

Air Quality Assessment

Port Talbot Data Centre

Future-tech SCi Limited

AIR QUALITY ASSESSMENT

Quality Management

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1 Introduction

Purpose of the Report

- 1.1 This Air Quality Assessment has been prepared to support a planning application for the construction and operation of a Data Centre at Tyn-Y-Caeau, Margam.
- 1.2 The Application Site is located within the administrative area of Neath Port Talbot County Borough Council (NPTCBC). NPTCBC has designated part of Port Talbot as an Air Quality Management Area (AQMA) due to high levels of particulate matter (PM₁₀). The AQMA is approximately 430m northwest of the application site, at the closest point.
- 1.3 This air quality assessment covers the following aspects:
- Construction phase - an evaluation of the temporary effects from fugitive construction dust; and
 - Operational phase – an evaluation of the impacts of the key emission sources to air (i.e. the six diesel-powered back-up generators) on the local area during testing and 24-hour emergency use.
- 1.4 This report begins by setting out the policy and legislative context for the assessment. The methods and criteria used to assess potential air quality effects have then been described. The baseline air quality conditions have been established taking into account Defra estimates, local authority documents and the results of any local monitoring. The results of the assessment of air quality impacts have been presented and mitigation measures recommended, where required. A conclusion has been drawn on the significance of the residual construction and operational-phase effects.

2 Legislation and Policy Context

Ambient Air Quality Legislation and National Policy

Air Quality Standards Regulations

- 2.1 The Air Quality Standards Regulations 2010 [i], amended by The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020 [ii], sets limit values for ambient air concentrations for the main air pollutants: particulate matter (PM₁₀ and PM_{2.5}), nitrogen dioxide (NO₂), sulphur dioxide (SO₂), ozone (O₃), carbon monoxide (CO), lead (Pb) and benzene, certain toxic heavy metals (arsenic, cadmium and nickel) and polycyclic aromatic hydrocarbons (PAHs).
- 2.2 These limit values are legally binding on the Secretary of State. The Government and devolved administrations operate various national ambient air quality monitoring networks to measure compliance and develop plans to meet the limit values.

UK Air Quality Strategy

- 2.3 The Environment Act 1995 [iii] established the requirement for the Government and the devolved administrations to produce a National Air Quality Strategy (AQS) for improving ambient air quality, the first being published in 1997 and having been revised several times since, with the latest published in 2007 [iv]. The Strategy sets UK air quality standards♦ and objectives# for the pollutants in the Air Quality Standards Regulations plus 1,3-butadiene and recognises that action at national, regional and local level may be needed, depending on the scale and nature of the air quality problem. There is no legal requirement to meet objectives set within the UK AQS except where equivalent limit values are set within the Air Quality Standards Regulations.
- 2.4 The 1995 Environment Act also established the UK system of Local Air Quality Management (LAQM), that requires local authorities to go through a process of review and assessment of air quality in their areas, identifying places where objectives are not likely to be met, then declaring Air Quality Management Areas (AQMAS) and putting in place Air Quality Action Plans to improve air quality. These plans also contribute, at local level, to the achievement of the limit values in the Air Quality Standards Regulations.

* Standards are concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. Standards, as the benchmarks for setting objectives, are set purely with regard to scientific evidence and medical evidence on the effects of the particular pollutant on health, or on the wider environment, as minimum or zero risk levels.

Objectives are policy targets expressed as a concentration that should be achieved, all the time or for a percentage of time, by a certain date.

- 2.5 The limit values and objectives relevant to this assessment are summarised in Table 2.1. Although the limit values and the AQS objectives are numerically equal, there are some differences in where they apply and who is responsible for their achievement.
- 2.6 The Environment Agency online guidance entitled 'Environmental management – guidance, Air emissions risk assessment for your environmental permit' [v] provides further assessment criteria in the form of Environmental Assessment Levels (EALs).

Table 2.1: Summary of Relevant Air Quality Limit Values, Objectives and EALs

Pollutant	Averaging Period	Objectives/ Limit Values	Not to be Exceeded More Than
Nitrogen Dioxide (NO ₂)	1-hour	200 µg.m ⁻³	18 times per calendar year
	Annual	40 µg.m ⁻³	-
Particulate Matter (PM ₁₀)	24-hour	50 µg.m ⁻³	35 times per calendar year
	Annual	40 µg.m ⁻³	-
Particulate Matter (PM _{2.5})	Annual	20 µg.m ⁻³	-
Carbon monoxide	Maximum daily running 8 hour mean	10,000 µg.m ⁻³	-
	Maximum 1-hour	30,000 µg.m ⁻³	-
Benzene*	Annual	5 µg.m ⁻³	-
	Maximum 24-hour	30 µg.m ⁻³	-
Sulphur Dioxide (SO ₂)	15-minute	266 µg.m ⁻³	> 35 times per calendar year
	1-hour	350 µg.m ⁻³	> 24 times per calendar year
	24-hour	125 µg.m ⁻³	> 3 times per calendar year
*The generators emit hydrocarbons. The Environment Agency EAL for benzene has been used for total hydrocarbons. This comprises a highly conservative and precautionary approach as benzene has the most stringent EAL and conforms with EA guidance.			

- 2.7 The values detailed within Table 2.1 have hereafter referred to as Air Quality Assessment Levels (AQAL).

National Planning Policy

National Planning Policy Framework

- 2.8 Current land use policies for out the land use planning policies of the Welsh Government and is intended to provide a strategic policy framework to assist local authorities in the preparation of their development plans. Planning Policy Wales (PPW) is supported by twenty-four Technical Advice Notes (TANs) which give further guidance on specific topics. Procedural advice is also given in the National Assembly for Wales/Welsh Office topic. Procedural advice is also given in the National Assembly for Wales/Welsh Office Circulars. Planning authorities may use planning conditions or

obligations to meet planning aims to protect the environment. PPW, the TANs and Circulars may be material to decisions made on individual planning applications and will be taken into account by the Secretary of State and his Inspectors in the determination of called-in planning applications and appeals.

Section 6.7 of PPW concerns Air Quality and Soundscape. Most relevant to this assessment, it states that:

“Planning authorities must consider the potential for temporary environmental risk, including airborne pollution and surface and subsurface risks, arising during the construction phases of development. Where appropriate planning authorities should require a construction management plan, covering pollution prevention, noisy plant, hours of operation, dust mitigation and details for keeping residents informed about temporary risks.”

“The location of potentially polluting development adjacent to sensitive receptors will be unacceptable where health and amenity impacts cannot be minimised through appropriate design and mitigation measures. It is the overall expectation that levels of pollution should be reduced as far as possible and for this reason the location of potentially polluting development should be taken into account as part of overall strategies in development plans to ensure it can be appropriately located and maximum environmental benefits can be gained through measures such as green infrastructure.”

“Early consideration is required to ascertain whether the location and design of proposed development is acceptable where air pollution or noise- generating development is likely to affect a protected species, or is proposed in an area likely to affect a statutorily designated site (such as Natura 2000 sites or SSSIs) or a tranquil urban green space (including but not limited to formally designated ‘quiet areas’) valued for the restorative respite and contact with nature that they offer to residents of busy towns and cities.”

PPW recognises that transport emissions contribute significantly to climate change and poor local air quality, which can in turn affect people’s health. TAN 18 on Transport elaborates further on traffic growth and its implications on the UK’s ability to meet objectives for greenhouse gas emissions and for air quality. It advises that local planning authorities should therefore take into account statutory air quality objectives together with the outcomes of reviews and assessments any Air Quality Action Plans that may have been prepared.

Local Planning Policy

- 2.9 The NPTCBC’s Local Development Plan (LDP) was adopted in January 2016. The LDP guides the future development, providing a clear vision for the County Borough setting out where, when and how much new development can take place. Policies relevant to air quality have been listed below.

Policy SP 16 (Environmental Protection)

Air, water and ground quality and the environment generally will be protected and where feasible improved through the following measures:

Ensuring that proposals have no significant adverse effects on water, ground or air quality and do not significantly increase pollution levels [...]

Ensuring that developments do not increase the number of people exposed to significant levels of pollution.

Policy EN 8 (Pollution and Land Stability)

Proposals which would be likely to have an unacceptable adverse effect on health, biodiversity and/or local amenity or would expose people to unacceptable risk due to the following will not be permitted:

Air pollution [...]

Proposals which would create new problems or exacerbate existing problems detailed above will not be acceptable unless mitigation measures are included to reduce the risk of harm to public health, biodiversity and/or local amenity to an acceptable level.

Policy EN 9 (Developments in the Central Port Talbot Area)

Developments in the central Port Talbot area that could result in breaches of air quality objectives during their construction phase, will be required to be undertaken in accordance with a Construction Management Plan submitted as part of the planning process and agreed by the Council.

3 Assessment Methodology

Approach

- 3.1 The scope and methodology for this assessment was discussed with the Environmental Health Officer within NPTCBC by email correspondence between 22nd and 28th August 2024.
- 3.2 This air quality assessment includes the key elements listed below:
- Establishing the background Ambient Concentration (AC) from consideration of Air Quality Review & Assessment findings and assessment of existing local air quality through a review of available air quality monitoring and Defra background map data in the vicinity of the site.
 - A qualitative assessment of likely construction-phase dust impacts.
 - Quantitative assessment of the operational effects on local air quality from stack emissions utilising a “new generation” Gaussian dispersion model, ADMS 6. Assessment of Process Contributions (PC) from the facility in isolation, and assessment of resultant Predicted Environmental Concentrations (PEC), taking into account cumulative impacts through incorporation of the AC.
- 3.3 Air quality guidance advises that the organisation engaged in assessing the overall risks should hold relevant qualifications and/or extensive experience in undertaking air quality assessments. The RPS air quality team members involved at various stages of this assessment have professional affiliations that include Member of the Institute of Air Quality Management and Member of the Institution of Environmental Science and have the required academic qualifications for these professional bodies.

Construction Phase - Methodology

- 3.4 Dust is the generic term used to describe particulate matter in the size range 1-75 µm in diameter [vi]. Particles greater than 75 µm in diameter are termed grit rather than dust. Dusts can contain a wide range of particles of different sizes. The normal fate of suspended (i.e. airborne) dust is deposition. The rate of deposition depends largely on the size of the particle and its density; together these influence the aerodynamic and gravitational effects that determine the distance it travels and how long it stays suspended in the air before it settles out onto a surface. In addition, some particles may agglomerate to become fewer, larger particles; whilst others react chemically.
- 3.5 The effects of dust are linked to particle size and two main categories are usually considered:
- PM₁₀ particles, those up to 10 µm in diameter, remain suspended in the air for long periods and are small enough to be breathed in and so can potentially impact on health; and

- Dust, generally considered to be particles larger than 10 µm which fall out of the air quite quickly and can soil surfaces (e.g. a car, window sill, laundry). Additionally, dust can potentially have adverse effects on vegetation and fauna at sensitive habitat sites.
- 3.6 The IAQM Guidance on the ‘assessment of dust from demolition and construction (v2.2, 2024)’ sets out 250 m as the distance from the site boundary and 50 m from the site traffic route(s) up to 250 m of the entrance, within which there could potentially be nuisance dust and PM₁₀ effects on human receptors. For sensitive ecological receptors, the corresponding distances are 50 m in both cases. These distances are set to be deliberately conservative.
- 3.7 Concentration-based limit values and objectives have been set for the PM₁₀ suspended particle fraction, but no statutory or official numerical air quality criterion for dust annoyance has been set at a UK, European or World Health Organisation (WHO) level. Construction dust assessments have tended to be risk based, focusing on the appropriate measures to be used to keep dust impacts at an acceptable level.
- 3.8 The IAQM dust guidance aims to estimate the impacts of both PM₁₀ and dust through a risk-based assessment procedure. The IAQM dust guidance document states: *“The impacts depend on the mitigation measures adopted. Therefore, the emphasis in this document is on classifying the risk of dust impacts from a site, which will then allow mitigation measures commensurate with that risk to be identified.”*
- 3.9 The IAQM dust guidance provides a methodological framework, but notes that professional judgement is required to assess effects: *“This is necessary, because the diverse range of projects that are likely to be subject to dust impact assessment means that it is not possible to be prescriptive as to how to assess the impacts. Also a wide range of factors affect the amount of dust that may arise, and these are not readily quantified.”*
- 3.10 Consistent with the recommendations in the IAQM dust guidance, a risk-based assessment has been undertaken for the development, using the well-established source-pathway-receptor approach:
- The dust impact (the change in dust levels attributable to the development activity) at a particular receptor will depend on the magnitude of the dust source and the effectiveness of the pathway (i.e. the route through the air) from source to receptor.
 - The effects of the dust are the results of these changes in dust levels on the exposed receptors, for example annoyance or adverse health effects. The effect experienced for a given exposure depends on the sensitivity of the particular receptor to dust. An assessment of the overall dust effect for the area as a whole has been made using professional judgement taking into account both the change in dust levels (as indicated by the Dust Impact Risk for individual receptors) and the absolute dust levels, together with the sensitivities of local receptors and other relevant factors for the area.
- 3.11 The detail of the dust assessment methodology is provided in Appendix A.

- 3.12 The dust risk categories that have been determined for each of the four activities (demolition, earthworks, construction and trackout) have been used to define the appropriate site-specific mitigation measures based on those described in the IAQM dust guidance. The guidance states that provided the mitigation measures are successfully implemented, the resultant effects of the dust exposure will normally be *“not significant”*.
- 3.13 The assessment methodology does not consider the air quality impacts of dust from any contaminated land or buildings.

Operational Phase - Methodology

- 3.14 The key pollutant emissions associated with the diesel-powered back-up generators are oxides of nitrogen (NO_x), PM₁₀, PM_{2.5} (particles up to 2.5 µm in diameter, a subset of PM₁₀), SO₂, CO and hydrocarbons.
- 3.15 Emissions of total NO_x from combustion sources comprise nitric oxide (NO) and NO₂. The NO oxidises in the atmosphere to form NO₂. The assessment of operational impacts therefore focuses on changes in NO₂ concentrations at surrounding receptors.
- 3.16 The assessment for human receptors is detailed within the main body of this report. However, the assessment for ecological receptors is detailed within Appendix D.
- 3.17 The EPUK/IAQM Land-Use Planning & Development Control: Planning for Air Quality document indicates that air quality assessments should include developments increasing annual average daily Light Duty Vehicle (LDV) traffic flows by more than 100 within or adjacent to an AQMA and more than 500 elsewhere. Once operational, the development is expected to generate a maximum total of up to 30 vehicles movements per day, of which 4 would be HDVs. The EPUK/IAQM thresholds are, therefore, highly unlikely to be exceeded; therefore, operational-vehicle exhaust emissions have not been assessed and can be considered negligible.

Atmospheric Dispersion Modelling of Pollutant Concentrations

- 3.18 In urban areas, pollutant concentrations are primarily determined by the balance between pollutant emissions that increase concentrations, and the ability of the atmosphere to reduce and remove pollutants by dispersion, advection, reaction and deposition. An atmospheric dispersion model is used as a practical way to simulate these complex processes; such a model requires a range of input data, which can include emissions rates, meteorological data and local topographical information. The model used and the input data relevant to this assessment are described in the following sub-sections.
- 3.19 The atmospheric pollutant concentrations in an urban area depend not only on local sources at a street scale, but also on the background pollutant level made up of the local urban-wide background, together with regional pollution and pollution from more remote sources brought in on the incoming

air mass. This background contribution needs to be added to the fraction from the modelled sources, and is usually obtained from measurements or estimates of urban background concentrations for the area in locations that are not directly affected by local emissions sources. Background pollution levels are described in detail in Section 4.

Dispersion Model Selection

- 3.20 Several commercially available dispersion models can predict ground level concentrations arising from emissions to atmosphere from elevated point sources. Modelling for this study has been undertaken using ADMS 6, a version of the ADMS (Atmospheric Dispersion Modelling System) developed by Cambridge Environmental Research Consultants (CERC) that models a wide range of buoyant and passive releases to atmosphere either individually or in combination. The model calculates the mean concentration over flat terrain and also allows for the effect of plume rise, complex terrain, buildings and deposition. Dispersion models predict atmospheric concentrations within a set level of confidence and there can be variations in results between models under certain conditions. The ADMS 6 model has been formally validated and is widely used in the UK and internationally for regulatory purposes.
- 3.21 ADMS comprises a number of individual modules each representing one of the processes contributing to dispersion or an aspect of data input and output. Amongst the features of ADMS are:
- An up-to-date dispersion model in which the boundary layer structure is characterised by the height of the boundary layer and the Monin-Obukhov length, a length scale dependent on the friction velocity and the heat flux at the surface. This approach allows the vertical structure of the boundary layer, and hence concentrations, to be calculated more accurately than does the use of Pasquill-Gifford stability categories, which were used in many previous models (e.g. ISCST3). The restriction implied by the Pasquill-Gifford approach that the dispersion parameters are independent of height is avoided. In ADMS the concentration distribution is Gaussian in stable and neutral conditions, but the vertical distribution is non-Gaussian in convective conditions, to take account of the skewed structure of the vertical component of turbulence;
 - Several complex modules including the effects of plume rise, complex terrain, coastlines, concentration fluctuations and buildings; and
 - A facility to calculate long-term averages of hourly mean concentration, dry and wet deposition fluxes and radioactivity, and percentiles of hourly mean concentrations, from either statistical meteorological data or hourly average data.

