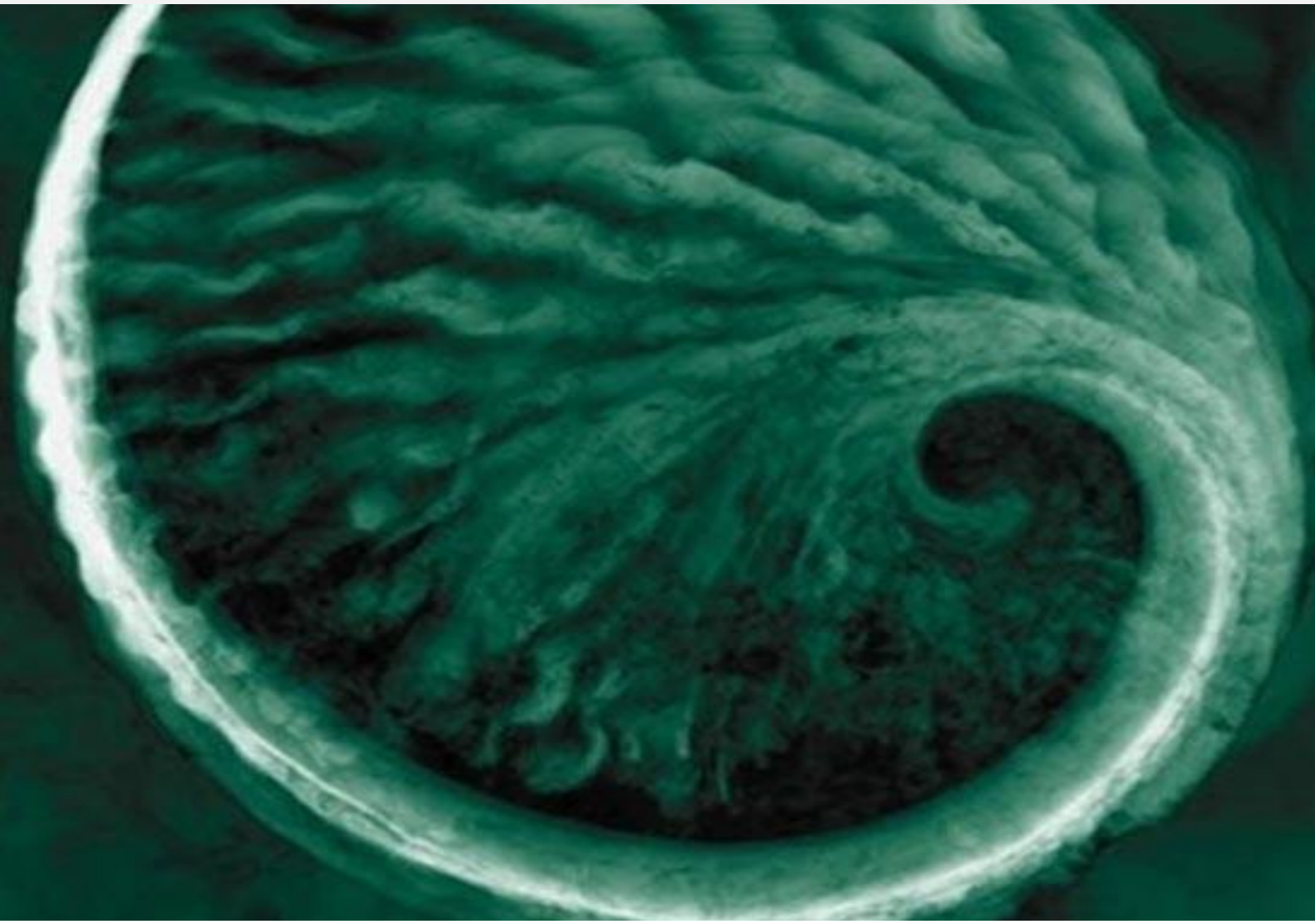

Draft Air Quality Management Plan

Whole Site Outage Scenarios – CWL01 & 02 Microsoft Ltd

03 November 2023

Project No.: 0657169

The business of sustainability

Document details	
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Draft	01	Becka Chanter, Dr. Cameron Taylor	Rahul Patel, Dr. Chris Hazell-Marshall	Susanne Baker	03/10/23	

