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# Permit Variation - Air Quality Assessment

## Morganite Electrical Carbon Ltd, Upper Fforest Way, Swansea

**Morganite Electrical Carbon Ltd**

CRM.443.008.AQ.R.004

'Experience and expertise working in union'

enzygo.com

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# Air Quality Assessment

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| Project: | CRM.443.008.AQ.R.004 |
| For: | Morganite Electrical Carbon Ltd |
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| Date: | July 2024 |
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## Tables and Figures

# 1.0 Introduction

## 1.1 Background

1.1.1 Enzygo Limited (Ltd) was commissioned by Morganite Electrical Carbon Ltd to undertake an air quality impact assessment to support a variation of the environmental permit (Ref. VP3339PD/V014) for the operations at their Morriston facility (the "Facility") on land off Upper Fforest Way, Swansea, Wales (the "Site").

1.1.2 The proposed change comprises the addition of a new graphitisation furnace and associated activities and removal of Long Metallised Carbon (LMC) process and associated emission points. This change will result in additional air emissions emissions from the new furnace, but a reduction in emissions due to the removal of the LMC process and associated emissions via point A10, which have been assessed in this report.

1.1.3 Emissions has potential to increase air pollutant concentrations in the vicinity of the site and an assessment was undertaken to quantify the significance of impacts upon sensitive human and ecological receptors.

1.1.4 This report has been updated following initial comments from National Resource Wales (NRW).

## 1.2 Site Location and Context

1.2.1 The Facility is located on land off Upper Fforest Way, Swansea at the approximate National Grid Reference (NGR): 267650, 198050. The area surrounding the site would be described as follows:

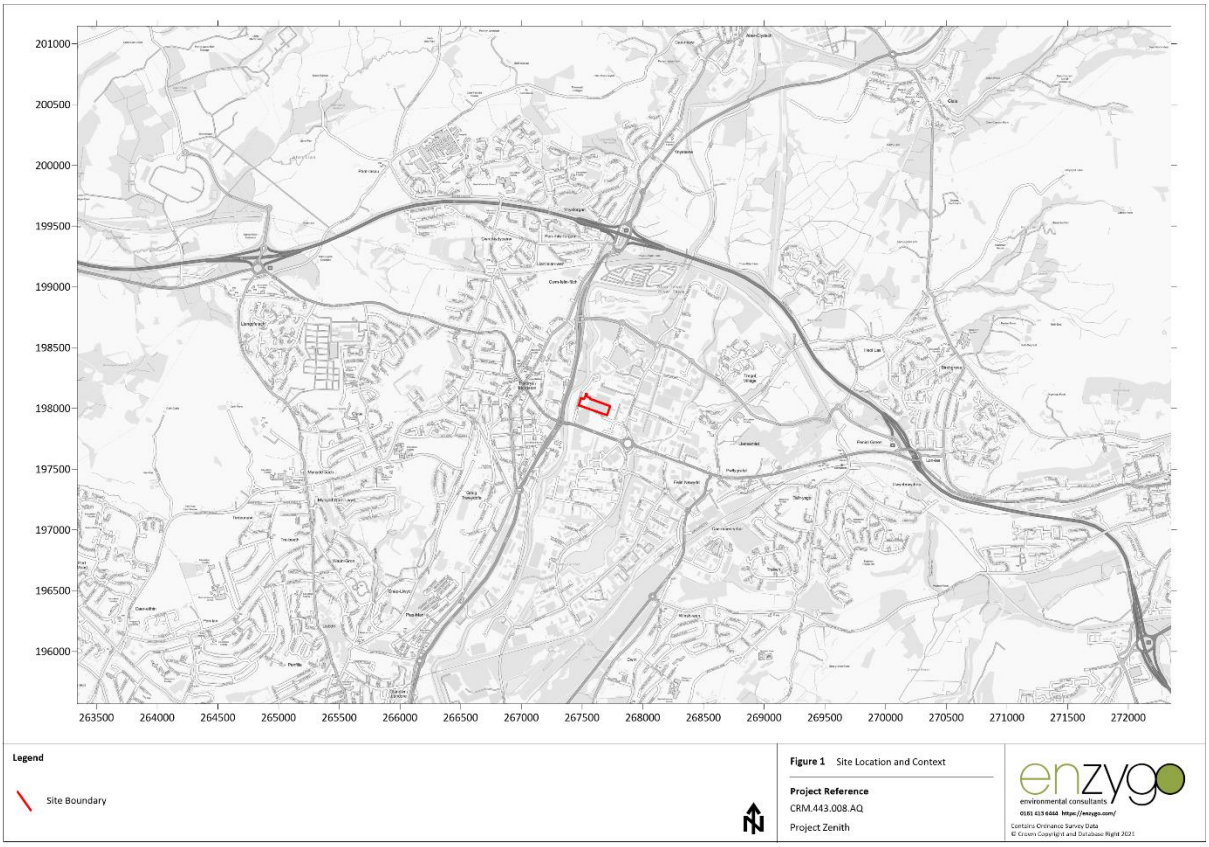
- To the north of the site are additional commercial/industrial units. Beyond this, at a distance of approximately 115 m is a small traveller site containing a number of residential mobile home units;
- To the immediate east of the site is the annex of the Premier Inn, a two-storey hotel accommodation building with windows on the southern elevation. Beyond this is the main Premier Inn building and other industrial/commercial units;
- To the south of the site is a large Asda supermarket and carpark. The supermarket is a 24-hour operation and includes a petrol filling station, accessed by Heron Way. Beyond the supermarket lies the A48, a stretch of dual carriageway between two roundabouts; and,
- To the west of the site is an area of woodland and public footpath and at a distance of 80m lies the River Tawe. Beyond this is the A4067 (North Road), a major trunk road between Swansea and the M4 motorway.

1.2.2 There are no Air Quality Management Areas (AQMA) located within the assessment extents.

1.2.3 There are statutory ecological sites within the assessment area, although it is local designations that are closest to the surrounds of the Site.

1.2.4 Reference should be made to Figure 1 for a reference of the site location and surrounding environment.

**Figure 1 – Site Location**




## 1.3 Limitations

1.3.1 This report has been produced in accordance with Enzygo's standard terms of engagement. Enzygo has prepared this report solely for the use of the Client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from Enzygo; a charge may be levied against such approval.

# 2.0 Legislation Guidance and Policy

2.1.1 The following legislation, guidance and policy will be considered and adhered to during the preparation of the Air Quality Assessment:

- The Air Quality Standards (Amendment) Regulations, updated on 31st December 2016[1];
- Part IV of the Environment Act (1995);
- Local Air Quality Management Technical Guidance 2022 LAQM (TG22), DEFRA, 2022[2];
- Air emissions risk assessment for your environmental permit, Environment Agency (EA), updated on 21st December 2023[3];
- Environmental permitting: air dispersion modelling reports, EA, updated on 19 January 2021[4];
- The Medium Combustion Plant Directive (MCPD), European Commission, EU 2015/2193, 25 November 2015[5].

## 2.2 UK Legislation

2.2.1 The Air Quality Standards (Amendment) Regulations (2016) came into force on 31st December 2016. These Regulations amend the Air Quality Standards Regulations 2010 and transpose the EU Directive 2008/50/EC into UK law. Air Quality Limit Values (AQLVs) were published in these regulations for 7 pollutants, as well as Target Values for an additional 6 pollutants.

2.2.2 Part IV of the Environment Act (1995) requires UK government to produce a national Air Quality Strategy (AQS) which contains standards, objectives, and measures for improving ambient air quality. The most recent AQS was produced by the Department for Environment, Food and Rural Affairs (DEFRA) and published in July 20071. The AQS sets out Air Quality Objectives (AQOs) that are maximum ambient pollutant concentrations that are not to be exceeded either without exception or with a permitted number of exceedances over a specified timescale. These are generally in line with the AQLVs, although the requirements for compliance vary slightly.

2.2.3 The annual and hour limits set out in Table 1 are specified as AQOs, Environmental Assessment Levels (EALs) or Ambient Air Directive (AAD) for ease these criteria are collectively referred to as Environmental Quality Standards (EQSs) throughout the assessment.

2.2.4 Table 1 presents the EQS for pollutants considered within this assessment.

[1] The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, DEFRA, 2007
[2] Local Air Quality Management Technical Guidance 2022 LAQM (TG22), DEFRA, August 2022.
[3] https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit
[4] https://www.gov.uk/guidance/environmental-permitting-air-dispersion-modelling-reports
[5] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32015L2193#ntr26-L_2015313EN.01001501-E0026

**Table 1: Air Quality Limit Values, Assessment Levels, Targets, and Objectives**

| Pollutant | Air Quality Objectives | |
|---|---|---|
| | Concentration (µg/m³) | Averaging Periods |
| Nitrogen dioxide ($NO_2$) | 40 | Annual mean |
| | 200 | 1-hour mean; not to be exceeded more than 18 times a year |
| Particulate matter with an aerodynamic diameter of less than 10µm ($PM_{10}$) | 40 | Annual mean |
| | 50 | 24-hour mean; not to be exceeded more than 35 times a year |
| Particulate matter with an aerodynamic diameter of less than 2.5µm ($PM_{2.5}$) | 20 | Annual mean |
| Total Organic Carbon (TOC) as Benzene ($C_6H_6$) | 5 | Annual mean |
| | 30 | 24-hour mean |
| Sulphur dioxide ($SO_2$) | 125 | 24-hour mean; not to be exceeded more than 3 times a year |
| | 350 | 1-hour mean; not to be exceeded more than 24 times a year |
| | 266 | 15-minute mean; not to be exceeded more than 35 times a year |
| Polycyclic Aromatic Hydrocarbons (PAH) as benzo(a)pyrene (BaP) | 0.00025 | Annual mean |

2.2.5 Table 2 summarises the advice provided in the DEFRA guidance LAQM (TG22)[2] on where the EQS for pollutants considered within this report apply.

**Table 2: Where the EQS Apply**

| Averaging Period | Objectives Should Apply At | Objectives Should Not Apply At |
|---|---|---|
| Annual mean | All locations where members of the public might be regularly exposed<br>Building facades of residential properties, schools, hospitals, care homes etc. | Building facades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term |
| 24-hour and 8 hour mean | As above together with hotels<br>Gardens of residential properties | Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term |
| 1-hour mean | As above, and kerbside sites (pavements of busy shopping streets), parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more. Any outdoor locations where members | Kerbside sites where the public would not be expected to have regular access |

| Averaging Period | Objectives Should Apply At | Objectives Should Not Apply At |
|---|---|---|
| | of the public are expected to spend one hour or longer | |
| 15-minute mean | All locations where members of the public might reasonably be exposed for a period of 15 minutes | - |

## 2.3 Ecological Critical Loads and Levels

2.3.1 Impacts on ecological designations will be assessed in accordance with the EA guidance3. Critical loads (CLd) and levels (CLv) have been designated based on the sensitivity of the receiving habitat. Table 3 presents the CLd and CLv for the protection of vegetation for pollutants considered within this assessment.

**Table 3: Critical Levels for the Protection of Vegetation**

| Pollutant | Critical Levels and Loads | |
|---|---|---|
| | Concentration (µg/m³) | Averaging Periods |
| Oxides of Nitrogen ($NO_x$) | 30 | Annual mean |
| | 75 | 24-hour mean |
| $SO_2$ | 10 (presence of lichen and bryophytes) | Annual mean |
| | 20 (all other species) | |
| Nutrient Nitrogen Deposition | Site Specific (See Section 4.6) | Annual mean |
| Acid Nitrogen Deposition | Site Specific (See Section 4.6) | Annual mean |

2.3.2 The significance of impacts will be compared against the relevant CLd and CLv data obtained from the UK Air Pollution Information System (APIS)[6].

[6] http://www.apis.ac.uk/

# 3.0 Methodology

## 3.1 Stack Emissions Assessment

3.1.1 Emissions releases associated with the new point sources detailed within the permit variation were assessed. Existing emission contributions were also presented and included within the PECs.

3.1.2 To quantify process contributions dispersion modelling was undertaken using ADMS-6, which is a short-range dispersion modelling software package developed by Cambridge Environmental Research Consultants (CERC). The model simulates a wide range of buoyant and passive releases to atmosphere. It estimates the concentration for each source and receptor combination for every hour of input meteorology and calculates user-selected long-term and short-term averages.

3.1.3 The dispersion modelling data was as follows:

- Information on stack locations and dimensions were provided by Morganite Electrical Carbon Ltd;
- Process conditions were confirmed by Morganite Electrical Carbon Ltd;
- Emission rates were based on permit emission limits values and monitoring data for existing sources; and
- Appropriate data to describe meteorological conditions in the vicinity of the site were obtained from Atmospheric Dispersion Modelling (ADM) Ltd.

3.1.4 Modelling predictions produced by the ADMS-6 model are widely accepted by local authorities, the EA and DEFRA. The above information was entered into the ADMS-6 model, processed, and compared against the relevant EQSs and assessment criteria to determine impact significance.

## 3.2 Modelling Scenarios

3.2.1 The modelled pollutant scenarios considered in the modelling assessment are summarised in Table 4.

**Table 4: Dispersion Modelling Scenarios**

| Pollutant | Modelled As | |
|---|---|---|
| | Short Term | Long Term |
| $NO_2$ | 99.79th percentile (%ile) 1-hour mean | Annual mean |
| $NO_x$ | 24-hour mean | Annual mean |
| $PM_{10}$ | 90.41%ile 24-hour mean | Annual mean |
| $PM_{2.5}$ | - | Annual mean |
| $SO_2$ | 99.9%ile 15-minute mean | Annual mean |
| | 99.73%ile 1-hour mean | |
| | 99.18%ile 24-hour mean | |
| Total Organic Carbon (TOC) as Benzene | 24-hour mean | Annual mean |

| Pollutant | Modelled As | |
|---|---|---|
| | Short Term | Long Term |
| Polycyclic Aromatic Hydrocarbons (PAH) as benzo(a)pyrene (BaP) | - | Annual mean |
| Nitrogen deposition | - | Annual deposition |
| Acid deposition | - | Annual deposition |

3.2.2 Some short-term air quality criteria are framed in terms of the number of occasions in a calendar year on which the concentration should not be exceeded. As such, the percentiles (%ile) shown in Table 4 represent the relationship between the permitted number of exceedances of short-period concentrations and the number of periods within a calendar year.

3.2.3 For the purposes of dispersion modelling, it was considered that the entire PM emission consisted of only $PM_{10}$ or $PM_{2.5}$. This allowed an assessment of the maximum ground level impacts, with respect to the relevant criteria. Actual plant emissions of PM are unlikely to only consist of only the smaller PM fractions and therefore this can be considered as a worst-case assumption.

3.2.4 Similarly, it was considered that the entire TOC emission consisted of only benzene. This allowed the maximum ground level impacts to be assessed with respect to the AQLV. Actual plant emissions of TOCs are unlikely to only consist of one species, resulting in a worst-case assessment.

## 3.3 Process Conditions

3.3.1 Process conditions for the emissions stack were provided through correspondence with Morganite Electrical Carbon Ltd. The installation of the new graphitisation furnace will include 3 new stacks as part of the variation labelled A70, A71 and A72. Existing emission points A10, A15, A19, A27, A28 and A61 associated with existing production lines have also been considered. Table 5 shows the modelled process parameters.

**Table 5: Process Conditions Per Stack**

| ID | Source | Location (NGR) | Stack Height (m) | Internal Stack Diameter (m) | Temp (c°) | Undiluted Volume Flow Rate ($Am^3/s$)[a] | Volume Flow Rate ($Am^3/s$) | Flue Gas Velocity (m/s) |
|---|---|---|---|---|---|---|---|---|
| New A70 | Proposed | 267674, 197969 | 27.0 | 0.40 | 67.0 | 0.794 | 2.222 | 17.68 |
| New A71 | Generator | 267698, 197961 | 27.0 | 0.175 | 414.0 | - | 0.867 | 36.05 |
| New A72 | Proposed | 267675, 197971 | 9.0 | 0.40 | 15.0 | - | 1.90 | 15.12 |
| A15 | Production Line 1 | 267688, 197968 | 4.8 | 0.35 | 31.9 | - | 0.920 | 9.57 |
| A19 | Production Line 4 | 267553, 198060 | 9.0 | 0.30 | 21.0 | - | 0.630 | 8.92 |
| A27 Kilns 1/2 | Production Line 1 | 267649, 197990 | 27.4 | 0.75 | 123.0 | - | 3.483 | 7.88 |
| A28 Kiln-3 | Production Line 1 | 267639, 197993 | 27.4 | 0.75 | 197.0 | - | 4.439 | 10.05 |
| A61 Kiln-5 | Production Line 1 | 267606, 198006 | 27.4 | 0.75 | 91.0 | - | 3.350 | 7.58 |

(a) A70 Flue gas will be diluted with air to provide an exit flue gas flow of 8,000 $m^3$/hr. Emissions for A70 are based on undiluted flow of 2,860 $m^3$/hr. Other flue gases are not diluted

3.3.2 The generator is small and would be used for emergency purposes only and therefore use and emission impacts are likely to be negligible. It is also below regulatory thresholds:

- Specified generator controls do not apply as generator is operated for less than 50hrs per year only for the purpose of testing and maintenance, and it is part of a Schedule 1 listed activity.
- It is below the MCPD threshold and emission limits do not apply as generator is below 1MWth and it is operated for <500 hrs per year.

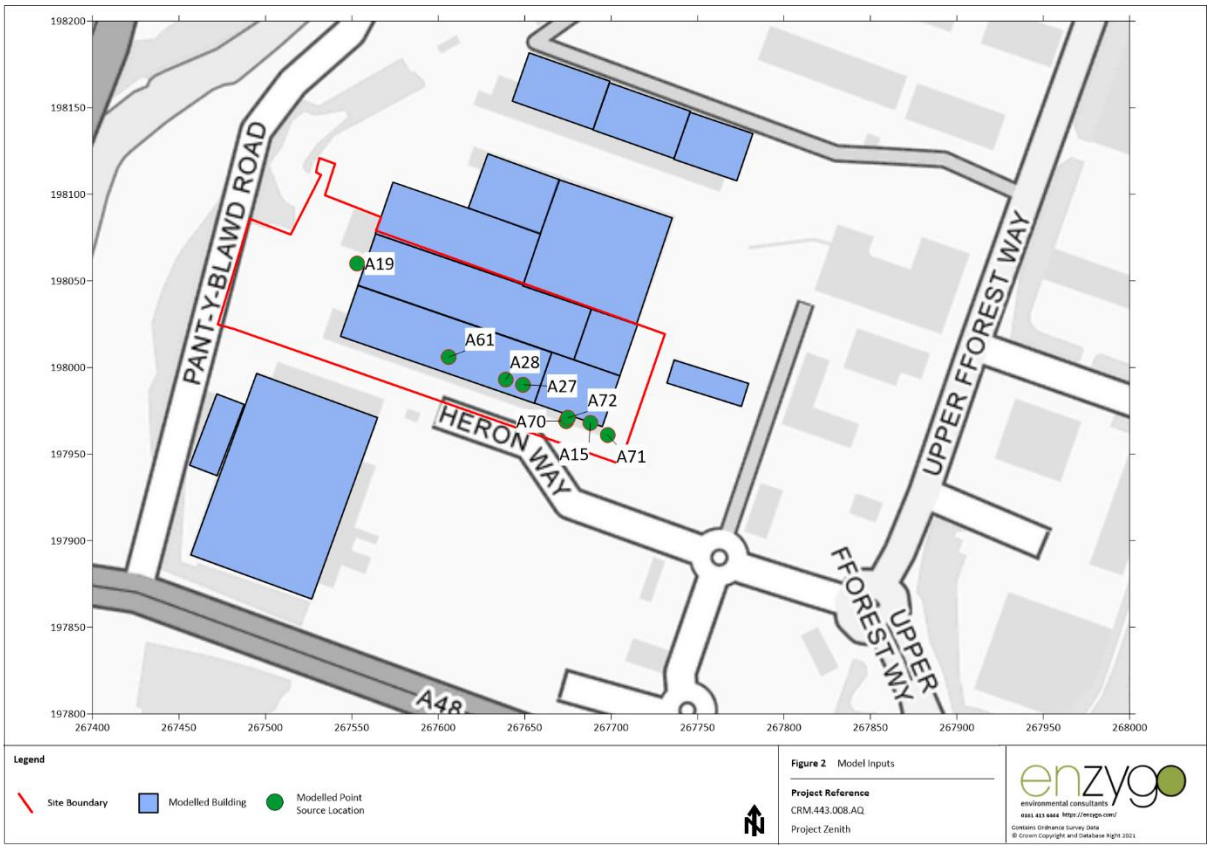
3.3.3 Emergency use of the generator is unlikely as there is a robust power supply from the national grid to the facility with a dedicated transformer for the new furnace.

3.3.4 However, to assume a worst case scenario, the contribution to impacts was considered in this assessment using guidance provided by the EA document 'Specified generators: air dispersion modelling example short term statistical analysis'[7].

3.3.5 This advises that annual mean PCs associated with operation hours less than a full calendar year can be calculated by scaling down long term predictions. In this instance a proportional scaling factor of 0.285 was applied to annual mean PC results. The factor equates to the operational hours per year of 50 divided by the operational envelope of 8760 hours.

