ELECTRICITY GENERATION PLANT

SOLUTIA, TRASTON ROAD, NEWPORT

AIR QUALITY ASSESSMENT

April 2019

Report Ref: 01.0024.051 v2

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CONTENTS

1.0 INTRODUCTION

1.1 Background

This air quality assessment has been undertaken by Isopleth Ltd on behalf of UK Power Reserve Ltd ('UKPR').

The assessment considers air quality impacts associated with the operation of the existing Solutia electricity generation plant at their site on land at Traston Road, Newport NP19 4RD (Figure 1). The site lies within the administrative area of Newport City Council (NCC).

The air quality impact of the operational development has been assessed in order to comply with the requirements of the Medium Combustion Plant Directive (MCPD). The type, source and significance of potential impacts are identified and any additional measures that should be employed to minimise these impacts are described.

The key pollutant associated with operation of the spark ignition engines considered in this assessment is nitrogen dioxide (NO_x as NO_2). Although carbon monoxide (CO) is also emitted, there is no requirement to undertake an assessment of this pollutant under the MCPD Guidance for units fuelled by natural gas. Other pollutants, such as sulphur dioxide (SO_2), sometimes associated with the operation of spark ignition engines (when run on biogas) are generated in negligible levels when using this fuel type. Predicted ground level concentrations of these pollutants are compared with relevant air quality standards and guidelines for the protection of human health and sensitive habitats.

1.2 Scope

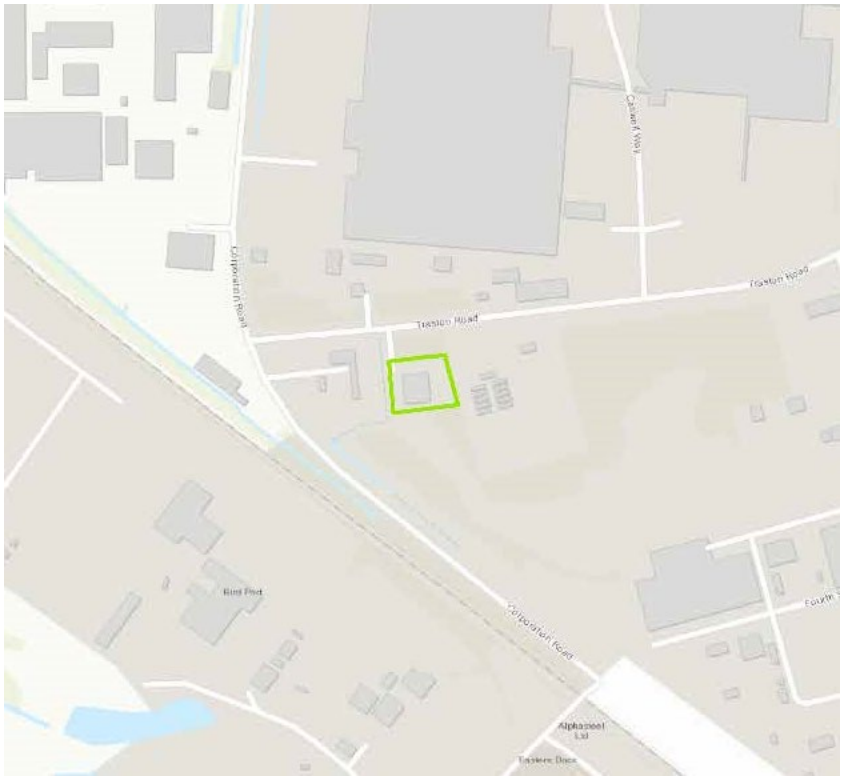
This detailed assessment report relates to the impact of air pollutants from the operation of the facility. Results of the dispersion modelling for engine exhaust emissions are presented in terms of concentrations, with a description of significance in line with the requirements of the MCPD permitting guidance.

2.0 SITE DESCRIPTION

2.1 Location

The Solutia facility is located on land at the 1 Traston Rd, Newport, NP19 4RD. The approximate National Grid Reference for the site is 333015, 185700. A location plan of the site is presented as Figure 1.

Figure 1: Site Location



The closest human receptors are located a significant distance from the facility:

- Lysaght Avenue (842m);
- Traston Lane (982m);
- Lliswerry High School (1144m);
- Spytty Lane (1103m);
- Hart Farm (1419m);
- Mill parade (1486m); and
- Castle Street (1519m).

The closest ecological receptors are:

- River Usk SSSI / SAC; and
- Gwent Levels SSSI.

2.2 Development Description

The plant consists of five GE Jenbacher 620 units (engines 1, 2 & 3 rated at 2.7MWe and engines 5 & 6 rated at 3MWe) and a single GE Jenbacher 616 unit (engine 4 rated at 2.05MWe). These units combust natural gas and produce electricity which is sold onto the National Grid.

Four of the engines are fitted with 15m stacks and are situated in a dedicated building of approximately 10m in height. The other 2 engines are containerised and sited outside the building with 12m (vertically orientated) exhausts.