Signature Page

03 November 2023

Draft Air Quality Management Plan

Whole Site Outage Scenarios – CWL01 & 02 Microsoft Ltd

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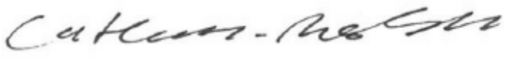

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Acronyms and Abbreviations

Name	Description
AQIA	Air Quality Impact Assessment
AQMP	Air Quality Management Plan
AEGL	Acute Exposure Guideline
DC	Data Centre
DEFRA	Department for Environment, Food and Rural Affairs
DMS	Document Management System
ERM	Environmental Resources Management
EP	Environmental Permit
GDPR	General Data Protection Regulation
m	Metre

MWth	Megawatt Thermal input
NCC	Newport City Council
NRW	Natural Resources Wales
OS	Ordnance Survey
PEC	Predicted Environmental Concentration
SCR	Selective Catalytic Reduction

1. INTRODUCTION

The CWL01 and CWL02 data centres will be operated by Microsoft Limited (Microsoft) and will be regulated by Natural Resources Wales (NRW) under an environmental permit (EP). The main permitted activity at the site will be the operation of diesel generators providing emergency backup power in case of grid failure. This document outlines the draft air quality management plan (AQMP) to be used in case of a power outage at the CWL01 and CWL02 data centres, once constructed and operational. This document will be updated following completion of the environmental permits.

This AQMP has been prepared by Environmental Resources Management Ltd (ERM) on behalf of Microsoft. The AQMP covers emissions assessment, regulator notification and engagement actions in the event of a major, unplanned power loss at the facility. In this instance multiple standby diesel generators would be required to operate the facility, the emissions from which could pose a risk to air quality.

On the basis of the AQIA this draft AQMP is not required to cover normal operations including testing.

Details of the CWL01 and CWL02 data centres are provided in **Table 1** below, which would be updated following environmental permit submission.

Table 1 Site Information

Permit Number	TBC
Address	Microsoft CWL01 and CWL02 Data Centres Imperial Business Park, Celtic Way, Duffryn, Newport NP10
OS – grid coordinates	ST 27886 84154

The documentation references related to the environmental permit application are provided in **Table 2** below.

Table 2 Related Documentation

Document	Title
Air Quality modelling report	Air Quality Impact Assessment – Air Quality Technical Report, Update – Microsoft Quinn (06/10/2023)
Environmental permit	Not yet issued
Environmental permit application documents	Not yet available