3.3.6 The stack locations and building layout are presented in Figure 2.

**Figure 2 – ADMS-6 Inputs**




[7] https://www.gov.uk/guidance/specified-generators-dispersion-modelling-assessment

## 3.4 Emissions

3.4.1 The emission rates from the new stacks were calculated based on maximum permitted emission concentrations and volumetric flow rates detailed in Table 5.

3.4.2 Two scenarios were considered where long- and short-term values apply:

- Long term (daily average) emission limits and monitored concentrations for comparison against long and short term EQS; and
- Short term (hourly, 24-hour and 15-minute) monitored $NO_x$ emission and $SO_2$ monitored profiles for kiln emissions for comparison against short term $NO_x$ and $SO_2$ EQSs.

3.4.3 $SO_2$ emissions stack monitoring indicates a higher short term peak characteristic and therefore a temporal emission variation was provided by Morganite Electrical Carbon Ltd to assess 24-hour, 1 hour and 15-minute peak concentrations.

3.4.4 The calculated mass emissions rates in grams per second (g/s) are shown in Table 6.

**Table 6: Modelled Emission Concentrations and Mass Rates**

| Stack | Pollutant | Modelled Emission Concentration (mg/Nm$^3$) | Modelled Mass Emission Rate (g/s) |
|---|---|---|---|
| A70 (Furnace) New | TPM | 10 [a] | 0.006 [b] |
| | $SO_2$ | 100 [a] | 0.175 [b] |
| | TOC | 40 [a] | 0.07 [b] |
| | BaP | 0.015 [a] | 0.0000262 [b] |
| A71 (280 kWe rated Emergency Generator) [g] New | NOx | 5.62 g/kWh | 0.437 |
| | TPM | 0.08 g/kWh | 0.006 |
| | $SO_2$ | 120 g/kWh | 0.08 |
| | TOC | 0.22 g/kWh | 0.0171 |
| A72 New | TPM | 10 [a] | 0.018 [b] |
| A15 | TPM | 4 [c] | 0.003 |
| A19 | TPM | 5 [c] | 0.003 |
| A27 | NOx | 150 [d] | 0.035 [e] |
| | TPM | 10 [c] | 0.024 |
| | $SO_2$ [h] | See emission profile Section 3.5 | |
| | BaP | 0.01 [c] | 0.000024 |
| | Short Term $NO_x$ | 250 [f] | 0.0588 [e] |
| A28 | $NO_x$ | 150 [d] | 0.038 [e] |
| | TPM | 10 [c] | 0.026 |
| | $SO_2$ [h] | See emission profile Section 3.5 | |
| | BaP | 0.01 [c] | 0.000026 |
| | Short Term $NO_x$ | 250 [f] | 0.0632 [e] |
| A61 | $NO_x$ | 150 [d] | 0.037 [e] |
| | TPM | 10 [c] | 0.025 |

| Stack | Pollutant | Modelled Emission Concentration (mg/Nm$^3$) | Modelled Mass Emission Rate (g/s) |
|---|---|---|---|
| | $SO_2$ [h] | See emission profile Section 3.5 | |
| | BaP | 0.01 [c] | 0.000025 |
| | Short Term $NO_x$ | 250 [f] | 0.0616 [e] |

(a) ELV Reference conditions: dry gas, standard pressure, 273.15K.

(b) Assumed actual condition: 2% $H_2O$.

(c) ELV Reference conditions: standard pressure, 273.15K, no correction for moisture

(d) ELV Reference conditions: standard pressure, 273.15K, dry gas, 11% $O_2$

(e) Assumed actual condition: 2% $H_2O$, 20% $O_2$

(f) Based on maximum monitored emissions

(g) 280 kWe rating in standby mode taken from Volvo Penta Emissions Datasheet, emission based on data given in g/kWh – this is not an emission limit. Generator is below MCPD thresholds and used for emergency use only therefore MCPD and SG limits do not apply.

(h) Existing furnace $SO_2$ limits have not been used in this assessment. Lower concentrations based on monitoring data profiles have been used (see Section 3.5)

## 3.5 Time Varied Emissions

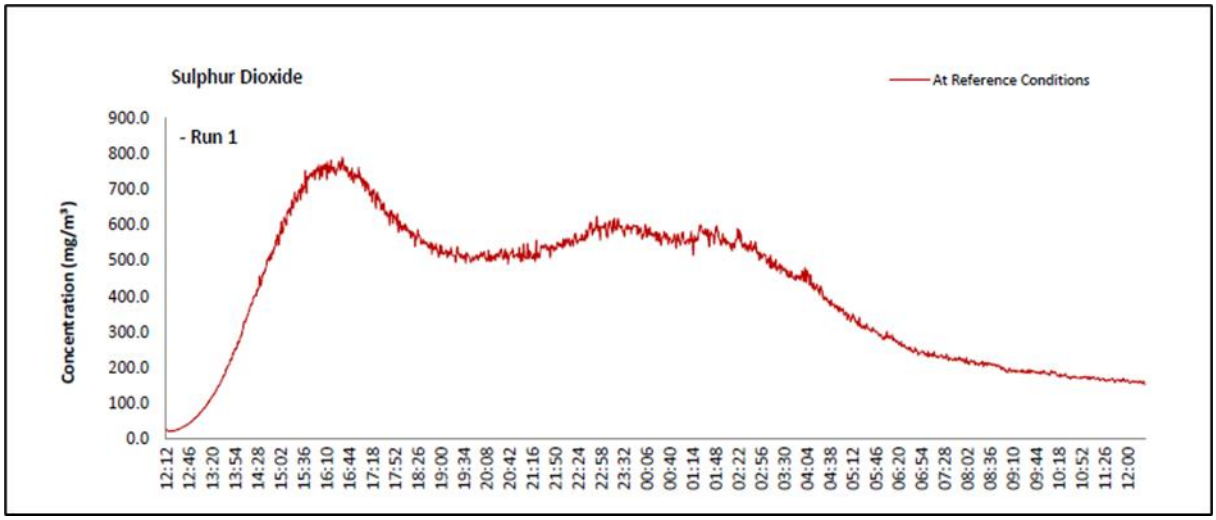
3.5.1 For existing and all new proposed emission sources (with the exception of the kiln emissions) modelling has been undertaken assuming stacks are emitting operation 24 hours per day for 365 days per year at permitted limits. This again is considered as a worst-case assessment.

3.5.2 However for consideration of $SO_2$ impacts for the existing kiln emissions (A27, A28 and A61). The following $SO_2$ emission profile was provided by Morganite Electrical Carbon Ltd and a lower proposed limit value of 500 mg/Nm$^3$ was used.

3.5.3 Figure 3 and Figure 4 shows the typical temporal variation of $SO_2$ emissions from a kiln during a "Programme 12" process over 24 hours. The profiles reflect the process where much of the sulphur in the kiln is burned off in the early stages as the temperature increases, causing the observed emission peaks.

3.5.4 It was considered important to reflect these peaks in the modelling methodology, particularly when assessing $SO_2$ concentrations.

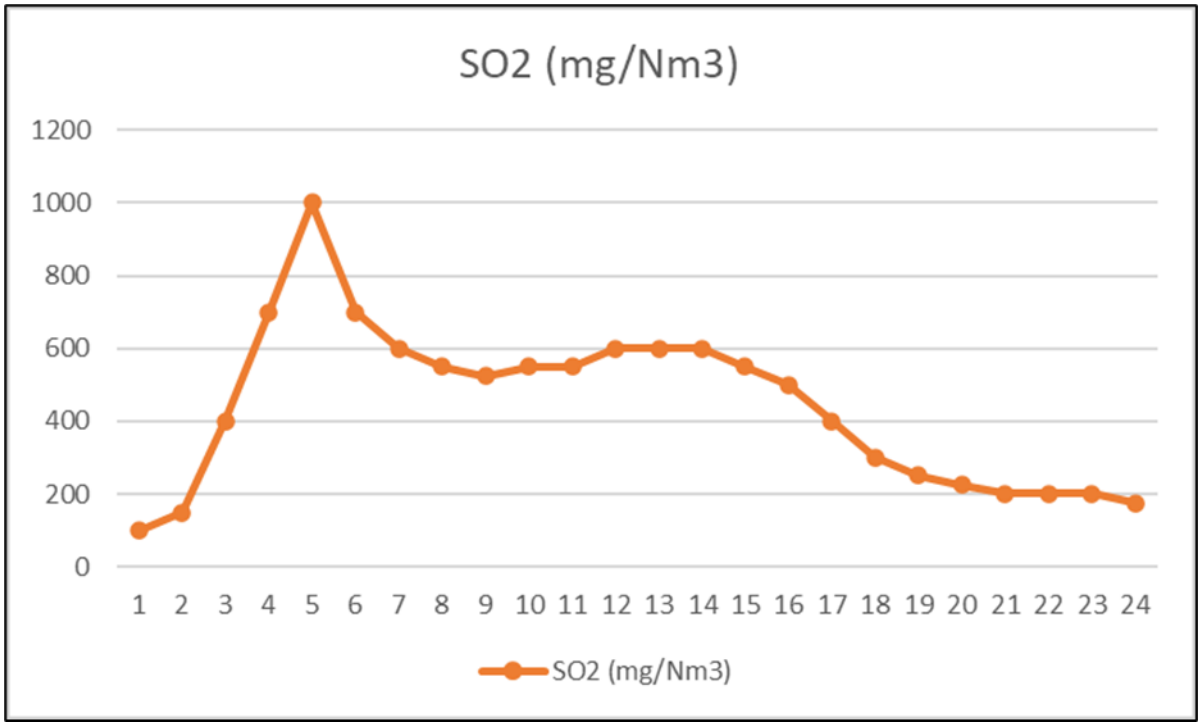
**Figure 3 Monitored "Programme 12" Emission Profile**




3.5.5 Figure 3 shows that $SO_2$ emissions typically peak at under 800 mg/Nm$^3$ for an hourly average.

3.5.6 To provide a robust assessment and to allow a margin for higher peak emissions the following diurnal emission profile was input into ADMS-6 using a peak 1 hour mean emission of 1000 mg/Nm$^3$ as shown in Figure 4.

**Figure 4 – ADMS Diurnal $SO_2$ Emission Profile**




3.5.7 The emissions for each hour were applied to the flow rates for each kiln emission stack to give the emissions shown in Table 7.

**Table 7 – Kiln 24-Hour Emissions Profiles**

| Hour | $SO_2$ Concentrations (mg/Nm$^3$) | A27 Emission (g/s) | A28 Emission (g/s) | A61 Emission (g/s) |
|---|---|---|---|---|
| 0 | 100 | 0.240 | 0.258 | 0.251 |
| 1 | 150 | 0.360 | 0.387 | 0.377 |
| 2 | 400 | 0.960 | 1.031 | 1.005 |
| 3 | 700 | 1.681 | 1.805 | 1.759 |
| 4 | 1000 | 2.401 | 2.578 | 2.513 |
| 5 | 700 | 1.681 | 1.805 | 1.759 |
| 6 | 600 | 1.441 | 1.547 | 1.508 |
| 7 | 550 | 1.321 | 1.418 | 1.382 |
| 8 | 525 | 1.261 | 1.354 | 1.319 |
| 9 | 550 | 1.321 | 1.418 | 1.382 |
| 10 | 550 | 1.321 | 1.418 | 1.382 |
| 11 | 600 | 1.441 | 1.547 | 1.508 |
| 12 | 600 | 1.441 | 1.547 | 1.508 |
| 13 | 600 | 1.441 | 1.547 | 1.508 |
| 14 | 550 | 1.321 | 1.418 | 1.382 |

| Hour | $SO_2$ Concentrations ($mg/Nm^3$) | A27 Emission (g/s) | A28 Emission (g/s) | A61 Emission (g/s) |
|---|---|---|---|---|
| 15 | 500 | 1.201 | 1.289 | 1.256 |
| 16 | 400 | 0.960 | 1.031 | 1.005 |
| 17 | 300 | 0.720 | 0.774 | 0.754 |
| 18 | 250 | 0.600 | 0.645 | 0.628 |
| 19 | 225 | 0.540 | 0.580 | 0.565 |
| 20 | 200 | 0.480 | 0.516 | 0.503 |
| 21 | 200 | 0.480 | 0.516 | 0.503 |
| 22 | 200 | 0.480 | 0.516 | 0.503 |
| 23 | 175 | 0.420 | 0.451 | 0.440 |
| **24 hour Mean** | **442** | | | |

3.5.8 Morganite Electrical Carbon Ltd have confirmed the processes runs on one kiln per day, in which operations shift between existing and proposed kilns. To reflect operational variations Morganite Electrical Carbon Ltd provided the following phasing for the commencement of processes at 09:00 hours on the following days:

- Monday: kiln 1 or 2 (A27);
- Tuesday: kiln 1 or 2 (A27);
- Wednesday: kiln 3 (A28);
- Thursday: kiln 5 (A61);
- Friday: kiln 1 or 2 (A27); and
- Saturday and Sunday: no kiln process commenced.

3.5.9 The diurnal and weekly profiles were input into ADMS-6 as a '**.var file*' for each meteorological year modelled to provide $SO_2$ impacts in the vicinity of the site for comparison against against AQSs described in Table 4.

### Emergency Generator emissions

3.5.10 For consideration of the proposed emergency generator which would operate for a maximum of 50 hours per year (in reality much less than this) it was assumed that NOx, PM, VOC and 24 hour $SO_2$ are emitted constantly which would be a large overestimation of real emissions. Actual impact contributions from this source will be small.

3.5.11 To consider 15 minute and 1 hour $SO_2$ emission in more detail hypergeometric probability distribution was undertaken rather than assuming constant operation as existing source emissions are higher.

3.5.12 The hypergeometric distribution methodology is provided within the EA Guidance and informed by the EA document 'Specified generators: air dispersion modelling example short term statistical analysis'[8]. This statistical analysis randomly selects multiple hours within a year and predicts the probability of an exceedance of the EQS.

[8] https://www.gov.uk/guidance/specified-generators-dispersion-modelling-assessment

3.5.13 The EA guidance states that where the probability is:

- 1% or less – exceedances are highly unlikely;
- less than 5% – exceedances are unlikely as long as the generator plant operational lifetime is no more than 20 years; and
- more than or equal to 5% – there is potential for exceedances and the regulator will consider if not significant on a case-by-case basis.

3.5.14 The EA guidance[8] also states that annual mean PCs associated with operation hours less than a full calendar year can be calculated by applying a proportional factor. For a maximum generator operation of 50 hours per year a factor of 0.0057 was applied to annual mean PC results.

3.5.15 Specific results are presented for these metrics without generator emissions and further statistical analysis then carried out at each receptor to include contributions from the generator. The generator is neither an MCP or a Specific Generator, therefore requirements of EPR Schedules 25A&B do not apply

## 3.6 Assessment Extents

3.6.1 Ambient concentrations were predicted over the following area grid to allow pollutant contours where required: NGR: 266725, 197200 to 268725, 198900.

3.6.2 One Cartesian grid with a resolution of 20 m and a height of 1.5 m was included in the model. Results were subsequently used to produce contour plots within the Surfer software package.

## 3.7 Human Sensitive Receptors

3.7.1 A desk-top study was undertaken in order to identify sensitive human receptor locations in the vicinity of the site that required specific consideration during the assessment. This includes locations where members of the general public may be present for specific periods of time.

3.7.2 These were modelled at the minimum height of relevant exposure, equivalent to the average breathing height. The modelled receptors are summarised in Table 8.

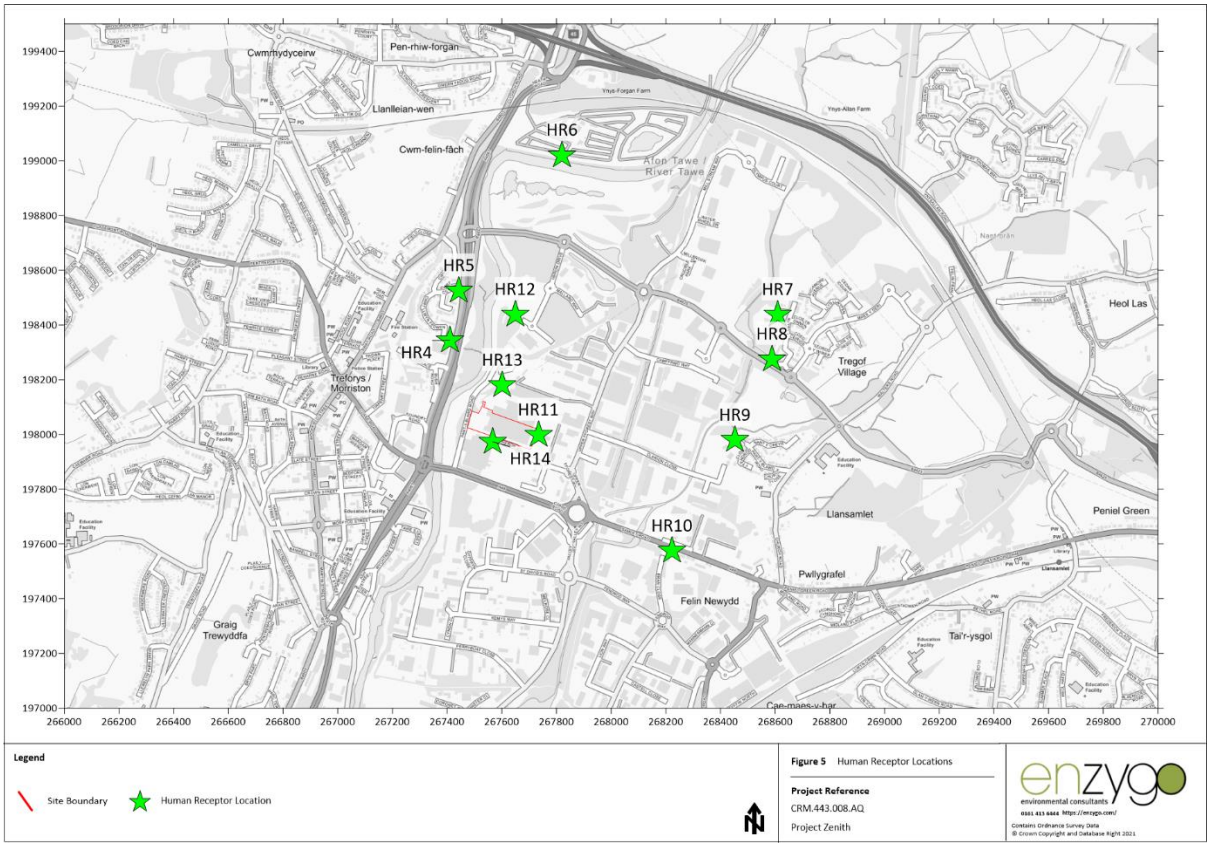
**Table 8: Sensitive Human Receptors**

| Receptor | | Land Use | NGR (m) | | Height (m) |
|---|---|---|---|---|---|
| | | | X | Y | |
| HR1 | Morriston Primary School | Residential | 267218.1 | 197787.9 | 1.5 |
| HR2 | 40 Clase Rd, Morriston | Residential | 267220.1 | 197919.2 | 1.5 |
| HR3 | 31 Bush Road, Morriston | Residential | 267337.6 | 198133.6 | 1.5 |
| HR4 | 59 Cwrt Llwyn Fedwen, Morriston | Residential | 267410.2 | 198343.5 | 1.5 |
| HR5 | 14 Cwrt Cilmeri, Morriston | Residential | 267443.3 | 198525.1 | 1.5 |
| HR6 | Riverside Holiday Park | Residential | 267820.7 | 199020.5 | 1.5 |
| HR7 | 45 Heol Y Celyn, Tregof Village | Residential | 268608.7 | 198437.8 | 1.5 |
| HR8 | Cwrt Y Fedwen, Tregof Village | Residential | 268588.1 | 198275.1 | 1.5 |
| HR9 | 31 Pant-Y-Blawd Rd, Tregof Village | Residential | 268452.7 | 197979.1 | 1.5 |
| HR10 | 54 Samlet Rd, Llansamlet | Residential | 268222.1 | 197574.3 | 1.5 |
| HR11 | Premier Inn Swansea North Hotel | Commercial | 267734.0 | 197997.9 | 1.5 |

| Receptor | | Land Use | NGR (m) | | Height (m) |
|---|---|---|---|---|---|
| | | | X | Y | |
| HR12 | Runtech Limited | Commercial | 267648.8 | 198438.6 | 1.5 |
| HR13 | Travellers Site | Residential | 267779.3 | 198118.6 | 1.5 |
| HR14 | Asda | Commercial | 267566.0 | 197973.2 | 1.5 |

3.7.3 The modelled human receptor locations are displayed in Figure 5.

**Figure 5 - Modelled Human Receptor Locations**




## 3.8 Ecological Sensitive Receptors

3.8.1 With regard to receptors of ecological sensitivity, the EA guidance 'Air emissions risk assessment for your environmental permit' states:

> "Note that conservation sites need only be considered where they fall within set distances of the activity:
>
> - SPAs, SACs or Ramsar sites within 10 km of the Site;
> - National Nature Reserves (NNRs), Local Nature Reserves (LNRs), Local Wildlife Sites (LWS) and Ancient Woodland (AW) within 2 km of the application site."
> - Sites of Special Scientific Importance (SSSIs) were also considered within 10 km of the Site.