Model Inputs

Meteorological Data

- 3.22 The most important meteorological parameters governing the atmospheric dispersion of pollutants are wind direction, wind speed and atmospheric stability as described below:
- Wind direction determines the sector of the compass into which the plume is dispersed;
 - Wind speed affects the distance that the plume travels over time and can affect plume dispersion by increasing the initial dilution of pollutants and inhibiting plume rise; and
 - Atmospheric stability is a measure of the turbulence of the air, and particularly of its vertical motion. It therefore affects the spread of the plume as it travels away from the source. New generation dispersion models, including ADMS, use a parameter known as the Monin-Obukhov length that, together with the wind speed, describes the stability of the atmosphere.
- 3.23 For meteorological data to be suitable for dispersion modelling purposes, a number of meteorological parameters need to be measured on an hourly basis. These parameters include wind speed, wind direction, cloud cover and temperature. There are only a limited number of sites where the required meteorological measurements are made.
- 3.24 The year of meteorological data that is used for a modelling assessment can have a significant effect on source contribution concentrations. Dispersion model simulations have been performed using five years of data from St Athans, between 2019 and 2023. A surface roughness length of 0.3 m has been applied for the selected meteorological data recording site.
- 3.25 Wind roses have been produced for each of the years of meteorological data used in this assessment and are presented in Appendix E.

Stack Parameters and Emissions Rates used in the Model

- 3.26 The Proposed Development comprises six backup generators, with individual flue stacks. The stack locations are shown in Appendix E. The emissions characteristics for each stack modelled are provided in Table 3.1 and
- 3.27 Table 3.2 (note that as the six backup generators are the same engine model with the same stack dimensions, the stack emission parameters are identical and only one set of parameters have been presented). A stack height calculation has been performed and is included in Appendix C.

Table 3.1 Stack Characteristics (per Stack)

Parameter	Unit	Stack
Stack height	m	19
Internal diameter (individual flues)	m	0.6
Efflux velocity	m.s ⁻¹	28.3

Efflux temperature	°C	458
Actual volumetric flow	Am ³ .s ⁻¹	8.0
Oxygen by (dry) volume	%	5.05
Water by volume	%	1
Normalised volumetric flow (dry, 0°C, 5% O ₂)	Nm ³ .s ⁻¹	2.95

Table 3.2 Mass Emissions (per Stack) of Released Pollutant

Pollutants	Mass Emission Rate (g.s ⁻¹)
NO _x	14.42
PM	0.03
CO	0.58
SO ₂	0.12
Hydrocarbons	0.23

- 3.28 For the modelling and assessment of hydrocarbons releases, the highly conservative and precautionary approach that has been taken is to assume all emissions are in the form of benzene. This is consistent with the Environment Agency's online guidance [v] which states that *"If you release volatile organic compounds into the air and do not know what all the substances in them are, treat them all as 100% benzene in your risk assessment."*
- 3.29 For the purposes of this assessment, all particles are assumed to be less than 10 µm in diameter (i.e. PM₁₀). Furthermore, all particles are also assumed to be less than 2.5 µm in diameter (i.e. PM_{2.5}). In reality, the PM₁₀ and PM_{2.5} concentrations will be a smaller proportion of the total particulate emissions and the PM_{2.5} concentration will be a smaller proportion of the PM₁₀ concentration. Therefore, this can be considered a conservative estimate of the likely particulate emissions in each size fraction.

Modelled Scenarios

- 3.30 The diesel generators will only operate during a maintenance scenario (0.5 hours each per engine, per week, running independently) and in an emergency scenario (an example emergency scenario has been assessed where five engines operate simultaneously for 24 hours, with the sixth engine acting in reserve).
- 3.31 The period of 24 hours used in the modelling for emergency operation is considered to be a highly conservative estimate. Such events are triggered by utility (grid) power outages or critical maintenance of the power infrastructure system.

Terrain

- 3.32 The presence of elevated terrain can significantly affect (usually increase) ground level concentrations of pollutants emitted from elevated sources such as stacks, by reducing the distance

between the plume centre line and ground level and by increasing turbulence and, hence, plume mixing. A complex terrain has been included in the model.

Surface Roughness

- 3.33 The roughness of the terrain over which a plume passes can have a significant effect on dispersion by altering the velocity profile with height, and the degree of atmospheric turbulence. This is accounted for by a parameter called the surface roughness length.
- 3.34 A surface roughness length of 0.5 m has been used within the model to represent the average surface characteristics across the study area. This surface roughness length is typical of parkland and open suburbia.

Building Wake Effects

- 3.35 The movement of air over and around buildings generates areas of flow circulation, which can lead to increased ground level concentrations in the building wakes. Where building heights are greater than about 30 - 40% of the stack height, downwash effects can be significant. Table 3.3 sets out the dimensions of the buildings included within the assessment.

Table 3.3: Dimensions of Building Included Within the Dispersion Model

Building	National Grid Reference of Building Centre	Height (m)	Length (m)	Width (m)	Angle (°) from North
Proposed Building 1	279302, 186427	18	63.0	36.0	334
Proposed Building 2	279290, 186399	18	23.0	9.5	334
Existing Onsite Building 1	279268, 186380	10	29.0	16.0	60
Existing Offsite Building 1	279004, 186446	16	62.0	27.5	80
Existing Offsite Building 2	278947, 186351	24	98.0	61.0	80
Existing Offsite Building 3	279107, 186177	14	26.0	14.0	0
Existing Offsite Building 4	279077, 186156	22	30.0	31.0	1
Existing Offsite Building 5	279022, 186169	11	61.0	42.0	359

Receptors

- 3.36 The air quality assessment predicts the impacts at locations that could be sensitive to any changes. For assessing human-health impacts, such sensitive receptors should be selected where the public is regularly present and likely to be exposed over the averaging period of the objective. LAQM.TG22 [vii] provides examples of exposure locations and these are summarised in Table 3.4.

Table 3.4: Example of Where Air Quality Objectives Apply

Averaging Period	Objectives should apply at:	Objectives should generally not apply at:
Annual-mean	All locations where members of the public might be regularly exposed. Building façades of residential properties, schools, hospitals, care homes.	Building façades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to locations at the buildings façades), or any other location where public exposure is expected to be short-term.
Daily-mean	All locations where the annual-mean objective would apply, together with hotels. Gardens of residential properties.	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short-term.
Hourly-mean	All locations where the annual and 24 hour mean would apply. Kerbside sites (e.g. pavement of busy shopping streets). Those parts of car parks, bus stations and railway stations etc which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more. Any outdoor locations to which the public might reasonably be expected to spend 1-hour or longer.	Kerbside sites where the public would not be expected to have regular access
15-min mean	All locations where members of the public might reasonably be exposed for a period of 15 minutes or longer.	

- 3.37 Modelling of point source impacts has been undertaken using a grid of 3 km by 3 km with a grid spacing of 28 m, at a height of 1.5m (representative of average breathing height), centred on the Application Site.
- 3.38 In addition, the effects of the proposed development have been assessed at the façades of local existing receptors. All human receptors have been modelled at a height of 1.5 m, representative of typical head height. All ecological receptors have been modelled at a height of 0m. The locations of modelled receptors are listed in Table 3.5 and/or illustrated in Appendix E.

Table 3.5: Modelled Sensitive Receptors

Receptor	National Grid Reference	National Grid Reference
	X(m)	X(m)
ESR 1	279342	186113
ESR 2	279550	186326
ESR 3	279666	186133
ESR 4	279001	186908
ESR 5	279700	186225
ESR 6	278950	186624

Receptor	National Grid Reference	National Grid Reference
	X(m)	X(m)
ESR 7	279454	185956
ESR 8	279663	186186
ESR 9	279815	186994
ESR 10	278941	187107
ESR 11	278933	187227
ESR 12	278946	187354
ESR 13	279985	186380
ESR 14	279047	186756

Note: Receptors have been modelled at 1.5m above ground level, representative of typical head height

- 3.39 To be conservative, it has been assumed that the AQS objectives for all the different averaging periods apply at all of the modelled discrete receptors. In reality, the annual mean objectives will only apply at the facades of modelled residential dwellings.
- 3.40 The locations of the ecological receptors are discussed in detail in Appendix D and E.

NO_x to NO₂ Assumptions

- 3.41 The NO_x emissions will typically comprise approximately 90-95% nitrogen monoxide (NO) and 5-10% nitrogen dioxide (NO₂) at the point of release. The NO oxidises in the atmosphere in the presence of sunlight, ozone and volatile organic compounds to form NO₂, which is the principal concern in terms of environmental health effects. The Environment Agency advises [viii] that:

“For combustion processes where no more than 10% of nitrogen oxides are emitted as nitrogen dioxide, you can assume worst case conversion ratios to nitrogen dioxide of:

35% for short-term average concentrations

70% for long-term average concentrations”

- 3.42 These ratios have been used in the assessment.

Modelling of Long-term and Short-term Emissions

- 3.43 Long-term (annual-mean) pollutants have been modelled for comparison with the relevant annual mean objectives. The models were run with every engine assumed to run for all hours in the year. The model output was then multiplied by the percentage of the year each engine is expected to run.
- 3.44 For short-term NO₂, the objective is for the hourly-mean concentration not to exceed 200 µg.m⁻³ more than 18 times per calendar year. As there are 8,760 hours in a non-leap year, the hourly-mean concentration would need to be below 200 µg.m⁻³ in 8,742 hours, i.e. 99.79% of the time.
- 3.45 For short-term PM₁₀, the objective is for the hourly-mean concentration not to exceed 50 µg.m⁻³ more than 35 times per calendar year. As there are 8,760 hours in a non-leap year, the hourly-mean

concentration would need to be below $50 \mu\text{g.m}^{-3}$ in 8,725 hours, i.e. 90.41% of the time. Therefore, the 90.41st percentile of hourly PM_{10} has been modelled.

- 3.46 The short-term emissions for the other pollutants have been calculated accordingly.
- 3.47 The model has been run with all generators operating in every hour to test the impacts associated with the widest range of meteorological conditions. Where the 99.79th percentile is exceeded, the cumulative hypergeometric distribution has been used to estimate the likelihood of there being 19 or more hours where the predicted hourly-mean NO_2 concentration exceeds $200 \mu\text{g.m}^{-3}$ in a calendar year, coinciding with operational hours. In accordance with the Environment Agency *Guidance on dispersion modelling for oxides of nitrogen assessment from specified generators*, the probability has then been multiplied by a *safety factor* of 2.5. For the purposes of this assessment, if the probability is below 1% an exceedance is considered highly unlikely. If it is below 5%, an exceedance is considered unlikely.
- 3.48 Similarly, probability calculations have been undertaken for exceedance of other short-term objectives / assessment levels where appropriate.

Significance Criteria

- 3.49 The EPUK/IAQM Land-Use Planning & Development Control: Planning for Air Quality document advises that:

"The significance of the effects arising from the impacts on air quality will depend on a number of factors and will need to be considered alongside the benefits of the development in question. Development under current planning policy is required to be sustainable and the definition of this includes social and economic dimensions, as well as environmental. Development brings opportunities for reducing emissions at a wider level through the use of more efficient technologies and better designed buildings, which could well displace emissions elsewhere, even if they increase at the development site. Conversely, development can also have adverse consequences for air quality at a wider level through its effects on trip generation."

- 3.50 When describing the air quality impact at a sensitive receptor, the change in magnitude of the concentration should be considered in the context of the absolute concentration at the sensitive receptor. Table 3.6 provides the EPUK/IAQM approach for describing the long-term human-health air quality impacts on sensitive receptors in the surrounding area.

Table 3.6: Long-term (Annual-mean) Impact Descriptors for Individual Sensitive Receptors

Long term average concentration at receptor in assessment year	% Change in concentration relative to Air Quality Assessment Level			
	1	2-5	6-10	>10
75 % or less of AQAL	Negligible	Negligible	Slight	Moderate
76 -94 % of AQAL	Negligible	Slight	Moderate	Moderate

95 - 102 % of AQAL	Slight	Moderate	Moderate	Substantial
103 – 109 % of AQAL	Moderate	Moderate	Substantial	Substantial
110 % or more than AQAL	Moderate	Substantial	Substantial	Substantial

1. AQAL = Air Quality Assessment Level, which may be an air quality objective, EU limit or target value, or an Environment Agency 'Environmental Assessment Level (EAL)'.

2. The table is intended to be used by rounding the change in percentage pollutant concentration to whole numbers, which then makes it clearer which cell the impact falls within. The user is encouraged to treat the numbers with recognition of their likely accuracy and not assume a false level of precision. Changes of 0%, i.e. less than 0.5% will be described as negligible.

3. The table is only designed to be used with annual mean concentrations.

4. Descriptors for individual receptors only; the overall significance is determined using professional judgement. For example, a 'moderate' adverse impact at one receptor may not mean that the overall impact has a significant effect. Other factors need to be considered.

5. When defining the concentration as a percentage of the AQAL, use the 'without scheme' concentration where there is a decrease in pollutant concentration and the 'with scheme;' concentration for an increase.

6. The total concentration categories reflect the degree of potential harm by reference to the AQAL value. At exposure less than 75% of this value, i.e. well below, the degree of harm is likely to be small. As the exposure approaches and exceeds the AQAL, the degree of harm increases. This change naturally becomes more important when the result is an exposure that is approximately equal to, or greater than the AQAL.

7. It is unwise to ascribe too much accuracy to incremental changes or background concentrations, and this is especially important when total concentrations are close to the AQAL. For a given year in the future, it is impossible to define the new total concentration without recognising the inherent uncertainty, which is why there is a category that has a range around the AQAL, rather than being exactly equal to it.

3.51 The human-health impact descriptors above apply at individual receptors. The EPUK/IAQM guidance states that the impact descriptors *"are not, of themselves, a clear and unambiguous guide to reaching a conclusion on significance. These impact descriptors are intended for application at a series of individual receptors. Whilst it may be that there are 'slight', 'moderate' or 'substantial' impacts at one or more receptors, the overall effect may not necessarily be judged as being significant in some circumstances."*

3.52 The above criteria and matrix are for assessing the long-term impacts; for short term impacts the EPUK/IAQM guidance states that:

"The Environment Agency uses a threshold criterion of 10% of the short term AQAL as a screening criterion for the maximum short term impact. This is a reasonable value to take and this guidance also adopts this as a basis for defining an impact that is sufficiently small in magnitude to be regarded as having an insignificant effect. Background concentrations are less important in determining the severity of impact for short-term concentrations, not least because the peak concentrations attributable to the source and the background are not additive."

Where such peak short term concentrations from an elevated source are in the range 10-20% of the relevant AQAL, then their magnitude can be described as small, those in the range 20-50% medium and those above 50% as large. These are the maximum concentrations experienced in any year and the severity of this impact can be described as slight, moderate and substantial respectively, without the need to reference background or baseline concentrations. That is not to say that background concentrations are unimportant, but they will, on an annual average basis, be a much smaller quantity than the peak concentration caused by a substantial plume and it is the contribution that is used as a measure of the impact, not the overall concentration at a receptor. This approach is intended to be a streamlined and pragmatic assessment procedure that avoids undue complexity."

3.53 Professional judgement by a competent, suitably qualified professional is required to establish the significance associated with the consequence of the impacts. This judgement is likely to take into account the extent of the current and future population exposure to the impacts and the influence and/or validity of any assumptions adopted during the assessment process.

3.54 The on-line Environment Agency online guidance entitled '*Environmental management – guidance, Air emissions risk assessment for your environmental permit*' (EA, 2020a). This guidance provides details for screening out substances for detailed assessment. In particular, it states that:

"To screen out a PC for any substance so that you don't need to do any further assessment of it, the PC must meet both of the following criteria:

the short-term PC is less than 10% of the short-term environmental standard

the long-term PC is less than 1% of the long-term environmental standard

If you meet both of these criteria you don't need to do any further assessment of the substance.

If you don't meet them you need to carry out a second stage of screening to determine the impact of the PEC."

3.55 It continues by stating that:

"You must do detailed modelling for any PECs not screened out as insignificant.¹"

3.56 It then states that further action may be required where:

"your PCs could cause a PEC to exceed an environmental standard (unless the PC is very small compared to other contributions – if you think this is the case contact the Environment Agency)

The PEC is already exceeding an environmental standard"

Uncertainty

3.57 All air quality assessment tools, whether models or monitoring measurements, have a degree of uncertainty associated with the results. The choices that the practitioner makes in setting-up the model, choosing the input data, and selecting the baseline monitoring data will decide whether the final predicted impact should be considered a central estimate, or an estimate tending towards the upper bounds of the uncertainty range (i.e. tending towards worst-case).

3.58 The atmospheric dispersion model itself contributes some of this uncertainty, due to it being a simplified version of the real situation: it uses a sophisticated set of mathematical equations to approximate the complex physical and chemical atmospheric processes taking place as a pollutant

¹ PCs and PECs are explained in paragraph 3.1.2.

is released and as it travels to a receptor. The predictive ability of even the best model is limited by how well the turbulent nature of the atmosphere can be represented.

3.59 Each of the data inputs for the model, listed earlier, will also have some uncertainty associated with them. Where it has been necessary to make assumptions, these have mainly been made towards the upper end of the range informed by an analysis of relevant, available data to achieve an assessment that has a conservative bias overall. Where no significant effects are predicted, based on conservative assumptions, there is no need to revisit these assumptions, although the opportunity exists to do so.

3.60 The main components of uncertainty in the total predicted concentrations, made up of the background concentration and the modelled fraction, include those summarised in Table 3.7.

Table 3.7: Approaches to Dealing with Uncertainty used Within the Assessment

Concentration	Source of Uncertainty	Approach to Dealing with Uncertainty	Comments
Background Concentration	Characterisation of future baseline air quality (i.e. the air quality conditions in the future assuming that the development does not proceed)	The background concentration for the assessment is based on a comparison of local monitored concentrations and Defra mapped concentration estimates.	The conservative assumptions adopted ensure that the background concentration used within the model contribute to the final result being towards the top of the uncertainty range, rather than a central estimate.
		The future background concentration used in the assessment is the same as the current background concentration and no reduction has been assumed. This is a conservative assumption as, in reality, background concentrations are likely to reduce over time as cleaner vehicle technologies form an increasing proportion of the fleet.	
Model Input/Output Data	Meteorological Data	Uncertainties arise from any differences between the conditions at the met station and the development site, and between the historical met years and the future years. These have been minimised by using meteorological data collated at a representative measuring site. The model has been run for five full years of meteorological conditions.	The modelled fraction is likely to contribute to the predicted concentrations being between a central estimate and the top of the uncertainty range.
	Receptors	The model has been run for a grid of receptors. In addition, receptor locations have been identified where concentrations are highest or where the greatest changes are expected.	