2. SENSITIVE HUMAN RECEPTORS

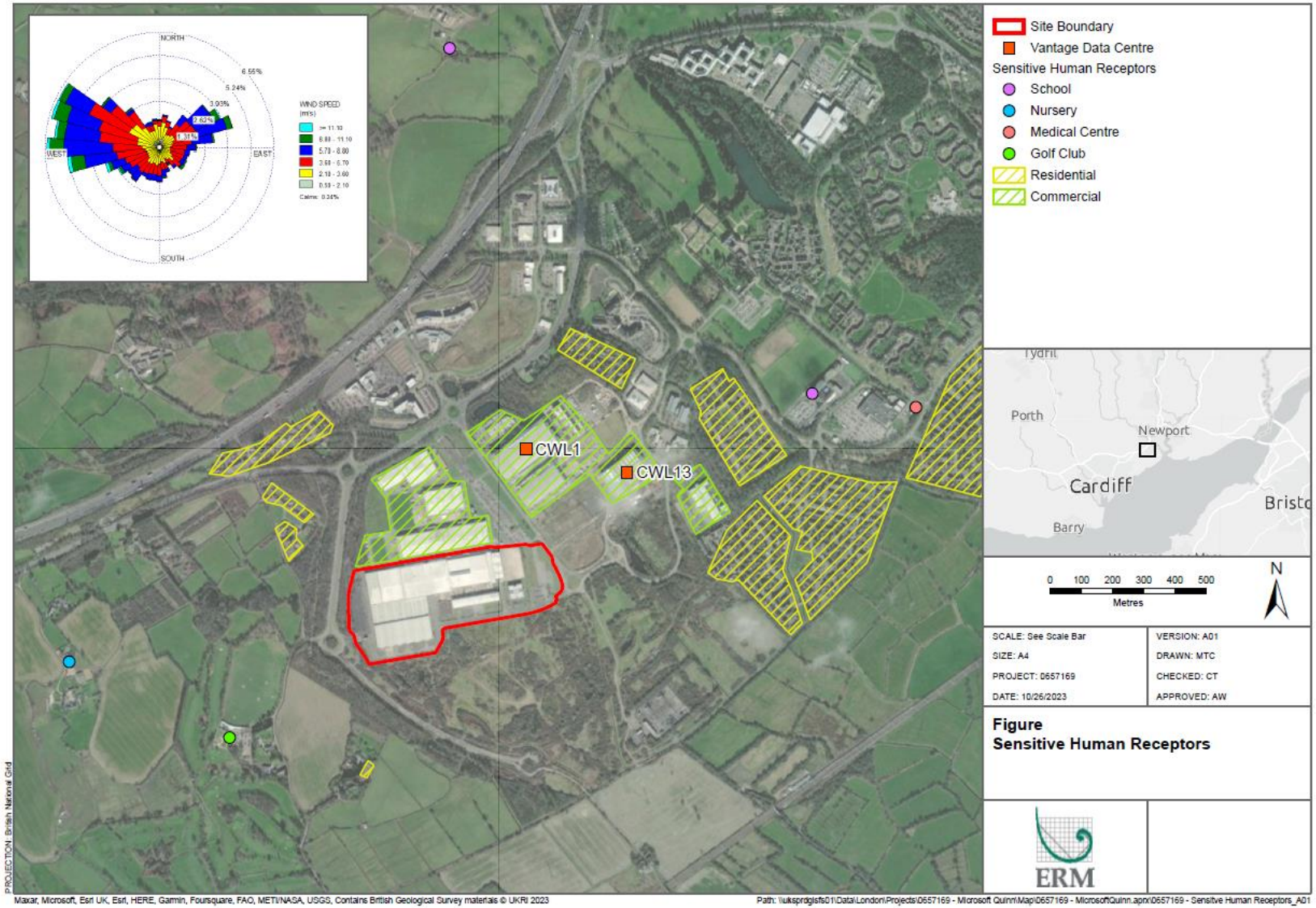
- The site is located within the Newport Imperial Estate amongst other commercial buildings. Error! Reference source not found.The nearby sensitive human receptors are summarised in

and Figure 1**.**

Table 3 Nearest Identified Sensitive Human Potential Receptors

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

Figure 1 Representative Potential Sensitive Receptors



3. SCENARIOS REQUIRING USE OF THE AQMP

The total number of permitted diesel fuelled backup generators across the CWL01 & CWL02 site is 31.

The description of the standby diesel generator capacity on site is detailed in

Table 4 below.