3.8.2 A study was undertaken to identify any statutory designated sites of ecological or nature conservation importance within the distances stated above. This was completed using the

Multi-Agency Geographic Information for the Countryside (MAGIC) web-based interactive mapping service, which draws information on key environmental schemes and designations.

3.8.3 South East Wales Biodiversity Records Centre (SEWBRC) provided locations and citations associated with local designations within 2 km of the Facility.

3.8.4 The receptor points are chosen to represent the closest points to the Facility and are displayed in Table 9 and Figure 6. No further designations are located within the assessment buffers.

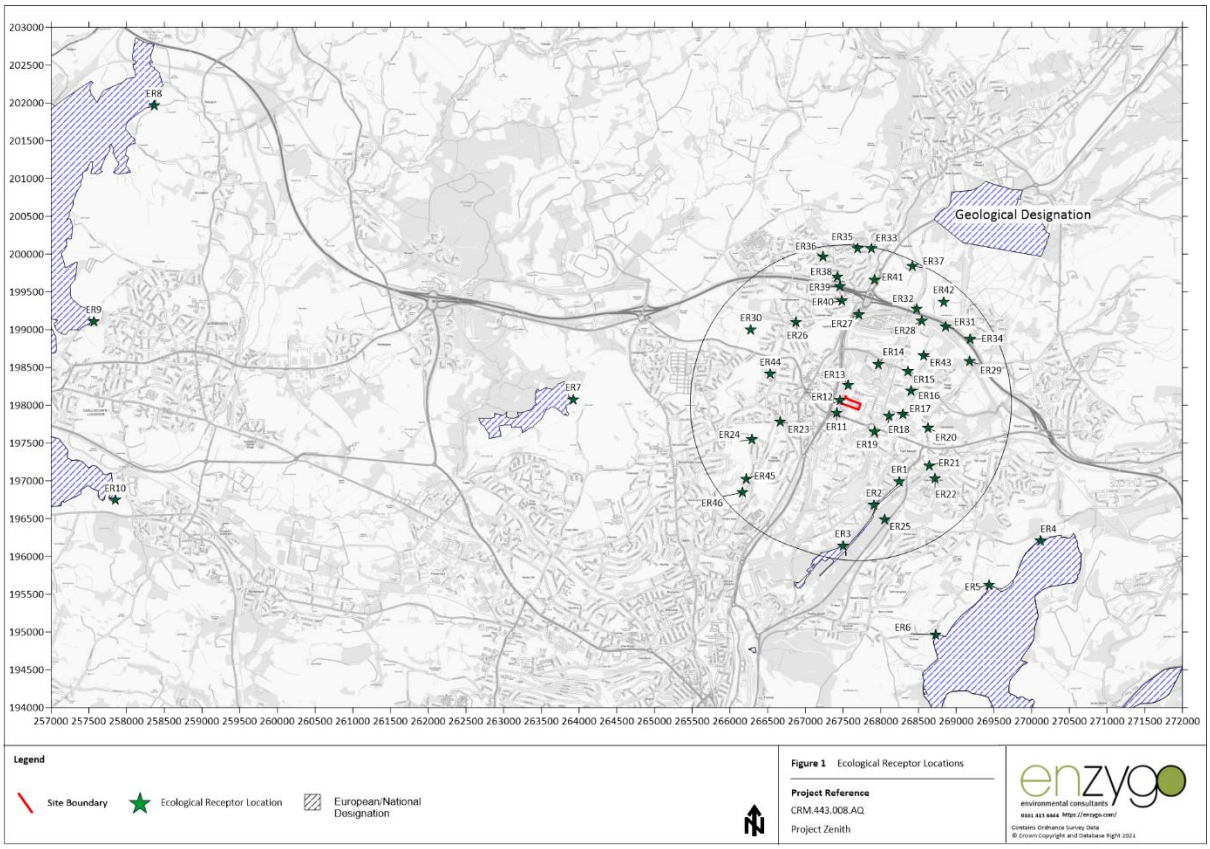
**Table 9: Ecological Sensitive Receptors**

| Site ID, Name and NBGRC ID | | Type | NGR (m) | | Distance to Site (m) |
|---|---|---|---|---|---|
| | | | X | Y | |
| ER1 | Six Pit, Swansea Vale and White Rock | SSSI | 268247 | 196989 | 1,219 |
| ER2 | Six Pit, Swansea Vale and White Rock | SSSI | 267910 | 196679 | 1,395 |
| ER3 | Six Pit, Swansea Vale and White Rock | SSSI | 267497 | 196138 | 1,917 |
| ER4 | Crymlyn Bog | SSSI | 270118 | 196207 | 3,083 |
| ER5 | Crymlyn Bog | Ramsar, SAC, SSSI | 269437 | 195623 | 3,016 |
| ER6 | Crymlyn Bog | Ramsar, SAC, SSSI, NNR | 268730 | 194965 | 3,269 |
| ER7 | Penplas Grasslands | SSSI | 263922 | 198075 | 3,724 |
| ER8 | Carmarthen Bay and Estuaries, Burry Inlet | Ramsar, SAC, SSSI, SPA | 258366 | 201963 | 10,071 |
| ER9 | Carmarthen Bay and Estuaries, Burry Inlet | Ramsar, SAC, SSSI, SPA | 257566 | 199104 | 10,135 |
| ER10 | Carmarthen Bay and Estuaries, Burry Inlet | Ramsar, SAC, SSSI, SPA | 257852 | 196741 | 9,881 |
| ER11 | Tawe Corridor | LWS | 267419 | 197892 | 276 |
| ER12 | Tawe Corridor | LWS | 267461 | 198065 | 186 |
| ER13 | Tawe Corridor | LWS | 267570 | 198263 | 227 |
| ER14 | Tawe Corridor | LWS | 267967 | 198538 | 585 |
| ER15 | Swansea Vale / Fendrod NR | LWS | 268363 | 198446 | 820 |
| ER16 | Swansea Vale / Fendrod NR | LWS | 268398 | 198192 | 766 |
| ER17 | Swansea Vale / Fendrod NR | LWS | 268292 | 197880 | 668 |
| ER18 | Fendrod Lake and Nant-y-Fendrod | LWS | 268113 | 197856 | 505 |
| ER19 | Fendrod Lake and Nant-y-Fendrod | LWS | 267922 | 197644 | 490 |
| ER20 | Llansamlet Marshes | LWS | 268626 | 197692 | 1,043 |
| ER21 | Main Swansea - Fishguard Railway Line | LWS | 268645 | 197193 | 1,316 |
| ER22 | Trallwn Marsh and Wood | LWS | 268722 | 197033 | 1,480 |
| ER23 | Trewyddfa Slopes | LWS | 266669 | 197783 | 1,013 |
| ER24 | Llewellyn Heath | LWS | 266294 | 197547 | 1,442 |
| ER25 | Pluck Lake | LWS | 268055 | 196487 | 1,615 |
| ER26 | Cwm Rhydyceirw to Birchgrove railway | LWS | 266877 | 199098 | 1,301 |
| ER27 | Cwm Rhydyceirw to Birchgrove railway | LWS | 267707 | 199195 | 1,148 |

| Site ID, Name and NBGRC ID | | Type | NGR (m) | | Distance to Site (m) |
|---|---|---|---|---|---|
| | | | X | Y | |
| ER28 | Cwm Rhydyceirw to Birchgrove railway | LWS | 268541 | 199110 | 1,388 |
| ER29 | Cwm Rhydyceirw to Birchgrove railway | LWS | 269178 | 198577 | 1,620 |
| ER30 | Llangyfelach Golf Course & Surrounds | LWS | 266278 | 198996 | 1,664 |
| ER31 | M4 Corridor | LWS | 268863 | 199037 | 1,567 |
| ER32 | Ynystanglws | LWS | 268475 | 199276 | 1,480 |
| ER33 | Ynysforgan Wood | LWS | 267874 | 200073 | 2,037 |
| ER34 | Upper Bran Grazing-Marshes & Heol Las Coalyard | LWS | 269187 | 198871 | 1,746 |
| ER35 | Ancient Woodland 1 | AW | 267689 | 200069 | 2000 |
| ER36 | Ancient Woodland 2 | AW | 267232 | 199961 | 1956 |
| ER37 | Ancient Woodland 3 | AW | 268420 | 199843 | 1954 |
| ER38 | Ancient Woodland 4 | AW | 267429 | 199694 | 1660 |
| ER39 | Ancient Woodland 5 | AW | 267460 | 199573 | 1535 |
| ER40 | Ancient Woodland 6 | AW | 267488 | 199377 | 1337 |
| ER41 | Ancient Woodland 7 | AW | 267916 | 199659 | 1632 |
| ER42 | Ancient Woodland 8 | AW | 268834 | 199365 | 1773 |
| ER43 | Ancient Woodland 9 | AW | 268573 | 198652 | 1106 |
| ER44 | Ancient Woodland 10 | AW | 266536 | 198410 | 1168 |
| ER45 | Ancient Woodland 11 | AW | 266216 | 197023 | 1760 |
| ER46 | Ancient Woodland 12 | AW | 266168 | 196846 | 1906 |

3.8.5 The modelled ecological receptor locations are displayed in Figure 6.

**Figure 6 – Modelled Ecological Receptor Locations**




## 3.9 Baseline Conditions

3.9.1 A desktop study was undertaken to define the baseline air quality within the vicinity of the application site. Pollutant background concentrations for the site and human receptor locations have been sourced from the DEFRA background maps and national monitoring networks. Background concentrations and depositions for ecological receptors have been derived from the UK Air Pollution Information System (APIS) website[6].

3.9.2 All baseline information is detailed in Section 4.0.

## 3.10 Meteorological Data

3.10.1 Hourly sequential meteorological data used in this assessment was taken from Mumbles meteorological station located approximately 12 km southwest of the Facility and modelled for the site area and provided as Numerical Weather Prediction (NWP) data.

3.10.2 All meteorological data used in the assessment was provided by ADM Ltd, which is an established distributor of meteorological data within the UK. Maximum emissions across the five years (2019 - 2023) of meteorological data were utilised to ensure a worse case assessment.

3.10.3 Figure 7 shows the 5 years wind-rose dataset.

**Figure 7 – Meteorological Data Wind Roses**


## 3.11 Roughness Length

3.11.1 The specific roughness length ($z_0$) values used to represent conditions in the vicinity of the application site is summarised in Table 10.

**Table 10: Utilised Roughness Length**

| Location | Roughness length (m) | ADMS Description |
|---|---|---|
| Assessment Area | 1.0 | Cities, woodlands |

## 3.12 Monin-Obukhov Length

3.12.1 The Monin-Obukhov length provides a measure of the stability of the atmosphere. The specific length value used to represent conditions in the vicinity of the application site is summarised in Table 11.

**Table 11: Utilised Monin-Obukhov Lengths**

| Location | Monin-Obukhov length (m) | ADMS Description |
|---|---|---|
| Assessment Extents | 30 | Mixed urban/industrial |

## 3.13 Surface Albedo and Priestley-Taylor Parameter

3.13.1 The surface albedo and Priestley-Taylor parameters used in the assessment were the model default values of 0.23 and 1 respectively.

## 3.14 Terrain Data

3.14.1 Ordnance Survey Landform Panorama terrain data was included for the application site and surrounding assessment extents in order to take account of the specific flow field produced by variations in ground height throughout the assessment extents.

3.14.2 This was pre-processed using the dedicated function within ADMS-6 and covers all modelling input and receptor location.

## 3.15 Building Effects

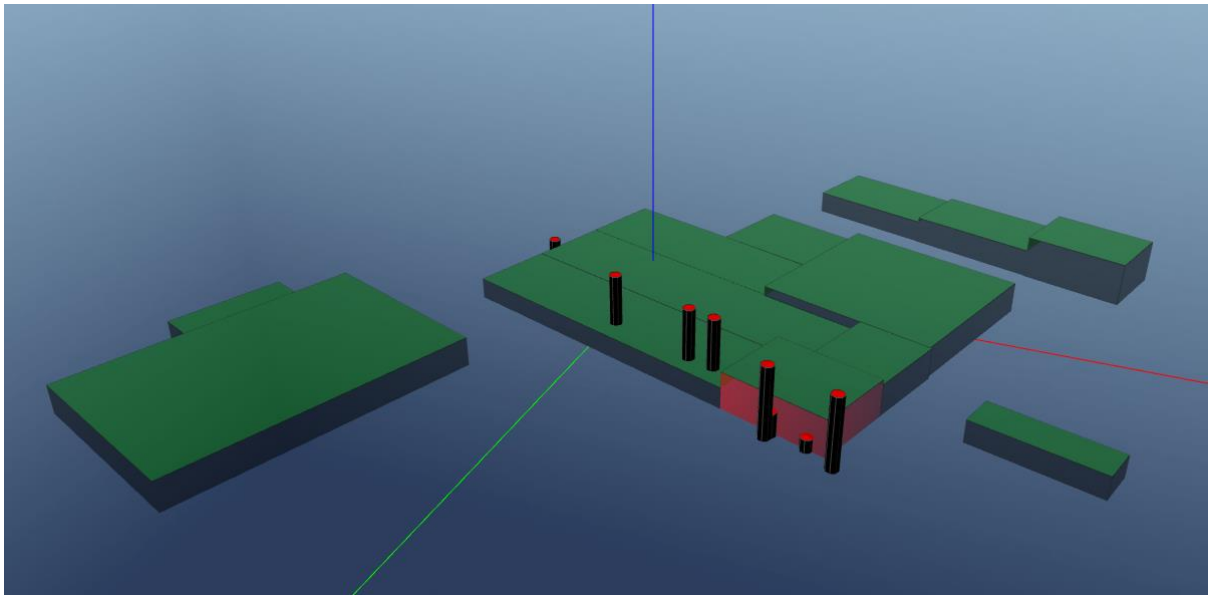
3.15.1 The dispersion of substances released from elevated sources can be influenced by the presence of buildings close to the emission point. Structures can interrupt the wind flows and cause significantly higher ground-level concentrations close to base of buildings than would arise in the absence of the buildings.

3.15.2 Building heights model inputs are summarised in Table 12.

**Table 12: Building Geometries**

| Building | | NGR (m) | | Height (m) | Length / Diameter (m) | Width (m) | Angle (°) |
|---|---|---|---|---|---|---|---|
| | | X | Y | | | | |
| 1 | Morganite 1 Front | 267680.3 | 197987.3 | 14.0 | 31.0 | 41.6 | 199.1 |
| 2 | Morganite 2 Rear | 267604.5 | 198013.3 | 8.0 | 31.0 | 118.6 | 199.0 |
| 3 | Morganite 2 Front | 267696.8 | 198014.6 | 12.0 | 31.2 | 28.3 | 199.2 |
| 4 | Morganite 2 Rear | 267621.1 | 198040.8 | 8.0 | 31.3 | 132.1 | 199.0 |
| 5 | Morganite 3 Front | 267692.1 | 198066.7 | 12.0 | 64.9 | 69.4 | 198.6 |
| 6 | Morganite 3a Rear | 267611.4 | 198077.4 | 8.0 | 31.4 | 90.4 | 199.0 |
| 7 | Morganite 3b Rear | 267643.8 | 198100.2 | 8.0 | 33.3 | 44.2 | 199.9 |
| 8 | Something Different Wholesale Front | 267759.1 | 198127.6 | 17.0 | 28.8 | 38.5 | 198.8 |
| 9 | Something Different Wholesale Mid | 267717.7 | 198142.5 | 11.0 | 28.9 | 49.6 | 199.4 |
| 10 | Something Different Wholesale Rear | 267671.0 | 198159.5 | 9.0 | 29.5 | 49.5 | 199.3 |
| 11 | ASDA | 267510.8 | 197931.4 | 11.0 | 111.5 | 74.5 | 200.0 |
| 12 | ASDA Annex | 267471.9 | 197961.1 | 8.0 | 44.1 | 17.0 | 200.9 |
| 13 | Premier Inn | 267755.9 | 197990.9 | 8.5 | 13.9 | 45.1 | 197.4 |

3.15.3 A three-dimensional representation of the modelled building layout is provided below.



## 3.16 $NO_x$ to $NO_2$ Conversion

3.16.1 Ground level $NO_x$ concentrations were predicted through dispersion modelling. $NO_2$ concentrations reported in the results section assume conversion from $NO_x$ to $NO_2$, based upon EA guidance[4] detailed below:

- 35% for short-term average concentrations
- 70% for long-term average concentrations

## 3.17 15-minute Sulphur Dioxide Concentration Predictions

3.17.1 15-minute mean $SO_2$ concentrations have been calculated using the following correction factor based upon empirical relationships with the 99.9$^{th}$ percentile of 1-hour means, as described in EA guidance:

- 99.9$^{th}$ percentile of 15-minute means = 1.34 * 99.9$^{th}$ percentile of 1-hour means.

## 3.18 Deposition Rates

3.18.1 Deposition rates were calculated using the conversion factors provided within EA document 'Technical Guidance on Detailed Modelling approach for an Appropriate Assessment for Emissions to Air AQTAG 06[9]. Predicted pollutant concentrations were multiplied by the relevant deposition velocity and conversion factor to calculate the speciated dry deposition flux. The conversion factors used are presented within Table 13.

**Table 13: Conversion Factors to Determine Dry Deposition Flux**

| Pollutant | Grassland Deposition Velocity (m/s) | Forest Deposition Velocity (m/s) | Conversion Factor (µg/m$^2$/s to kg/ha/yr) |
|---|---|---|---|
| $NO_2$ | 0.0015 | 0.003 | 95.9 |
| $SO_2$ | 0.012 | 0.024 | 157.7 |

[9] AQTAG 06: Technical guidance on detailed modelling approach for an appropriate assessment for emissions to air, EA, 2014

3.18.2 Acid deposition occurs as a result of $NO_2$, $SO_2$ and HCl. Predicted ground level pollutant concentrations were converted to kilo-equivalent ion depositions (keq/ha/yr) for comparison with the CLd for acid deposition at each of the identified ecological receptors.

3.18.3 The conversion to units of equivalents, a measure of the potential acidifying effect of a species, was undertaken by multiplying the dry deposition flux by the standard conversion factors shown in Table 14.

**Table 14: Conversion Factors to Units of Equivalents**

| Species | Conversion Factor from kg/ha/yr to keq/ha/yr |
|---|---|
| N | Divide by 14 |
| S | Divide by 16 |

3.18.4 The total N proportion was calculated from NO2 concentrations. The proportion of the EQS consisting of the process contribution (PC) and Predicted Environmental Concentration (PEC) were then calculated using the tool available on the APIS website.

## 3.19 Assessment Criteria

3.19.1 Predicted ground level pollutant concentrations and deposition rates were compared with the relevant EQS identified within Table 1 to Table 3.

## 3.20 Significance of Impacts

### Human Receptors

3.20.1 Guidance for assessing the significance of emissions impacts from point sources is provided in the EA's online guidance3.

3.20.2 Predicted pollutant concentrations are summarised in the following formats:

- PC - Predicted pollutant concentration as a result of proposed new and combined emissions from the Facility – PCs were assessed for both new and combined site emissions; and
- PEC - Total predicted pollutant concentration as a result of new and existing emissions from the Facility and existing baseline levels.

*Initial Screening Stage*

3.20.3 The significance of predicted impact has been assessed in accordance with criteria in the EA guidance 'Air emissions risk assessment for your environmental permit' and through consideration of likely effects as a result of the proposals. The EA guidance states that process contributions can be considered insignificant if:

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

3.20.4 If both criteria are met predicted impacts can be considered insignificant and no further analysis is required.

*Second Screening Stage*

3.20.5 If the above criteria are not met then a second stage of screening to determine the impact of the PEC is required:

- The short-term PC is less than 20% of the short-term environmental standards minus twice the long-term background concentration; and
- The long-term PEC is less than 70% of the long-term environmental standards.

3.20.6 If both of these criteria are met during the second stage of screening then predicted impacts can be considered insignificant. Should these criteria be exceeded then the PEC should be checked against the EQS.

3.20.7 The IAQM's position[10] is that an exceedance of 1% of the EQS is effectively a PC impact of 1.49% or greater.

### Ecological Receptors

3.20.8 If emissions that affect LWS or LNR meet both of the following criteria outlined within the EA guidance 'Air emissions risk assessment for your environmental permit', can be considered insignificant:

- The short-term PC is less than 100% of the short-term environmental standard; and
- The long-term PC is less than 100% of the long-term environmental standard.

## 3.21 Modelling Uncertainties

3.21.1 Uncertainty in dispersion modelling predictions can be associated with a variety of factors, including:

- Model uncertainty - due to known model limitations;
- Data uncertainty - due to errors in input data, including emission estimates, operational procedures, land use characteristics and meteorology; and
- Variability - randomness of measurements used.