3.61 The analysis of the component uncertainties indicates that, overall, the predicted total concentration is likely to be towards the high end of the range of predictions (i.e. towards worst-case) rather than

being a central estimate. The actual concentrations that will be found when the site is operational are unlikely to be higher than those presented within this report and are more likely to be lower.

4 Baseline Air Quality Conditions

Overview

- 4.1 The background concentration often represents a large proportion of the total pollution concentration, so it is important that the ambient concentration selected for the assessment is realistic. EPUK & IAQM guidance highlight public information from Defra and local monitoring studies as potential sources of information on air quality.
- 4.2 LAQM.TG22 recommends that Defra mapped concentration estimates are used to inform background concentrations in air quality modelling and states that: *“Where appropriate these data can be supplemented by and compared with local measurements of background, although care should be exercised to ensure that the monitoring site is representative of background air quality”*.
- 4.3 For this assessment, the ambient air quality has been characterised by drawing on information from the following public sources:
- Defra maps [ix], which show estimated pollutant concentrations across the UK in 1 km grid squares;
 - published results of local authority Review and Assessment (R&A) studies of air quality, including local monitoring and modelling studies; and
 - results published by national monitoring networks.
- 4.4 A detailed description of how the baseline air quality has been derived for the proposed development is provided in Appendix B. The ambient concentrations used in the assessment are set out in Table 4.1.

Table 4.1 Summary of Assumed Ambient Concentrations

Pollutant	Long-term	Short-term (a)	Data Source
Particulate Matter (PM ₁₀)	26.6 µg.m ⁻³	53.3 µg.m ⁻³	Monitored at Margam AURN (2023)
Particulate Matter (PM _{2.5})	9.9 µg.m ⁻³	-	Defra Maps (2024)
Sulphur dioxide (SO ₂)	4.6 µg.m ⁻³	9.2 µg.m ⁻³	Defra Maps (2001)
Nitrogen dioxide (NO ₂)	25.3 µg.m ⁻³	50.5 µg.m ⁻³	Defra Maps (2024)
TVOCs	0.8 µg.m ⁻³	1.6 µg.m ⁻³	Monitored as Benzene, Margam AURN (2023)
Carbon Monoxide (CO)	0.2 mg.m ⁻³	0.4 mg.m ⁻³	Defra Maps (2001)

Note:

- (a) Short-term concentrations approximately equate to the 90th percentile, which is approximately equivalent to 2 x the annual mean.

5 Assessment of Construction Effects

Construction Dust

- 5.1 Whilst no detailed construction phase information is currently available, the type of activities that could cause fugitive dust emissions are: demolition; earthworks; handling and disposal of spoil; wind-blown particulate material from stockpiles; handling of loose construction materials; and movement of vehicles, both on and off site.
- 5.2 The level and distribution of construction dust emissions will vary according to factors such as the type of dust, duration and location of dust-generating activity, weather conditions and the effectiveness of suppression methods.
- 5.3 The main effect of any dust emissions, if not mitigated, could be annoyance due to soiling of surfaces, particularly windows, cars and laundry. However, it is normally possible, by implementation of proper control, to ensure that dust deposition does not give rise to significant adverse effects, although short-term events may occur (for example, due to technical failure or exceptional weather conditions). The following assessment, using the IAQM methodology, predicts the risk of dust impacts and the level of mitigation that is required to control the residual effects to a level that is “not significant”.

Risk of Dust Impacts

Source

- 5.4 It is understood that the immediately adjacent premises will be retained and converted to office space for use as part of the proposed development. However, it is understood that the annex to the existing onsite building will be demolished. The volume of the annex building is estimated to be below 12,000 m³. The dust emission magnitude for the demolition phase is therefore classified, using the IAQM dust guidance, as small.
- 5.5 The site area is less than 18,000 m², the dust emission magnitude for the earthworks phase is classified as small.
- 5.6 The total volume of the buildings to be constructed would be between 12,000 and 75,000 m³ and the dust emission magnitude for the construction phase is classified as medium.
- 5.7 Assuming that the maximum number of outwards movements in any one day is between 20 and 50 HDVs, the dust emission magnitude for trackout would be classified as medium.

Table 5.1 Dust Emission Magnitude for Earthworks, Construction and Trackout

Demolition	Earthworks	Construction	Trackout
Small	Small	Medium	Medium

Pathway and Receptor - Sensitivity of the Area

5.8 All demolition, earthworks and construction activities are assumed to occur within the site boundary. As such, receptors at distances within 20 m, 50 m, 100 m and 250 m of the site boundary have been identified and are illustrated in Appendix E. The sensitivity of the area has been classified and the results are provided in Table 5.2 below.

Table 5.2 Sensitivity of the Surrounding Area for Earthworks and Construction

Potential Impact	Sensitivity of the Surrounding Area	Reason for Sensitivity Classification
Dust Soiling	Low	1-10 highly sensitivity receptors located within 100 - 250 m of the site boundary.
Human Health	Low	1-10 highly sensitivity receptors located within 100 - 250 m of the site boundary. Background PM ₁₀ concentrations for the assessment = 26.6 µg.m ⁻³
Ecological Effects	N.A.	All ecological receptors are located at a distance of over 50m from the site boundary.

5.9 The Dust Emission Magnitude for trackout is classified as medium and trackout may occur on roads up to 250 m from the site. The major routes within 250 m of the site are the A48 and Heolcae'r-Bont. The sensitivity of the area has been classified and the results are provided in Table 5.3

Table 5.3 Sensitivity of the Surrounding Area for Trackout

Potential Impact	Sensitivity of the Surrounding Area	Reason for Sensitivity Classification
Dust Soiling	Low	1 – 10 low sensitivity receptors located within 20 m of Heolcae'r-Bont.
Human Health	Low	1 – 10 low sensitivity receptors located within 20 m of Heolcae'r-Bont.
Ecological Effects	Medium	A medium sensitive receptor (i.e. ancient woodland) located within 20 m of the A48.

Overall Dust Risk

5.10 The Dust Emission Magnitude has been considered in the context of the Sensitivity of the Area to give the Dust Impact Risk. Table 5.4 summarises the Dust Impact Risk for the four activities.

Table 5.4 Dust Impact Risk for Demolition, Earthworks, Construction and Trackout

Source	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Negligible	Negligible	Low	Low
Human Health	Negligible	Negligible	Low	Low
Ecological Effects	N.A.	N.A.	N.A.	Medium
Risk	Negligible	Negligible	Low	Medium

- 5.11 Taking the site as a whole, the overall risk is deemed to be medium. The mitigation measures appropriate to a level of risk for the site as a whole and for each of the phases are set out in Section 7.
- 5.12 Provided this package of mitigation measures is implemented, the residual construction dust effects will not be significant. The IAQM dust guidance states that *“for almost all construction activity, the aim should be to prevent significant effects on receptors through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be ‘not significant’.”* The IAQM dust guidance recommends that significance is only assigned to the effect after the activities are considered with mitigation in place.

6 Assessment of Operational Effects

Results of Stack Emissions Modelling

6.1 For the long-term and short-term impacts, the highest PCs predicted for the testing and emergency scenarios at sensitive receptors have been presented.

Nitrogen Dioxide (NO₂) Impacts

Long-term Impacts

6.2 Table 6.1 summarises the maximum NO₂ PC and PEC values for the modelled scenarios at the selected discrete sensitive receptors. The EPUK/IAQM impact descriptors are also shown.

Table 6.1 Long-term Predicted NO₂ Concentrations at Sensitive Receptors – All Scenarios

Receptors	Process Contribution (Annual mean) (µg.m ⁻³)	Process Contribution as % of AQAL	Predicted Environmental Concentration (µg.m ⁻³)	Impact Descriptor
Testing Scenario				
ESR 1	0.005	<0.1	25.3	Negligible
ESR 2	0.113	0.3	25.4	Negligible
ESR 3	0.028	0.1	25.3	Negligible
ESR 4	0.009	<0.1	25.3	Negligible
ESR 5	0.045	0.1	25.3	Negligible
ESR 6	0.020	<0.1	25.3	Negligible
ESR 7	0.003	<0.1	25.3	Negligible
ESR 8	0.039	0.1	25.3	Negligible
ESR 9	0.006	<0.1	25.3	Negligible
ESR 10	0.005	<0.1	25.3	Negligible
ESR 11	0.004	<0.1	25.3	Negligible
ESR 12	0.003	<0.1	25.3	Negligible
ESR 13	0.029	0.1	25.3	Negligible
ESR 14	0.015	<0.1	25.3	Negligible
Emergency Scenario				
ESR 1	0.027	0.1	25.3	Negligible
ESR 2	0.488	1.2	25.7	Negligible
ESR 3	0.123	0.3	25.4	Negligible

ESR 4	0.042	0.1	25.3	Negligible
ESR 5	0.201	0.5	25.5	Negligible
ESR 6	0.096	0.2	25.3	Negligible
ESR 7	0.014	<0.1	25.3	Negligible
ESR 8	0.173	0.4	25.4	Negligible
ESR 9	0.028	0.1	25.3	Negligible
ESR 10	0.025	0.1	25.3	Negligible
ESR 11	0.019	<0.1	25.3	Negligible
ESR 12	0.015	<0.1	25.3	Negligible
ESR 13	0.133	0.3	25.4	Negligible
ESR 14	0.071	0.2	25.3	Negligible
AQAL for annual-mean NO ₂ is 40 µg.m ⁻³				

6.3 The PCs at sensitive receptors for all scenarios do not exceed 1% of the annual-mean AQAL of 40 µg.m⁻³. When the PCs are added to the background concentration, the total PECs are all below 40 µg.m⁻³ at all receptors. The impact descriptor at all receptors and across the grid is 'negligible'.

Short-term Impacts

6.4 As the EPUK & IAQM impact descriptors only apply to long-term concentrations, the Environment Agency criterion of 10% of the short-term AQAL has been used to screen-out impacts as not having a significant effect.

6.5 Table 6.2 summarises the maximum PCs across the modelled grid.

Table 6.2 Short-term Predicted NO₂ Concentrations at Sensitive Receptors

Receptors	Maintenance Scenario		Emergency Scenario	
	PC as 99.79 Percentile (µg.m ⁻³)	PC as a % of AQAL	PC as 99.79 Percentile (µg.m ⁻³)	PC as a % of AQAL
ESR 1	63.3	32	318.3	159
ESR 2	124.1	62	629.3	315
ESR 3	60.8	30	298.4	149
ESR 4	35.3	18	195.5	98
ESR 5	64.3	32	324.3	162
ESR 6	67.8	34	351.3	176
ESR 7	37.2	19	185.8	93
ESR 8	71.2	36	338.6	169
ESR 9	20.3	10	110.2	55

ESR 10	25.4	13	133.2	67
ESR 11	23.6	12	122.2	61
ESR 12	20.5	10	103.8	52
ESR 13	35.7	18	184.6	92
ESR 14	53.6	27	270.7	135
AQAL for hourly-mean NO ₂ percentile is 200 µg.m ⁻³				

- 6.6 The results show that the maximum short-term PC at the majority of receptors for the testing scenario is above 10% of the AQAL. However, when the PC is added to the background concentration of 50.5 µg.m⁻³, the total PEC is well below 200 µg.m⁻³ at all receptors. As such, the short-term NO₂ impacts are not considered to be potentially significant for the testing scenario.
- 6.7 The results show that the maximum short-term PC at all receptors for the emergency scenario is above 10% of the AQAL. Therefore, the model has been run again to determine the hourly concentrations at the worst affected receptor, ESR 2. Analysis of the data indicates that when the PC is added to the background concentration, the maximum number of hourly concentrations above 200 µg.m⁻³ is predicted to be 1,614. The cumulative hypergeometric distribution has been used to estimate the probability of there being 19 or more hours where the predicted hourly-mean NO₂ concentration exceeds 200 µg.m⁻³ in a calendar year, coinciding with the 24 hours of operation. The probability is well below 1% and, therefore, extremely unlikely.

Particulate Matter (PM₁₀ and PM_{2.5}) Impacts

Long-term Impacts

- 6.8 Table 6.3 summarises the maximum PM₁₀ PC and PEC values for all modelled scenarios at the selected discrete sensitive receptors. The EPUK & IAQM impact descriptors are also shown.

Table 6.3 Long-term Predicted PM₁₀ Concentrations at Sensitive Receptors – All Scenarios

Receptors	Process Contribution (Annual mean) (µg.m ⁻³)	Process Contribution as % of AQAL	Predicted Environmental Concentration (µg.m ⁻³)	Impact Descriptor
Testing Scenario				
ESR 1	<0.01	<0.1	26.6	Negligible
ESR 2	<0.01	<0.1	26.6	Negligible
ESR 3	<0.01	<0.1	26.6	Negligible
ESR 4	<0.01	<0.1	26.6	Negligible
ESR 5	<0.01	<0.1	26.6	Negligible

ESR 6	<0.01	<0.1	26.6	Negligible
ESR 7	<0.01	<0.1	26.6	Negligible
ESR 8	<0.01	<0.1	26.6	Negligible
ESR 9	<0.01	<0.1	26.6	Negligible
ESR 10	<0.01	<0.1	26.6	Negligible
ESR 11	<0.01	<0.1	26.6	Negligible
ESR 12	<0.01	<0.1	26.6	Negligible
ESR 13	<0.01	<0.1	26.6	Negligible
ESR 14	<0.01	<0.1	26.6	Negligible
Emergency Scenario				
ESR 1	<0.01	<0.1	26.6	Negligible
ESR 2	<0.01	<0.1	26.6	Negligible
ESR 3	<0.01	<0.1	26.6	Negligible
ESR 4	<0.01	<0.1	26.6	Negligible
ESR 5	<0.01	<0.1	26.6	Negligible
ESR 6	<0.01	<0.1	26.6	Negligible
ESR 7	<0.01	<0.1	26.6	Negligible
ESR 8	<0.01	<0.1	26.6	Negligible
ESR 9	<0.01	<0.1	26.6	Negligible
ESR 10	<0.01	<0.1	26.6	Negligible
ESR 11	<0.01	<0.1	26.6	Negligible
ESR 12	<0.01	<0.1	26.6	Negligible
ESR 13	<0.01	<0.1	26.6	Negligible
ESR 14	<0.01	<0.1	26.6	Negligible
AQAL for annual-mean PM ₁₀ is 40 µg.m ⁻³				

6.9 The PCs for all scenarios do not exceed 1% of the annual-mean AQAL of 40 µg.m⁻³. When the PCs are added to the background concentration, the total PECs are all below 40 µg.m⁻³. The impact descriptor at all receptors is 'negligible'.

6.10 For PM_{2.5}, if it is conservatively assumed that all PM₁₀ is PM_{2.5}, then the maximum PC at the considered receptors is <0.1% of the annual-mean AQAL of 20 µg.m⁻³. Therefore, the impact descriptor is also 'negligible' at all receptors.

Short-term Impacts

6.11 Table 6.4 summarises the maximum PCs for the testing and emergency scenarios at the selected sensitive receptors. The emergency scenario has not been modelled as the hours of operation (24 hours, i.e. 1 day) are fewer than the number required by the objective (35 days).

Table 6.4 Short-term Predicted PM₁₀ Concentrations at Sensitive Receptors

Receptors	Maintenance Scenario		Emergency Scenario	
	PC as 99.41 Percentile (µg.m ⁻³)	PC as a % of AQAL	PC as 99.41 Percentile (µg.m ⁻³)	PC as a % of AQAL
ESR 1	<0.01	<0.1	0.09	0.2
ESR 2	0.01	<0.1	1.37	2.7
ESR 3	<0.01	<0.1	0.39	0.8
ESR 4	<0.01	<0.1	0.14	0.3
ESR 5	0.01	<0.1	0.58	1.2
ESR 6	<0.01	<0.1	0.35	0.7
ESR 7	<0.01	<0.1	0.05	0.1
ESR 8	<0.01	<0.1	0.54	1.1
ESR 9	<0.01	<0.1	0.10	0.2
ESR 10	<0.01	<0.1	0.09	0.2
ESR 11	<0.01	<0.1	0.07	0.1
ESR 12	<0.01	<0.1	0.05	0.1
ESR 13	<0.01	<0.1	0.33	0.7
ESR 14	<0.01	<0.1	0.23	0.5
AQAL for PM ₁₀ 24-hour percentile is 50 µg.m ⁻³				

6.12 The results show that the maximum short-term PC at all receptors is below 10% of the AQAL. As such, the short-term PM₁₀ impacts are not considered to be potentially significant.

Sulphur Dioxide (SO₂) Impacts

Short-term Impacts

6.13 Table 6.5, Table 6.6 and Table 6.7 summarises the maximum PCs for each modelled scenario at the selected discrete sensitive receptors.