Table 4 Generator Capacity On site

Item	Description
Permitted MWth	TBC once permit is issued (approximately 235 $MW_{thermal}$ input is the total generator thermal input capacity). Of note is that the diesel engines will be fitted with Selective Catalytic Reduction (SCR) systems for the purposes of abating emissions of oxides of nitrogen (NO_x). In the event of engine running the SCR would take approximately 5 – 15 minutes to warm up and become effective depending on the SCR fitted.
Installed number of standby engines	31 permitted diesel fuelled backup generators (28 colo, 2 admins and 1 water plant generators.
Resilience provision for the engines	TBC based on required load of the site
Site location	Commercial/residential – the site is located within the Imperial Park, which is predominantly commercial in nature, but is bounded on three sides by residential land.
Stack Arrangement (indicative or average height + characteristic)	Generators arranged around CWL01 and CWL02 site all have externally emitting vertical stacks of 14 m height.
Primary Grid connection description	TBC following discussion with Microsoft
Minimum distance to other large data centres or aggregated standby which could share the same Primary Grid connection.	There are other data centres operated by other operators located nearby to the site, one of which approximately 240m north east, with a second approximately 400 m to the east. Microsoft does not know how the incoming supplies for these other data centres is arranged as this information is not freely available online.
Standby Cluster? – estimated number of any off-site standby engines within 500m radius that would likely	From a review of the NRW's public register, within a 1 km radius, there is one other permitted data centre installation. Pre-application information from Newport City Council indicates that together with CWL01 and CWL02 the combined number of generators within 500m will be approximately 200.

operate in a national black-start scenario	Some data centres (DCs) in the area will not yet have been permitted and may not feature in the public register for operating standby engines.
Local Authority AQ management Zone	The site is not located within an air quality management area (AQMA) designated by Newport City Council. The nearest AQMA is located at Bassaleg approximately 2.8km to the northeast of CWL01 and CWL02 and impact assessments indicate that this AQMA would not be significantly impacted by the operation of CWL01 and CWL02 engines in the event of emergency operations.

Potential air quality effects during back-up generator operation in the event of a major, unplanned power loss (emergency event) have been considered to help establish the appropriate actions the site should undertake including notification and receptor surveillance. This plan provides information on the modelled Predicted Environmental Concentration (PEC) 1-hour maximum nitrogen dioxide (NO_2) concentrations for CWL01 and CWL02 for realistic generator running scenarios in an emergency, this being all 28 backup generators running at 60% load. Baseline for these analyses is outlined in the AQIA but are taken from DEFRA mapping.

Modelled potential NO_2 concentrations at potential receptors have been assessed against the Welsh 1 hour air quality standard for NO_2 of 200µg/m^3 and the US EPA 1-hour Acute Exposure Guideline Level 1 (AEGL-1) of 940 µg/m^3. The AEGL-1 threshold does not have any regulatory status in the UK but is referenced here as a guideline above which humans may experience symptoms of acute NO_2 exposure[1]. Any scenario where the modelled PEC is predicted to exceed the 1-hour AEGL-1 at 60% engine load will trigger the use of the AQMP actions listed in **Section 5**.

Table 5 provides details of the potential site outage scenarios considered. Due to the early stage of design, the details of specific outage scenarios is not available therefore only an emergency outage scenario in which power to the entire site is cut off is considered.

It should be noted that the air quality modelling to inform the scenarios listed in **Table 5** is based on the generators operating at 60% load during an emergency and that all 31 generators as included in the design are actually installed.

It is recommended that site judgement is taken when emergency operations occur, noting that whilst the emergency modelled scenario does not exceed the AEGL-1 threshold there may be cumulative effects which occur in conjunction with other local data centres. **Table 5**Error! Reference source not found. outlines the modelled emergency scenario.

[1] Environmental Agency. Data Centre FAQ Headline Approach – Draft. https://consult.environment-agency.gov.uk/psc/cr0-4td-digital-realty-uk-limited/supporting_documents/Data%20Centre%20FAQ.pdf

Table 5 Outage Scenarios

Scenario	Description of Realistic Outage Scenarios based on a review of the way the site could reasonably be expected to react to a range of modes of power loss	Probability	MWth input and number of generators	Run duration (hours)	Active management using actions in Section Error! Reference source not found. required?
Worst case – loss of all mains power supplies	The whole site suffers a loss of power following a blackout either as a result of grid, substation or HV cable failure. All generators would run simultaneously up to required site load.	Highly unlikely	Load requirement for site unknown, but approximately 60% Approximately 140 MWh (all generators up to required load required for site. Up to 31 generators)	>1	No management actions required. Wales AQS for NO_2 1 hour of 200µg/m^3 is exceeded however the AEGL-1 (940 µg/m^3) is not exceeded. Microsoft should take action as deemed relevant to the outage.