3.21.2 Further potential uncertainties in model results were minimised as far as practicable and worst-case assumptions applied throughout the modelling process, which relate to:

- Choice of model - ADMS 6 is a commonly used atmospheric dispersion model and results have been verified through a number of studies to ensure predictions are as accurate as possible;
- Meteorological data - Modelling was undertaken using five meteorological data sets (2015-2019) from the most appropriate observation site to the site to take account of variable worst-case conditions;
- Plant operating conditions - Operational parameters were supplied by Morganite Electrical Carbon Ltd based on the monitored data and proposed plant specifications. As such, these are considered to be representative of likely operating conditions; and

[10] https://www.iaqm.co.uk/text/position_statements/aq_impacts_sensitive_habitats.pdf

- Emission rates – based on industry standard maximum ELVs or the most recent monitoring data. As such, these are considered to be a robust approach.

It is considered that the application of the above measures and assumptions are sufficient enough to reduce significant uncertainty in the modelling results.

# 4.0 Baseline Conditions

## 4.1 Introduction

4.1.1 Existing air quality conditions in the vicinity of the application site was identified in order to provide a baseline for assessment. These are detailed in the following sections.

## 4.2 Local Air Quality Management

4.2.1 As required by the Environment Act (1995), City and County of Swansea (CCS) has undertaken a review and assessment of air quality within their area of administration. A review of DEFRA's database indicates 3 AQMAs declared by CCS of which the closest to the site is the Swansea Air Quality Management Area 2010. This is located 2.5 km from the Site and therefore stack emissions are unlikely to affect human receptors within this area.

## 4.3 Local Air Quality Monitoring

4.3.1 Monitoring of pollutant concentrations is undertaken by CCS throughout their area of administration using automatic and passive techniques. A review of the most recent Air Quality Status Report[11] (ASR) indicated one automatic analyser and 22 NO2 diffusion tubes located within approximately 3 km of the Site. Data from recent years at the automatic analyser are presented in Table 15.

**Table 15: Automatic Analyser Monitoring Results**

| Site ID and Name | Type | Distance to Site (m) | Pollutant | Concentration (µg/m³) | | | |
|---|---|---|---|---|---|---|---|
| | | | | 2019 | 2020 | 2021 | 2022 |
| CM2 – Morriston Groundhog | Roadside | 575 | $NO_2$ Annual Mean | 23.5 | 11.40 | 21.30 | 20.60 |
| | | | $NO_2$ (1 hr >200 µg/m³) | 0 | 3 | 0 | 0 |
| | | | $PM_{2.5}$ Annual Mean | 9.3 | 11.4 | 11.8 | 9.4 |

4.3.2 CCS also monitor annual mean NO2 concentrations using passive diffusion tube techniques. A review of the 2023. Monitoring data from recent years is presented in Table 16.

**Table 16: $NO_2$ Monitoring Results**

| Site Name | NGR (m) | | Distance to Site (m) | Annual Mean Concentration (µg/m³) | | | |
|---|---|---|---|---|---|---|---|
| | X | Y | | 2019 | 2020 | 2021 | 2022 |
| 40 - Morriston Groundhog | 267210 | 198278 | 492 | 19.9 | 14.3 | 17.7 | 15.6 |
| 41 - Woodfield Road | 266953 | 198085 | 694 | 27.4 | 22.8 | 26.1 | 22.6 |
| 43 - Clase Road | 267093 | 198063 | 553 | 26.4 | 20.9 | 25.2 | 22.7 |
| 44 - Ian's Walk | 267639 | 199543 | 1,494 | 21.7 | 15.5 | 18.5 | 16.4 |
| 45 – Glyncollen Drive | 267661 | 199451 | 1,402 | 23.0 | 18.2 | 21.4 | 18.4 |
| 50 - Nantyffin Road | 268530 | 197419 | 1,086 | 26.3 | 21.4 | 24.6 | 22.1 |
| 54 - Peniel Green Road | 268693 | 197416 | 1,223 | 24.5 | 19.7 | 23.6 | 20.7 |
| 55 - Peniel Green Road | 268789 | 197420 | 1,305 | 24.6 | 19.5 | 25.2 | 20.5 |
| 56 – Ynysallan Road | 269306 | 198661 | 1,769 | 27.7 | 23.1 | 24.0 | 22.0 |

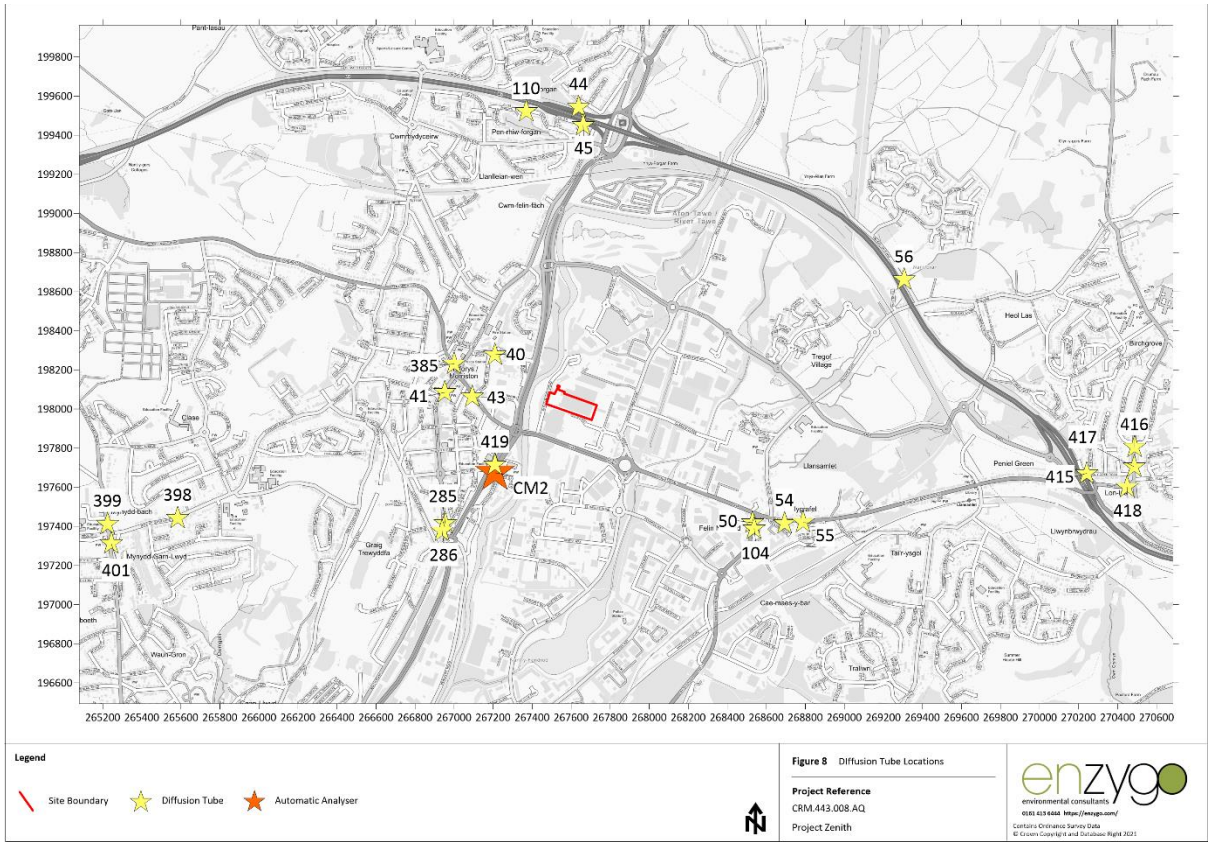
[11] 2022 Air Quality Annual Status Report, Bassetlaw District Council, November 2022

| Site Name | NGR (m) | | Distance to Site (m) | Annual Mean Concentration (µg/m³) | | | |
|---|---|---|---|---|---|---|---|
| | X | Y | | 2019 | 2020 | 2021 | 2022 |
| 104 - Nantyffin Road | 268538 | 197389 | 1,110 | 20.6 | 17.4 | 19.9 | 18.2 |
| 110 - Cefn Glas | 267369 | 199521 | 1,498 | 18.7 | 14.2 | 17.1 | 15.5 |
| 285 - Martin Street | 266955 | 197415 | 938 | 26.2 | 20.2 | 23.5 | 22.3 |
| 286 - Martin Street | 266938 | 197377 | 976 | 24.3 | 19.4 | 22.0 | 21.2 |
| 385 – Pentrepoeth Road | 267001 | 198231 | 670 | 26.8 | 20.9 | 24.5 | 21.6 |
| 398 - Mynydd Garllwyn Road | 265584 | 197442 | 2,149 | 16.0 | 13.3 | 13.9 | 12.5 |
| 399 - Mynydd Garllwyn Road | 265224 | 197412 | 2,504 | 26.6 | 18.4 | 22.8 | 19.9 |
| 401 - Llangyfelach Road | 265243 | 197312 | 2,513 | 23.9 | 18.7 | 21.1 | 20.4 |
| 415 – Danycoed | 270242 | 197671 | 2,623 | 25.9 | 21.1 | 23.3 | 21.5 |
| 416 – Birchgrove Road | 270487 | 197805 | 2,851 | 18.2 | 14.9 | 16.2 | 14.2 |
| 417 – Birchgrove Road | 270485 | 197705 | 2,860 | 22.7 | 16.8 | 18.3 | 15.7 |
| 418 – Birchgrove Road | 270449 | 197600 | 2,839 | 21.0 | 16.9 | 20.2 | 15.2 |
| 419 - Morriston Groundhog | 267210 | 197714 | 550 | 22.9 | 17.9 | 21.4 | 17.0 |

4.3.3 Monitoring data from recent years, does not indicate any exceedances of the annual mean or 1 hour mean AQOs at any locations within 3 km of the application site. 2020 and 2021 monitoring results were affected by the impacts of the COVID restrictions and are considered unrepresentative of normal conditions.

4.3.4 Figure 8 provides a graphical representation the diffusion tube monitoring locations.

**Figure 8 – Diffusion Tube Monitors**



## 4.4 DEFRA Background Concentrations

4.4.1 DEFRA has produced predictions of background pollutant concentrations on a 1 km by 1 km grid for the entire of the UK. The assessment extents, including human sensitive receptors, are located across numerous NGR squares. Data for these locations was downloaded from the DEFRA and summarised in Table 17.

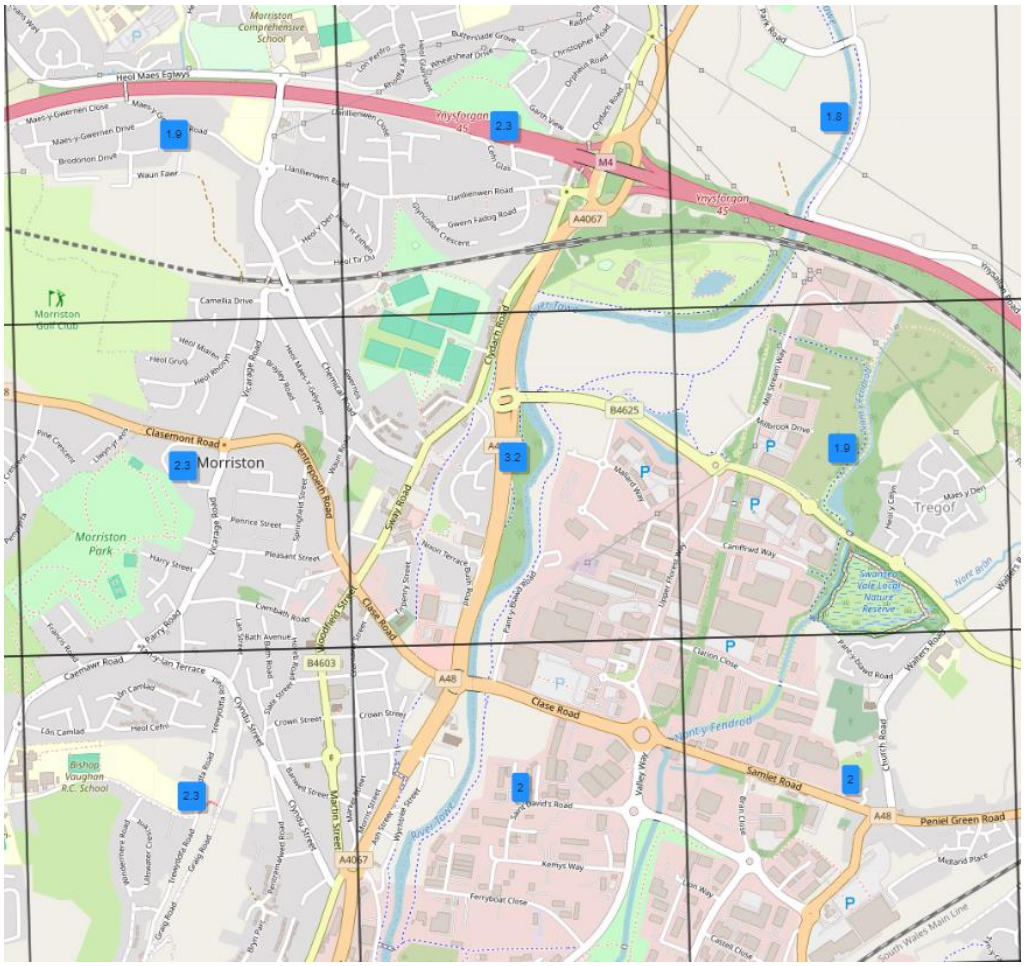
**Table 17: Predicted DEFRA Background Pollutant Concentrations**

| DEFRA Grid Square | Predicted Background Concentration (µg/m³) | | | | |
|---|---|---|---|---|---|
| | $NO_2$ | $NO_x$ | $PM_{10}$ | $PM_{2.5}$ | Benzene |
| 267500 197500 | 13.46 | 10.26 | 11.42 | 7.34 | 0.34 |
| 267500 198500 | 13.80 | 10.52 | 11.74 | 7.56 | 0.34 |
| 267500 199500 | 16.05 | 12.12 | 12.99 | 8.26 | 0.33 |
| 268500 198500 | 11.53 | 8.90 | 11.13 | 7.07 | 0.33 |
| 268500 197500 | 12.85 | 9.82 | 11.13 | 7.16 | 0.32 |

4.4.2 Background concentrations for $NO_X$, $NO_2$, $PM_{10}$ and $PM_{2.5}$ are predicted for 2024, whilst benzene is predicted for 2010. These are the most recent predictions available from DEFRA.

4.4.3 The most recent $SO_2$ background data published by DEFRA is from 2001, as such, more recently available data published on the APIS6 website was reviewed. The most recent data is a 3 year mean concentration from 2019 to 2021. The gridded background SO2 concentrations are shown in Figure 9.

**Figure 9 – APIS Gridded $SO_2$ Background**




*Source: APIS*

4.4.4 To avoid double counting an average background concentration of 2.06 mg/m$^3$ calculated from the surrounding grid squares the site was used when considering existing site impacts. A value of 3.2 mg/m3 was used as a background concentration when considering new emission impact in isolation.

4.4.5 It was assumed that the short-term background concentration is twice its long-term concentration to provide a robust case approach.

## 4.5 PAH Monitoring

4.5.1 Concentrations of BaP are monitored in the UK through the UK PAH Digitel (solid phase) network. The closest site is the urban background location at Swansea Cwm Level Park at NGR: 265906, 195897. The most recent data available from this site is from 2023 as summarised in Table 18.

**Table 18 Acid Gas Monitoring Results**

| Species | Annual Mean Concentration (ng/m$^3$) |
|---|---|
| BaP | 0.67 |

## 4.6 Ecology Baseline

4.6.1 CLd have been designated within the UK based on the sensitivity and relevant features of the receiving habitat. A review of the APIS website was undertaken in order to identify the most suitable habitat description and associated CLd for the designations considered within the model. For the LWS's and LNR's the APIS "Search by Location Function" has been used to determine baseline levels for these sites.

4.6.2 Where designations with multiple habitats, the most sensitive habitat has been used for both nitrogen and acid deposition for the purpose of this assessment.

4.6.3 CLd for nitrogen deposition are presented in Table 19.

**Table 19: Nitrogen Critical Load**

| ID | Nitrogen Critical Load Class | Nitrogen Critical Load (kgN/ha/yr) | |
|---|---|---|---|
| | | Min | Max |
| ER1 | Broadleaved deciduous woodland | 10 | 15 |
| ER2 | Broadleaved deciduous woodland | 10 | 15 |
| ER3 | Broadleaved deciduous woodland | 10 | 15 |
| ER4 | Carex echinata-Sphagnum recurvum/auriculatum mire | 5 | 10 |
| ER5 | Carex echinata-Sphagnum recurvum/auriculatum mire | 5 | 10 |
| ER6 | Carex echinata-Sphagnum recurvum/auriculatum mire | 5 | 10 |
| ER7 | Moist or wet mesotrophic to eutrophic hay meadow | 15 | 25 |
| ER8 | Atlantic upper-mid & mid-low salt marshes | 10 | 20 |
| ER9 | Atlantic upper-mid & mid-low salt marshes | 10 | 20 |
| ER10 | Atlantic upper-mid & mid-low salt marshes | 10 | 20 |
| ER11 | Broadleaved deciduous woodland | 10 | 15 |
| ER12 | Broadleaved deciduous woodland | 10 | 15 |
| ER13 | Broadleaved deciduous woodland | 10 | 15 |
| ER14 | Broadleaved deciduous woodland | 10 | 15 |
| ER15 | Broadleaved deciduous woodland | 10 | 15 |
| ER16 | Broadleaved deciduous woodland | 10 | 15 |
| ER17 | Broadleaved deciduous woodland | 10 | 15 |
| ER18 | Broadleaved deciduous woodland | 10 | 15 |
| ER19 | Broadleaved deciduous woodland | 10 | 15 |
| ER20 | Rich Fens | 10 | 15 |
| ER21 | Broadleaved deciduous woodland | 10 | 15 |
| ER22 | Broadleaved deciduous woodland | 10 | 15 |
| ER23 | Broadleaved deciduous woodland | 10 | 15 |
| ER24 | Broadleaved deciduous woodland | 10 | 15 |
| ER25 | Broadleaved deciduous woodland | 10 | 15 |
| ER26 | Broadleaved deciduous woodland | 10 | 15 |
| ER27 | Broadleaved deciduous woodland | 10 | 15 |
| ER28 | Broadleaved deciduous woodland | 10 | 15 |
| ER29 | Broadleaved deciduous woodland | 10 | 15 |

| ID | Nitrogen Critical Load Class | Nitrogen Critical Load (kgN/ha/yr) | |
|---|---|---|---|
| | | Min | Max |
| ER30 | Broadleaved deciduous woodland | 10 | 15 |
| ER31 | Broadleaved deciduous woodland | 10 | 15 |
| ER32 | Broadleaved deciduous woodland | 10 | 15 |
| ER33 | Broadleaved deciduous woodland | 10 | 15 |
| ER34 | Broadleaved deciduous woodland | 10 | 15 |
| ER35 | Broadleaved deciduous woodland | 10 | 15 |
| ER36 | Broadleaved deciduous woodland | 10 | 15 |
| ER37 | Broadleaved deciduous woodland | 10 | 15 |
| ER38 | Broadleaved deciduous woodland | 10 | 15 |
| ER39 | Broadleaved deciduous woodland | 10 | 15 |
| ER40 | Broadleaved deciduous woodland | 10 | 15 |
| ER41 | Broadleaved deciduous woodland | 10 | 15 |
| ER42 | Broadleaved deciduous woodland | 10 | 15 |
| ER43 | Broadleaved deciduous woodland | 10 | 15 |
| ER44 | Broadleaved deciduous woodland | 10 | 15 |
| ER45 | Broadleaved deciduous woodland | 10 | 15 |
| ER46 | Broadleaved deciduous woodland | 10 | 15 |