Table 6.5 Short-term Predicted SO₂ Concentrations at Sensitive Receptors – 15-minute mean

Receptors	Maintenance Scenario		Emergency Scenario	
	PC as 99.9 Percentile (µg.m ⁻³)	PC as a % of AQAL	PC as 99.9 Percentile (µg.m ⁻³)	PC as a % of AQAL
ESR 1	2.3	0.9	12.7	4.8
ESR 2	3.7	1.4	17.7	6.7
ESR 3	1.8	0.7	8.8	3.3
ESR 4	1.0	0.4	6.0	2.2
ESR 5	2.2	0.8	11.0	4.1
ESR 6	2.2	0.8	11.4	4.3
ESR 7	1.2	0.4	6.0	2.3
ESR 8	2.6	1.0	11.2	4.2
ESR 9	0.6	0.2	3.5	1.3
ESR 10	0.8	0.3	4.5	1.7
ESR 11	0.9	0.3	4.8	1.8
ESR 12	0.7	0.3	3.6	1.3
ESR 13	1.0	0.4	5.8	2.2
ESR 14	1.5	0.6	7.7	2.9
AQAL for SO ₂ 15-minute-mean percentile is 266 µg.m ⁻³				

Table 6.6 Short-term Predicted SO₂ Concentrations at Sensitive Receptors – 1-hour mean

Receptors	Maintenance Scenario		Emergency Scenario	
	PC as 99.73 Percentile (µg.m ⁻³)	PC as a % of AQAL	PC as 99.73 Percentile (µg.m ⁻³)	PC as a % of AQAL
ESR 1	1.5	0.4	7.7	2.2
ESR 2	3.0	0.9	15.3	4.4
ESR 3	1.5	0.4	7.2	2.0
ESR 4	0.9	0.2	4.8	1.4
ESR 5	1.6	0.5	7.9	2.3
ESR 6	1.6	0.5	8.4	2.4
ESR 7	0.9	0.2	4.3	1.2
ESR 8	1.7	0.5	8.3	2.4

ESR 9	0.5	0.1	2.5	0.7
ESR 10	0.6	0.2	3.2	0.9
ESR 11	0.6	0.2	2.8	0.8
ESR 12	0.5	0.1	2.4	0.7
ESR 13	0.9	0.2	4.4	1.3
ESR 14	1.3	0.4	6.6	1.9
AQAL for SO ₂ 1-hour mean percentile is 350 µg.m ⁻³				

Table 6.7 Short-term Predicted SO₂ Concentrations at Sensitive Receptors – 24-hour mean

Receptors	Maintenance Scenario		Emergency Scenario	
	PC as 99.18 Percentile (µg.m ⁻³)	PC as a % of AQAL	PC as 99.18 Percentile (µg.m ⁻³)	PC as a % of AQAL
ESR 1	0.02	<0.1	2.9	2.4
ESR 2	0.08	0.1	9.2	7.4
ESR 3	0.03	<0.1	3.9	3.1
ESR 4	0.02	<0.1	1.9	1.5
ESR 5	0.04	<0.1	4.3	3.4
ESR 6	0.03	<0.1	3.8	3.0
ESR 7	0.01	<0.1	1.3	1.0
ESR 8	0.04	<0.1	4.5	3.6
ESR 9	0.01	<0.1	1.2	0.9
ESR 10	0.01	<0.1	1.2	0.9
ESR 11	0.01	<0.1	0.9	0.7
ESR 12	0.01	<0.1	0.6	0.5
ESR 13	0.02	<0.1	2.3	1.8
ESR 14	0.02	<0.1	2.9	2.3
AQAL for SO ₂ 24-hour mean percentile is 125 µg.m ⁻³				

6.14 The results show that the maximum short-term PC at all receptors is below 10% of the AQAL. As such, the short-term SO₂ impacts are not considered to be potentially significant.

Carbon Monoxide (CO) Impacts

Short-term Impacts

6.15 Table 6.8 summarises the maximum running 8-hour PCs for all modelled scenarios at the selected sensitive receptors.

Table 6.8 Short-term Predicted CO Concentrations at Sensitive Receptors – All Scenarios

Receptors	Maintenance Scenario		Emergency Scenario	
	PC (8hr running mean) ($\mu\text{g.m}^{-3}$)	PC as a % of AQAL	PC (8hr running mean) ($\mu\text{g.m}^{-3}$)	PC as a % of AQAL
ESR 1	0.8	<0.1	33.0	0.3
ESR 2	1.6	<0.1	66.0	0.7
ESR 3	0.7	<0.1	28.2	0.3
ESR 4	0.4	<0.1	15.9	0.2
ESR 5	0.8	<0.1	31.6	0.3
ESR 6	0.9	<0.1	34.7	0.3
ESR 7	0.4	<0.1	16.6	0.2
ESR 8	0.9	<0.1	35.9	0.4
ESR 9	0.3	<0.1	12.7	0.1
ESR 10	0.3	<0.1	11.1	0.1
ESR 11	0.2	<0.1	9.2	0.1
ESR 12	0.2	<0.1	8.6	0.1
ESR 13	0.4	<0.1	16.0	0.2
ESR 14	0.6	<0.1	25.8	0.3

AQAL for CO as an 8-hour running mean is $10,000 \mu\text{g.m}^{-3}$

6.16 The PCs for all scenarios do not exceed 10% of the 8-hr running mean AQAL of $10,000 \mu\text{g.m}^{-3}$. As such the short-term CO impacts are not considered to be potentially significant.

6.17 Table 6.9 summarises the maximum hourly-mean PCs for all modelled scenarios at the selected sensitive receptors.

Table 6.9 Short-term Predicted CO Concentrations at Sensitive Receptors – All Scenarios

Receptors	Maintenance Scenario		Emergency Scenario	
	PC (Maximum hourly-mean) ($\mu\text{g.m}^{-3}$)	PC as a % of AQAL	PC (Maximum hourly-mean) ($\mu\text{g.m}^{-3}$)	PC as a % of AQAL
ESR 1	10.6	<0.1	54.6	0.2
ESR 2	17.6	0.1	88.2	0.3
ESR 3	7.9	<0.1	37.1	0.1
ESR 4	12.8	<0.1	65.7	0.2
ESR 5	14.8	<0.1	60.1	0.2
ESR 6	9.4	<0.1	47.5	0.2
ESR 7	6.8	<0.1	36.1	0.1
ESR 8	9.7	<0.1	44.4	0.1
ESR 9	14.3	<0.1	74.0	0.2
ESR 10	8.3	<0.1	42.5	0.1
ESR 11	6.3	<0.1	32.2	0.1
ESR 12	4.3	<0.1	22.0	0.1
ESR 13	11.5	<0.1	48.8	0.2
ESR 14	13.4	<0.1	65.0	0.2
AQAL for CO as a maximum 1-hour mean is 30,000 $\mu\text{g.m}^{-3}$				

6.18 The PCs for all scenarios do not exceed 10% of the maximum hourly-mean AQAL of 30,000 $\mu\text{g.m}^{-3}$. As such the short-term CO impacts are not considered to be potentially significant.

Hydrocarbon Impacts (Expressed as Benzene)

Long-term Impacts

6.19 Table 6.10 summarises the maximum PCs for all modelled scenarios at the selected sensitive receptors taking the conservative approach that all the hydrocarbon emissions are benzene. The EPUK/IAQM impact descriptors are also shown.

Table 6.10 Long-term Predicted Benzene Concentrations at Sensitive Receptors – All Scenarios

Receptors	Process Contribution (Annual mean) ($\mu\text{g.m}^{-3}$)	Process Contribution as % of AQAL	Predicted Environmental Concentration ($\mu\text{g.m}^{-3}$)	Impact Descriptor
Testing Scenario				
ESR 1	<0.01	<0.1	0.79	Negligible
ESR 2	<0.01	0.1	0.80	Negligible
ESR 3	<0.01	<0.1	0.79	Negligible
ESR 4	<0.01	<0.1	0.79	Negligible
ESR 5	<0.01	<0.1	0.79	Negligible
ESR 6	<0.01	<0.1	0.79	Negligible
ESR 7	<0.01	<0.1	0.79	Negligible
ESR 8	<0.01	<0.1	0.79	Negligible
ESR 9	<0.01	<0.1	0.79	Negligible
ESR 10	<0.01	<0.1	0.79	Negligible
ESR 11	<0.01	<0.1	0.79	Negligible
ESR 12	<0.01	<0.1	0.79	Negligible
ESR 13	<0.01	<0.1	0.79	Negligible
ESR 14	<0.01	<0.1	0.79	Negligible
Emergency Scenario				
ESR 1	<0.01	<0.1	0.79	Negligible
ESR 2	0.01	0.2	0.80	Negligible
ESR 3	<0.01	0.1	0.80	Negligible
ESR 4	<0.01	<0.1	0.79	Negligible
ESR 5	<0.01	0.1	0.80	Negligible
ESR 6	<0.01	<0.1	0.80	Negligible
ESR 7	<0.01	<0.1	0.79	Negligible
ESR 8	<0.01	0.1	0.80	Negligible
ESR 9	<0.01	<0.1	0.79	Negligible
ESR 10	<0.01	<0.1	0.79	Negligible
ESR 11	<0.01	<0.1	0.79	Negligible
ESR 12	<0.01	<0.1	0.79	Negligible
ESR 13	<0.01	0.1	0.80	Negligible
ESR 14	<0.01	<0.1	0.79	Negligible
AQAL for annual-mean for benzene is $5 \mu\text{g.m}^{-3}$				

6.20 The PCs do not exceed 1% of the annual-mean AQAL for benzene of $5 \mu\text{g.m}^{-3}$ at all receptors. The impact descriptor at all receptors is 'negligible'.

Short-term Impacts

6.21 Table 6.11 summarises the maximum PCs for all modelled scenarios at the selected sensitive receptors.

Table 6.11 Short-term Predicted Benzene Concentrations at Sensitive Receptors – All Scenarios

Receptors	Maintenance Scenario		Emergency Scenario	
	PC (Maximum 24 hour-mean) ($\mu\text{g.m}^{-3}$)	PC as a % of AQAL	PC (Maximum 24 hour-mean) ($\mu\text{g.m}^{-3}$)	PC as a % of AQAL
ESR 1	0.08	0.3	9.8	32.5
ESR 2	0.17	0.6	19.9	66.2
ESR 3	0.07	0.2	8.8	29.2
ESR 4	0.04	0.1	4.5	15.1
ESR 5	0.08	0.3	9.1	30.3
ESR 6	0.07	0.2	8.6	28.6
ESR 7	0.04	0.1	5.5	18.2
ESR 8	0.09	0.3	10.5	34.9
ESR 9	0.02	0.1	2.5	8.4
ESR 10	0.02	0.1	2.7	9.0
ESR 11	0.02	0.1	2.4	7.9
ESR 12	0.02	0.1	2.0	6.7
ESR 13	0.04	0.1	4.6	15.3
ESR 14	0.06	0.2	7.2	24.2
AQAL for benzene as a maximum 24-hour mean is $30 \mu\text{g.m}^{-3}$				

6.22 The PCs exceed 10% of the 24-hour mean AQAL of $30 \mu\text{g.m}^{-3}$ at receptors ESR 1 to 8, 13 and 14 in the emergency scenario. However, when the PC is added to the existing concentration of $1.59 \mu\text{g.m}^{-3}$, the PEC is below $30 \mu\text{g.m}^{-3}$. As such the short-term benzene impacts are not considered to be potentially significant.

Contours

6.23 Figure 6.1 shows the long-term NO₂ contour for the maintenance scenario and Figure 6.2 shows the short-term NO₂ contour for the maintenance scenario.

6.24 Figure 6.3 shows the long-term NO₂ contour for the emergency scenario and Figure 6.4 shows the short-term NO₂ contour for the emergency scenario.

Figure 6.1 Long-term Annual Mean NO₂ Contour (Maintenance)

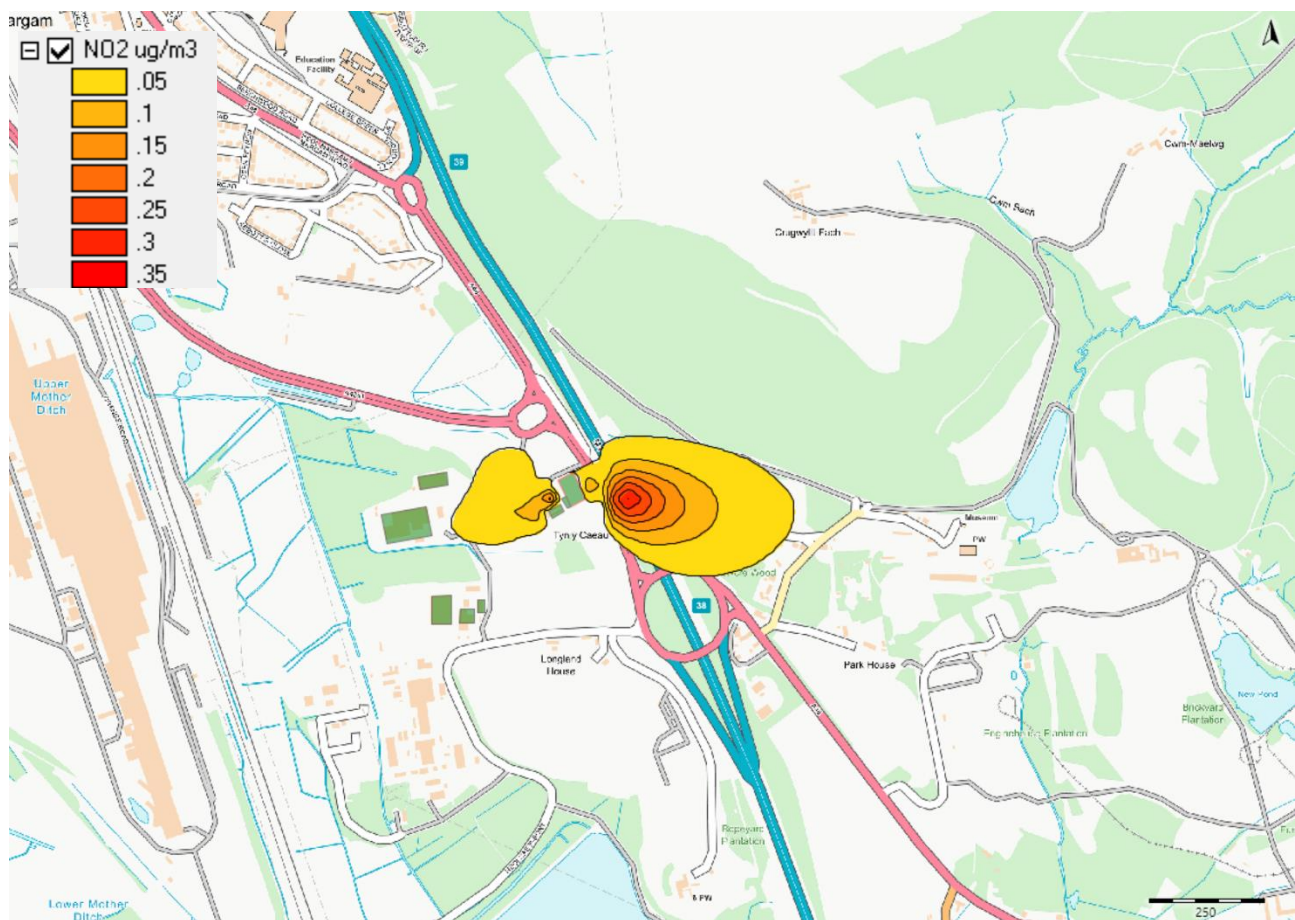


Figure 6.2 Short-term 99.79th Percentile NO₂ Contour (Maintenance)

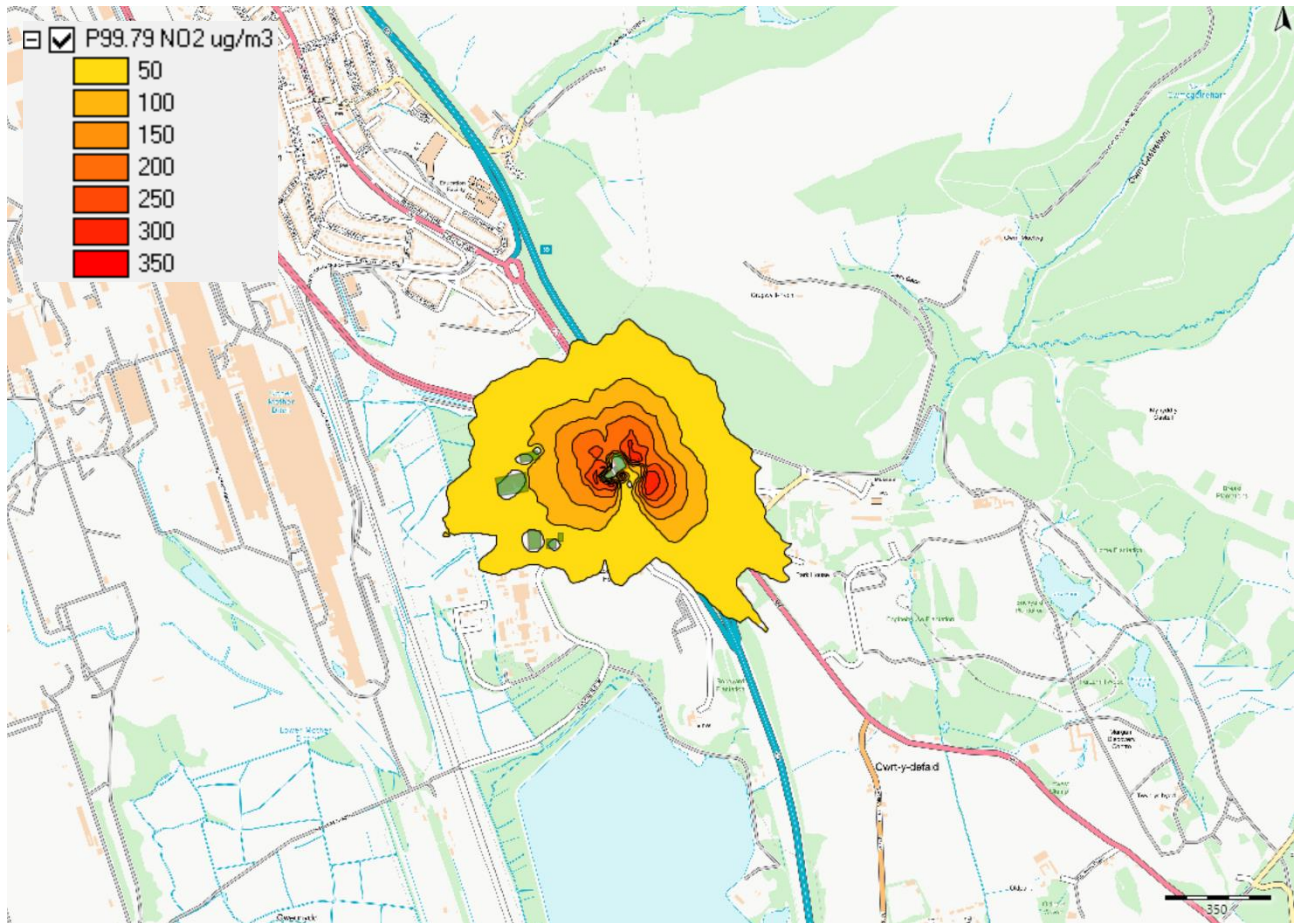


Figure 6.3 Long-term Annual Mean NO₂ Contour (Emergency)