This air quality assessment assumes that the facility will operate for all hours of the year.

3.0 REGULATORY STANDARDS AND GUIDELINES

3.1 International Legislation and Policy

European Directive 2008/50/EC of the European Parliament and of the Council of 21st May 2008, sets legally-binding Europe-wide limit values for the protection of public health and sensitive habitats. The Directive streamlines the European Union's air quality legislation by replacing four of the five existing Air Quality Directives within a single, integrated instrument.

The pollutants included are sulphur dioxide (SO_2), nitrogen dioxide (NO_2), particulate matter of less than 10 micrometres (µm) in aerodynamic diameter (PM_{10}), particulate matter of less than 2.5 µm in aerodynamic diameter lead ($PM_{2.5}$), lead (Pb), carbon monoxide (CO), benzene (C_6H_6), ozone (O_3), polycyclic aromatic hydrocarbons (PAHs), cadmium (Cd), arsenic (As), nickel (Ni) and mercury (Hg).

Directive 2008/50/EC makes it clear that the ambient air quality standards shall not be enforced where there is no regular public access and fixed habitation:

> *'2. Compliance with the limit values directed at the protection of human health shall not be assessed at the following locations:*
>
> *(a) any locations situated within areas where members of the public do not have access and there is no fixed habitation;*
>
> *(b) in accordance with Article 2(1), on factory premises or at industrial installations to which all relevant provisions concerning health and safety at work apply;*
>
> *(c) on the carriageway of roads; and on the central reservations of roads except where there is normally pedestrian access to the central reservation.'*

The implications of the UK decision to exit the European Union on the potential future of Regulations which transpose European Directives such as the Directive (EU) 2015/2193 of the European Parliament and of the Council of 25 November 2015 on the limitation of emissions of certain pollutants into the air from medium combustion plants (MCPD) or Directive 2010/75/EU on industrial emissions (IED) is unclear at this time. However in the near future it is possible that the requirements will be retained in a similar form in line with laws covered by the European Union (Withdrawal) Bill on 13th July 2017.

3.2 Air Quality Strategy for England, Scotland, Wales & Northern Ireland

The Government's policy on air quality within the UK is set out in the Air Quality Strategy (AQS) for England, Scotland, Wales and Northern Ireland (AQS) published in July 2007, pursuant to the requirements of Part IV of the Environment Act 1995. The AQS sets out a framework for reducing hazards to health from air pollution and ensuring that international commitments are met in the UK. The AQS is designed to be an evolving process that is monitored and regularly reviewed.

The AQS sets standards and objectives for ten main air pollutants to protect health, vegetation and ecosystems.

The air quality standards are long-term benchmarks for ambient pollutant concentrations which represent negligible or zero risk to health, based on medical and scientific evidence reviewed by the Expert Panel on Air Quality Standards (EPAQS) and the World Health Organisation (WHO). These are general concentration limits, above which sensitive members of the public (e.g. children, the elderly and the unwell) might experience adverse health effects.

The air quality objectives are medium-term policy based targets set by the Government which take into account economic efficiency, practicability, technical feasibility and timescale. Some objectives are equal to the EPAQS recommended standards or WHO guideline limits, whereas others involve a margin of tolerance, i.e. a limited number of permitted exceedences of the standard over a given period.

For some pollutants there is both a long-term (annual mean) standard and a short-term standard. In the case of NO_2, the short-term standard is for a 1-hour averaging period. These periods reflect the varying impacts on health of differing exposures to pollutants. The National air quality objectives are contained in the Air Quality (Wales) Regulations 2000, as amended by the Air Quality (Wales) (Amendment) Regulations 2002.

Table 3-1
Air Quality Strategy Objectives

Pollutant	Concentrations	Measured As
Nitrogen Dioxide (NO_2)	200 µg/m^3 not to be exceeded more than 18 times per year	1 hour mean
	40 µg/m^3	Annual mean

The health studies which provide the basis for the air quality standards are based on data for individuals within a population, and therefore the exposure should relate to that of an individual.

For the purposes of LAQM, regulations state that exceedances of the objectives should be assessed in relation to 'the quality of the air at locations which are situated outside of buildings or other natural or man-made structures, above or below ground, and where members of the public are regularly present'.

Examples of where the objectives should, and should not apply, are summarised in Table 3-2 below, as taken from DEFRA Guidance LAQM TG(16). This table should be considered in the context of the conclusions of various review documents such as The AQC report[1] *Relationship between the UK Air Quality Objectives and Occupational Air Quality Standards* (November 2016). In particular it is important that, when setting the objective, DEFRA took account of EPAQs's recommendations. It was also influenced by the limit value set in European Commission's First Air Quality Daughter Directive which made it clear that it only applied to *'outdoor air in the troposphere, excluding work places'*. The Ambient air quality Directive is consistent with this, stating that *'Compliance with the limit values directed at the protection*

[1] http://www.aqconsultants.co.uk/AQC/media/Reports/Relationship-between-the-UK-Air-Quality-Objectives-and-Occupational-Air-Quality-Standards.pdf

of human health shall not be assessed… on factory premises or at industrial installations to which all relevant provisions concerning health and safety at work apply'.