4.6.4 Table 20 shows the relevant CLd for acid deposition.

**Table 20: Acid Critical Load**

| ID | Acidity Critical Load Class | Critical Load (ke/ha/yr) | | |
|---|---|---|---|---|
| | | CLmaxS | CLminN | CLmaxN |
| ER1 | Unmanaged Broadleafed/Coniferous Woodland | 2.698 | 0.357 | 3.055 |
| ER2 | Unmanaged Broadleafed/Coniferous Woodland | 2.698 | 0.357 | 3.055 |
| ER3 | Unmanaged Broadleafed/Coniferous Woodland | 2.698 | 0.357 | 3.055 |
| ER4 | Bogs | 0.34 | 0.321 | 0.661 |
| ER5 | Bogs | 0.34 | 0.321 | 0.661 |
| ER6 | Bogs | 0.34 | 0.321 | 0.661 |
| ER7 | Acid Grassland | 0.43 | 0.581 | 1.011 |
| ER8 | Calcareous grassland | 4 | 0.856 | 4.856 |
| ER9 | Calcareous grassland | 4 | 0.856 | 4.856 |
| ER10 | Calcareous grassland | 4 | 0.856 | 4.856 |
| ER11 | Unmanaged Broadleafed/Coniferous Woodland | 2.699 | 0.357 | 3.056 |
| ER12 | Unmanaged Broadleafed/Coniferous Woodland | 2.699 | 0.357 | 3.056 |
| ER13 | Unmanaged Broadleafed/Coniferous Woodland | 2.699 | 0.357 | 3.056 |
| ER14 | Unmanaged Broadleafed/Coniferous Woodland | 2.699 | 0.357 | 3.056 |
| ER15 | Unmanaged Broadleafed/Coniferous Woodland | 2.72 | 0.357 | 3.077 |
| ER16 | Unmanaged Broadleafed/Coniferous Woodland | 2.72 | 0.357 | 3.077 |
| ER17 | Unmanaged Broadleafed/Coniferous Woodland | 2.72 | 0.357 | 3.077 |
| ER18 | Unmanaged Broadleafed/Coniferous Woodland | 2.72 | 0.357 | 3.077 |

| ID | Acidity Critical Load Class | Critical Load (ke/ha/yr) | | |
|---|---|---|---|---|
| | | CLmaxS | CLminN | CLmaxN |
| ER19 | Unmanaged Broadleafed/Coniferous Woodland | 2.72 | 0.357 | 3.077 |
| ER20 | Unmanaged Broadleafed/Coniferous Woodland | 1.683 | 0.142 | 1.825 |
| ER21 | Unmanaged Broadleafed/Coniferous Woodland | 1.683 | 0.142 | 1.825 |
| ER22 | Unmanaged Broadleafed/Coniferous Woodland | 1.683 | 0.142 | 1.825 |
| ER23 | Unmanaged Broadleafed/Coniferous Woodland | 2.725 | 0.357 | 3.082 |
| ER24 | Unmanaged Broadleafed/Coniferous Woodland | 2.725 | 0.357 | 3.082 |
| ER25 | Unmanaged Broadleafed/Coniferous Woodland | 2.698 | 0.357 | 3.055 |
| ER26 | Unmanaged Broadleafed/Coniferous Woodland | 2.729 | 0.357 | 3.086 |
| ER27 | Unmanaged Broadleafed/Coniferous Woodland | 2.731 | 0.357 | 3.088 |
| ER28 | Unmanaged Broadleafed/Coniferous Woodland | 1.708 | 0.142 | 1.85 |
| ER29 | Unmanaged Broadleafed/Coniferous Woodland | 1.708 | 0.142 | 1.85 |
| ER30 | Unmanaged Broadleafed/Coniferous Woodland | 2.729 | 0.357 | 3.086 |
| ER31 | Unmanaged Broadleafed/Coniferous Woodland | 1.708 | 0.142 | 1.85 |
| ER32 | Unmanaged Broadleafed/Coniferous Woodland | 1.708 | 0.142 | 1.85 |
| ER33 | Unmanaged Broadleafed/Coniferous Woodland | 0.888 | 0.285 | 1.173 |
| ER34 | Unmanaged Broadleafed/Coniferous Woodland | 1.708 | 0.142 | 1.85 |
| ER35 | Unmanaged Broadleafed/Coniferous Woodland | 0.888 | 0.285 | 1.173 |
| ER36 | Unmanaged Broadleafed/Coniferous Woodland | 2.731 | 0.357 | 3.088 |
| ER37 | Unmanaged Broadleafed/Coniferous Woodland | 1.708 | 0.142 | 1.85 |
| ER38 | Unmanaged Broadleafed/Coniferous Woodland | 2.731 | 0.357 | 3.088 |
| ER39 | Unmanaged Broadleafed/Coniferous Woodland | 2.731 | 0.357 | 3.088 |
| ER40 | Unmanaged Broadleafed/Coniferous Woodland | 2.731 | 0.357 | 3.088 |
| ER41 | Unmanaged Broadleafed/Coniferous Woodland | 2.731 | 0.357 | 3.088 |
| ER42 | Unmanaged Broadleafed/Coniferous Woodland | 1.708 | 0.142 | 1.85 |
| ER43 | Unmanaged Broadleafed/Coniferous Woodland | 2.72 | 0.357 | 3.077 |
| ER44 | Unmanaged Broadleafed/Coniferous Woodland | 2.733 | 0.357 | 3.09 |
| ER45 | Unmanaged Broadleafed/Coniferous Woodland | 2.725 | 0.357 | 3.082 |
| ER46 | Unmanaged Broadleafed/Coniferous Woodland | 2.698 | 0.357 | 3.055 |

(a) LWS and AW obtained via the APIS Search by Location Function

4.6.5 Background deposition rates were obtained from the APIS website and are summarised in Table 21. For Local designations the search by location function was used.

**Table 21: Background Deposition Rates**

| ID | Nitrogen (kgN/ha/yr) | Acid (keq/ha/yr) | |
|---|---|---|---|
| | | Nitrogen | Sulphur |
| ER1 | 17.5 | 1.83 | 0.18 |
| ER2 | 17.5 | 1.83 | 0.18 |
| ER3 | 17.5 | 1.24 | 0.23 |
| ER4 | 10.0 | 1.24 | 0.23 |
| ER5 | 10.0 | 1.24 | 0.23 |
| ER6 | 10.0 | 0.70 | 0.19 |

| ID | Nitrogen (kgN/ha/yr) | Acid (keq/ha/yr) | |
|---|---|---|---|
| | | Nitrogen | Sulphur |
| ER7 | 11.2 | 0.70 | 0.19 |
| ER8 | 11.2 | 0.70 | 0.19 |
| ER9 | 11.2 | 0.79 | 0.23 |
| ER10 | 11.2 | 0.78 | 0.17 |
| ER11 | 17.8 | 0.78 | 0.17 |
| ER12 | 18.0 | 0.78 | 0.17 |
| ER13 | 18.0 | 1.27 | 0.22 |
| ER14 | 18.0 | 1.27 | 0.22 |
| ER15 | 17.9 | 1.27 | 0.22 |
| ER16 | 17.9 | 1.27 | 0.22 |
| ER17 | 17.7 | 1.28 | 0.23 |
| ER18 | 17.7 | 1.28 | 0.23 |
| ER19 | 17.7 | 1.28 | 0.23 |
| ER20 | 10.2 | 1.28 | 0.23 |
| ER21 | 17.7 | 1.28 | 0.23 |
| ER22 | 17.4 | 1.27 | 0.23 |
| ER23 | 18.1 | 1.27 | 0.23 |
| ER24 | 18.1 | 1.27 | 0.23 |
| ER25 | 17.4 | 1.29 | 0.24 |
| ER26 | 18.4 | 1.29 | 0.24 |
| ER27 | 18.2 | 1.24 | 0.23 |
| ER28 | 18.1 | 1.31 | 0.24 |
| ER29 | 17.8 | 1.30 | 0.23 |
| ER30 | 18.2 | 1.29 | 0.23 |
| ER31 | 17.8 | 1.29 | 0.23 |
| ER32 | 18.2 | 1.31 | 0.24 |
| ER33 | 18.3 | 1.29 | 0.23 |
| ER34 | 10.4 | 1.29 | 0.23 |
| ER35 | 19.8 | 0.23 | 1.42 |
| ER36 | 19.6 | 0.23 | 1.40 |
| ER37 | 19.45 | 0.23 | 1.39 |
| ER38 | 19.61 | 0.23 | 1.40 |
| ER39 | 19.61 | 0.23 | 1.40 |
| ER40 | 19.61 | 0.23 | 1.40 |
| ER41 | 19.61 | 0.23 | 1.40 |
| ER42 | 19.45 | 0.23 | 1.40 |
| ER43 | 19.21 | 0.23 | 1.37 |
| ER44 | 19.6 | 0.24 | 1.40 |
| ER45 | 19.4 | 0.24 | 1.39 |
| ER46 | 19.12 | 0.23 | 1.51 |

4.6.6 Background pollutant concentrations are summarised in Table 22 and represent the maximum predicted concentrations at each designation as provided by APIS.

**Table 22: Background Concentrations**

| ID | Background Concentration (µg/m³) | |
|---|---|---|
| | $NO_x$ | $SO_2$ |
| ER1 | 14.0 | 2.0 |
| ER2 | 14.0 | 2.0 |
| ER3 | 14.0 | 2.0 |
| ER4 | 12.8 | 2.0 |
| ER5 | 12.8 | 2.0 |
| ER6 | 12.8 | 2.0 |
| ER7 | 10.0 | 1.6 |
| ER8 | 9.3 | 1.2 |
| ER9 | 9.3 | 1.2 |
| ER10 | 9.3 | 1.2 |
| ER11 | 13.8 | 2.0 |
| ER12 | 14.8 | 3.2 |
| ER13 | 14.8 | 3.2 |
| ER14 | 14.8 | 3.2 |
| ER15 | 12.0 | 1.9 |
| ER16 | 12.0 | 1.9 |
| ER17 | 13.2 | 2.0 |
| ER18 | 13.2 | 2.0 |
| ER19 | 13.2 | 2.0 |
| ER20 | 12.8 | 1.8 |
| ER21 | 13.2 | 2.0 |
| ER22 | 12.4 | 1.9 |
| ER23 | 12.3 | 2.3 |
| ER24 | 12.3 | 2.3 |
| ER25 | 12.4 | 1.9 |
| ER26 | 14.5 | 1.9 |
| ER27 | 17.1 | 2.3 |
| ER28 | 15.2 | 1.8 |
| ER29 | 14.5 | 1.7 |
| ER30 | 11.9 | 2.3 |
| ER31 | 14.5 | 1.7 |
| ER32 | 17.1 | 2.3 |
| ER33 | 10.1 | 1.6 |
| ER34 | 14.5 | 1.7 |
| ER35 | 9.0 | 1.6 |
| ER36 | 14.3 | 2.3 |

| ID | Background Concentration (µg/m$^3$) | |
|---|---|---|
| | $NO_x$ | $SO_2$ |
| ER37 | 12.2 | 1.7 |
| ER38 | 14.3 | 2.3 |
| ER39 | 14.3 | 2.3 |
| ER40 | 14.3 | 2.3 |
| ER41 | 14.3 | 2.3 |
| ER42 | 12.2 | 1.7 |
| ER43 | 10.5 | 1.9 |
| ER44 | 10.8 | 2.4 |
| ER45 | 11.2 | 2.4 |
| ER46 | 13.2 | 2.3 |

# 5.0 Results

## 5.1 Introduction

5.1.1 Dispersion modelling was undertaken with the inputs described in Section 3 and the emissions given in Table 6. Contour plots were produced for pollutant species where impacts could not be screened as insignificant using the EA's screening criteria.

5.1.2 Predicted pollutant concentrations were predicted separately for 5 assessment years and the maximum concentration reported in the following sections for each relevant substance and metric for the new emissions sources. Impacts were assessed for the new proposed emissions and existing emissions contributions are also presented and included within the PECs. Concentrations were assessed against EA guidance[3] criteria to determine impact acceptability.

5.1.3 Receptor locations HR11, HR12 and HR14 which represent commercial premises are not considered sensitive to annual mean or 24-hour exposure (except HR11 included in 24- hour assessment). As such, analysis of long term means impacts at these locations have not been included in the following Sections.

5.1.4 PC contributions from existing site emissions are also shown in the tables.

## 5.2 Human Sensitive Receptors

### Nitrogen Dioxide

*Annual Mean*

5.2.1 Predicted maximum annual mean $NO_2$ process concentrations at relevant senstive receptors are summarised in Table 23.

**Table 23: Annual Mean $NO_2$ Concentrations**

| Receptor | Concentration (µg/m³) | | Proportion of EQS (%) | | |
|---|---|---|---|---|---|
| | New PC | PEC | New PC | PEC | Combined Site PC |
| HR1 | 0.001 | 10.3 | 0.002 | 25.7 | 0.1 |
| HR2 | 0.001 | 10.3 | 0.003 | 25.8 | 0.1 |
| HR3 | 0.001 | 10.6 | 0.003 | 26.4 | 0.1 |
| HR4 | 0.001 | 10.6 | 0.003 | 26.4 | 0.1 |
| HR5 | 0.001 | 10.6 | 0.002 | 26.4 | 0.1 |
| HR6 | 0.000 | 12.1 | 0.001 | 30.4 | 0.0 |
| HR7 | 0.001 | 8.9 | 0.001 | 22.3 | 0.1 |
| HR8 | 0.001 | 8.9 | 0.002 | 22.3 | 0.1 |
| HR9 | 0.001 | 9.9 | 0.003 | 24.6 | 0.1 |
| HR10 | 0.001 | 9.9 | 0.002 | 24.6 | 0.1 |
| HR13 | 0.004 | 10.8 | 0.009 | 27.0 | 0.3 |

1 Predicted concentrations were assessed against the relevant annual mean EQS of 40 µg/m³.

5.2.2 As indicated in Table 23, predicted maximum annual mean concentrations over a 5-year data set are below the EQS at all sensitive receptor locations.

5.2.3 PC proportions of the annual mean EQS are less than 1% at all receptor locations and impacts can be screened as insignificant.

5.2.4 Overall, impacts on annual mean $NO_2$ concentrations are considered acceptable.

5.2.5 Combined existing and proposed site emissions are also deemed insignificant.

*1-hour Mean*

5.2.6 Predicted maximum 99.79%ile 1-hour mean $NO_2$ process concentrations are summarised in Table 24.

**Table 24: 1-Hour Mean $NO_2$ Concentrations**

| Receptor | Concentration (µg/m³) | | Proportion of EQS (%) | | |
|---|---|---|---|---|---|
| | New PC | PEC | New PC | PEC* | Combined Site PC |
| HR1 | 1.6 | 27.2 | 0.8 | 0.9 | 1.2 |
| HR2 | 2.1 | 29.0 | 1.0 | 1.2 | 1.5 |
| HR3 | 2.6 | 31.7 | 1.3 | 1.5 | 1.9 |
| HR4 | 2.0 | 29.2 | 1.0 | 1.1 | 1.4 |
| HR5 | 2.1 | 28.8 | 1.0 | 1.2 | 1.4 |
| HR6 | 1.1 | 28.6 | 0.6 | 0.6 | 0.8 |
| HR7 | 1.0 | 21.5 | 0.5 | 0.5 | 0.6 |
| HR8 | 1.0 | 21.6 | 0.5 | 0.6 | 0.7 |
| HR9 | 1.2 | 24.0 | 0.6 | 0.6 | 0.8 |
| HR10 | 1.7 | 26.0 | 0.9 | 1.0 | 1.1 |
| HR11 | 3.2 | 39.9 | 1.6 | 1.8 | 3.4 |
| HR12 | 2.2 | 29.5 | 1.1 | 1.2 | 1.5 |
| HR13 | 6.6 | 48.4 | 3.3 | 3.7 | 4.1 |
| HR14 | 5.2 | 41.2 | 2.6 | 2.9 | 3.5 |

1 Predicted concentrations were assessed against the relevant 99.79%ile 1-hour mean EQS of 200 µg/m³.

* PC minus twice long term background concentration

5.2.7 As indicated in Table 24, predicted maximum 1-hour mean concentrations are below the relevant EQS at all sensitive receptor locations.

5.2.8 PC proportions are less than 10% at all receptor locations, and based on EA screening criteria, impacts on 1-hour mean concentrations can be screened out as insignificant.

5.2.9 As such, impacts on 1-hour mean $NO_2$ concentrations can be considered acceptable.

5.2.10 Combined existing and proposed site emissions are also deemed insignificant.

### Particulate Matter

*Annual Mean $PM_{10}$*

5.2.11 Predicted maximum annual mean $PM_{10}$ process concentrations are summarised in Table 25.

**Table 25: Annual Mean $PM_{10}$ Concentrations**

| Receptor | Concentration (µg/m³) | | Proportion of EQS (%) | | |
|---|---|---|---|---|---|
| | New PC | PEC | New PC | PEC | Existing Site PC |
| HR1 | 0.02 | 11.5 | 0.04 | 28.7 | 0.1 |
| HR2 | 0.02 | 11.5 | 0.05 | 28.7 | 0.2 |
| HR3 | 0.03 | 11.8 | 0.07 | 29.6 | 0.2 |
| HR4 | 0.03 | 11.8 | 0.07 | 29.6 | 0.2 |
| HR5 | 0.02 | 11.8 | 0.05 | 29.5 | 0.2 |
| HR6 | 0.01 | 13.0 | 0.02 | 32.6 | 0.1 |
| HR7 | 0.01 | 11.2 | 0.02 | 27.9 | 0.1 |
| HR8 | 0.01 | 11.2 | 0.03 | 27.9 | 0.1 |
| HR9 | 0.02 | 11.2 | 0.05 | 28.0 | 0.1 |
| HR10 | 0.01 | 11.2 | 0.03 | 27.9 | 0.1 |
| HR13 | 0.1 | 12.3 | 0.3 | 30.7 | 0.7 |

1 Predicted concentrations were assessed against the Annual mean EQS of 40 µg/m³.

5.2.12 As indicated in Table 25, predicted maximum annual mean concentrations are below the relevant EQS at all sensitive receptor locations.

5.2.13 PC proportions of the annual mean EQS are less than 1% at all receptor locations senstive to annual mean exposure and, as such, all impacts can be screened as insignificant.

5.2.14 As such, new emission impacts on annual mean $PM_{10}$ concentrations can be considered as acceptable.

5.2.15 Combined existing and proposed site emissions are also deemed insignificant.

*24-Hour Mean $PM_{10}$*

5.2.16 Predicted 90.41%ile 24-hour mean $PM_{10}$ concentrations are summarised in Table 26.

**Table 26: 24-Hour Mean $PM_{10}$ Concentrations**

| Receptor | Concentration (µg/m³) | | Proportion of EQS (%) | | | |
|---|---|---|---|---|---|---|
| | New PC | PEC | New PC | PEC* | Combined Site PC | Combined Site PEC |
| HR1 | 0.1 | 23.1 | 0.2 | 0.3 | 0.5 | 0.9 |
| HR2 | 0.1 | 23.1 | 0.2 | 0.3 | 0.6 | 1.0 |
| HR3 | 0.1 | 23.9 | 0.3 | 0.5 | 0.8 | 1.5 |
| HR4 | 0.1 | 23.8 | 0.2 | 0.4 | 0.7 | 1.4 |
| HR5 | 0.1 | 23.7 | 0.2 | 0.3 | 0.5 | 1.0 |
| HR6 | 0.0 | 26.1 | 0.1 | 0.1 | 0.2 | 0.4 |
| HR7 | 0.0 | 22.4 | 0.1 | 0.1 | 0.2 | 0.4 |
| HR8 | 0.0 | 22.4 | 0.1 | 0.1 | 0.2 | 0.4 |
| HR9 | 0.1 | 22.4 | 0.1 | 0.2 | 0.3 | 0.6 |
| HR10 | 0.1 | 22.4 | 0.1 | 0.2 | 0.3 | 0.5 |
| HR11 | 5.7 | 33.9 | 11.4 | 20.9 | 22.1 | 40.7 |
| HR13 | 0.5 | 24.5 | 1.0 | 1.8 | 2.0 | 3.7 |

1 Predicted concentrations were assessed against the 90.41%ile 24-hour mean EQS of 50 µg/m³.

* PC minus twice long term background concentration

5.2.17 As indicated in Table 26, predicted maximum 24-hour mean concentrations are below the relevant EQS at all sensitive receptor locations.

5.2.18 New emissions PC proportions are less than 10% at all receptor locations with the exception of ER11 where the short-term PC is marginally greater than 20% of the EQS minus twice the long-term background concentration. New emission impacts on 24-hour mean concentrations cannot initially be screened out as insignificant.

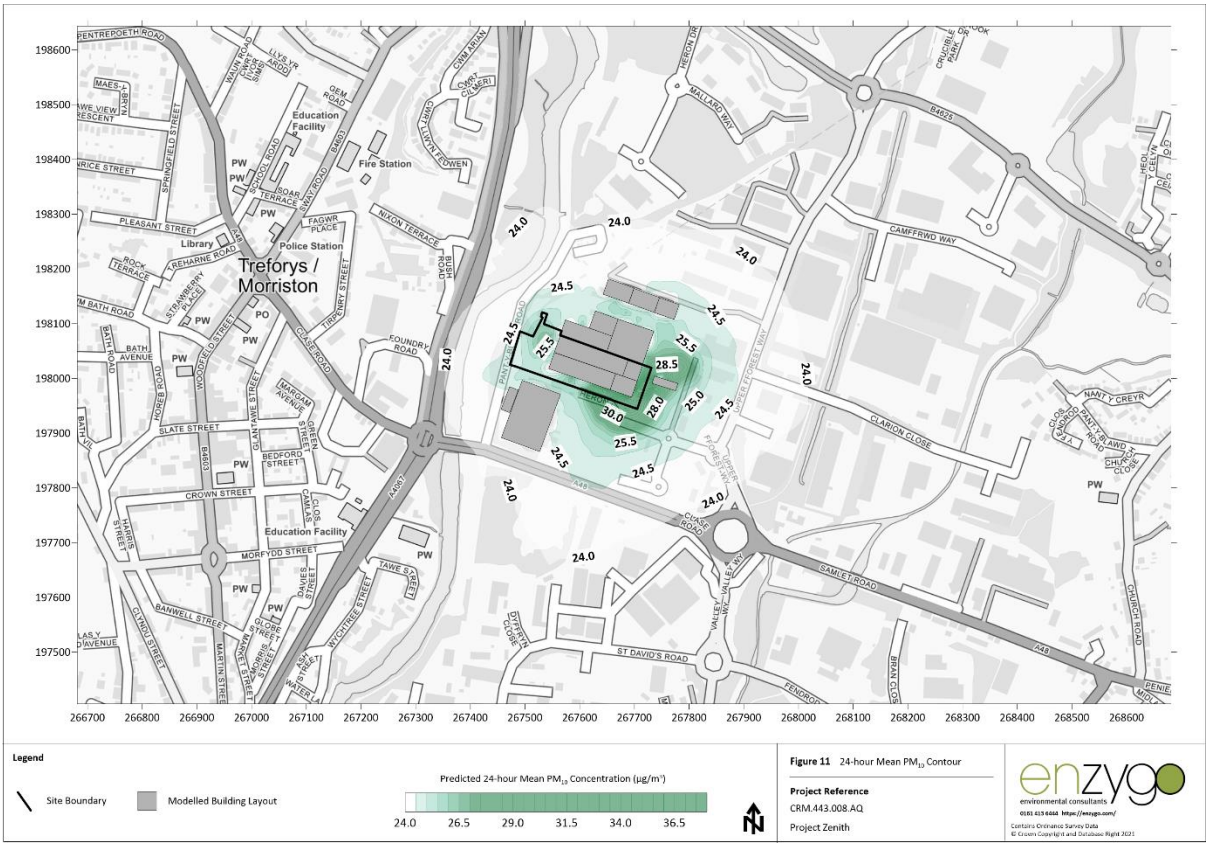
5.2.19 As such impacts of all new emissions on 24-hour mean $PM_{10}$ concentrations cannot be considered acceptable.