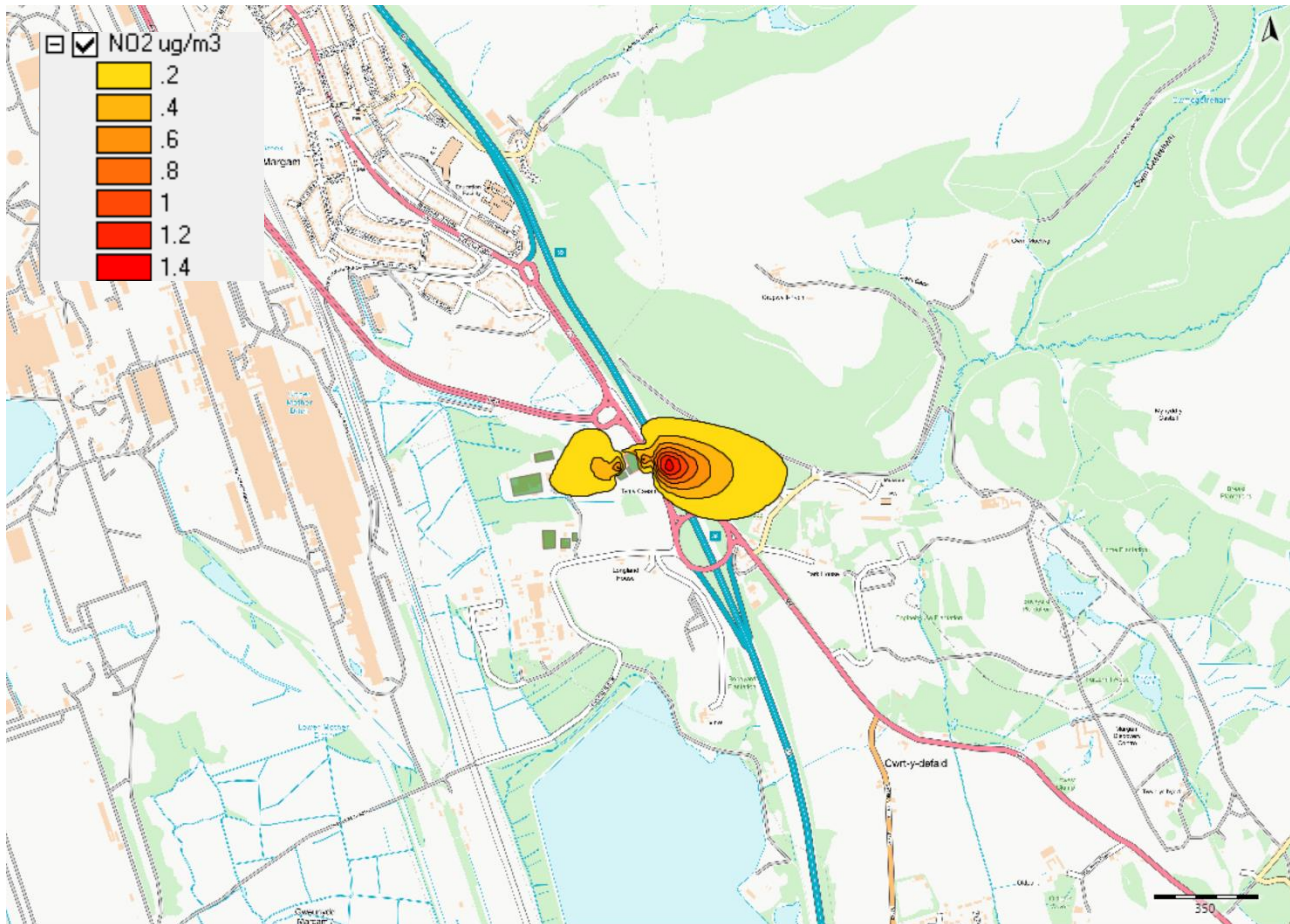
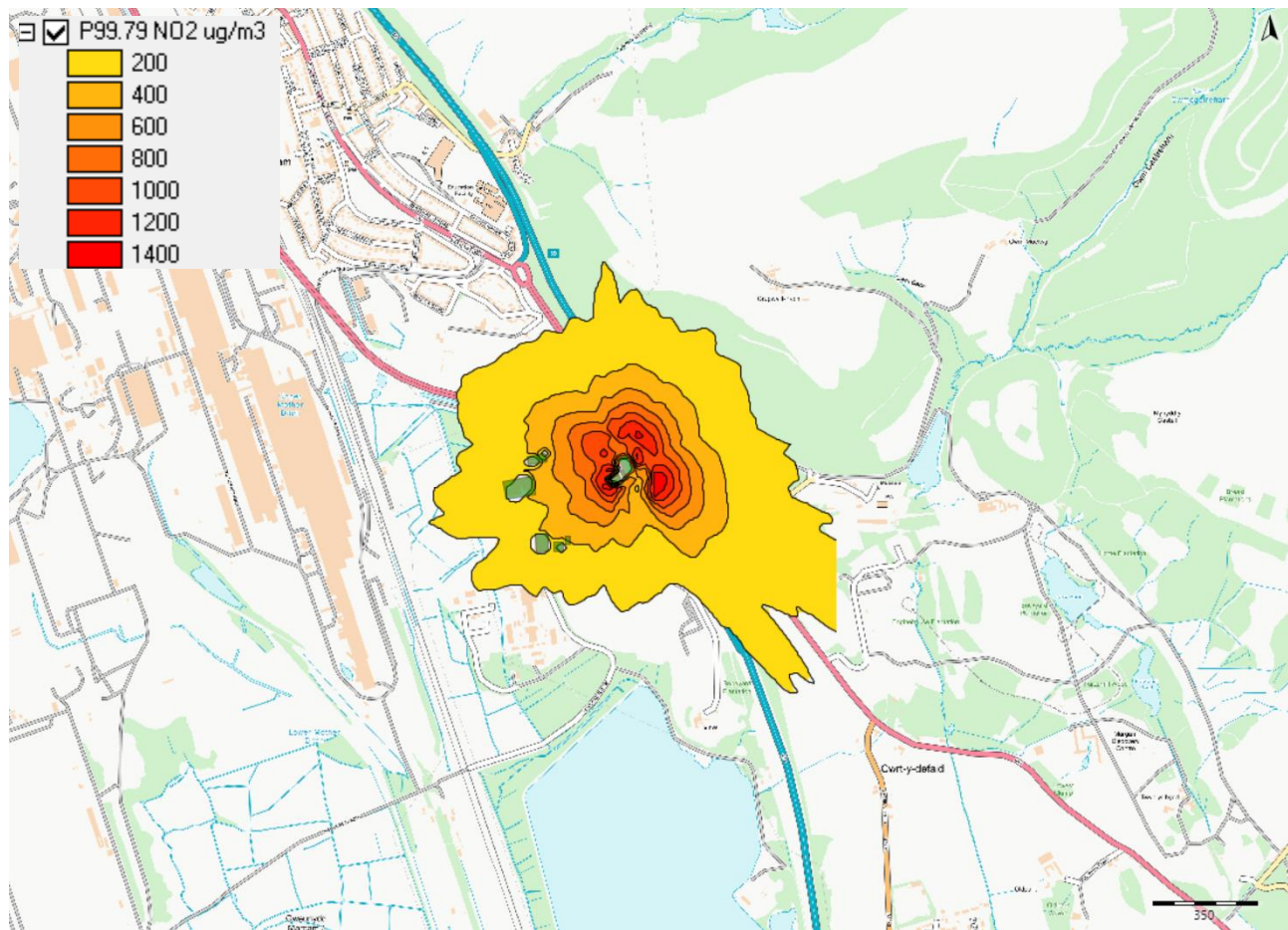


Figure 6.4 Short-term 99.79th Percentile NO₂ Contour (Emergency)



Significance of Effects

- 6.25 It is generally considered good practice that, where possible, an assessment should communicate effects both numerically and descriptively. Professional judgement by a competent, suitably qualified professional is required to establish the significance associated with the consequence of the impacts.
- 6.26 The impacts predicted at individual receptors and the geographical extent over which such impacts occur, can be used to inform the judgement on the impact on the surrounding area as a whole, and whether the resulting overall effect is significant or not. The IAQM guidance states, *“Whilst it may be that there are ‘slight’, ‘moderate’, or ‘substantial’ impacts at one or more receptors, the overall effect may not necessarily be judged as being significant in some circumstances.”* and *“...a ‘moderate’ or ‘substantial’ impact may not have a significant effect if it is confined to a very small area and where it is not obviously the cause of harm to human health.”*
- 6.27 Using professional judgement, the resulting air quality effect is considered to be ‘not significant’ overall.

7 Mitigation

Mitigation During Construction

- 7.1 The IAQM dust guidance lists mitigation measures for low, medium and high dust risks.
- 7.2 As summarised in Table 5.4, the predicted Dust Impact Risk is classified, at worst, as negligible for demolition and earthworks, low for construction and medium for Trackout. The general site measures described as 'highly recommended' for medium risks are listed below. The 'highly recommended' measures for low risk construction and medium risk trackout are also listed.

Communications

- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
- Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
- Display the head or regional office contact information

Dust Management Plan

- Develop and implement a Dust Management Plan (DMP) (which may include measures to control other emissions), approved by the Local Authority. The level of detail will depend on the risk, and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site. The DMP may include monitoring of dust.

Site Management

- Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
- Make the complaints log available to the local authority when asked.
- Record any exceptional incidents that cause dust and/or air emissions, either on- or off- site, and the action taken to resolve the situation in the log book.

Monitoring

- Carry out regular dust soiling checks of surfaces such as street furniture, cars and window-sills within 100 m of site boundary.
- Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.

- Agree dust deposition, dust flux, or real-time PM10 continuous monitoring locations with the Local Authority. Commence baseline monitoring at least three months before work commences on site or, if it a large site, before work on a phase commences. A shorter monitoring period or concurrent upwind and downwind monitoring may be agreed by the local authority. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction [x].

Preparing and Maintaining the Site

- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible. Use screening intelligently where possible – e.g. locating site offices between potentially dusty activities and the receptors.
- Erect solid screens or barriers around the site boundary.
- Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extended period.
- Avoid site runoff of water or mud.
- Keep site fencing, barriers and scaffolding clean.
- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.
- Depending on the duration that stockpiles will be present and their size - cover, seed, fence or water to prevent wind whipping.

Operating Vehicle/machinery and Sustainable Travel

- Ensure all vehicles switch off engines when stationary – no idling vehicles.
- Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.
- Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.

Operations

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible.
- Use enclosed chutes, conveyors and covered skips, where practicable.

- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
- Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

Waste Management

- Avoid bonfires and burning of waste materials.

Demolition

- Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.
- Avoid explosive blasting, using appropriate manual or mechanical alternatives.
- Bag and remove any biological debris or damp down such material before demolition.

Low Risk Measures Specific to Construction

- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.

Medium Risk Measures Specific to Trackout

- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.
- Avoid dry sweeping of large areas.
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
- Record all inspections of haul routes and any subsequent action in a site log book.
- Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).
- Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.

- Access gates to be located at least 10 m from receptors where possible.
- 7.3 The IAQM dust guidance states that with the recommended dust mitigation measures in place the residual effect will normally be “not significant” and recommends that the mitigation is secured by way of a planning condition, a legal obligation or by legislation.

8 Summary

- 8.1 This air quality assessment has been undertaken to support a planning application for the proposed Data Centre at Tyn-Y-Caeau, Margam.
- 8.2 Impacts during construction, such as dust generation, are predicted to be of short duration and only relevant during the construction phase. The results of the risk assessment for construction dust impacts, undertaken using the IAQM dust guidance, indicates that before the implementation of mitigation and controls the risk of dust impacts will be medium to negligible. Implementation of the highly-recommended mitigation measures described in the IAQM construction dust guidance should reduce the residual dust effects to a level categorised as “*not significant*”.
- 8.3 Once operational, the key source of emissions to air are the back-up diesel-powered generators. Concentrations of NO₂, PM₁₀, PM_{2.5}, SO₂, CO and benzene have been predicted across a grid and at selected sensitive receptors using a detailed atmospheric dispersion model and compared with the relevant long and short-term AQALs.
- 8.4 The long-term operational impacts for all pollutants are predicted to be ‘not significant’ for surrounding human receptors, considering the changes in pollutant concentrations and absolute levels.
- 8.5 The short-term operational impacts for all pollutants are considered to be ‘not significant’ for surrounding human receptors.
- 8.6 Using professional judgement, the resulting air quality effect is considered ‘not significant’ for surrounding human receptors.
- 8.7 The assessment for ecological receptors is detailed within Appendix D.

APPENDICES

Appendix A: Detailed Construction Dust Assessment Methodology

Source

- A.1 The IAQM dust guidance gives examples of the dust emission magnitudes for demolition, earthworks and construction activities and trackout. These example dust emission magnitudes are based on the site area, building volume, number of HDV movements generated by the activities and the materials used. These example magnitudes have been combined with details of the period of construction activities to provide the ranking for the source magnitude that is set out in Table A.1.

Table A.1 Risk Allocation – Source (Dust Emission Magnitude)

Features of the Source of Dust Emissions	Dust Emission Magnitude
Demolition - building over 75,000 m³, potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities > 12 m above ground level. Earthworks – total site area over 110,000 m², potentially dusty soil type (e.g. clay), >10 heavy earth moving vehicles active at any one time, formation of bunds > 6 m in height. Construction - total building volume over 75,000 m³, activities include piling, on-site concrete batching, sand blasting. Trackout – over 50 HDV outwards movements in any one day, potentially dusty surface material (e.g. High clay content), unpaved road length > 100 m.	Large
Demolition - building between 12,000 to 75,000 m³, potentially dusty construction material and demolition activities 6 - 12 m above ground level. Earthworks – total site area between 18,000 to 110,000 m², moderately dusty soil type (e.g. silt), 5 – 10 heavy earth moving vehicles active at any one time, formation of bunds 3 - 6 m in height. Construction - total building volume between 12,000 and 75,000 m³, use of construction materials with high potential for dust release (e.g. concrete), on-site concrete batching. Trackout – 20 - 50 HDV outwards movements in any one day, moderately dusty surface material (e.g. High clay content), unpaved road length 50 – 100 m.	Medium
Demolition - building less than 12,000 m³, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities < 6 m above ground, demolition during winter months. Earthworks – total site area less than 18,000 m². Soil type with large grain size (e.g. sand), < 5 heavy earth moving vehicles active at any one time, formation of bunds < 3 m in height. Construction - total building volume below 12,000 m³, use of construction materials with low potential for dust release (e.g. metal cladding or timber). Trackout – < 20 HDV outwards movements in any one day, surface material with low potential for dust release, unpaved road length < 50 m.	Small

Pathway and Receptor - Sensitivity of the Area

- A.2 Pathway means the route by which dust and particulate matter may be carried from the source to a receptor. The main factor affecting the pathway effectiveness is the distance from the receptor to the source. The orientation of the receptors to the source compared to the prevailing wind direction is a relevant risk factor for long-duration construction projects; however, short-term construction projects may be limited to a few months when the most frequent wind direction might be quite different, so adverse effects can potentially occur in any direction from the site.
- A.3 As set out in the IAQM dust guidance, a number of attempts have been made to categorise receptors into high, medium and low sensitivity categories; however there is no unified sensitivity classification scheme that covers the quite different potential effects on property, human health and ecological receptors.
- A.4 Table A.2, A.3 and A.4 sets out the IAQM basis for categorising the sensitivity of people, property and ecological habitats to dust and PM₁₀.