As such, commercial / industrial occupiers of industrial units would therefore be outside the requirements of the air quality objectives. Occupiers of industrial units where members of the public would 'regularly be present' are however within the requirements.

Table 3-2
Air Quality Strategy Objectives

Averaging Period	Objectives should apply at:	Objectives should generally not apply at:
Annual mean	All locations where members of the public might be regularly exposed. Building façades of residential properties, schools, hospitals, care homes etc.	Building façades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term.
1-hour mean	All locations where the annual mean and: 24 and 8-hour mean objectives apply. Kerbside sites (for example, pavements of busy shopping streets). Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more. Any outdoor locations where members of the public might reasonably expected to spend one hour or longer.	Kerbside sites where the public would not be expected to have regular access.

3.3 Local Air Quality Management (LAQM)

Part IV of the Environment Act 1995 also requires local authorities to periodically Review and Assess the quality of air within their administrative area. The Reviews have to consider the present and future air quality and whether any air quality objectives prescribed in Regulations are being achieved or are likely to be achieved in the future. The review process in Wales is described in Welsh Government document '*Local air quality management in Wales Policy guidance'* June 2017 PG(W)(17).

Where any of the prescribed air quality objectives are not likely to be achieved the authority concerned must designate that part an Air Quality Management Area (AQMA). For each AQMA, the local authority has a duty to draw up an Air Quality Action Plan (AQAP) setting out the measures the authority intends to introduce to deliver improvements in local air quality

in pursuit of the air quality objectives. Local authorities are not statutorily obliged to meet the objectives, but they must show that they are working towards them.

The Department of Environment, Food and Rural Affairs (DEFRA) has published technical guidance for use by local authorities in their Review and Assessment work. This guidance is commonly referred to as LAQM.TG(16). Full details are available on the DEFRA website.

3.4 Medium Combustion Plant Directive (MCPD)

Directive (EU) 2015/2193 of the European Parliament and the Council of 25th November 2015 on the limitation of emissions of certain pollutants into the air from medium combustion plants (Medium Combustion Plant (MCP) Directive) regulates pollutant emissions from the combustion of fuels in plants with a rated thermal input equal to or greater than 1 megawatt (MWth) and less than 50 MWth.

The MCPD entered into force on 18th December 2015 and has been transposed into the Environmental Permitting Regulations, most recently through The Environmental Permitting (England and Wales) (Amendment) Regulations 2018 No. 110.

The MCPD regulates emissions of NO_x, SO_2, and particulate matter (PM_{10}) into the air with the aim of reducing those emissions and the risks to human health and the environment they may cause. It also lays down rules to monitor emissions of carbon monoxide (CO).

Natural Resources Wales has issued guidance relating to MCPD regulation and assessment, including:

> *'Emissions from specified generators (Version 1). Guidance on dispersion modelling for oxides of nitrogen assessment from specified generators.'*

This NRW guidance states that it is intended for use with:

- Tranche A generators that have NO_X emissions greater than 500 mg/Nm^3 (at 273.15 K, 101.3 kPa, 0% moisture and 15% oxygen), with aggregated rated thermal inputs of greater than 5 MW_{th} and operating more than 50 hours per year;
- Tranche B generators with NO_X emissions less than 190 mg/Nm^3, with aggregated thermal inputs greater than 1 MW_{th} and operating more than 50 hours per year where there is a higher risk of NOX impacts. For example, where the plant is located in or near an Air Quality Management Area (AQMA) declared for NO_2, or operates for more than 500 hours per year.

These include former Tranche A generators with transitional arrangements of:

- NO_X emissions less than 500 mg/Nm^3 with aggregated rated thermal inputs greater than 5 MW_{th}; and aggregated rated thermal inputs less than 5 MW_{th}.

This detailed air quality assessment is compliant with the requirements of the NRW guidance.

4.0 ASSESSMENT METHODOLOGY

This assessment has been prepared in accordance with the method described below. This is consistent with the NRW Guidance on Dispersion Modelling referenced above.

4.1 Stack Emissions

The scope of the impact assessment for stack emissions from the operational facility has been determined in the following way:

- review of air quality data for the area surrounding the Site, including data from the Defra Air Quality Information Resource (UK-AIR) and the Air Pollution Information System (APIS);
- desk study to confirm the location of nearby areas that may be sensitive to changes in local air quality; and
- review of emission parameters for the combustion plant and dispersion modelling using the Breeze AERMOD 8 dispersion model (version 16216r) to predict ground-level concentrations of pollutants at sensitive human and habitat receptor locations.

A single model scenario has been assessed which represents the existing layout. MCPD emission limits have been assumed for the purposes of the modelling assessment and the plant is assumed to be operating at full load for the entire year (8760 hours per year) for both short term and long term impacts.