Based on a reasonable worst-case modelling assessment, there is no predicted exceedance of the AEGL-1 threshold at identified sensitive receptors in the vicinity of CWL01 and CWL02. The actions outlined in this AQMP are therefore unlikely to be triggered unless there are extensive design changes following this draft of the AQMP, or there is a need to consider cumulative impacts with other nearby data centres.

Table 6 provides a summary of the air quality modelling assessments undertaken for the specified outage scenario. This includes:

- A reasonable worst-case modelling assessment using the meteorological data for the single least favourable meteorological year for the years 2017-2021, for all hours in the day which gives the highest modelled NO_2 concentration at a receptor.

Table 6 Air Quality Assessment Headline Figures

Results from the Predicted Environmental Concentration NO2 air quality assessment	
Conservative peak NO_2 concentrations under the worst case scenario	For the modelled worst-case scenario of the 31 permitted generators running simultaneously with SCR (scenario from **Table 5** above), a peak NO_2 concentration of 226 µg/m^3 (1 hour maximum) has been predicted for the Predicted Environmental Concentration (PEC), based on 60% load.
Key risk factors, as identified by air quality assessments	
Times of day, season	If generators are required to run in an emergency during rush hour, this may have a greater potential net effect on nearby receptors due to the elevated baseline NO_2 concentrations. The running of the generators in an emergency cannot be controlled to avoid specific times of the day and will need to be run when required.
Wind direction	Wind direction will be key as it will influence the plume direction, should an outage scenario occur. Cardiff Weather Station data should be used, as well as wind rose record information.

It is noted that there are other data centres in the vicinity of the project site. Whilst based on the modelling of the emergency scenario at this site there is no potential of the generators to exceed the AEGL-1 threshold, it should be noted that were there to be a total grid failure the combined impact of generators from all the data centres in the area could cause a cumulative effect that may lead to an exceedance of the AEGL-1. It is advised that discussions are conducted with other local data centre providers to develop a joint AQMP to understand the risk and if needed develop a joint response.

4. MONITORING ACTIVITIES

Microsoft will invest in air quality monitoring to assist with air quality management at the Newport site. Details of the potential monitoring methods are summarised in Table 7.

Table 7 Monitoring Activities

Type of monitor	Application
Handheld Crowcon gas analyser	• Portable unit that can be carried by site staff whilst walking around site following the surveillance route, see Error! Reference source not found.**.** • Limit of detection for NO_2 is approximately 1,000µg/m^3 (just above AEGL-1). • Level alarms can be set at discrete intervals e.g., AEGL-1 guideline threshold, or as close as possible on account of limit of detection (i.e. 1,000µg/m^3). • Measures air quality instantaneously and will provide a positive result of a defined threshold if detected (as per alarm outlined above).
Fixed AQMesh pods	• Sensitive fixed-point unit for accurate ambient air quality monitoring. • Can detect NO_2 at low ambient concentrations well below the one-hour air quality standard of 200 µg/$m^{3.}$ • Takes readings at 15-minute intervals and reports an hourly average for the previous hour's monitored air quality – i.e., a 60-minute lag from having "real time" data. • Data can be viewed via a website to provide an indication of the potential influence of the site's activities on local ambient air quality. • Can be used to sense-check monitored air quality by the handheld units. • Can be used to monitor local wind conditions.

As well as on site monitoring, there is also a third-party ambient air quality monitoring station in Newport, the names and locations of this site is given in **Error! Reference source not found.**. Air quality from these monitoring stations may also be used as part of this AQMP.