Table A.2 Sensitivities of People and Property Receptors to Dust

Receptor	Sensitivity
Principles:- Users can reasonably expect enjoyment of a high level of amenity; or the appearance, aesthetics or value of their property would be diminished by soiling; and the people or property would reasonably be expected to be present continuously, or at least regularly for extended periods as part of the normal pattern of use of the land. Indicative Examples:- Dwellings. Museums and other culturally important collections. Medium and long-term car parks and car showrooms.	High
Principles:- Users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; or the appearance, aesthetics or value of their property could be diminished by soiling; or the people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land. Indicative Examples:- Parks. Places of work.	Medium
Principles:- the enjoyment of amenity would not reasonably be expected; or there is property that would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling; or there is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. Indicative Examples:- Playing fields, farmland (unless commercially-sensitive horticultural). Footpaths and roads. Short-term car parks.	Low

Table A.3 Sensitivities of People and Property Receptors to PM₁₀

Receptor	Sensitivity
Principles:- Locations where members of the public are exposed over a time period relevant to the air quality objective (in the case of the 24-hour objective for PM₁₀, a relevant location would be one where individuals may be exposed for eight hours or more in a day). Indicative Examples:- - Residential properties. - Schools, hospitals and residential care homes.	High
Principles:- Locations where the people exposed are workers and exposure is over a time period relevant to the air quality objective (in the case of the 24-hour objective for PM₁₀, a relevant location would be one where individuals may be exposed for eight hours or more in a day). Indicative Examples:- Office and shop workers (but generally excludes workers occupationally exposed to PM₁₀ as protection is covered by Health and Safety at Work legislation).	Medium
Principles:- Locations where human exposure is transient exposure. Indicative Examples:- Public footpaths. Playing fields, parks. Shopping streets.	Low

Table A.4 Sensitivities of Ecological Receptors to Dust

Receptor	Sensitivity
Principles:- - Locations with an international or national designation and the designated features may be affected by dust soiling; or - locations where there is a community of a particularly dust sensitive species such as vascular species included in the Red Data List For Great Britain. Indicative Examples:- - Special Area of Conservation (SAC) designated for acid heathlands adjacent to the demolition of a large site containing concrete (alkali) buildings or for the presence of lichen.	High
Principles:- - Locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown; or - locations with a national designation where the features may be affected by dust deposition. Indicative Examples:- - Site of Special Scientific Interest (SSSI) with dust sensitive features.	Medium
Principles:- - Locations with a local designation where the features may be affected by dust deposition. Indicative Examples:- - A Local Nature Reserve with dust sensitive features	Low

A.5 The IAQM methodology combines consideration of the pathway and receptor to derive the 'sensitivity of the area'. Table A.5, A.6 and A.7 show how the sensitivity of the area has been derived for this assessment.

Table A.5 Sensitivity of the Area to Dust Soiling Effects on People and Property

Receptor Sensitivity	Number of Receptors ^a	Distance from the Source (m) ^b			
		<20	<50	<100	<250
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

The sensitivity of the area has been derived for demolition, construction, earthworks and trackout.

a The total number of receptors within the stated distance has been estimated. Only the highest level of area sensitivity from the table has been recorded.

b For trackout, the distances have been measured from the side of the roads used by construction traffic. The impact declines with distance from the site, and it is only necessary to consider trackout impacts up to 50 m from the edge of the road.

Table A.6 Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM ₁₀ Concentration ^a	Number of Receptors ^{b, c}	Distance from the Source (m) ^d			
			<20	<50	<100	<250
High	> 32 µg.m ⁻³	>100	High	High	High	Medium
		10-100	High	High	Medium	Low
		1-10	High	Medium	Low	Low
	28 - 32 µg.m ⁻³	>100	High	High	Medium	Low
		10-100	High	Medium	Low	Low
		1-10	High	Medium	Low	Low
	24 - 28 µg.m ⁻³	>100	High	Medium	Low	Low
		10-100	High	Medium	Low	Low
		1-10	Medium	Low	Low	Low
	< 24 µg.m ⁻³	>100	Medium	Low	Low	Low
		10-100	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
Medium	> 32 µg.m ⁻³	>10	High	Medium	Low	Low
		1 – 10	Medium	Low	Low	Low
	28 – 32 µg.m ⁻³	> 10	Medium	Low	Low	Low
		1-10	Low	Low	Low	Low

Receptor Sensitivity	Annual Mean PM ₁₀ Concentration ^a	Number of Receptors ^{b, c}	Distance from the Source (m) ^d			
			<20	<50	<100	<250
	< 28 µg.m ⁻³	>1	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low

The sensitivity of the area has been derived for demolition, construction, earthworks and trackout.

a This refers to the background concentration derived from the assessment of baseline conditions later in this report. The concentration categories listed in this column apply to England, Wales and Northern Ireland but not to Scotland.

b The total number of receptors within the stated distance has been estimated. Only the highest level of area sensitivity from the table has been recorded.

c For high sensitivity receptors with high occupancy (such as schools or hospitals), the approximate number of occupants has been used to derive an equivalent number of receptors.

d For trackout, the distances should be measured from the side of the roads used by construction traffic. The impact declines with distance from the site, and it is only necessary to consider trackout impacts up to 50 m from the edge of the road.

Table A.7 Sensitivity of the Area to Ecological Impacts

Receptor Sensitivity	Distance from the Source (m) ^a	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

The sensitivity of the area has been derived for demolition, construction, earthworks and trackout and for each designated site.

a Only the highest level of area sensitivity has been recorded.

- A.6 The IAQM dust guidance lists the following additional factors that can potentially affect the sensitivity of the area and, where necessary, professional judgement has been used to adjust the sensitivity allocated to a particular area:
- any history of dust generating activities in the area;
 - the likelihood of concurrent dust generating activity on nearby sites;
 - any pre-existing screening between the source and the receptors;
 - any conclusions drawn from analysing local meteorological data which accurately represent the area; and if relevant the season during which the works will take place;
 - any conclusions drawn from local topography;
 - duration of the potential impact, as a receptor may become more sensitive over time; and
 - any known specific receptor sensitivities which are considered go beyond the classifications given in the table above.
- A.7 The matrices in Table A.8, Table A.9, Table A.10 and Table A.11 have been used to assign the risk for each activity to determine the level of mitigation that should be applied. For those cases where

the risk category is 'negligible', no mitigation measures are required beyond those mandated by legislation.

Table A.8 Risk of Dust Impacts – Demolition

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

Table A.9 Risk of Dust Impacts – Earthworks

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table A.10 Risk of Dust Impacts – Construction

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table A.11 Risk of Dust Impacts – Trackout

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Appendix B: Baseline

Nitrogen Dioxide

B.1 NPTCBC monitors NO₂ concentrations at three urban background / industrial locations within 3 km of the site (this includes one Automatic Urban and Rural Network (AURN) monitor). The most recently measured annual-mean NO₂ concentrations are presented in Table B.1.

Table B.1 Measured Annual-mean NO₂ Concentrations (µg.m⁻³)

Site Name	Type	Location	2020	2021	2022	2023
DT3	Diffusion Tube	Urban Background	10.7	*	*	*
DT19	Diffusion Tube	Industrial	13.4	15.2	*	*
PT2 Margam	AURN	Industrial	12.0	13.0	*	11.2
* Data not available						

B.2 The highest 2024 mapped Defra background NO₂ annual mean concentration for the study area is 25.3 µg.m⁻³. Therefore, 25.3 µg.m⁻³ has been applied in this assessment.

Sulphur Dioxide

B.3 The AURN monitors ambient concentrations of SO₂. The nearest monitoring location for SO₂ (with the most complete data) is at PT2 Margam.

B.4 The most recently measured annual-mean SO₂ concentration is provided in Table B.2.

Table B.2 Measured Annual-mean SO₂ Concentrations (µg.m⁻³)

Site Name	Type	Location	2023
PT2 Margam	AURN	Industrial	2.5

B.5 The highest 2001 mapped Defra background SO₂ annual mean concentration for the study area is 4.6 µg.m⁻³. Therefore, 4.6 µg.m⁻³ has been applied in this assessment.

TVOCs (Benzene)

B.6 Benzene is measured at PT2 Margam. The most recently measured annual-mean benzene concentration is provided in Table B.3.

Table B.3 Measured Annual-mean Benzene Concentrations (µg.m⁻³)

Site Name	Type	Location	2023
PT2 Margam	AURN	Industrial	0.79

B.7 The highest 2001 mapped Defra background benzene annual mean concentration for the study area is 0.25 µg.m⁻³. Therefore, 0.79 µg.m⁻³ has been applied in this assessment.

Carbon Monoxide

B.8 CO is measured at PT2 Margam. The most recently measured annual-mean CO concentration is provided in in Table B.4.

Table B.4 Measured Annual-mean CO Concentrations ($\mu\text{g.m}^{-3}$)

Site Name	Type	Location	2023
PT2 Margam	AURN	Industrial	0.16

B.9 The highest 2001 mapped Defra background carbon monoxide annual mean concentration for the study area is $0.21 \mu\text{g.m}^{-3}$. Therefore, $0.21 \mu\text{g.m}^{-3}$ has been applied in this assessment.

Particulate Matter (PM_{10})

B.10 NPTCBC monitors PM_{10} concentrations at four industrial locations within 3 km of the site (this includes one AURN monitor). The most recently measured annual-mean PM_{10} concentrations are presented in Table B.5.

Table B.5 Measured Annual-mean PM_{10} Concentrations ($\mu\text{g.m}^{-3}$)

Site Name	Type	Location	2020	2021	2022	2023
DS1	Automatic	Industrial	23	25	*	*
TW1	Automatic	Industrial	20	20	*	*
PS2	Automatic	Industrial	24	20	*	*
PT2 Margam	AURN	Industrial	21	25	*	26.6
* Data not available						

B.11 The highest 2024 mapped Defra background PM_{10} annual mean concentration for the study area is $16.1 \mu\text{g.m}^{-3}$. Therefore, $26.6 \mu\text{g.m}^{-3}$ has been applied in this assessment.

Particulate Matter ($\text{PM}_{2.5}$)

B.12 NPTCBC monitors $\text{PM}_{2.5}$ concentrations at two industrial locations within 3 km of the site (this includes one AURN monitor). The most recently measured annual-mean $\text{PM}_{2.5}$ concentrations are presented in Table B.6.

Table B.6 Measured Annual-mean $\text{PM}_{2.5}$ Concentrations ($\mu\text{g.m}^{-3}$)

Site Name	Type	Location	2020	2021	2022	2023
PS2	Automatic	Industrial	9	9	*	*
PT2 Margam	AURN	Industrial	9	9	*	8.3
* Data not available						

- B.13 The highest 2024 mapped Defra background PM_{2.5} annual mean concentration for the study area is 9.9 µg.m⁻³. Therefore, 9.9 µg.m⁻³ has been applied in this assessment.

Appendix C: Stack Height Determination

- C.1 A stack height determination has been undertaken to establish the height at which there is minimal additional environmental benefit associated with the cost of further increasing the height of the stack. The Environment Agency removed their detailed guidance, Horizontal Guidance Note EPR H1 [xi], for undertaking risk assessments on 1 February 2016; however, the approach used here is consistent with that EA guidance which required the identification of “*an option that gives acceptable environmental performance but balances costs and benefits of implementing it.*”

Methodology

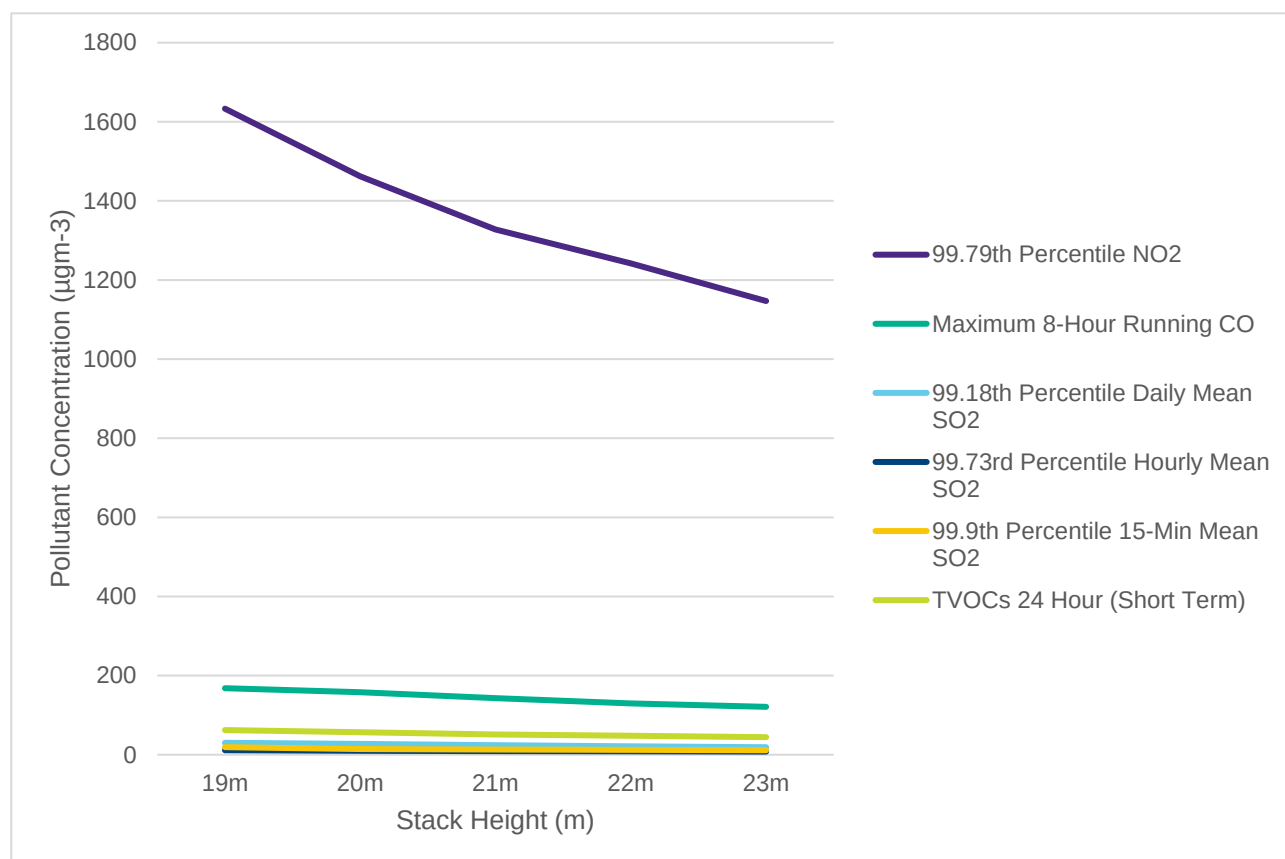
- C.2 Model simulations have been run using ADMS 6 to determine what stack height is required to provide adequate dispersion/dilution and to overcome local building wake effects.
- C.3 The stack height determination considers ground level concentrations over the averaging periods relevant to the air quality assessment, together with the full range of all likely meteorological conditions using five years (2019 to 2023) of hourly sequential meteorological data from St Athans. The model was run for a range of stack heights between 19 m and 23 m, in 1 m increments.
- C.4 For the purposes of stack height determination, the modelled domain was 3 km by 3 km centred on the proposed development and with a grid spacing of 28 m. Results have been reported for the location where the highest concentration is predicted and for the worst-case meteorological conditions.

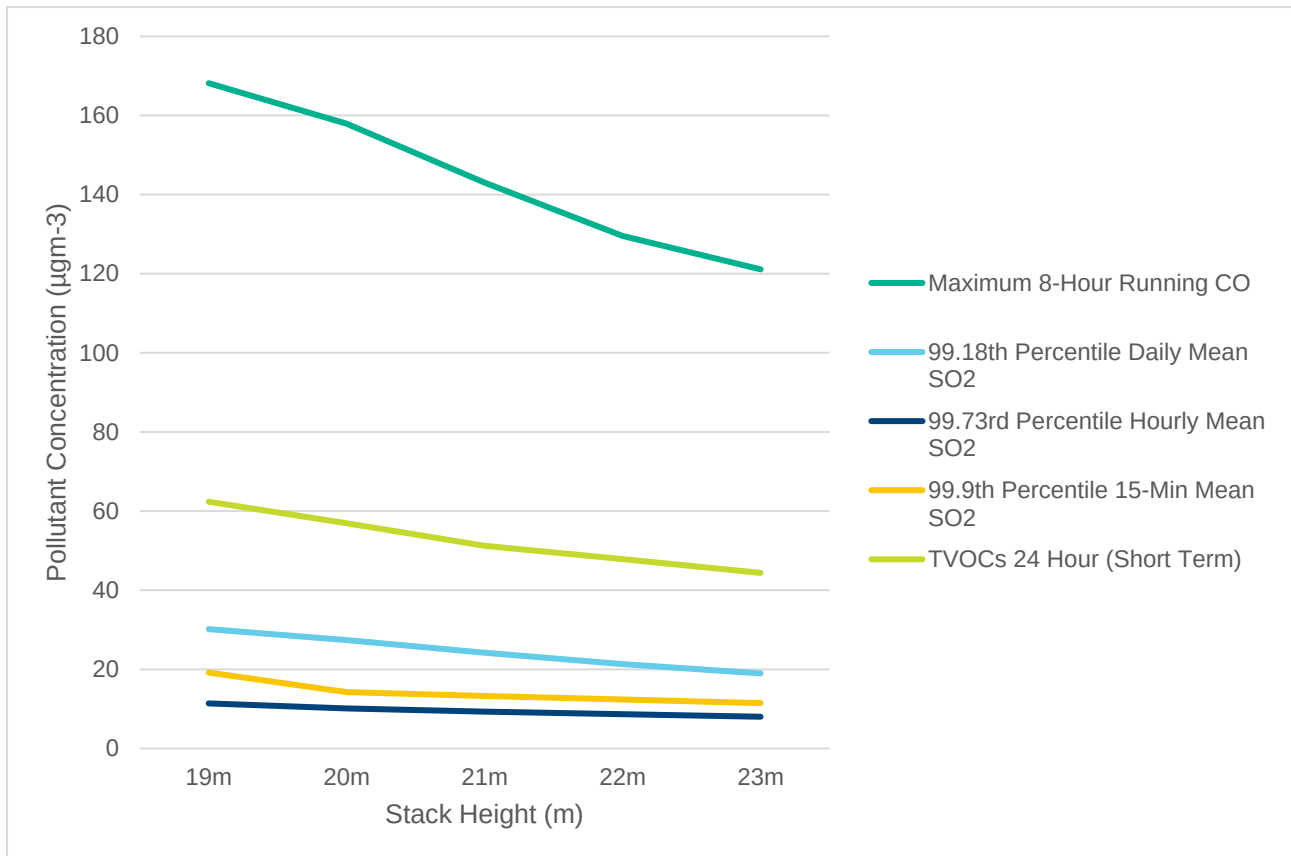
Stack Height Determination Results

- C.5 The stack height modelling results have been analysed in two stages:

Stage 1 - The maximum predicted Process Contributions (PCs) have been plotted against height to determine if there is a height at which no benefit is gained from increases in stack heights.