The input parameters used in the assessment are identified in Appendix A.

4.2 Local Meteorological Data

The dispersion modelling has been carried out using five years (2013-2017) of hourly sequential meteorological data in order to take account of inter-annual variability and reduce the effect of any atypical conditions. Data from Cardiff (Rhoose) meteorological station has been used for the assessment. This site is the most representative data currently available for the area which provides the level of completeness required for dispersion modelling (i.e. minimal missing data).

A windrose for all years of meteorological data are presented in Appendix B.

4.3 Topography

The presence of elevated terrain can significantly affect the dispersion of pollutants and the resulting ground level concentration in a number of ways. Elevated terrain reduces the distance between the plume centre line and the ground level, thereby increasing ground level concentrations. Elevated terrain can also increase turbulence and, hence, plume mixing with the effect of increasing concentrations near to a source and reducing concentrations further away.

The generation facility lies at a basal elevation of around 1m AoD. Topography has been incorporated within the dispersion model.

AERMOD utilises digital elevation data to determine the impact of topography on dispersion from a source. Topographical data for the site has been obtained in OS digital (.ntf) format. Data was processed by the AERMAP function within AERMOD to calculate terrain heights, and interpolate data to calculate terrain heights for sources, buildings etc.

4.4 Building Downwash / Entrainment

The presence of buildings close to emission sources can significantly affect the dispersion of pollutants by leading to downwash. This occurs when a building distorts the wind flow, creating zones of increased turbulence. Increased turbulence causes the plume to come to ground earlier than otherwise would be the case and result in higher ground level concentrations closer to the stack. Downwash effects are only significant where building heights are greater than 40% of the emission release height. The downwash structures also need to be sufficiently close for their influence to be significant.

Four of the engines are fitted with 15m stacks and are situated in a dedicated building of approximately 10m in height. The other 2 engines are containerised and sited outside the building with 12m (vertically orientated) exhausts.

The engine building and engine containers have been included in the dispersion model to account for potential downwash effects. All other site buildings within 5 stack heights are lower than 40% of the stack and are therefore not relevant to the model.

4.5 Nitric Oxide to NO_2 Conversion

Oxides of nitrogen (NOx) emitted to atmosphere as a result of combustion will consist largely of nitric oxide (NO), a relatively innocuous substance. Once released into the atmosphere, NO is oxidised to NO_2. The proportion of NO converted to NO_2 depends on a number of factors including wind speed, distance from the source, solar irradiation and the availability of oxidants, such as ozone (O_3).

A conversion ratio of 70% NOx:NO_2 has been assumed for comparison of predicted concentrations with the long-term objectives for NO_2. A conversion ratio of 35% has been utilised for the assessment of short-term impacts, as recommended by Natural Resources Wales guidance[2].

4.6 Sensitive Human Health Receptors

The term 'sensitive receptors' includes any persons, locations or systems that may be susceptible to changes as a consequence of the operational facility. As described in section 3.2 of this report, annual objectives only apply at residences.

[2] AQMAU, Conversion Rates for NOx and NO_2.

A selection of the closest residential receptors to the development which have been used for modelling purposes are shown in Table 4.1. It is recognised that this list is not exhaustive, however these receptors have been selected in order to provide an indication of impacts in all directions from the operational facility site. All of the receptors below are greater than 800m from the site.

Table 4-1
Modelled Receptors: Human

Reference	Description	OS GR Xm	OS GR Ym	Height (m AoD)
D1	Lysaght Avenue	332761.4	186502.8	2.0
D2	Traston Lane	333821.6	186258.0	4.5
D3	Lliswerry High School	334029.2	186227.1	4.3
D4	Spytty Lane	333344.7	186751.9	3.9
D5	Hart Farm	334310.2	185122.2	3.1
D6	Mill parade	331683.2	186361.2	1.0
D7	Castle Street	331918.4	186752.9	2.0

Impacts have also been assessed by use of a receptor grid at 30m resolution across the model domain. These results have been presented as impact isopleths and this allows the concentration at all locations to be determined. These predicted ground level concentrations may then be compared with relevant long term air quality standards and guidelines for the protection of health.

4.7 Sensitive Habitats and Ecosystems

The presence of the following habitat sites has been assessed:

- Special Areas of Conservation (SACs) and candidate SACs (cSACs) designated under the EC Habitats Directive[3];
- Special Protection Areas (SPAs) and potential SPAs designated under the EC Birds Directive[4];
- Ramsar Sites designated under the Convention on Wetlands of International Importance[5]; and
- Sites of Special Scientific Interest (SSSI).

A search has also been completed for Ancient Woodlands and Local Nature reserves although the NRW permitting air quality limits for these sites are relatively high.

Where sensitive ecological receptors are present, maximum predicted ground level concentrations of NOx are compared with relevant critical levels, thresholds of airborne

[3] Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora.

[4] Council Directive 79/409/EEC on the conservation of wild birds.