5.2.20 The combined emissions PC is greater than 10% at HR11 and short-term PC is greater than 20% of the EQS minus twice the long-term background concentration.

5.2.21 However the maximum 5 year PEC is 68% of the EQS at this location and given the large headroom to the EQS, impacts are deemed acceptable.

5.2.22 Figure 10 shows that the PEC is below the EQS at all senstive locations.

**Figure 10: 24-hour Mean $PM_{10}$ Concentration Contours**




*Annual Mean $PM_{2.5}$*

5.2.23 Predicted maximum annual mean $PM_{2.5}$ process concentrations are summarised in Table 27.

**Table 27: Predicted Annual Mean $PM_{2.5}$ Concentrations.**

| Receptor | Concentration (µg/m³) | | Proportion of EQS (%) | | |
|---|---|---|---|---|---|
| | New PC | PEC | New PC | PEC | Combined Site PC |
| HR1 | 0.02 | 7.4 | 0.08 | 36.8 | 0.3 |
| HR2 | 0.02 | 7.4 | 0.09 | 36.8 | 0.3 |
| HR3 | 0.02 | 7.4 | 0.14 | 36.8 | 0.5 |
| HR4 | 0.03 | 7.6 | 0.14 | 37.9 | 0.5 |
| HR5 | 0.03 | 7.6 | 0.10 | 37.9 | 0.3 |
| HR6 | 0.02 | 7.6 | 0.04 | 37.9 | 0.1 |
| HR7 | 0.01 | 8.3 | 0.05 | 41.4 | 0.2 |
| HR8 | 0.01 | 7.1 | 0.06 | 35.4 | 0.2 |
| HR9 | 0.01 | 7.1 | 0.09 | 35.4 | 0.3 |
| HR10 | 0.02 | 7.2 | 0.07 | 35.9 | 0.2 |
| HR13 | 0.12 | 7.7 | 0.58 | 38.4 | 1.4 |

1 Predicted concentrations were assessed against the annual mean EQS of 20 µg/m³.

5.2.24 As indicated in Table 27, predicted maximum annual mean concentrations are below the relevant EQS at all sensitive receptor locations where annual mean exposure is applicable.

5.2.25 New emission PC proportions of the annual mean EQS are less than 1% at all receptor locations sensitive to annual mean exposure and, as such, all new emissions impacts can be screened as insignificant.

5.2.26 with the exception of HR13 where the PEC is below 70% of the EQS and, as such, all new emissions impacts can be screened as insignificant.

5.2.27 Overall, impacts of new emissions on annual mean $PM_{2.5}$ concentrations can be considered acceptable.

5.2.28 Combined emission PC proportions of the annual mean EQS are also less than 1% at all receptor locations with the exception of HR13 where the PEC is well below 70% of the EQS and, as such, all emissions impacts can be screened as insignificant.

### Total Organic Carbon

*Annual Mean*

5.2.29 Predicted annual mean TOC concentrations (as benzene) are summarised in Table 28.

**Table 28 Predicted Annual Mean TOC (as Benzene) Concentrations**

| Receptor | Concentration (µg/m³) | | Proportion of EQS (%) | |
|---|---|---|---|---|
| | New PC | PEC | New PC | PEC |
| HR1 | 0.03 | 0.4 | 0.7 | 7.5 |
| HR2 | 0.04 | 0.4 | 0.9 | 7.7 |
| HR3 | 0.05 | 0.4 | 1.0 | 7.7 |
| HR4 | 0.05 | 0.4 | 1.1 | 7.8 |
| HR5 | 0.04 | 0.4 | 0.8 | 7.5 |
| HR6 | 0.02 | 0.3 | 0.3 | 6.8 |
| HR7 | 0.02 | 0.3 | 0.5 | 7.0 |
| HR8 | 0.03 | 0.4 | 0.6 | 7.1 |
| HR9 | 0.04 | 0.4 | 0.8 | 7.2 |
| HR10 | 0.03 | 0.4 | 0.7 | 7.1 |
| HR13 | 0.15 | 0.5 | 3.1 | 9.8 |

1 Table Notes: Predicted concentrations were assessed against the relevant EQS: 5 µg/m³

5.2.30 As indicated in Table 28, predicted annual mean TOC (as Benzene) concentrations were below the relevant EQS at all sensitive receptor locations.

5.2.31 The new emissions PC proportion of the annual mean EQS exceeds 1% at 3 sensitive receptor locations. However as the annual mean PEC is below 70% of the EQS at all receptor locations all annual mean impacts can be screened as insignificant.

5.2.32 There are no existing site TOC emissions.

*24-Hour Mean*

5.2.33 Predicted 24-hour mean TOC (as benzene) concentrations are summarised in Table 29.

**Table 29 Predicted 24-Hour Mean TOC (as Benzene) Concentrations**

| Receptor | Concentration (µg/m³) | | Proportion of EQS (%) | |
|---|---|---|---|---|
| | PC | PEC | PC | PEC* |
| HR1 | 0.5 | 0.5 | 1.7 | 1.7 |
| HR2 | 0.7 | 0.7 | 2.2 | 2.2 |
| HR3 | 0.8 | 0.8 | 2.7 | 2.7 |
| HR4 | 0.8 | 0.8 | 2.6 | 2.6 |
| HR5 | 0.6 | 0.6 | 2.1 | 2.1 |
| HR6 | 0.2 | 0.2 | 0.8 | 0.8 |
| HR7 | 0.2 | 0.2 | 0.7 | 0.7 |
| HR8 | 0.2 | 0.2 | 0.7 | 0.7 |
| HR9 | 0.4 | 0.4 | 1.2 | 1.2 |
| HR10 | 0.4 | 0.4 | 1.3 | 1.3 |
| HR11 | 2.3 | 2.3 | 7.6 | 7.6 |
| HR13 | 1.9 | 1.9 | 6.2 | 6.2 |

Table Notes: Predicted concentrations were assessed against the relevant EQS: 24-hour mean EQS of 30 µg/m³.
* PC minus twice long term background concentration

5.2.34 As indicated in Table 29, predicted 24-hour mean TOC (as Benzene) concentrations were also well below the relevant EQS at all sensitive receptor locations.

5.2.35 New emission PC proportions of the annual mean EQS are less than 10% at all receptor locations sensitive to 24-hour mean exposure and, as such, all new emissions impacts can be screened as insignificant.

5.2.36 As such all TOC (as benzene) impacts are considered to be acceptable.

### Sulphur Dioxide

*24-hour Mean*

5.2.37 Predicted maximum 99.18%ile 24-hour mean $SO_2$ concentrations are summarised in Table 30.

**Table 30: 24-Hour Mean $SO_2$ Concentrations**

| Receptor | Concentration (µg/m³) | | Proportion of EQS (%) | | |
|---|---|---|---|---|---|
| | New PC | PEC | New PC | PEC* | Combined Site PC |
| HR1 | 0.8 | 9.9 | 0.7 | 0.7 | 4.6 |
| HR2 | 1.1 | 12.4 | 0.8 | 0.9 | 6.7 |
| HR3 | 1.4 | 15.7 | 1.1 | 1.2 | 9.2 |
| HR4 | 1.1 | 11.9 | 0.9 | 0.9 | 6.2 |
| HR5 | 0.9 | 10.3 | 0.7 | 0.7 | 5.0 |
| HR6 | 0.4 | 6.4 | 0.3 | 0.3 | 1.8 |

| Receptor | Concentration (µg/m$^3$) | | Proportion of EQS (%) | | |
|---|---|---|---|---|---|
| | New PC | PEC | New PC | PEC* | Combined Site PC |
| HR7 | 0.4 | 6.6 | 0.3 | 0.3 | 2.0 |
| HR8 | 0.4 | 7.0 | 0.3 | 0.3 | 2.3 |
| HR9 | 0.6 | 8.6 | 0.5 | 0.5 | 3.5 |
| HR10 | 0.7 | 8.5 | 0.6 | 0.6 | 3.5 |
| HR11 | 3.4 | 36.3 | 2.8 | 2.8 | 25.7 |
| HR13 | 3.7 | 23.2 | 2.9 | 3.0 | 15.3 |

1 Predicted concentrations were assessed against 99.18%ile 24-hour mean EQS of 125 µg/m$^3$.

* PC minus twice long term background concentration

5.2.38 As indicated in Table 30, predicted 24-hour mean concentrations are below the relevant EQS at all sensitive receptor locations.

5.2.39 New emissions PC proportions of the 24-hour mean EQS are less than 10% at all receptor locations and impacts on concentrations can be screened out as insignificant.

5.2.40 As such impacts of all new emissions on 24-hour mean $SO_2$ concentrations are considered acceptable.

5.2.41 The combined emissions PC is greater than 10% at 2 locations. However the maximum 5 year PEC is only 29% of the EQS at a sensitive location and given the large headroom to the EQS existing concentrations are deemed not significant.

*1-hour Mean*

5.2.42 Predicted maximum 99.73%ile 1-hour mean $SO_2$ concentrations are summarised in Table 31.

**Table 31: 1-Hour Mean $SO_2$ Concentrations**

| Receptor | Concentration (µg/m$^3$) | | Proportion of EQS (%) | | |
|---|---|---|---|---|---|
| | New PC | PEC | New PC | PEC* | Existing Site PC |
| HR1 | 2.1 | 19.3 | 0.6 | 0.6 | 4.6 |
| HR2 | 2.9 | 25.7 | 0.8 | 0.8 | 6.4 |
| HR3 | 3.3 | 29.6 | 1.0 | 1.0 | 7.6 |
| HR4 | 3.2 | 25.9 | 0.9 | 0.9 | 6.5 |
| HR5 | 3.0 | 22.5 | 0.8 | 0.9 | 5.5 |
| HR6 | 1.4 | 11.1 | 0.4 | 0.4 | 2.2 |
| HR7 | 1.3 | 11.3 | 0.4 | 0.4 | 2.2 |
| HR8 | 1.2 | 11.9 | 0.3 | 0.4 | 2.4 |
| HR9 | 1.5 | 16.4 | 0.4 | 0.4 | 3.7 |

| Receptor | Concentration (µg/m$^3$) | | Proportion of EQS (%) | | |
|---|---|---|---|---|---|
| | New PC | PEC | New PC | PEC* | Existing Site PC |
| HR10 | 2.1 | 16.5 | 0.6 | 0.6 | 3.8 |
| HR11 | 12.4 | 105.3 | 3.6 | 3.6 | 29.2 |
| HR12 | 2.6 | 22.6 | 0.7 | 0.7 | 5.6 |
| HR13 | 9.4 | 52.7 | 2.7 | 2.7 | 14.7 |
| HR14 | 8.5 | 91.1 | 2.4 | 2.5 | 25.6 |

1 Predicted concentrations were assessed against 99.73%ile 1-hour mean EQS of 350 µg/m$^3$.

* PC minus twice long term background concentration

5.2.43 As indicated in Table 31, predicted maximum 1-hour mean concentrations are below the relevant EQS at all sensitive receptor locations.

5.2.44 New emissions PC proportions are less than 10% at all receptor locations. Based on the EA screening criteria, new emission impacts on concentrations can be screened out as insignificant.

5.2.45 As such impacts of new emissions on 1-hour mean $SO_2$ concentrations can be considered acceptable.

5.2.46 The combined site emissions PC is greater than 10% at 3 locations predominantly due to existing emissions. However the maximum PEC is only 30% of the EQS at a sensitive location and given the large headroom to the EQS existing concentrations are deemed not significant.

5.2.47 Figure 11 shows the contour display for 1-hour mean $SO_2$ concentration from all emission sources. Concentrations are below the EQS at sensitive receptors across the assessment extents.

**Figure 11: 1-Hour Mean $SO_2$ Concentration Contours**


*15-minute Mean*

5.2.48 Predicted maximum 99.9%ile 15-minute mean $SO_2$ concentrations are summarised in Table 32.

**Table 32: 15-minute Mean $SO_2$ Concentrations**

| Receptor | Concentration (µg/m³) | | Proportion of EQS (%) | | |
|---|---|---|---|---|---|
| | PC | PEC | PC | PEC* | Combined Site PC |
| HR1 | 3.5 | 29.3 | 1.3 | 1.3 | 4.6 |
| HR2 | 4.7 | 43.0 | 1.8 | 1.8 | 6.4 |
| HR3 | 5.2 | 49.6 | 2.0 | 2.0 | 7.6 |
| HR4 | 5.0 | 38.4 | 1.9 | 1.9 | 6.5 |
| HR5 | 4.6 | 32.3 | 1.7 | 1.7 | 5.5 |
| HR6 | 2.2 | 19.2 | 0.8 | 0.8 | 2.2 |
| HR7 | 2.1 | 16.2 | 0.8 | 0.8 | 2.2 |
| HR8 | 2.0 | 18.1 | 0.7 | 0.8 | 2.4 |
| HR9 | 2.0 | 26.0 | 0.7 | 0.8 | 3.7 |
| HR10 | 3.2 | 24.4 | 1.2 | 1.2 | 3.8 |

| Receptor | Concentration (µg/m$^3$) | | Proportion of EQS (%) | | |
|---|---|---|---|---|---|
| | PC | PEC | PC | PEC* | Combined Site PC |
| HR11 | 29.5 | 184.0 | 11.1 | 11.3 | 29.2 |
| HR12 | 4.2 | 35.7 | 1.6 | 1.6 | 5.6 |
| HR13 | 14.2 | 90.0 | 5.3 | 5.4 | 14.7 |
| HR14 | 12.8 | 151.8 | 4.8 | 4.9 | 25.6 |

1 Predicted concentrations were assessed against 99.9%ile 15-minute mean EQS of 266 µg/m$^3$.

* PC minus twice long term background concentration

5.2.49 As indicated in Table 32, predicted maximum 15-minute mean concentrations are below the relevant EQS at all sensitive receptor locations.

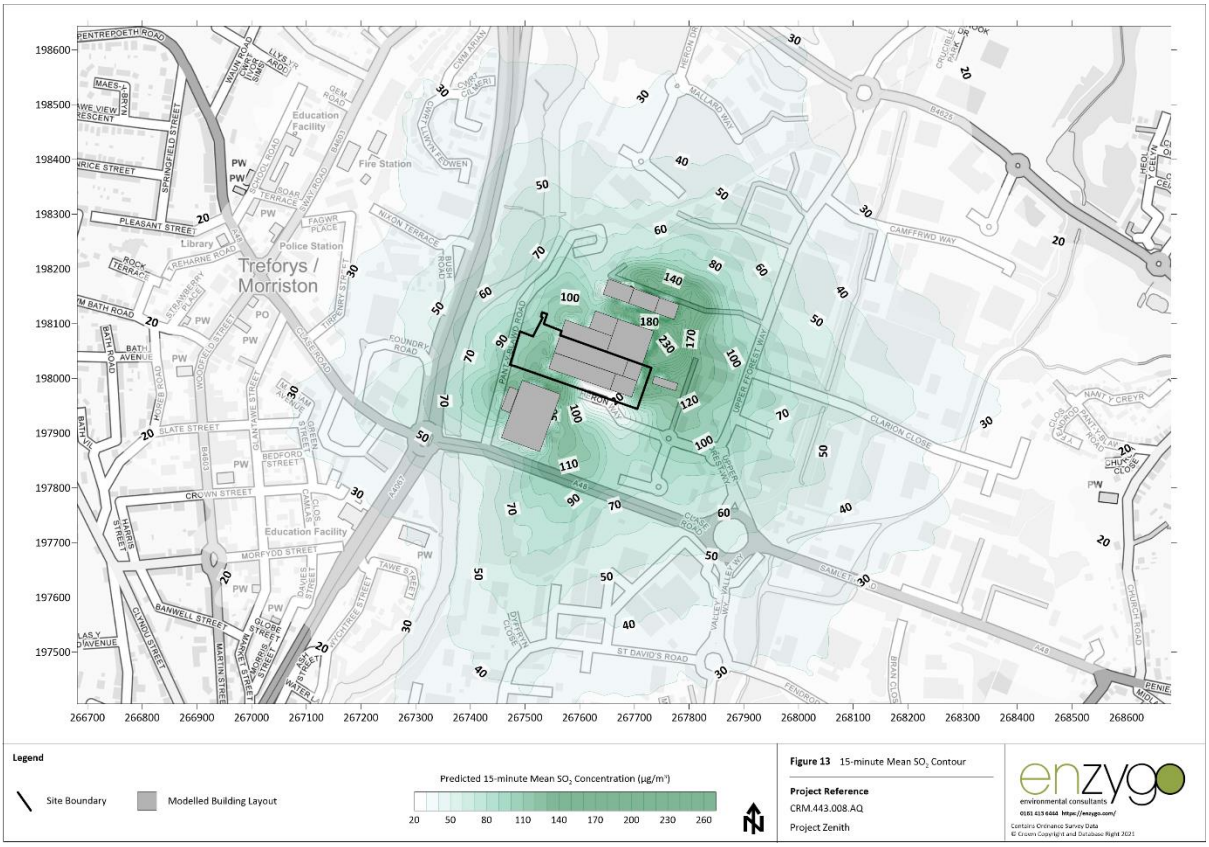
5.2.50 PC proportions are less than 10% at all receptor locations with the exception of HR11 where the short-term PC is greater than 20% of the EQS minus twice the long-term background concentration. New emission impacts on 24-hour mean concentrations cannot initially be screened out as insignificant.

5.2.51 As such impacts of emissions on 15-minute mean $SO_2$ concentrations can be considered acceptable.

5.2.52 Similarly, the combined emissions PC is greater than 10% at 3 locations. However the 5 year maximum PEC is only 71% of the EQS at a sensitive location and given the large headroom to the EQS existing concentrations are deemed not significant. As such impacts of emissions on 15-minute mean $SO_2$ concentrations can be considered acceptable.

5.2.53 **Error! Reference source not found.** shows that the total PEC is below the EQS across the assessment extents.

**Figure 12: 15-Minute Mean $SO_2$ Concentration Contours**




*Emergency Generator $SO_2$ Emissions Short Term Impacts*

5.2.54 An approach utilising hypergeometric probability distribution was undertaken in order to assess potential for exceedances of the short term (15 minute and 1-hour) $SO_2$ AQO based on the maximum 50 annual operational hours for the emergency generator. This was based on the total $SO_2$ concentrations from all existing and proposed new emissions points.

5.2.55 The cumulative hypergeometric distribution for the 99.9%ile 15-minute mean at each sensitive receptor location is detailed in Table 33.

**Table 33: Predicted 99.9%ile 15-minute Mean $SO_2$ – Hypergeometric Distribution**

| Receptor | Number of Exceedances | Hypergeometric Distribution (%) | Hypergeometric Distribution for Continuous Operation (%) |
|---|---|---|---|
| H1 | 0 | <0.1 | <0.1 |
| H2 | 0 | <0.1 | <0.1 |
| H3 | 0 | <0.1 | <0.1 |
| H4 | 0 | <0.1 | <0.1 |
| H5 | 0 | <0.1 | <0.1 |
| H6 | 0 | <0.1 | <0.1 |
| H7 | 0 | <0.1 | <0.1 |
| H8 | 0 | <0.1 | <0.1 |
| H9 | 0 | <0.1 | <0.1 |
| H10 | 0 | <0.1 | <0.1 |
| H11 | 0 | <0.1 | <0.1 |

| Receptor | Number of Exceedances | Hypergeometric Distribution (%) | Hypergeometric Distribution for Continuous Operation (%) |
|---|---|---|---|
| H12 | 0 | <0.1 | <0.1 |
| H13 | 1 | <0.1 | <0.1 |
| H14 | 0 | <0.1 | <0.1 |

Predicted concentrations were assessed against 99.9%ile 15-minute mean EQS of 266 µg/m$^3$.

5.2.56 As indicated in Table 33, the cumulative hypergeometric distribution calculates the EQS exceedance probability to be <0.1% at all receptor locations. Based on this probability, the 15-minute mean EQS for $SO_2$ is very unlikely to be exceeded at any location during operations of the proposals including the emergency generator.