Table 8 Nearest Ambient Air Quality Monitoring Stations (3rd party operated)

No.	Name	X Co-ordinates	Y Co-ordinates
1	Newport Automatic Urban Rural Monitoring Network (AURN)	332410	189604

Access to current readings at: https://uk-air.defra.gov.uk/latest/currentlevels?view=site

5. ACTIONS TO BE FOLLOWED DURING OUTAGE SCENARIOS

The actions outlined in Figure 2 are informed by an understanding of the potential for emissions to effect local air quality, based on an air quality model which has been run specifically for the operating regime planned to facilitate the running of the standby diesel generators on site. Note, this process involves local air quality monitoring using either instruments recommended in Table 7.

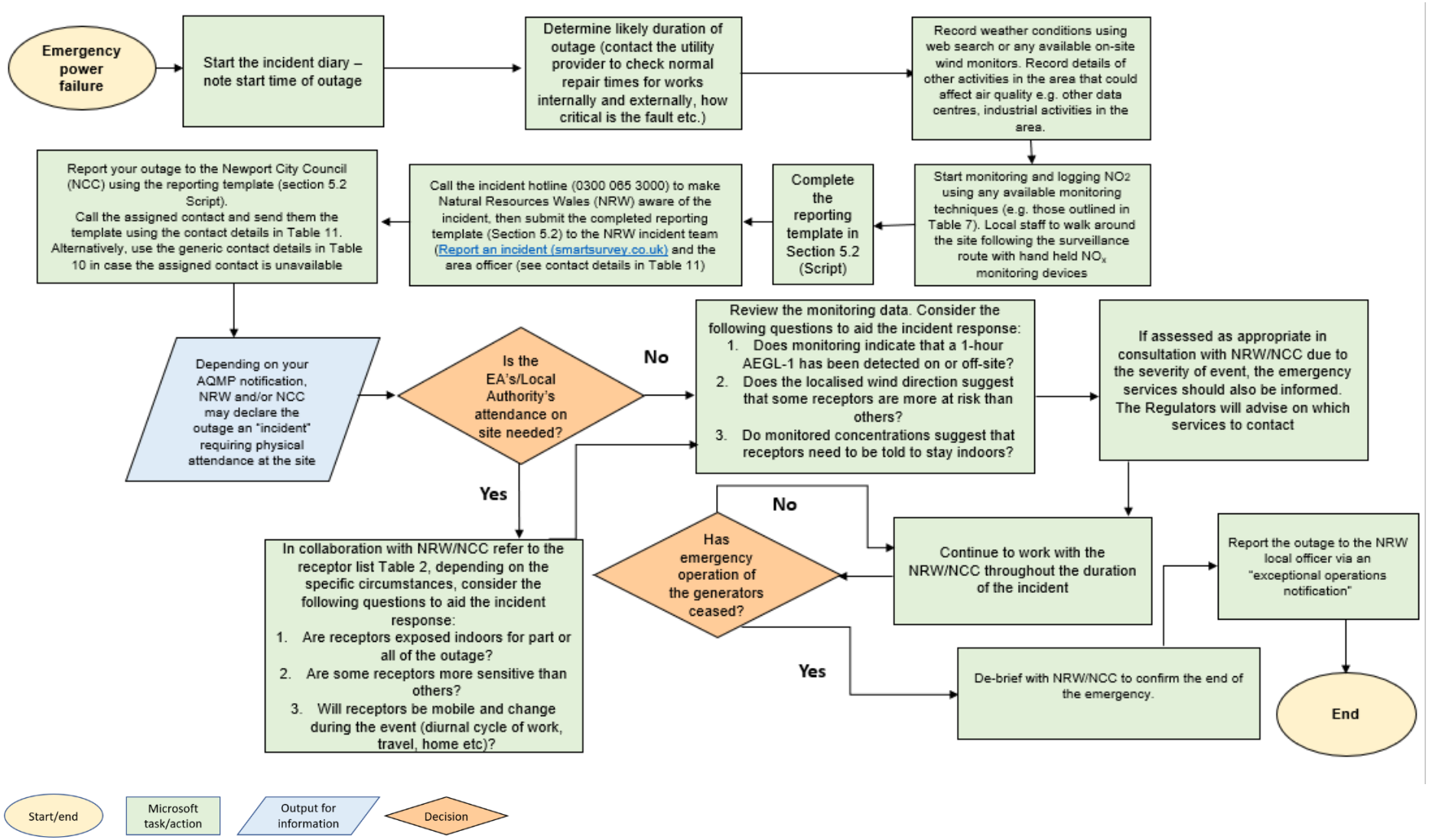
Dispersion modelling assessments do not suggest that the running of generators at the site, including the emergency scenario, has the potential to exceed the AEGL-1 threshold at sensitive receptors in the vicinity.