[5] Ramsar (1971), The Convention of Wetlands of International Importance especially as Waterfowl Habitat.

pollutant concentrations above which damage may be sustained to sensitive plants and animals. The development is not a significant source of SO_2 or HCL / HF.

The critical levels are based on monitoring criteria and only apply in the following areas:

- more than 20 km from agglomerations; and
- more than 5 km away from other built up areas, industrial installations motorways and major roads with a traffic count of more than 50,000 vehicles per day.

Critical loads refer to the threshold beyond which deposition of pollutants to water or land results in measurable damage to vegetation and habitats. Predicted concentrations of SO_2, NOx and HCl (where applicable) are also used to determine acid and nutrient nitrogen deposition rates, using typical deposition velocities. The maximum predicted deposition rates are compared with site specific critical loads obtained from APIS.

A MAGIC map showing ecological receptors is shown in Appendix E. It can be seen that there are two sites of national or international ecological interest within 5km and no local sites within 2km of the facility. The closest point of the SSSIs is shown in Table 4-2, below.

Table 4-2
Modelled Receptors: Ecological

Reference	Description	OS GR Xm	OS GR Ym	Height (m AoD)
E1	River Usk	304676.0	197255.0	266.1
E2	Gwent Levels SSSI	304023.0	204412.0	239.3

Impacts at the local site can be seen from the impact isopleths provided in Appendix D. A summary of critical levels for the protection of sensitive ecosystems and vegetation is presented in Appendix C.

4.8 Significance of Impact

NRW Significance criteria is described in *Air emissions risk assessment for your environmental permit*. This involves a staged approach, first considering Process Contribution only (PC) and then Predicted Environmental Concentration (PEC) where necessary.

4.8.1 Stage 1

The NRW Guidance describes that, to screen out a PC for any substance so that no further assessment is needed for that pollutant, the PC must meet both of the following criteria:

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

If both of these criteria are met no further assessment of the substance is required. There will be a need to carry out a second stage of screening to determine the impact of the PEC if the criteria are not met.

4.8.2 Stage 2

The NRW Guidance describes that, in the second stage of screening if both of the following requirements are met there is no requirement for any further assessment of that substance. Detailed modelling will be required for emissions that don't meet both of the following requirements:

- 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

The guidance then states that no further action is needed if the assessment has shown that both of the following apply:

- emissions comply with BAT associated emission levels (AELs) or the equivalent requirements where there is no BAT AEL; and
- the resulting PECs are not predicted to exceed environmental standards

A cost benefit analysis is required if any of the following apply:

- PCs could cause a PEC to exceed an environmental standard (unless the PC is very small compared to other contributors);
- the PEC is already exceeding an environmental standard;
- the activity or part of it isn't covered by a 'BAT reference document' (BREF);
- the emissions from the facility don't comply with BAT AELs; or
- a BAT assessment has been requested.

If the emissions from the facility that affect ecological sites meet both of the following criteria, they are insignificant:

- the short-term PC is less than 10% of the short-term environmental standard for protected conservation areas; and
- the long-term PC is less than 1% of the long-term environmental standard for protected conservation areas

If these requirements are not met there is a need to calculate the PEC and check the PEC against the standard for protected conservation areas.

- If your long-term PC is greater than 1% and the PEC is less than 70% of the long-term environmental standard, the emissions are insignificant and there is no requirement to assess them any further; however
- If the PEC is greater than 70% of the long-term environmental standard, detailed modelling is required.

5.0 BASELINE CONDITIONS

5.1 Council Review and Assessment of Air Quality

The Newport City Council 2017 Air Quality Status Report states that:

> *'A number of changes to the city's AQMAs will come into effect from 1 July 2018 and Newport will then have 11 AQMAs:*
>
> - *Caerleon (AQMA amended)*
> - *Malpas Road south (AQMA amended)*
> - *Chepstow Road / Clarence Place / Caerleon Road (AQMA amended and combined)*
> - *Cefn Road (new AQMA)*
> - *Caerphilly Road (new AQMA)*
> - *George Street (new AQMA)*
>
> *AQMAs along the M4:*
>
> - *Royal Oak Hill (no change)*
> - *Glasllwch Crescent (no change)*
> - *St Julians (no change)*
> - *High Cross (new AQMA)*
> - *Shaftesbury (no change)'*

The site does not lie within an AQMA, the closest being the George Street AQMA:

> *'The George Street AQMA encompasses - George Street between George Street / Commercial Road Junction to the George Street / Lower Dock Street Junction.'*

There are no NO_2 Air Quality Management areas with the potential to be affected by the development.

5.2 Local Monitoring Data

The 2017 Air Quality Status Report states that NCC did not undertake any monitoring for NO_2 which is directly relevant to the facility.

5.3 DEFRA Background Maps

Additional information on background concentrations in the vicinity of the development site has been obtained from the DEFRA background pollutant maps. The 2019 background concentration from grid square 333000, 185500 which represents the operational site is 14.7µg/m^3. The estimated DEFRA background NO_2 concentration is therefore 'well below' the relevant objective for this pollutant.