5.2.57 The cumulative hypergeometric distribution for the 99.73%ile 1 hour mean at each sensitive receptor location is detailed in Table 34.

**Table 34: Predicted 99.73%ile 1-Hour Mean $SO_2$ – Hypergeometric Distribution**

| Receptor | Number of Exceedances | Hypergeometric Distribution (%) | Hypergeometric Distribution for Continuous Operation (%) |
|---|---|---|---|
| H1 | 0 | <0.1 | <0.1 |
| H2 | 0 | <0.1 | <0.1 |
| H3 | 0 | <0.1 | <0.1 |
| H4 | 0 | <0.1 | <0.1 |
| H5 | 0 | <0.1 | <0.1 |
| H6 | 0 | <0.1 | <0.1 |
| H7 | 0 | <0.1 | <0.1 |
| H8 | 0 | <0.1 | <0.1 |
| H9 | 0 | <0.1 | <0.1 |
| H10 | 0 | <0.1 | <0.1 |
| H11 | 0 | <0.1 | <0.1 |
| H12 | 0 | <0.1 | <0.1 |
| H13 | 0 | <0.1 | <0.1 |
| H14 | 0 | <0.1 | <0.1 |

1 Predicted concentrations were assessed against 99.73%ile 1-hour mean EQS of 350 µg/m$^3$.

5.2.58 As indicated in Table 34, the cumulative hypergeometric distribution calculates the EQS exceedance probability to be <0.1% at all receptor locations. Based on this, the 1-hour mean EQS for $SO_2$ is very unlikely to be exceeded at any location during operations of the proposals including use of the emergency generator.

5.2.59 Based on the maximum use of the proposed generator impacts are considered to be not significant.

### Benzo(a)pyrene (BaP)

5.2.60 Predicted annual mean BaP concentrations are summarised in Table 35.

**Table 35: Annual Mean BaP Concentrations**

| Receptor | Concentration (µg/m³) | | Proportion of EQS (%) | | |
|---|---|---|---|---|---|
| | PC | PEC | PC | PEC | Existing Site PC |
| HR1 | 0.000045 | 0.0000278 | <0.1 | 0.000 | <0.1 |
| HR2 | 0.000059 | 0.0000382 | <0.1 | 0.001 | <0.1 |
| HR3 | 0.000080 | 0.0000706 | <0.1 | 0.001 | <0.1 |
| HR4 | 0.000042 | 0.0000708 | <0.1 | 0.001 | <0.1 |
| HR5 | 0.000032 | 0.0000515 | <0.1 | 0.001 | <0.1 |
| HR6 | 0.000017 | 0.0000177 | <0.1 | 0.000 | <0.1 |
| HR7 | 0.000039 | 0.0000231 | <0.1 | 0.000 | <0.1 |
| HR8 | 0.000048 | 0.0000287 | <0.1 | 0.000 | <0.1 |
| HR9 | 0.000059 | 0.0000441 | <0.1 | 0.001 | <0.1 |
| HR10 | 0.000043 | 0.0000376 | <0.1 | 0.001 | <0.1 |
| HR13 | 0.000451 | 0.0001656 | 0.18 | 0.003 | 0.18 |

1 Predicted concentrations were assessed against the relevant annual mean EQS of 0.25 µg/m³.

5.2.61 As indicated in Table 35, predicted maximum annual mean concentrations over a 5-year data set are below the EQS at all sensitive receptor locations.

5.2.62 New emissions PC proportions of the annual mean EQS are less than 1% at all receptor locations and impacts can be screened as insignificant.

5.2.63 Overall, impacts on annual mean BaP concentrations are considered acceptable.

5.2.64 Combined site emissions are also insignificant.

## 5.3 Ecological Receptor Results

### Oxides of Nitrogen

5.3.1 Predicted annual mean $NO_x$ concentrations at sensitive ecological receptors are summarised in Table 36.

**Table 36 Predicted Annual Mean $NO_x$ Concentrations**

| Receptor | | Concentration (µg/m³) | | Proportion of EQS (%) | | |
|---|---|---|---|---|---|---|
| | | PC | PEC | PC | PEC | Combined Site PC |
| ER1 | Six Pit, Swansea Vale and White Rock SSSI | 0.000002 | 14.0 | <0.1 | 46.7 | <0.1 |
| ER2 | Six Pit, Swansea Vale and White Rock SSSI | 0.000001 | 14.0 | <0.1 | 46.7 | <0.1 |

| Receptor | | Concentration (µg/m³) | | Proportion of EQS (%) | | |
|---|---|---|---|---|---|---|
| | | PC | PEC | PC | PEC | Combined Site PC |
| ER3 | Six Pit, Swansea Vale and White Rock SSSI | 0.000001 | 14.0 | <0.1 | 46.7 | <0.1 |
| ER4 | Crymlyn Bog SSSI | 0.000001 | 12.8 | <0.1 | 42.7 | <0.1 |
| ER5 | Crymlyn Bog Ramsar, SAC, SSSI | 0.000001 | 12.8 | <0.1 | 42.7 | <0.1 |
| ER6 | Crymlyn Bog Ramsar, SAC, SSSI, NNR | <0.000001 | 12.8 | <0.1 | 42.7 | <0.1 |
| ER7 | Penplas Grasslands SSSI | <0.000001 | 10.0 | <0.1 | 33.3 | <0.1 |
| ER8 | Carmarthen Bay and Estuaries, Burry Inlet Ramsar, SAC, SSSI, SPA | <0.000001 | 9.3 | <0.1 | 31.0 | <0.1 |
| ER9 | Carmarthen Bay and Estuaries, Burry Inlet Ramsar, SAC, SSSI, SPA | <0.000001 | 9.3 | <0.1 | 31.0 | <0.1 |
| ER10 | Carmarthen Bay and Estuaries, Burry Inlet Ramsar, SAC, SSSI, SPA | <0.000001 | 9.3 | <0.1 | 31.0 | <0.1 |
| ER11 | Tawe Corridor LWS | 0.000018 | 13.8 | <0.1 | 46.0 | 0.5 |
| ER12 | Tawe Corridor LWS | 0.000017 | 14.8 | <0.1 | 49.3 | 0.7 |
| ER13 | Tawe Corridor LWS | 0.000019 | 14.8 | <0.1 | 49.3 | 0.5 |
| ER14 | Tawe Corridor LWS | 0.000009 | 14.8 | <0.1 | 49.3 | 0.2 |
| ER15 | Swansea Vale / Fendrod NR LWS | 0.000007 | 12.0 | <0.1 | 40.0 | 0.2 |
| ER16 | Swansea Vale / Fendrod NR LWS | 0.000008 | 12.0 | <0.1 | 40.0 | 0.2 |
| ER17 | Swansea Vale / Fendrod NR LWS | 0.000011 | 13.2 | <0.1 | 44.0 | 0.2 |
| ER18 | Fendrod Lake and Nant-y-Fendrod LWS | 0.000016 | 13.2 | <0.1 | 44.0 | 0.3 |
| ER19 | Fendrod Lake and Nant-y-Fendrod LWS | 0.000012 | 13.2 | <0.1 | 44.0 | 0.2 |
| ER20 | Llansamlet Marshes LWS | 0.000005 | 12.8 | <0.1 | 42.7 | 0.1 |
| ER21 | Main Swansea - Fishguard Railway Line LWS | 0.000002 | 13.2 | <0.1 | 44.0 | 0.1 |
| ER22 | Trallwn Marsh and Wood LWS | 0.000002 | 12.4 | <0.1 | 41.3 | <0.1 |
| ER23 | Trewyddfa Slopes LWS | 0.000002 | 12.3 | <0.1 | 41.0 | 0.1 |
| ER24 | Llewellyn Heath LWS | 0.000001 | 12.3 | <0.1 | 41.0 | <0.1 |
| ER25 | Pluck Lake LWS | 0.000001 | 12.4 | <0.1 | 41.3 | <0.1 |
| ER26 | Cwm Rhydyceirw to Birchgrove railway LWS | 0.000002 | 14.5 | <0.1 | 48.3 | 0.1 |

| Receptor | | Concentration (µg/m³) | | Proportion of EQS (%) | | |
|---|---|---|---|---|---|---|
| | | PC | PEC | PC | PEC | Combined Site PC |
| ER27 | Cwm Rhydyceirw to Birchgrove railway LWS | 0.000002 | 17.1 | <0.1 | 57.0 | 0.1 |
| ER28 | Cwm Rhydyceirw to Birchgrove railway LWS | 0.000003 | 15.2 | <0.1 | 50.7 | 0.1 |
| ER29 | Cwm Rhydyceirw to Birchgrove railway LWS | 0.000002 | 14.5 | <0.1 | 48.3 | 0.1 |
| ER30 | Llangyfelach Golf Course & Surrounds LWS | 0.000001 | 11.9 | <0.1 | 39.7 | <0.1 |
| ER31 | M4 Corridor LWS | 0.000002 | 14.5 | <0.1 | 48.3 | 0.1 |
| ER32 | Ynystanglws LWS | 0.000003 | 17.1 | <0.1 | 57.0 | 0.1 |
| ER33 | Ynysforgan Wood LWS | 0.000001 | 10.1 | <0.1 | 33.7 | <0.1 |
| ER34 | Upper Bran Grazing-Marshes & Heol Las Coalyard LWS | 0.000002 | 14.5 | <0.1 | 48.3 | <0.1 |
| ER35 | Ancient Woodland 1 | 0.000001 | 9.0 | <0.1 | 29.9 | <0.1 |
| ER36 | Ancient Woodland 2 | 0.000001 | 14.3 | <0.1 | 47.6 | <0.1 |
| ER37 | Ancient Woodland 3 | 0.000002 | 12.2 | <0.1 | 40.5 | <0.1 |
| ER38 | Ancient Woodland 4 | 0.000001 | 14.3 | <0.1 | 47.6 | <0.1 |
| ER39 | Ancient Woodland 5 | 0.000001 | 14.3 | <0.1 | 47.6 | <0.1 |
| ER40 | Ancient Woodland 6 | 0.000002 | 14.3 | <0.1 | 47.6 | <0.1 |
| ER41 | Ancient Woodland 7 | 0.000002 | 14.3 | <0.1 | 47.6 | <0.1 |
| ER42 | Ancient Woodland 8 | 0.000002 | 12.2 | <0.1 | 40.5 | <0.1 |
| ER43 | Ancient Woodland 9 | 0.000004 | 10.5 | <0.1 | 34.9 | 0.1 |
| ER44 | Ancient Woodland 10 | 0.000002 | 10.8 | <0.1 | 36.1 | <0.1 |
| ER45 | Ancient Woodland 11 | 0.000001 | 11.2 | <0.1 | 37.4 | <0.1 |
| ER46 | Ancient Woodland 12 | 0.000001 | 13.2 | <0.1 | 43.9 | <0.1 |

5.3.2 Predicted 24-hour mean NOx concentrations are summarised in Table 37.

**Table 37 Predicted 24-Hour Mean $NO_x$ Concentrations**

| Receptor | | Concentration (µg/m³) | | Proportion of EQS (%) | | |
|---|---|---|---|---|---|---|
| | | PC | PEC | PC | PEC | Combined Site PC |
| ER1 | Six Pit, Swansea Vale and White Rock SSSI | 0.9 | 28.9 | 0.4 | 14.4 | 0.5 |
| ER2 | Six Pit, Swansea Vale and White Rock SSSI | 0.7 | 28.7 | 0.3 | 14.3 | 0.4 |
| ER3 | Six Pit, Swansea Vale and White Rock SSSI | 0.4 | 28.4 | 0.2 | 14.2 | 0.3 |
| ER4 | Crymlyn Bog SSSI | 0.2 | 25.8 | 0.1 | 12.9 | 0.1 |
| ER5 | Crymlyn Bog Ramsar, SAC, SSSI | 0.3 | 25.9 | 0.1 | 12.9 | 0.2 |
| ER6 | Crymlyn Bog Ramsar, SAC, SSSI, NNR | 0.2 | 25.8 | 0.1 | 12.9 | 0.1 |
| ER7 | Penplas Grasslands SSSI | 0.2 | 20.2 | 0.1 | 10.1 | 0.1 |
| ER8 | Carmarthen Bay and Estuaries, Burry Inlet Ramsar, SAC, SSSI, SPA | 0.1 | 18.7 | <0.1 | 9.3 | 0.0 |
| ER9 | Carmarthen Bay and Estuaries, Burry Inlet Ramsar, SAC, SSSI, SPA | 0.1 | 18.7 | <0.1 | 9.3 | 0.0 |
| ER10 | Carmarthen Bay and Estuaries, Burry Inlet Ramsar, SAC, SSSI, SPA | 0.1 | 18.7 | <0.1 | 9.3 | 0.1 |
| ER11 | Tawe Corridor LWS | 7.7 | 35.3 | 3.9 | 17.7 | 4.6 |
| ER12 | Tawe Corridor LWS | 6.6 | 36.2 | 3.3 | 18.1 | 4.5 |
| ER13 | Tawe Corridor LWS | 5.4 | 35.0 | 2.7 | 17.5 | 3.4 |
| ER14 | Tawe Corridor LWS | 2.5 | 32.1 | 1.3 | 16.1 | 1.5 |
| ER15 | Swansea Vale / Fendrod NR LWS | 1.5 | 25.5 | 0.8 | 12.8 | 0.9 |
| ER16 | Swansea Vale / Fendrod NR LWS | 1.6 | 25.6 | 0.8 | 12.8 | 1.0 |
| ER17 | Swansea Vale / Fendrod NR LWS | 2.1 | 28.5 | 1.1 | 14.3 | 1.3 |
| ER18 | Fendrod Lake and Nant-y-Fendrod LWS | 3.5 | 29.9 | 1.8 | 15.0 | 2.1 |
| ER19 | Fendrod Lake and Nant-y-Fendrod LWS | 3.7 | 30.1 | 1.8 | 15.0 | 2.1 |
| ER20 | Llansamlet Marshes LWS | 1.3 | 26.9 | 0.7 | 13.5 | 0.8 |
| ER21 | Main Swansea - Fishguard Railway Line LWS | 1.0 | 27.4 | 0.5 | 13.7 | 0.6 |
| ER22 | Trallwn Marsh and Wood LWS | 0.8 | 25.6 | 0.4 | 12.8 | 0.5 |

| Receptor | | Concentration (µg/m³) | | Proportion of EQS (%) | | |
|---|---|---|---|---|---|---|
| | | PC | PEC | PC | PEC | Combined Site PC |
| ER23 | Trewyddfa Slopes LWS | 0.9 | 25.5 | 0.5 | 12.8 | 0.6 |
| ER24 | Llewellyn Heath LWS | 0.5 | 25.1 | 0.3 | 12.6 | 0.3 |
| ER25 | Pluck Lake LWS | 0.5 | 25.3 | 0.3 | 12.7 | 0.3 |
| ER26 | Cwm Rhydyceirw to Birchgrove railway LWS | 0.9 | 29.9 | 0.4 | 14.9 | 0.5 |
| ER27 | Cwm Rhydyceirw to Birchgrove railway LWS | 1.0 | 35.2 | 0.5 | 17.6 | 0.6 |
| ER28 | Cwm Rhydyceirw to Birchgrove railway LWS | 1.0 | 31.4 | 0.5 | 15.7 | 0.6 |
| ER29 | Cwm Rhydyceirw to Birchgrove railway LWS | 0.5 | 29.5 | 0.3 | 14.8 | 0.3 |
| ER30 | Llangyfelach Golf Course & Surrounds LWS | 0.5 | 24.3 | 0.2 | 12.1 | 0.3 |
| ER31 | M4 Corridor LWS | 0.7 | 29.7 | 0.4 | 14.9 | 0.4 |
| ER32 | Ynystanglws LWS | 1.1 | 35.3 | 0.6 | 17.7 | 0.7 |
| ER33 | Ynysforgan Wood LWS | 0.5 | 20.7 | 0.2 | 10.3 | 0.3 |
| ER34 | Upper Bran Grazing-Marshes & Heol Las Coalyard LWS | 0.5 | 29.5 | 0.3 | 14.8 | 0.3 |
| ER35 | Ancient Woodland 1 | 0.4 | 18.4 | 0.2 | 9.2 | 0.3 |
| ER36 | Ancient Woodland 2 | 0.6 | 29.2 | 0.3 | 14.6 | 0.4 |
| ER37 | Ancient Woodland 3 | 0.7 | 25.0 | 0.3 | 12.5 | 0.4 |
| ER38 | Ancient Woodland 4 | 0.7 | 29.2 | 0.3 | 14.6 | 0.4 |
| ER39 | Ancient Woodland 5 | 0.7 | 29.3 | 0.4 | 14.6 | 0.4 |
| ER40 | Ancient Woodland 6 | 0.8 | 29.4 | 0.4 | 14.7 | 0.5 |
| ER41 | Ancient Woodland 7 | 0.6 | 29.2 | 0.3 | 14.6 | 0.4 |
| ER42 | Ancient Woodland 8 | 0.6 | 24.9 | 0.3 | 12.5 | 0.4 |
| ER43 | Ancient Woodland 9 | 1.1 | 22.0 | 0.5 | 11.0 | 0.6 |
| ER44 | Ancient Woodland 10 | 0.7 | 22.4 | 0.4 | 11.2 | 0.4 |
| ER45 | Ancient Woodland 11 | 0.4 | 22.8 | 0.2 | 11.4 | 0.2 |
| ER46 | Ancient Woodland 12 | 0.3 | 26.7 | 0.2 | 13.3 | 0.2 |

5.3.3 As indicated in Table 36, predicted annual mean $NO_x$ concentrations were below the relevant EQS at all sensitive receptor locations.

5.3.4 The PC proportion of the EQS was below 1% at all receptor locations. As such, impacts on annual mean $NO_x$ concentrations can be screened out as insignificant.

5.3.5 As indicated in Table 37, predicted 24-hour mean $NO_x$ concentrations were below the relevant EQS at all sensitive receptor locations.

5.3.6 The new emission PC proportion of the EQS was below 10% at all receptor locations. As such, impacts on 24-hour mean NOx concentrations can be screened out as insignificant.