The process described below and shown in Figure 2**,** has been included on a voluntary basis to be followed if deemed necessary by the Microsoft site manager or in dialogue with Natural Resources Wales or Newport City Council.

5.1 Hand-Held Monitoring

There is currently no ambient air quality monitoring taking place at the site. It is therefore recommended that in the event of an emergency scenario in which all generators at the site are running that hand held ambient air quality monitoring is undertake. This is to ascertain the NO_2 levels compared with the AEGL-1 1-hour guideline (i.e. 940 µg/m3 /0.5 ppm/482 ppb) using a handheld instrument in downwind residential areas, ideally in co-ordination with the regulatory authorities. Refer to Figure 1 for the principal residential areas in the vicinity of the site that may require surveillance.

Figure 2 Process Flow of Actions to be Followed During Outage Scenario



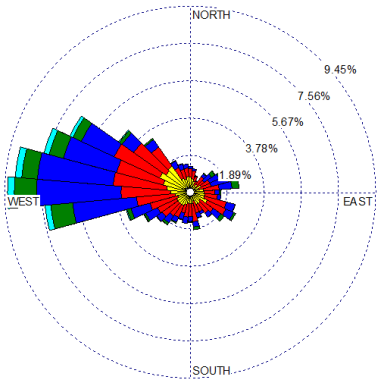
5.2 Newport City Council Reporting Format

Reporting format to be agreed with Newport City Council during the planning process. Below is an example of a reporting table.

Information on Incident	Details
Type of Incident	**This is a self-reported potentially polluting event to air quality caused by an NRW permitted installation**
Permit reference	EPR/XXXXXX
Location:	<address & post code>
Start time and date of the outage:	<dd/mm/yy hh:mm>
Initial Understanding of the Incident:	We are a large EPR permitted site with significant aggregated standby emergency plant needing to operate due to a likely prolonged power outage. This has the potential to lead to ambient air quality breaches especially if power loss exceeds 18 hours duration.
Potential Duration & Scale	
Assessment of the current outage scenario	<copy the appropriate text from table 1.4>
Assessment of likely hours emergency power could be running	<hours>
Number of standby generators expected to be operating after 30 minutes	<n>
Number of standby generators actually or predicted to be operating after 2 hours	<n>
Initial Actions being taken:	We have initiated the agreed air quality action plan (AQMP – for info this will be logged in your document management system DMS under the permit reference). The AQMP includes the requirement to make this notification as soon as practical.
Other steps taken include:	<other steps taken include>
Local NRW Site permit contact:	<enter name from contact sheet>
Updates	<reference>:
	Confirm that the outage has ceased
Visual Impact (fumes etc):	Yes/No
Commenced AQ assessment of impacts at potential receptors	Yes/No commenced at hh:mm
AQMESH/Hand Held monitor readings are available	Provide readings
Wind and weather conditions locally are	Provide overview of conditions.
Contact Details:	
For urgent enquiries, please call	xxxxxx
If you're unable to get in touch, please email our service desk and request that we return your call urgently, providing details of the information you require.	xxxxxx.