6.0 PREDICTED IMPACTS

6.1 Human Receptors

The predicted process contribution (PC) at the maximum point of impact (offsite) is presented in Table 6.1.

Table 6-1
Maximum Predicted Ground Level Concentrations (µg/m³)

Pollutant	Averaging Period	EAL (µg/m³)	PC (µg/m³)	PC (%age of EAL)
NO_2	1-hour	200	232.3	116%

[*18th Highest value of operational period, equating to 99.79th percentile of entire year.]

The results show that the process contribution is above the relevant objective outside of the site boundary, however as can be seen in Appendix D this is not at a location where a member of the public may reasonably be expected to spend 1 hour or more. The impacts at the industrial estate (i.e. workplaces) would fall under the regulation of the Health and Safety Executive. The potentially significant long-term and short-term impacts are compared with the baseline concentrations (i.e. PC + Baseline, or Predicted Environmental Concentration, 'PEC') for the operational facility in Table 6.2.

Table 6-2
Comparison of Predictions with Baseline Concentrations (µg/m³)

Pollutant	EAL	Baseline	PEC	PEC (as a %age of EAL)
NO_2	200	29.4	261.7	131%

As with the PC the PEC is above the relevant objective outside of the site boundary, however as can be seen in Appendix D this is not at a location where a member of the public may reasonably be expected to spend 1 hour or more. The results at the human receptor locations are shown below.

Table 6-3
Receptor Impact Concentrations (µg/m³)

Receptor Ref	PC Annual NO_2	PEC Annual NO_2	PC 1-hr NO_2	PEC 1-hr NO_2
R1	0.81	15.5	12.0	41.4
R2	1.00	15.7	10.1	39.5
R3	0.91	15.6	8.4	37.8
R4	0.56	15.3	8.6	38.0
R5	1.06	15.8	7.4	36.8
R6	0.39	15.1	6.4	35.9
R7	0.34	15.1	5.9	35.3

Maximum predicted impacts at receptor locations are well within the objective limits for protection of human health, as can be seen in Table 6.3 and Appendix D. The highest long term NO_2 impact is predicted to fall at receptor R5 (Hart Farm) which is less than 39.4% of the annual NO_2 objective.

6.2 Ecological Receptors

The impacts at the SSSI locations (annual and 24-hour) can be seen in Table 6-4, below.

Table 6-4
Ecological Impact Concentrations (µg/m^3)

Receptor Ref	PC Annual NO_2	PEC Annual NO_2	PC 24-hr NO_2	PEC 24-hr NO_2
E1	2.43	8.1%	14.09	18.8%
E3	0.90	3.0%	2.89	3.9%

Appendix D shows the NO_2 impact in relation to the 24-hour limit of 75µg/m^3.

6.3 Summary

As would be expected, the air quality impact is high at locations adjacent to the generators, within the industrial estate. This is not a location where the hourly or annual objectives would apply. However, at locations where the hourly and / or annual objectives must be applied, levels are well below the relevant NO_2 objectives.

8.0 CONCLUSIONS

An assessment has been carried out to determine the local air quality impacts associated with the operation of the facility.

Detailed air quality modelling using the AERMOD 8 dispersion model has been undertaken to predict the impacts associated with stack emissions from the gas engines at the Site. Emissions from the stacks have been assumed to occur for the full year when comparing against short term and long term air quality limits.

Although impacts are high immediately adjacent to the site, all impacts (human and ecological) are predicted to be below limit values at locations where the Air Quality Directive states that they must be applied.