Graph A: Maximum Predicted Process Contributions vs Stack Height





Stage 2 – The on-line EA guidance is for risk assessments and provides details for screening out substances for detailed assessment. In particular, it states that:

“To screen out a PC for any substance so that you don’t need to do any further assessment of it, the PC must meet both of the following criteria:

- the short-term PC is less than 10% of the short-term environmental standard
- the long-term PC is less than 1% of the long-term environmental standard

If you meet both of these criteria you don’t need to do any further assessment of the substance.

If you don’t meet them you need to carry out a second stage of screening to determine the impact of the PEC.”

C.6 It continues by stating that:

“You must do detailed modelling for any PECs not screened out as insignificant.”

C.7 It then states that further action may be required where:

- “your PCs could cause a PEC to exceed an environmental standard (unless the PC is very small compared to other contributions – if you think this is the case contact the Environment Agency)
- The PEC is already exceeding an environmental standard”

C.8 The EA online guidance 'Environmental permitting: air dispersion modelling reports' [xii] states:

"For a detailed modelling assessment PCs are insignificant where they are less than:

- 10% of a short-term environmental standard
- 1% of a long-term environmental standard
- At the detailed modelling stage there are no criteria to determine whether:
- PCs are significant
- PECs are insignificant or significant

You must explain how you judged significance and base this on the site specific circumstances."

C.9 On that basis, the stack height has been determined as the height at which:

- The effects are not considered significant if the short-term PC is less than 10% of the short-term Environmental Assessment Level (EAL) or the PEC is below the EAL; and
- The effects are not considered significant if the long-term PC is less than 1% of the long-term EAL or the PEC is below the EAL.

C.10 Table C.1 provides the maximum predicted PC for a range of pollutants, covering a range of averaging periods, at each stack height modelled. Table C.2 provides the maximum predicted PC as a percentage of the EAL at each stack height modelled. Table C.3 provides the maximum predicted PEC as a percentage of the EAL at each stack height modelled.

Table C.1 Maximum Predicted Process Contributions ($\mu\text{g}\cdot\text{m}^{-3}$) at each Stack Height Modelled

Stack Height (m)	Annual-mean PM_{10}	90.41 st percentile daily mean PM_{10}	99.73 rd percentile hourly mean SO_2	99.18 th percentile daily mean SO_2	99.9 th percentile 15-minute mean SO_2	Annual-mean NO_2	99.79 th percentile NO_2	Maximum 8-hour running CO	1 Hour Max CO	TVOCs (Annual Mean)	TVOCs 24 Hour (short term)	Annual Mean $\text{PM}_{2.5}$
19	0.004	3.9	39.8	30.2	51.0	1.5	1633	168	369	0.03	62.4	0.004
20	0.004	3.4	35.4	27.4	37.9	1.3	1462	158	382	0.03	56.9	0.004
21	0.003	3.1	32.5	24.2	35.3	1.2	1328	143	323	0.03	51.2	0.003
22	0.003	2.8	30.4	21.3	32.9	1.1	1242	130	323	0.03	47.9	0.003
23	0.003	2.6	28.0	19.0	30.5	1.0	1147	121	323	0.02	44.4	0.003

Table C.2 Maximum Predicted Process Contributions as a Percentage of the EAL at each Stack Height Modelled

Stack Height (m)	Annual-mean PM ₁₀	90.41 st percentile daily mean PM ₁₀	99.73 rd percentile hourly mean SO ₂	99.18 th percentile daily mean SO ₂	99.9 th percentile 15-minute mean SO ₂	Annual-mean NO ₂	99.79 th percentile NO ₂	Maximum 8-hour running CO	1 Hour Max CO	TVOCs (Annual Mean)	TVOCs 24 Hour (short term)	Annual Mean PM _{2.5}
19	<0.1	7.8	11.4	24.1	19.2	3.8	817	1.7	1.2	0.7	208	<0.1
20	<0.1	6.8	10.1	21.9	14.2	3.4	731	1.6	1.3	0.6	190	<0.1
21	<0.1	6.2	9.3	19.3	13.3	3.1	664	1.4	1.1	0.6	171	<0.1
22	<0.1	5.7	8.7	17.0	12.4	2.8	621	1.3	1.1	0.5	160	<0.1
23	<0.1	5.3	8.0	15.2	11.5	2.6	573	1.2	1.1	0.5	148	<0.1

Cells are shaded grey where the predicted process contribution is above 1% of EAL for long-term average periods and 10% for short-term average periods.

Table C.3 Maximum Predicted Environmental Concentration as a Percentage of the EAL at each Stack Height Modelled

Stack Height (m)	Annual-mean PM ₁₀	90.41 st percentile daily mean PM ₁₀	99.73 rd percentile hourly mean SO ₂	99.18 th percentile daily mean SO ₂	99.9 th percentile 15-minute mean SO ₂	Annual-mean NO ₂	99.79 th percentile NO ₂	Maximum 8-hour running CO	1 Hour Max CO	TVOCs (Annual Mean)	TVOCs 24 Hour (short term)	Annual Mean PM _{2.5}
EAL	40	50	350	125	266	40	200	10,000	30,000	5	30	20
19	67	114	14	31	24	67	842	5	2	17	213	50
20	67	113	13	29	19	66	756	4	2	16	195	50
21	67	113	12	27	18	66	689	4	2	16	176	50
22	67	112	11	24	17	66	646	4	2	16	165	50
23	67	112	11	23	16	66	599	4	2	16	153	50

- C.11 The results in Table C.2 and Table C.3 indicate that for all pollutants and averaging periods the PCs are either below 1% / 10% of the EAL, or the PECs are all below the EALs, at all heights with the exception of short-term NO₂ and TVOCs which has been discussed further in Section 6.
- C.12 On this basis, and using the significance criteria adopted for this assessment, the impacts would be considered not significant at all heights modelled and the proposed stack height of 19 m is considered to be appropriate.

Appendix D: Ecological Impacts

The Environment Agency guidance on ‘Screening for protected conservations areas’ [xiii] requires identification of:

- Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and Ramsar sites (protected wetlands) within 10 km of the proposed development; and
- Sites of Special Scientific Interest (SSSIs) and Local Nature sites (ancient woods, local wildlife sites (LWSs) and national and local nature reserves) within 2 km of the proposed development.

The relevant sites which have been identified by are listed in Table D.1 and are shown in Appendix E.

Critical Levels

Critical levels are maximum atmospheric concentrations of pollutants for the protection of vegetation and ecosystems and are specified within relevant European air quality directives and corresponding UK air quality regulations. Annual-mean PCs and PECs of NO_x have been calculated for comparison with the 30 µg.m⁻³ critical level. The maximum daily-mean PCs and PECs of NO_x have been calculated for comparison with the 200 µg.m⁻³ critical level. Annual-mean PCs and PECs of SO₂ have been calculated for comparison with the 20 µg.m⁻³ critical level. Where relevant, background concentrations at each designated site have been derived from the UK Air Pollution Information System (APIS) database [xiv].

Critical Loads

Critical loads refer to the quantity of pollutant deposited, below which significant harmful effects on sensitive elements of the environment do not occur, according to present knowledge.

Critical Loads – Nutrient Nitrogen Deposition

Percentage contributions to nutrient nitrogen deposition have been derived from the results of the ADMS dispersion modelling. Deposition rates have been calculated using empirical methods recommended by the Environment Agency, as follows:

- The dry deposition flux (µg.m⁻².s⁻¹) has been calculated by multiplying the ground level NO₂ concentrations (µg.m⁻³) by the deposition velocity. The Environment Agency guidance provides deposition velocities of 0.0015 m.s⁻¹ for short habitats and 0.003 m.s⁻¹ for tall habitats.
- Units of µg.m⁻².s⁻¹ have been converted to units of kg.ha⁻¹.year⁻¹ by multiplying the dry deposition flux by the standard conversion factor of 96 for NO_x.
- Predicted contributions to nitrogen deposition have been calculated and compared with the relevant critical load range for the habitat types associated with the designated site. These have been derived from the APIS database.

Critical Loads – Acidification

The dry deposition flux (µg.m⁻².s⁻¹) has been calculated by multiplying the ground level SO₂ concentrations (µg.m⁻³) by the deposition velocity. The Environment Agency guidance provides deposition velocities of 0.012 m.s⁻¹ for short habitats and 0.024 m.s⁻¹ for tall habitats. Units of µg.m⁻².s⁻¹ have been converted to units of kg.ha⁻¹.year⁻¹ by multiplying the dry deposition flux by the standard conversion factor of 157.7 for SO₂.

The acid deposition rate, in equivalents $\text{keq} \cdot \text{ha}^{-1} \cdot \text{year}^{-1}$, has been calculated by multiplying the dry deposition flux ($\text{kg} \cdot \text{ha}^{-1} \cdot \text{year}^{-1}$) by a conversion factor of 0.071428 for N and 0.0625 for S. This takes into account the degree to which a chemical species is acidifying, calculated as the proportion of N within the molecule.

Wet deposition in the near field is not significant compared with dry deposition for N [xv] and therefore for the purposes of this assessment, wet deposition has not been considered.

Predicted contributions to acid deposition have been calculated and compared with the minimum critical load function for the habitat types associated with the designated site as derived from the APIS database.

Significance Criteria

The PC and PEC of NO_x and N/acid deposition have been compared against the relevant critical level/load, for the relevant habitat type/interest feature.

For SACs, SPAs, Ramsars and SSSIs, the Environment Agency guidelines [xvi] state that:

"To screen out a PC for any substance so that you don't need to do any further assessment of it, the PC must meet both of the following criteria:

the short-term PC is less than 10% of the short-term environmental standard

the long-term PC is less than 1% of the long-term environmental standard

If you meet both of these criteria you don't need to do any further assessment of the substance.

If you don't meet them you need to carry out a second stage of screening to determine the impact of the PEC."

It continues by stating that:

"If your long-term PC is greater than 1% and your PEC is less than 70% of the long-term environmental standard, the emissions are insignificant – you don't need to assess them any further.

If your PEC is greater than 70% of the long-term environmental standard, you need to do detailed modelling."

For LWSs, it states:

If your emissions meet both of the following criteria they're insignificant – you don't need to assess them any further:

the short-term PC is less than 100% of the short-term environmental standard

the long-term PC is less than 100% of the long-term environmental standard

You don't need to calculate PEC for local nature sites. If your PC exceeds the screening criteria you need to do detailed modelling."

Results

The relevant sites have been identified and are listed in Table D.1. The ambient NO_x concentrations and existing deposition rates have been obtained from APIS. The deposition rates have been obtained for the various habitats across the sites. These are provided in Table D.1.

The predicted annual-mean NO_x concentrations are compared with the critical level in Table D.2.

The predicted maximum daily-mean NO_x concentrations are compared with the critical level in Table D.3.

The predicted annual-mean SO₂ concentrations are compared with the critical level in Table D.4.

The predicted nutrient N deposition rates are compared with the critical load in Table D.5. The lowest critical loads for nitrogen deposition have been also obtained from APIS.

The maximum predicted acid deposition rates are compared with the critical load function in Tables D.6 and D.7. The critical loads for the nitrogen and sulphur component for acid deposition have been also obtained from APIS.

Table D.1 Average Background Concentrations

Site	Designation	Habitat	NOx ($\mu\text{g.m}^{-3}$)	SO ₂ ($\mu\text{g.m}^{-3}$)	Nitrogen Deposition Rate ($\text{kgN.ha}^{-1}\text{.yr}^{-1}$)	Acid Deposition Nitrogen ($\text{keq.ha}^{-1}\text{.yr}^{-1}$)	Acid Deposition Sulphur ($\text{keq.ha}^{-1}\text{.yr}^{-1}$)
Surrounding Ancient Woodland		Broadleaved, Mixed and Yew Woodland	18.2	4.5	19.9	1.3	0.3
Margam Moors	SSSI	Marshy grassland	10.8	2.6	9.6	Not sensitive	
Cefn Cribwr Grasslands	SAC	Northern Atlantic wet heaths with Erica tetralix	11.4	2.9	11.6	1.0*	1.0*
Kenfig / Cynffig	SAC	Fixed coastal dunes with herbaceous vegetation (grey dunes)	10.4	1.7	9.6	0.8*	0.8*

* Data relating to specific nitrogen and sulphur derived deposition unavailable. Therefore, total acid deposition has been applied.

Eglwys Nunydd Reservoir SSSI – No sensitive features identified on APIS. Therefore, this SSSI has not been considered within the assessment.

Table D.2 Predicted Annual-Mean NOx Concentrations at Designated Habitat Sites

Site	PC Testing Scenario ($\mu\text{g.m}^{-3}$)	PC/Critical Level (%)	PC Emergency Scenario ($\mu\text{g.m}^{-3}$)	PC/Critical Level (%)
Surrounding Ancient Woodland	0.20	0.67	1.04	3.46
Margam Moors	<0.01	0.01	0.01	0.04
Cefn Cribwr Grasslands	<0.01	0.01	0.01	0.03
Kenfig / Cynffig	<0.01	0.01	0.01	0.03

Critical level = 30 $\mu\text{g.m}^{-3}$

Table D.3 Predicted Daily-Mean NO_x Concentrations at Designated Habitat Sites

Site	Testing Scenario				Emergency Scenario			
	PC ($\mu\text{g.m}^{-3}$)	PC/Critical Level (%)	PEC ($\mu\text{g.m}^{-3}$)	PEC/ Critical Level (%)	PC ($\mu\text{g.m}^{-3}$)	PC/Critical Level (%)	PEC ($\mu\text{g.m}^{-3}$)	PEC/ Critical Level (%)
Surrounding Ancient Woodland	19.38	9.69	55.8	27.9	2,130.1	1,065.0	2,166.5	1,083.2
Margam Moors	0.50	0.25	22.1	11.1	53.5	26.8	75.1	37.6
Cefn Cribwr Grasslands	0.23	0.12	23.0	11.5	28.3	14.1	51.1	25.5
Kenfig / Cynffig	0.39	0.19	21.2	10.6	47.5	23.8	68.3	34.2

Critical level used = $200 \mu\text{g.m}^{-3}$ (see comments below)

Table D.4 Predicted Annual-Mean SO₂ Concentrations at Designated Habitat Sites

Site	PC Testing Scenario ($\mu\text{g.m}^{-3}$)	PC/Critical Level (%)	PC Emergency Scenario ($\mu\text{g.m}^{-3}$)	PC/Critical Level (%)
Surrounding Ancient Woodland	<0.01	0.02	0.01	0.09
Margam Moors	<0.01	<0.01	<0.01	<0.01
Cefn Cribwr Grasslands	<0.01	<0.01	<0.01	<0.01
Kenfig / Cynffig	<0.01	<0.01	<0.01	<0.01

Critical level used = $10 \mu\text{g.m}^{-3}$

Table D.5 Predicted Annual-Mean N Deposition at Designated Habitat Sites

Site	Tall or Short	Lower Critical Load (kgN.ha ⁻¹ .yr ⁻¹)	Testing Scenario		Emergency Scenario	
			PC (kgN.ha ⁻¹ .yr ⁻¹)	PC/ Critical Load (%)	PC (kgN.ha ⁻¹ .yr ⁻¹)	PC/ Critical Load (%)
Surrounding Ancient Woodland	Tall	10	0.04	0.41	0.21	2.09
Margam Moors	Short	6	<0.01	<0.01	<0.01	0.02
Cefn Cribwr Grasslands	Short	5	<0.01	<0.01	<0.01	0.02
Kenfig / Cynffig	Short	5	<0.01	<0.01	<0.01	0.02

Table D.6 Predicted Acid Deposition at Designated Habitat Sites – Testing Scenario

Habitat Site	Critical Load ((eq.ha ⁻¹ .yr ⁻¹)	PC (keq.ha ⁻¹ .yr ⁻¹)	PC/CL (%)
Surrounding Ancient Woodland	0.934	<0.01	0.35
Margam Moors	N.A.	<0.01	N.A.
Cefn Cribwr Grasslands	1.287	<0.01	<0.01
Kenfig / Cynffig	1.708	<0.01	<0.01

N/A = No critical load for designated habitat site

Table D.7 Predicted Acid Deposition at Designated Habitat Sites – Emergency Scenario

Habitat Site	Critical Load ((eq.ha ⁻¹ .yr ⁻¹)	PC (keq.ha ⁻¹ .yr ⁻¹)	PC/CL (%)
Surrounding Ancient Woodland	0.934	0.02	1.82
Margam Moors	N.A.	<0.01	N.A.
Cefn Cribwr Grasslands	1.287	<0.01	0.01
Kenfig / Cynffig	1.708	<0.01	<0.01

N/A = No critical load for designated habitat site

Interpretation of Results

Table D.2 shows that the maximum annual-mean NO_x PC is less than 100% of the critical level at the surrounding ancient woodlands, and less than 1% of the critical level at the surrounding SSSI and SACs, for all scenarios. As such, the impact is not likely to have a significant effect.

Table D.3 shows the maximum daily-mean NO_x PC as a percentage of a critical level of 200 µg.m⁻³. The IAQM 2019 'Guide to the assessment of air quality impacts on designated nature conservation sites guidance' says: *"The critical level is generally considered to be 75 µg/m³; but this only applies where there are high concentrations of SO₂ and ozone, which is not generally the current situation in the UK.... If a regulator does require the use of the short term NO_x critical level, given the low UK SO₂ concentrations IAQM consider it is most appropriate to use 200 µg/m³ as the short term critical load (sic)."*

For the testing scenario, the PC is below 100% of 200 µg.m⁻³ at the surrounding ancient woodlands, and less than 10% of 200 µg.m⁻³ at the surrounding SSSI and SACs. As such, the impact is not likely to have a significant effect.