5.3 Wind-Rose

Figure 3 Wind-Roses taken from Cardiff Weather Station 2017 - 2021



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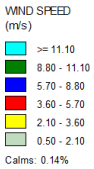
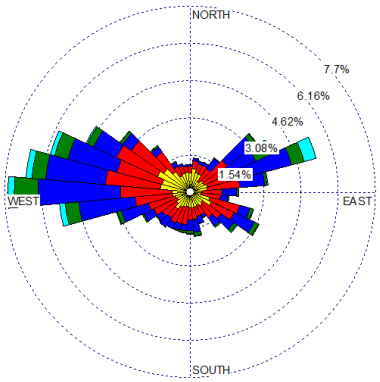
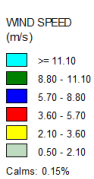
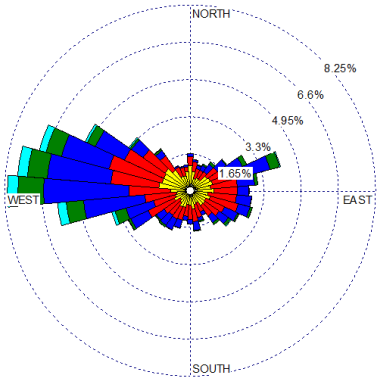


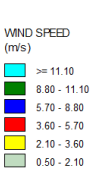


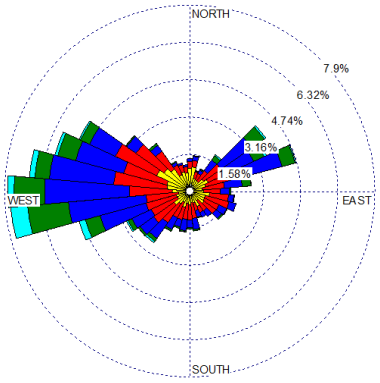
2018





2019

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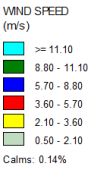
1.58%
WEST
EAST
SOUTH

2020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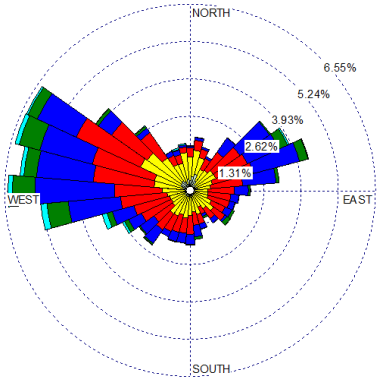
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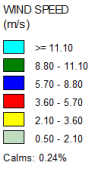
SOUTH

2021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2.10 - 3.60
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Calms: 0.24%

6. RESPONSIBILITIES

It is the responsibility of everyone on-site to ensure the environment is protected for the duration of the project. To manage this effectively, there will be key individuals who are assigned specific responsibilities to ensure that all persons employed on the Project know the responsibilities expected of them.

Microsoft will commit to providing the names and descriptions of key personnel and responsibilities on site in order to manage air quality in a table such as **Error! Reference source not found.**. This will be updated during the planning process.

Table 9 Responsibilities

Names	Description
Microsoft to confirm names	Microsoft to confirm roles and responsibility description
Microsoft to confirm names	Microsoft to confirm roles and responsibility description
	Microsoft to confirm roles and responsibility description
	Microsoft to confirm roles and responsibility description
	Microsoft to confirm roles and responsibility description
	Microsoft to confirm roles and responsibility description

7. CONTACTS

Contact details will be provided for operation of the Proposed Development. Below are table examples of the contacts.

Table 10 Public Access Contacts

Operator Contact		
Corporate contact and call centre	TBC	XXX
		XXX
CWL01 contact	TBC	XXX
CWL02 contact	TBC	XXX
External Contacts		
Local Council	Environmental Health – general enquiries	Phone: 01633 656 656 between 9am and 5pm Monday to Friday
		Email: info@newport.gov.uk
NRW incident hotline	24-hour contact phone number	0300 065 3000
	Report incident online – NRW form	Report an incident (smartsurvey.co.uk)

Table 11 Private Contacts (GDPR Considerations)

Operator Contact		
Site contact		Phone
Consultancy and technical support	Environmental Resource Management (UK) Limited – ERM	---
External Contacts		
Environmental Regulator (NRW)	TBC	---
	TBC	Phone
	TBC	Email

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
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