APPENDIX A: INPUT DATA

Table A-1
Modelling Inputs

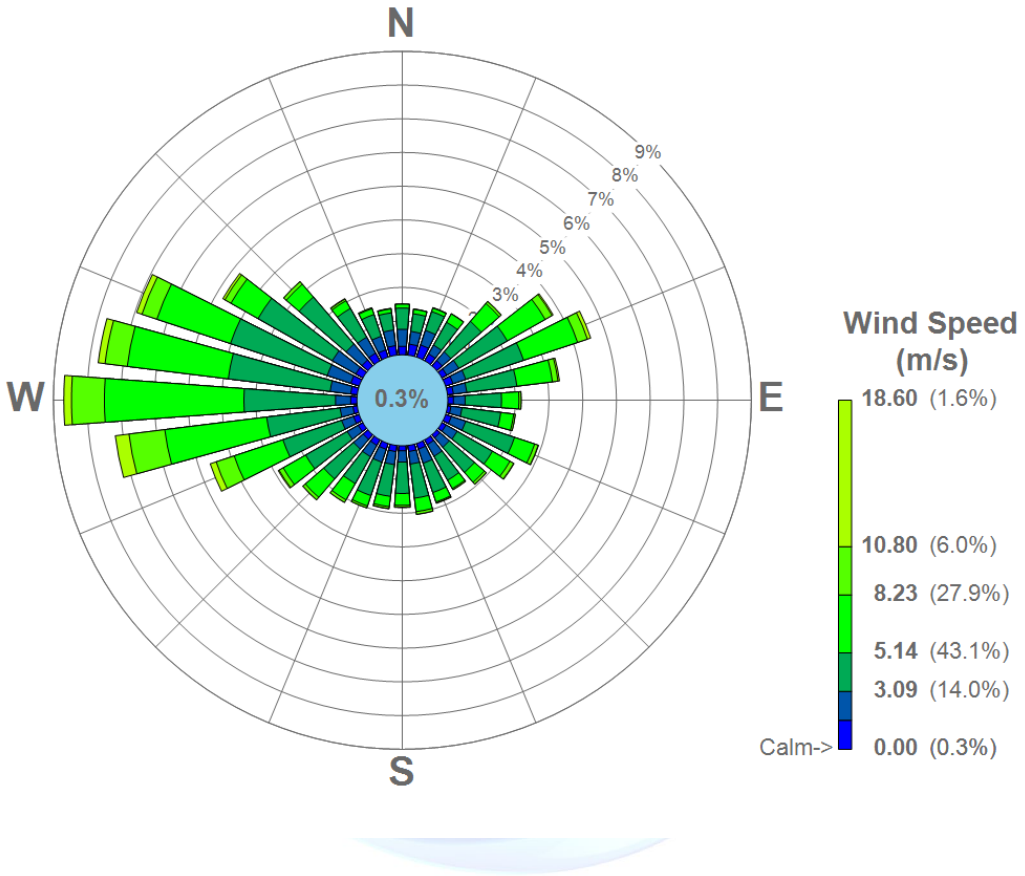
Parameter	Modelled Value		
No. of engines	2	1	3
Engine rating (kWe)	3041	2057	2717
Total capacity (MWe)	6.082	2.057	8.151
NOx concentration (mg/nm^3)*	190	190	190
CO concentration (mg/nm^3)	350	350	350
Exhaust Temp (K)	709	709	709
Normalised Flow (Nm^3/s per engine)	6.55	4.43	5.85
Actual Flow (Am^3/s per engine)	10.05	6.80	8.98
NOx mass emission (g/s) per engine*	1.24	0.84	1.11
CO mass emission (g/s) per engine	2.29	1.55	2.05
Stack Diameter (m)	0.60	0.60	0.60
Velocity of release (m/s)	35.54	24.04	31.75

Table A-2
Stack Locations

Stack	OS Xm	OS Ym
Engine 1	333013.4	185708.9
Engine 2	333013.4	185704.4
Engine 3	333013.7	185700.0
Engine 4	333014.1	185695.7
Engine 5	333037.1	185722.5
Engine 6	333037.4	185719.1

APPENDIX B: WIND DATA

Figure B-1
Wind Data: Cardiff Rhoose (2014 – 2018)



APPENDIX C: AIR QUALITY LIMITS

Table C-1
Air Quality Strategy Objectives

Pollutant	Concentrations	Measured As
Nitrogen Dioxide (NO_2)	200 µg/m^3 not to be exceeded more than 18 times per year	1 hour mean
	40 µg/m^3	Annual mean
Nitrogen Dioxide (NO_x)	30 µg/m^3	Annual mean : Protection of Vegetation
	75 µg/m^3	24h: Protection of Vegetation