In the emergency scenario, the PC is above 10% of 200 µg.m⁻³ at the surrounding SSSI and SACs. However, the PECs are well below 200 µg.m⁻³ in all instances (the maximum PEC at the surrounding SSSI and SACs being 37.6% of the critical level). For the surrounding ancient woodlands, the PC and PEC is above 100% of 200 µg.m⁻³. The emergency scenario assumes that 5 of the 6 engines run at the same time for a period of 24 hours. The critical level would only be exceeded should an emergency occur. In the event of a loss of utility power to the site, an outage is expected to be less than 24 hours and therefore the modelled results for the emergency scenario are likely to be conservative due to the low probability of an emergency event of such a long duration.

For the worst meteorological year:

- The model predicts 182 daily-mean NO_x concentrations above 200 µg.m⁻³. Using the cumulative hypergeometric distribution, the probability of an emergency occurring on one of those 182 days, when randomly selecting 1 day, is 50%. When this is multiplied by the safety factor of 2.5, the probability is 100%.

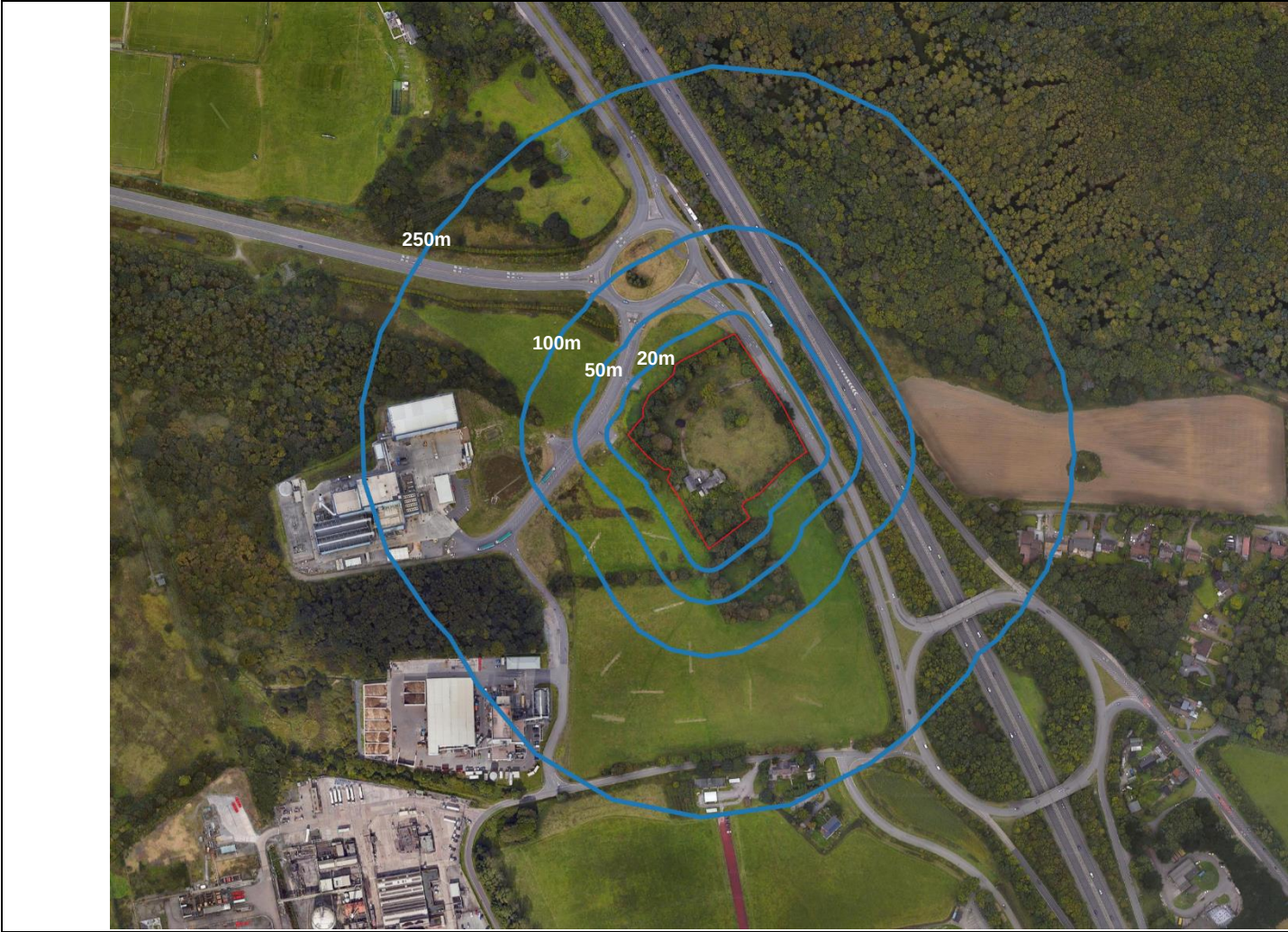
Although a significant impact on daily mean NO_x concentration, during a 24-hour emergency scenario, cannot be screened out, it is important to note that a consequent significant ecological effect may not necessarily occur. It is advised that an appropriately qualified ecologist is consulted to determine the potential for significant ecological effects.

Table D.4 shows that the maximum annual-mean SO₂ PC is less than 100% of the critical level at the surrounding ancient woodlands, and less than 1% of the critical level at the surrounding SSSI and SACs, for all scenarios. As such, the impact is not likely to have a significant effect.

Table D.5 shows that the maximum nitrogen deposition PC is less than 100% of the critical load at the surrounding ancient woodlands, and less than 1% of the critical level at the surrounding SSSI and SACs, for all scenarios. As such, the impact is not likely to have a significant effect.

Table D.6 and D.7 show that the maximum acid deposition PC is less than 100% of the critical load at the surrounding ancient woodlands, and less than 1% of the critical level at the surrounding SSSI and SACs, for all scenarios. As such, the impact is not likely to have a significant effect.

Appendix E: Figures



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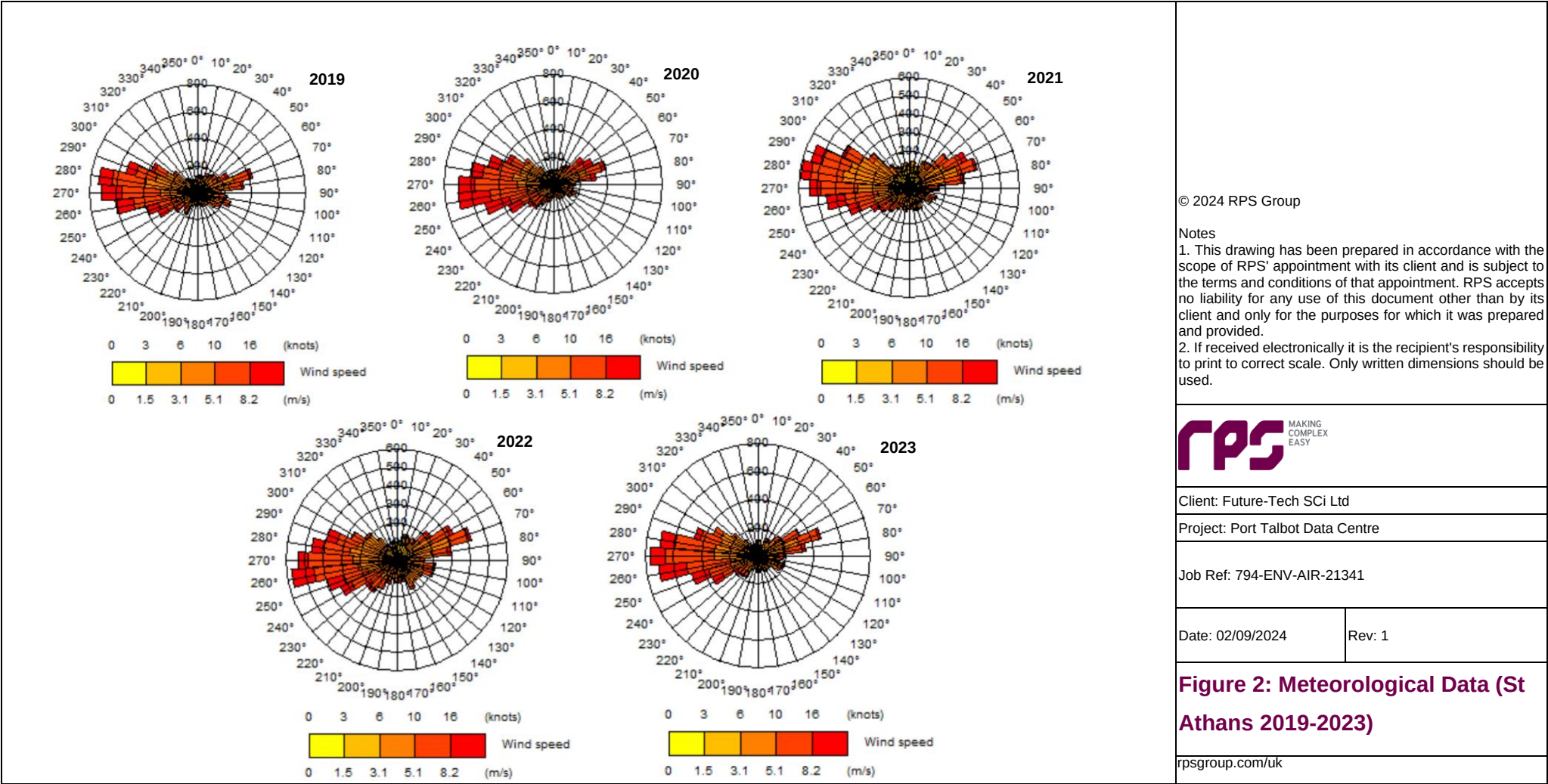
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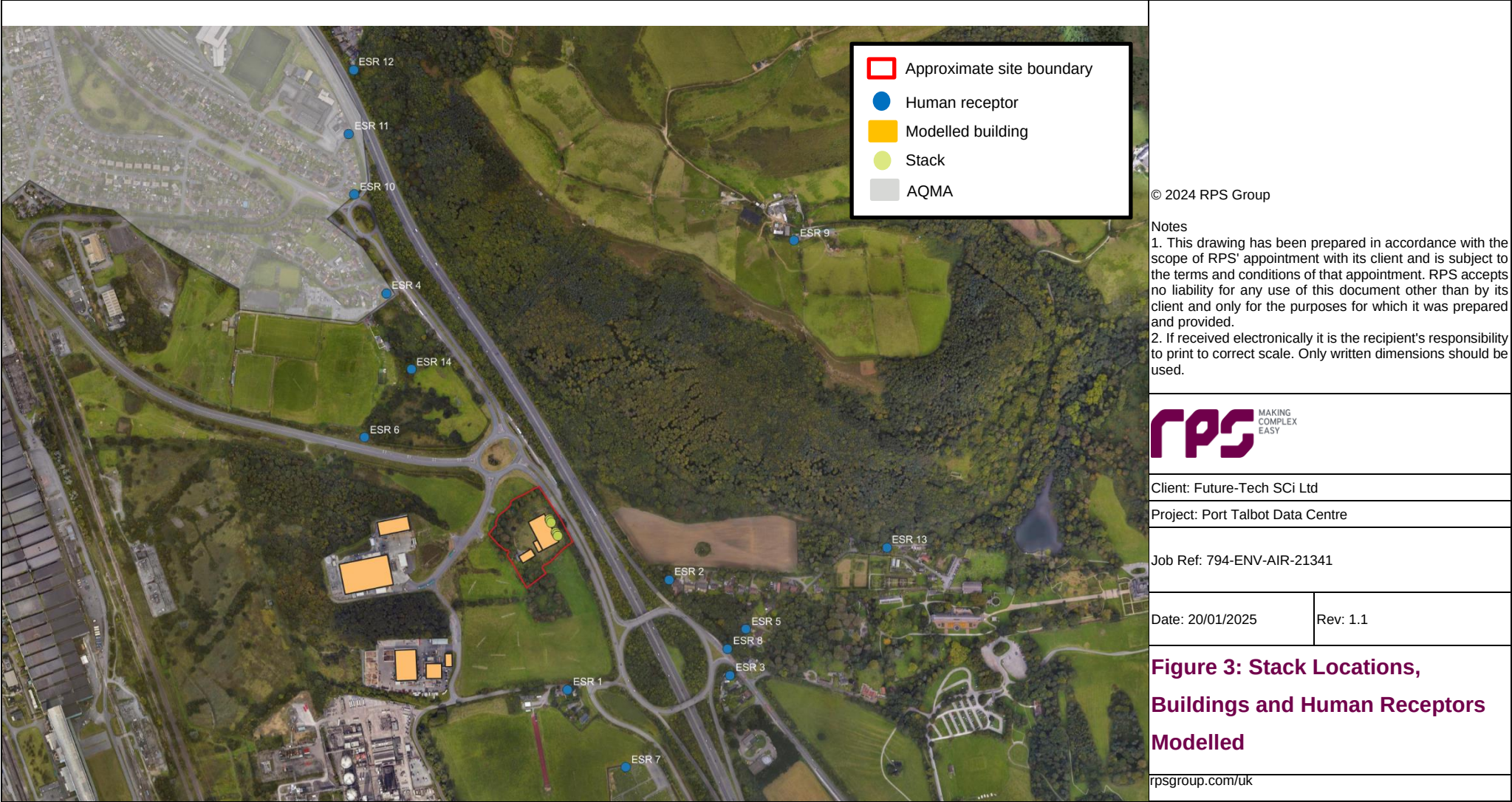
Date: 02/09/2024

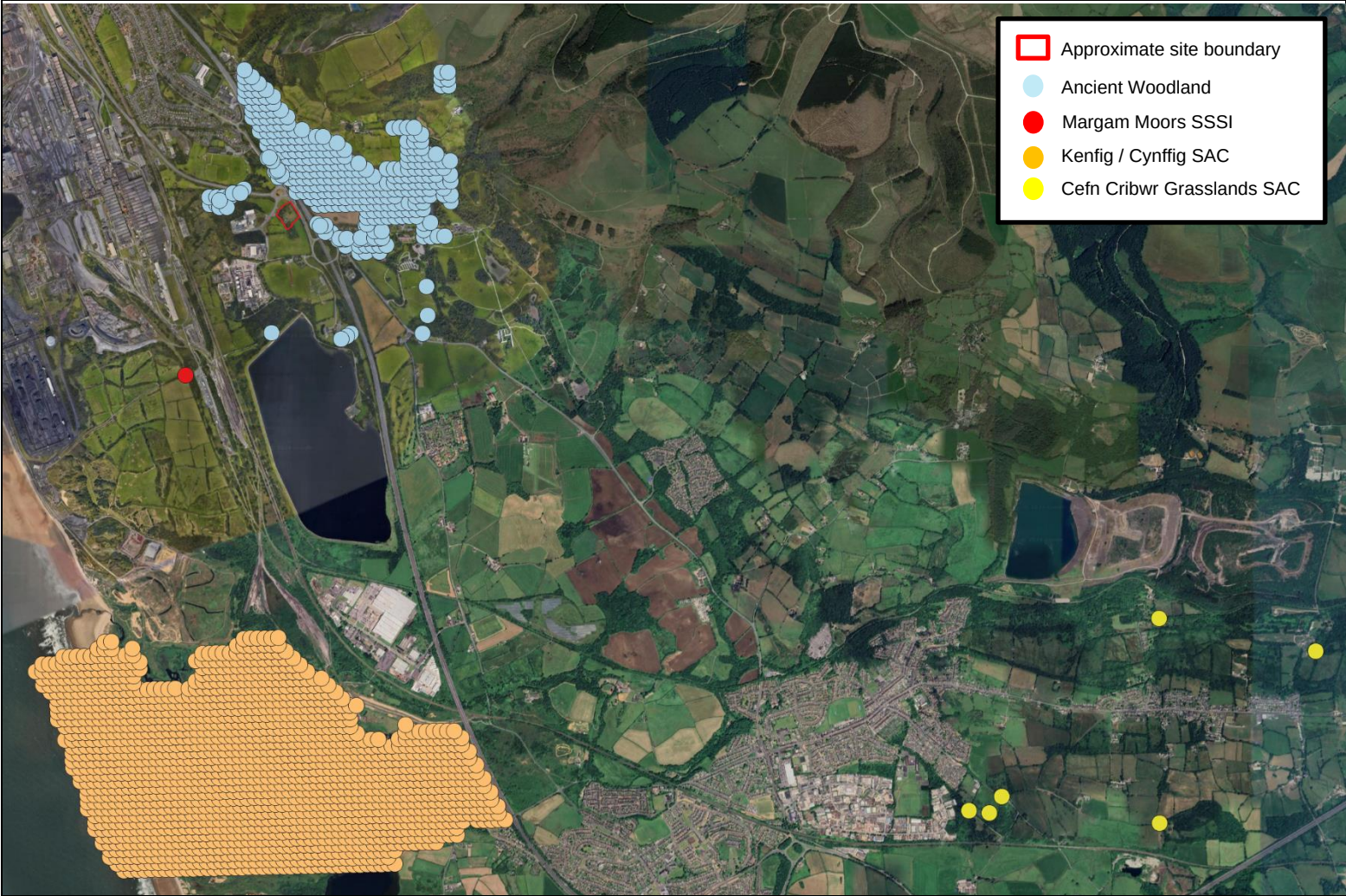
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Figure 1: Construction Dust Buffers

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Figure 4: Ecological Receptors Modelled

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