5.3.7 As such all new emission NOx impacts on ecological designations are acceptable.

5.3.8 All impacts from the combined site emissions also do not exceed the insignificance thresholds.

### Sulphur Dioxide

5.3.9 Predicted annual mean $SO_2$ concentrations are summarised in Table 38.

**Table 38: Annual Mean $SO_2$ Concentrations**

| Receptor | | Concentration (µg/m³) | | Proportion of EQS (%) | | |
|---|---|---|---|---|---|---|
| | | PC | PEC | PC | PEC | Combined Site PC |
| ER1 | Six Pit, Swansea Vale and White Rock SSSI | 0.02 | 2.0 | 0.2 | 20.2 | 1.3 |
| ER2 | Six Pit, Swansea Vale and White Rock SSSI | 0.02 | 2.0 | 0.2 | 20.2 | 1.0 |
| ER3 | Six Pit, Swansea Vale and White Rock SSSI | 0.01 | 2.0 | 0.1 | 20.1 | 0.8 |
| ER4 | Crymlyn Bog SSSI | 0.01 | 2.0 | 0.1 | 20.1 | 0.4 |
| ER5 | Crymlyn Bog Ramsar, SAC, SSSI | <0.01 | 2.0 | 0.1 | 20.1 | 0.3 |
| ER6 | Crymlyn Bog Ramsar, SAC, SSSI, NNR | <0.01 | 2.0 | <0.1 | 20.0 | 0.2 |
| ER7 | Penplas Grasslands SSSI | <0.01 | 1.6 | <0.1 | 16.0 | 0.2 |
| ER8 | Carmarthen Bay and Estuaries, Burry Inlet Ramsar, SAC, SSSI, SPA | <0.01 | 1.2 | <0.1 | 12.0 | <0.1 |
| ER9 | Carmarthen Bay and Estuaries, Burry Inlet Ramsar, SAC, SSSI, SPA | <0.01 | 1.2 | <0.1 | 12.0 | 0.1 |
| ER10 | Carmarthen Bay and Estuaries, Burry Inlet Ramsar, SAC, SSSI, SPA | <0.01 | 1.2 | <0.1 | 12.0 | 0.1 |
| ER11 | Tawe Corridor LWS | 0.19 | 2.2 | 1.9 | 21.9 | 11.5 |
| ER12 | Tawe Corridor LWS | 0.25 | 3.5 | 2.5 | 34.5 | 15.8 |
| ER13 | Tawe Corridor LWS | 0.21 | 3.4 | 2.1 | 34.1 | 12.7 |

| Receptor | | Concentration (µg/m³) | | Proportion of EQS (%) | | |
|---|---|---|---|---|---|---|
| | | PC | PEC | PC | PEC | Combined Site PC |
| ER14 | Tawe Corridor LWS | 0.10 | 3.3 | 1.0 | 33.0 | 5.5 |
| ER15 | Swansea Vale / Fendrod NR LWS | 0.08 | 2.0 | 0.8 | 19.8 | 4.2 |
| ER16 | Swansea Vale / Fendrod NR LWS | 0.10 | 2.0 | 1.0 | 20.0 | 5.3 |
| ER17 | Swansea Vale / Fendrod NR LWS | 0.12 | 2.1 | 1.2 | 21.2 | 6.1 |
| ER18 | Fendrod Lake and Nant-y-Fendrod LWS | 0.17 | 2.2 | 1.7 | 21.7 | 9.0 |
| ER19 | Fendrod Lake and Nant-y-Fendrod LWS | 0.12 | 2.1 | 1.2 | 21.2 | 6.1 |
| ER20 | Llansamlet Marshes LWS | 0.05 | 1.9 | 0.5 | 18.5 | 2.9 |
| ER21 | Main Swansea - Fishguard Railway Line LWS | 0.02 | 2.0 | 0.2 | 20.2 | 1.4 |
| ER22 | Trallwn Marsh and Wood LWS | 0.02 | 1.9 | 0.2 | 19.2 | 1.1 |
| ER23 | Trewyddfa Slopes LWS | 0.02 | 2.3 | 0.2 | 23.2 | 1.3 |
| ER24 | Llewellyn Heath LWS | 0.01 | 2.3 | 0.1 | 23.1 | 0.7 |
| ER25 | Pluck Lake LWS | 0.01 | 1.9 | 0.1 | 19.1 | 0.7 |
| ER26 | Cwm Rhydyceirw to Birchgrove railway LWS | 0.02 | 1.9 | 0.2 | 19.2 | 1.3 |
| ER27 | Cwm Rhydyceirw to Birchgrove railway LWS | 0.02 | 2.3 | 0.2 | 23.2 | 1.4 |
| ER28 | Cwm Rhydyceirw to Birchgrove railway LWS | 0.03 | 1.8 | 0.3 | 18.3 | 1.6 |
| ER29 | Cwm Rhydyceirw to Birchgrove railway LWS | 0.03 | 1.7 | 0.3 | 17.3 | 1.5 |
| ER30 | Llangyfelach Golf Course & Surrounds LWS | 0.01 | 2.3 | 0.1 | 23.1 | 0.6 |
| ER31 | M4 Corridor LWS | 0.03 | 1.7 | 0.3 | 17.3 | 1.4 |
| ER32 | Ynystanglws LWS | 0.03 | 2.3 | 0.3 | 23.3 | 1.4 |
| ER33 | Ynysforgan Wood LWS | 0.01 | 1.6 | 0.1 | 16.1 | 0.5 |
| ER34 | Upper Bran Grazing-Marshes & Heol Las Coalyard LWS | 0.03 | 1.7 | 0.3 | 17.3 | 1.3 |
| ER35 | Ancient Woodland 1 | 0.01 | 2.3 | 0.1 | 23.1 | 0.5 |
| ER36 | Ancient Woodland 2 | 0.02 | 1.7 | 0.2 | 17.3 | 0.5 |

| Receptor | | Concentration (µg/m³) | | Proportion of EQS (%) | | |
|---|---|---|---|---|---|---|
| | | PC | PEC | PC | PEC | Combined Site PC |
| ER37 | Ancient Woodland 3 | 0.01 | 2.4 | 0.1 | 23.5 | 0.8 |
| ER38 | Ancient Woodland 4 | 0.01 | 2.4 | 0.1 | 23.5 | 0.6 |
| ER39 | Ancient Woodland 5 | 0.02 | 2.4 | 0.2 | 23.6 | 0.7 |
| ER40 | Ancient Woodland 6 | 0.01 | 2.4 | 0.1 | 23.5 | 1.0 |
| ER41 | Ancient Woodland 7 | 0.02 | 1.7 | 0.2 | 17.2 | 0.9 |
| ER42 | Ancient Woodland 8 | 0.05 | 1.9 | 0.5 | 19.3 | 1.1 |
| ER43 | Ancient Woodland 9 | 0.02 | 2.4 | 0.2 | 24.2 | 2.5 |
| ER44 | Ancient Woodland 10 | 0.01 | 2.4 | 0.1 | 24.1 | 1.0 |
| ER45 | Ancient Woodland 11 | 0.01 | 2.3 | 0.1 | 23.1 | 0.5 |
| ER46 | Ancient Woodland 12 | 0.01 | 2.3 | 0.1 | 23.1 | 0.4 |

5.3.10 As indicated in Table 38, predicted annual mean $SO_2$ concentrations were below the relevant EQS at all sensitive receptor locations following analysis of worse case meteorological conditions across the 5-year data set.

5.3.11 The PC proportions of the annul mean EQS are less than 1% at all national and European designations (ER1-ER10) and 100% at all local receptors (ER10-ER46). Based on EA screening criteria, impacts on annual mean $SO_2$ concentrations are screened out as insignificant.

5.3.12 As such annual mean $SO_2$ impacts from new emission sources were determined to be acceptable.

5.3.13 The combined site sources PC also does not exceed the insignificance thresholds (above 1% at ER1 but well below 70% of the PEC).

### Nitrogen Deposition

5.3.14 Predicted annual mean nitrogen deposition rates are summarised in **Error! Reference source not found.**.

**Table 39: Predicted Annual Mean Nitrogen Deposition Rates**

| Receptor | Annual Mean Nitrogen Deposition Rate (kgN/ha/yr) | | Proportion of EQS (%) | | | | |
|---|---|---|---|---|---|---|---|
| | | | Low EQS | | High EQS | | Combined Site PC (low EQS) |
| | PC | PEC | PC | PEC | PC | PEC | |
| ER1 | 0.000001 | 17.5 | <0.1 | 175.0 | <0.1 | 116.7 | <0.1 |
| ER2 | <0.000001 | 17.5 | <0.1 | 175.0 | <0.1 | 116.7 | <0.1 |
| ER3 | <0.000001 | 17.5 | <0.1 | 175.0 | <0.1 | 116.7 | <0.1 |

| Receptor | Annual Mean Nitrogen Deposition Rate (kgN/ha/yr) | | Proportion of EQS (%) | | | | |
|---|---|---|---|---|---|---|---|
| | | | Low EQS | | High EQS | | Combined Site PC (low EQS) |
| | PC | PEC | PC | PEC | PC | PEC | |
| ER4 | <0.000001 | 10.0 | <0.1 | 200.0 | <0.1 | 100.0 | <0.1 |
| ER5 | <0.000001 | 10.0 | <0.1 | 200.0 | <0.1 | 100.0 | <0.1 |
| ER6 | <0.000001 | 10.0 | <0.1 | 200.0 | <0.1 | 100.0 | <0.1 |
| ER7 | <0.000001 | 11.2 | <0.1 | 74.7 | <0.1 | 44.8 | <0.1 |
| ER8 | <0.000001 | 11.2 | <0.1 | 112.0 | <0.1 | 56.0 | <0.1 |
| ER9 | <0.000001 | 11.2 | <0.1 | 112.0 | <0.1 | 56.0 | <0.1 |
| ER10 | <0.000001 | 11.2 | <0.1 | 112.0 | <0.1 | 56.0 | <0.1 |
| ER11 | 0.000005 | 17.8 | <0.1 | 178.0 | <0.1 | 89.0 | 0.4 |
| ER12 | 0.000005 | 18.0 | <0.1 | 180.0 | <0.1 | 90.0 | 0.6 |
| ER13 | 0.000005 | 18.0 | <0.1 | 180.0 | <0.1 | 90.0 | 0.4 |
| ER14 | 0.000002 | 18.0 | <0.1 | 180.0 | <0.1 | 90.0 | 0.2 |
| ER15 | 0.000002 | 17.9 | <0.1 | 179.0 | <0.1 | 89.5 | 0.1 |
| ER16 | 0.000002 | 17.9 | <0.1 | 179.0 | <0.1 | 89.5 | 0.2 |
| ER17 | 0.000003 | 17.7 | <0.1 | 177.0 | <0.1 | 88.5 | 0.2 |
| ER18 | 0.000005 | 17.7 | <0.1 | 177.0 | <0.1 | 88.5 | 0.3 |
| ER19 | 0.000003 | 17.7 | <0.1 | 177.0 | <0.1 | 88.5 | 0.2 |
| ER20 | 0.000001 | 10.2 | <0.1 | 102.0 | <0.1 | 51.0 | 0.1 |
| ER21 | 0.000001 | 17.7 | <0.1 | 177.0 | <0.1 | 88.5 | <0.1 |
| ER22 | 0.000001 | 17.4 | <0.1 | 174.0 | <0.1 | 87.0 | <0.1 |
| ER23 | 0.000001 | 18.1 | <0.1 | 181.0 | <0.1 | 90.5 | <0.1 |
| ER24 | <0.000001 | 18.1 | <0.1 | 181.0 | <0.1 | 90.5 | <0.1 |
| ER25 | <0.000001 | 17.4 | <0.1 | 174.0 | <0.1 | 87.0 | <0.1 |
| ER26 | 0.000001 | 18.4 | <0.1 | 184.0 | <0.1 | 92.0 | <0.1 |
| ER27 | 0.000001 | 18.2 | <0.1 | 182.0 | <0.1 | 91.0 | 0.1 |
| ER28 | 0.000001 | 18.1 | <0.1 | 181.0 | <0.1 | 90.5 | 0.1 |
| ER29 | 0.000001 | 17.8 | <0.1 | 178.0 | <0.1 | 89.0 | <0.1 |
| ER30 | <0.000001 | 18.2 | <0.1 | 182.0 | <0.1 | 91.0 | <0.1 |

| Receptor | Annual Mean Nitrogen Deposition Rate (kgN/ha/yr) | | Proportion of EQS (%) | | | | |
|---|---|---|---|---|---|---|---|
| | | | Low EQS | | High EQS | | Combined Site PC (low EQS) |
| | PC | PEC | PC | PEC | PC | PEC | |
| ER31 | 0.000001 | 17.8 | <0.1 | 178.0 | <0.1 | 89.0 | <0.1 |
| ER32 | 0.000001 | 18.2 | <0.1 | 182.0 | <0.1 | 91.0 | 0.1 |
| ER33 | <0.000001 | 18.3 | <0.1 | 183.0 | <0.1 | 91.5 | <0.1 |
| ER34 | 0.000001 | 10.4 | <0.1 | 104.0 | <0.1 | 52.0 | <0.1 |
| ER35 | <0.000001 | 19.8 | <0.1 | 198.0 | <0.1 | 132.0 | <0.1 |
| ER36 | <0.000001 | 19.6 | <0.1 | 196.0 | <0.1 | 130.7 | <0.1 |
| ER37 | <0.000001 | 19.5 | <0.1 | 194.5 | <0.1 | 129.7 | <0.1 |
| ER38 | <0.000001 | 19.6 | <0.1 | 196.1 | <0.1 | 130.7 | <0.1 |
| ER39 | <0.000001 | 19.6 | <0.1 | 196.1 | <0.1 | 130.7 | <0.1 |
| ER40 | <0.000001 | 19.6 | <0.1 | 196.1 | <0.1 | 130.7 | <0.1 |
| ER41 | <0.000001 | 19.6 | <0.1 | 196.1 | <0.1 | 130.7 | <0.1 |
| ER42 | <0.000001 | 19.5 | <0.1 | 194.5 | <0.1 | 129.7 | <0.1 |
| ER43 | <0.000001 | 19.2 | <0.1 | 192.1 | <0.1 | 128.1 | 0.1 |
| ER44 | <0.000001 | 19.6 | <0.1 | 196.0 | <0.1 | 130.7 | <0.1 |
| ER45 | <0.000001 | 19.4 | <0.1 | 194.0 | <0.1 | 129.3 | <0.1 |
| ER46 | <0.000001 | 19.1 | <0.1 | 191.2 | 0.0 | 127.5 | <0.1 |

5.3.15 As indicated in **Error! Reference source not found.**, predicted annual mean nitrogen deposition rates from new emissions were below 1% of the EQS for both the low and high EQSs at all sensitive receptor locations and can be screened as insignificant.

5.3.16 All N deposition impacts from the new emission sources was determined to be acceptable.

5.3.17 The combined sources PC also does not exceed 1% at any national and European designation or 100% at any local designation.

### Acid Deposition

5.3.18 Predicted annual mean acid deposition rates are summarised in Table 40. In accordance with the EA guidance3, the APIS site relevant CLd tool was used to determine whether there is an exceedance of the CL function for acid deposition.

**Table 40 Predicted Annual Mean Acid Deposition Rates**

| Receptor | Predicted Annual Mean Acid Deposition Rate (keq/ha/yr) | | Proportion of EQS (%) | | |
|---|---|---|---|---|---|
| | S | N | PC | PEC | Combined Site PC |
| ER1 | 0.0054 | <0.000001 | 0.2 | 48.1 | 0.99 |
| ER2 | 0.0039 | <0.000001 | 0.1 | 48.1 | 0.75 |
| ER3 | 0.0028 | <0.000001 | 0.1 | 48.1 | 0.59 |
| ER4 | 0.0008 | <0.000001 | 0.1 | 134.6 | 0.81 |
| ER5 | 0.0007 | <0.000001 | 0.1 | 134.6 | 0.63 |
| ER6 | 0.0005 | <0.000001 | 0.1 | 134.6 | 0.45 |
| ER7 | 0.0005 | <0.000001 | <0.1 | 100.9 | 0.23 |
| ER8 | 0.0001 | <0.000001 | <0.1 | 19.6 | 0.01 |
| ER9 | 0.0001 | <0.000001 | <0.1 | 19.6 | 0.01 |
| ER10 | 0.0001 | <0.000001 | <0.1 | 19.6 | 0.02 |
| ER11 | 0.0454 | <0.000001 | 1.5 | 48.8 | 8.96 |
| ER12 | 0.0592 | <0.000001 | 1.9 | 48.8 | 12.35 |
| ER13 | 0.0506 | <0.000001 | 1.7 | 48.8 | 9.91 |
| ER14 | 0.0242 | <0.000001 | 0.8 | 48.8 | 4.32 |
| ER15 | 0.0196 | <0.000001 | 0.6 | 49.1 | 3.28 |
| ER16 | 0.0241 | <0.000001 | 0.8 | 49.1 | 4.16 |
| ER17 | 0.0287 | <0.000001 | 0.9 | 49.1 | 4.72 |
| ER18 | 0.0397 | <0.000001 | 1.3 | 49.1 | 7.00 |
| ER19 | 0.0285 | <0.000001 | 0.9 | 49.1 | 4.76 |
| ER20 | 0.0123 | <0.000001 | 0.7 | 82.2 | 3.82 |
| ER21 | 0.0055 | <0.000001 | 0.3 | 82.2 | 1.89 |
| ER22 | 0.0042 | <0.000001 | 0.2 | 82.2 | 1.44 |
| ER23 | 0.0053 | <0.000001 | 0.2 | 49.6 | 1.00 |
| ER24 | 0.0025 | <0.000001 | 0.1 | 49.6 | 0.53 |
| ER25 | 0.0029 | <0.000001 | 0.1 | 48.1 | 0.54 |
| ER26 | 0.0049 | <0.000001 | 0.2 | 50.2 | 1.01 |
| ER27 | 0.0058 | <0.000001 | 0.2 | 49.5 | 1.08 |
| ER28 | 0.0076 | <0.000001 | 0.4 | 82.2 | 2.07 |

| Receptor | Predicted Annual Mean Acid Deposition Rate (keq/ha/yr) | | Proportion of EQS (%) | | |
|---|---|---|---|---|---|
| | S | N | PC | PEC | Combined Site PC |
| ER29 | 0.0071 | <0.000001 | 0.4 | 82.2 | 1.99 |
| ER30 | 0.0026 | <0.000001 | 0.1 | 50.2 | 0.50 |
| ER31 | 0.0066 | <0.000001 | 0.4 | 82.2 | 1.83 |
| ER32 | 0.0066 | <0.000001 | 0.4 | 82.2 | 1.84 |
| ER33 | 0.0021 | <0.000001 | 0.2 | 131.3 | 1.07 |
| ER34 | 0.0060 | <0.000001 | 0.3 | 82.2 | 1.67 |
| ER35 | 0.0019 | <0.000001 | 0.2 | 140.7 | 0.97 |
| ER36 | 0.0022 | <0.000001 | 0.1 | 52.8 | 0.37 |
| ER37 | 0.0036 | <0.000001 | 0.2 | 87.6 | 1.09 |
| ER38 | 0.0030 | <0.000001 | 0.1 | 52.8 | 0.50 |
| ER39 | 0.0035 | <0.000001 | 0.1 | 52.8 | 0.58 |
| ER40 | 0.0045 | <0.000001 | 0.1 | 52.8 | 0.75 |
| ER41 | 0.0034 | <0.000001 | 0.1 | 52.8 | 0.67 |
| ER42 | 0.0053 | <0.000001 | 0.3 | 88.1 | 1.43 |
| ER43 | 0.0120 | <0.000001 | 0.4 | 52.0 | 1.98 |
| ER44 | 0.0046 | <0.000001 | 0.1 | 53.1 | 0.80 |
| ER45 | 0.0017 | <0.000001 | 0.1 | 52.9 | 0.38 |
| ER46 | 0.0015 | <0.000001 | <0.1 | 57.0 | 0.32 |

5.3.19 As shown in Table 40, predicted annual mean acid deposition rates exceed the EQS at several receptor location as a baseline condition.

5.3.20 However, the new emission PC proportion of the EQS does not exceed 1% at all national and European designations (ER1-ER10) and 100% at all local receptors (ER11-ER46). Based on the EA screening criteria, acid deposition rates can be screened out as insignificant.

5.3.21 As such acid deposition impacts from the new emission sources was determined to be acceptable.

5.3.22 The combined sources PC also does not exceed the insignificance thresholds at any sensitive location.

# 6.0 Conclusion

6.1.1 Enzygo Ltd was commissioned by Morganite Electrical Carbon Ltd to undertake an air quality impact assessment to support a variation of the environmental permit on land off Upper Fforest Way, Swansea.

6.1.2 Dispersion modelling of pollutants, using emission limits and monitoring of existing stack emissions, was undertaken with ADMS 6 modelling software. Impacts at human and ecological sensitive receptors were predicted for the new proposed emissions in isolation and in-combination with existing emissions and results compared with the relevant EQSs and significance criteria.

6.1.3 Impacts were based on the use of the maximum predicted concentrations over the 5-year meteorological data set. Subsequently, the predicted concentrations are considered a robust assessment.

6.1.4 Predicted impacts on pollutant concentrations at human and ecological receptor locations could be screened out as insignificant for all new emissions sources.

6.1.5 Total PECs including existing emissions were examined in further detail for 24-hour mean $PM_{10}$ and 24-hour, 1-hour and 15-minute $SO_2$ concentrations. However, this indicated that the EQS would not be exceeded at any sensitive locations across the assessment extents, and given the headroom to the EQS impacts were deemed acceptable for total existing and new emissions.

6.1.6 All other impacts could be screened as insignificant.

6.1.7 All impacts from the new emission sources in the permit variation were deemed acceptable.

6.1.8 New proposed emissions when considered in combination with existing site emissions were also deemed acceptable.

# 7.0 Abbreviations

| | |
|---|---|
| AAD | Ambient Air Directive |
| ADM | Atmospheric Dispersion Modelling |
| ADMS | Atmospheric Dispersion Modelling Software |
| APIS | Atmospheric Pollution Information System |
| AQA | Air Quality Assessment |
| AQLV | Air Quality Limit Value |
| AQMA | Air Quality Management Area |
| AQO | Air Quality Objective |
| AQS | Air Quality Strategy |
| AQTAG | Air Quality Technical Advisory Group |
| ASR | Annual Status Report |
| AW | Ancient Woodland |
| CCS | City and County of Swansea |
| CERC | Cambridge Environmental Research Consultants |
| CLd | Critical Load |
| CLv | Critical Level |
| DEFRA | Department for Environment, Food and Rural Affairs |
| EA | Environment Agency |
| EAL | Environment Assessment Level |
| ELV | Emission Limit Values |
| EP | Environmental Permit |
| EPAQS | Expert Panel on Air Quality Standards |
| EPUK | Environmental Protection UK |
| EQS | Environmental Quality Standard |
| IAQM | Institute of Air Quality Management |
| LAQM | Local Air Quality Management |
| LMC | Long Metallised Carbon |
| LNR | Local Nature Reserve |
| LWS | Local Wildlife Site |
| MAGIC | Multi-Agency Geographic Information for the Countryside |
| MCPD | Medium Combustion Plant Directive |
| NRW | Natural Resources Wales |
| NGR | National Grid Reference |
| NNR | National Nature Reserve |
| $NO_x$ | Nitrogen Oxide |
| $NO_2$ | Nitrogen Dioxide |
| NPPF | The National Planning Policy Framework |
| NPPG | National Planning Practice Guidance |
| PAH | Polycyclic Aromatic Hydrocarbons |
| PC | Process Contribution |
| PEC | Predicted Environmental Concentration |
| PM | Particulate Matter |
| $PM_{10}$ | Particulate matter with an aerodynamic diameter of less than 10 µm |
| $PM_{2.5}$ | Particulate matter with an aerodynamic diameter of less than 2.5 µm |
| SAC | Special Area of Conservation |
| SEWBRC | South East Wales Biodiversity Records Centre |
| $SO_2$ | Sulphur Dioxide |
| SPA | Special Protection Area |
| SSSI | Site of Special Scientific Interest |
| TOC | Total Organic Compounds |

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