APPENDIX D: IMPACT PLOTS

Figure D1: Annual Average NO_2 impact PC

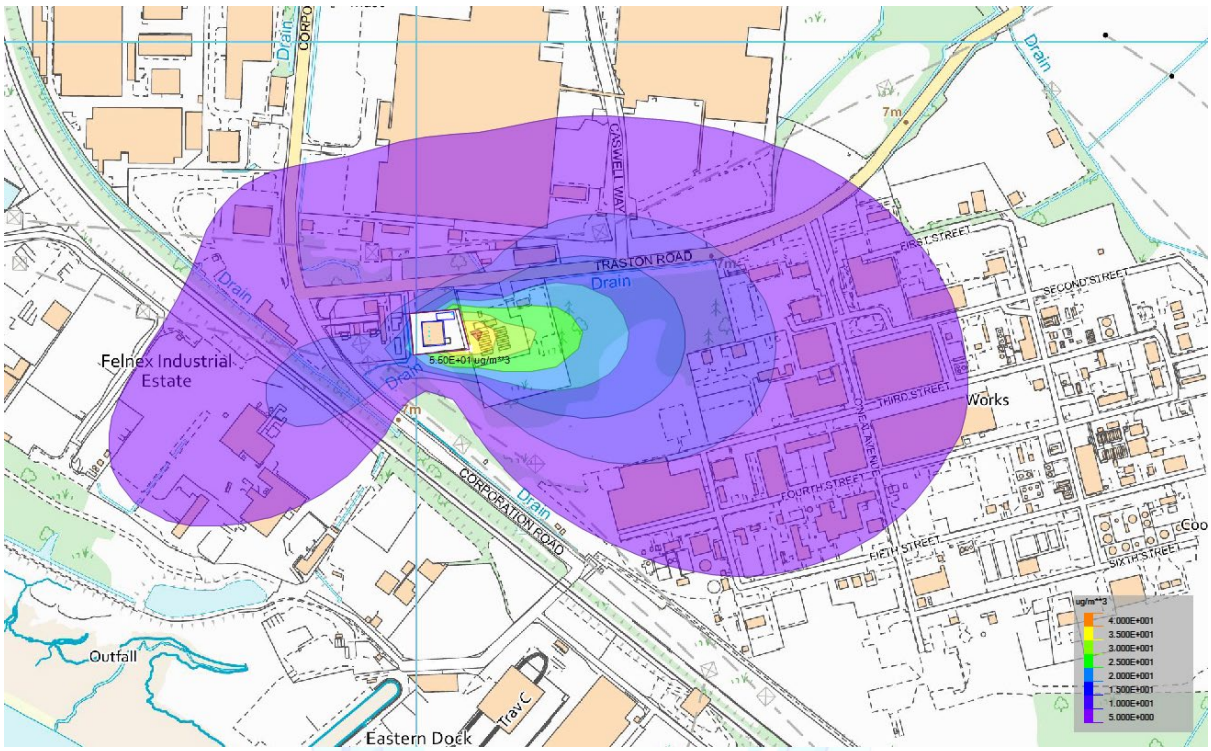


Figure D2: 1hr (99.79th percentile) NO_2 impact PC

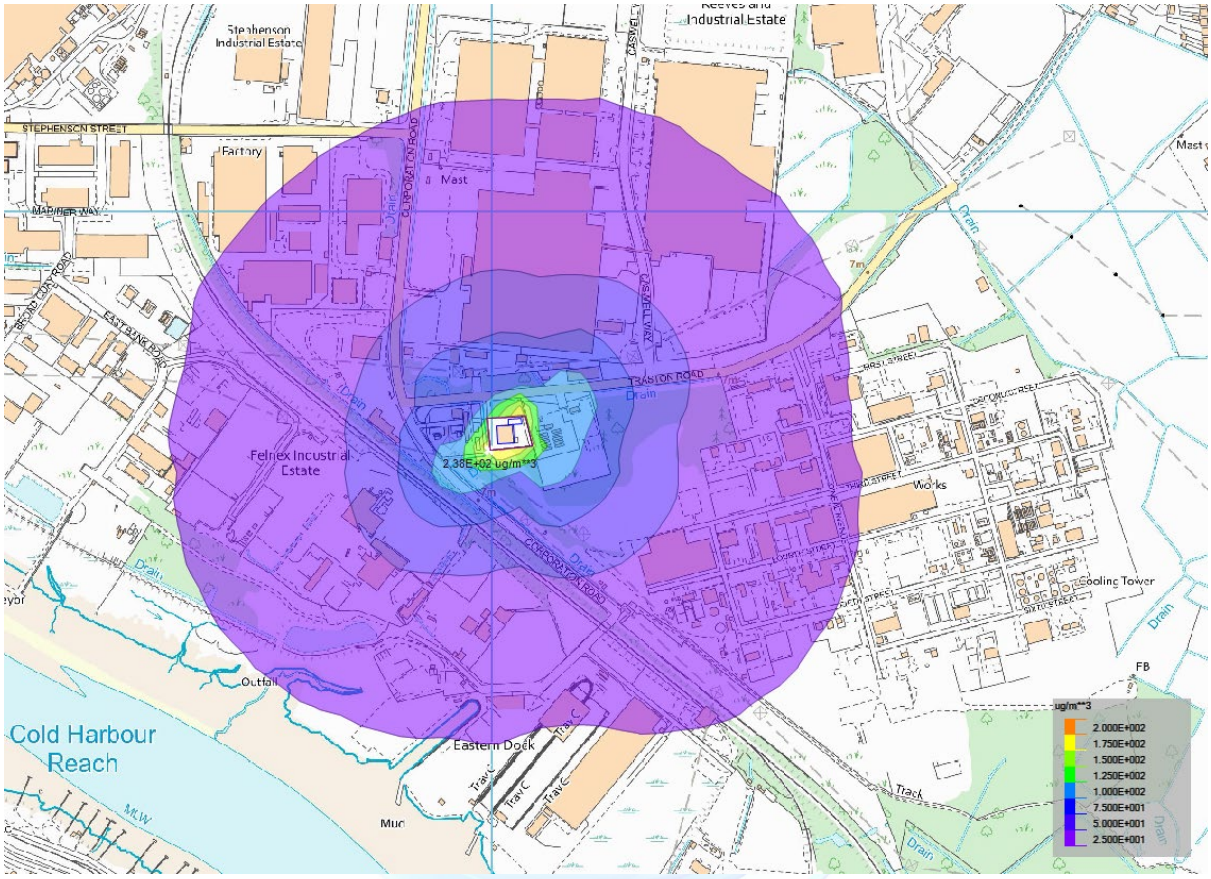
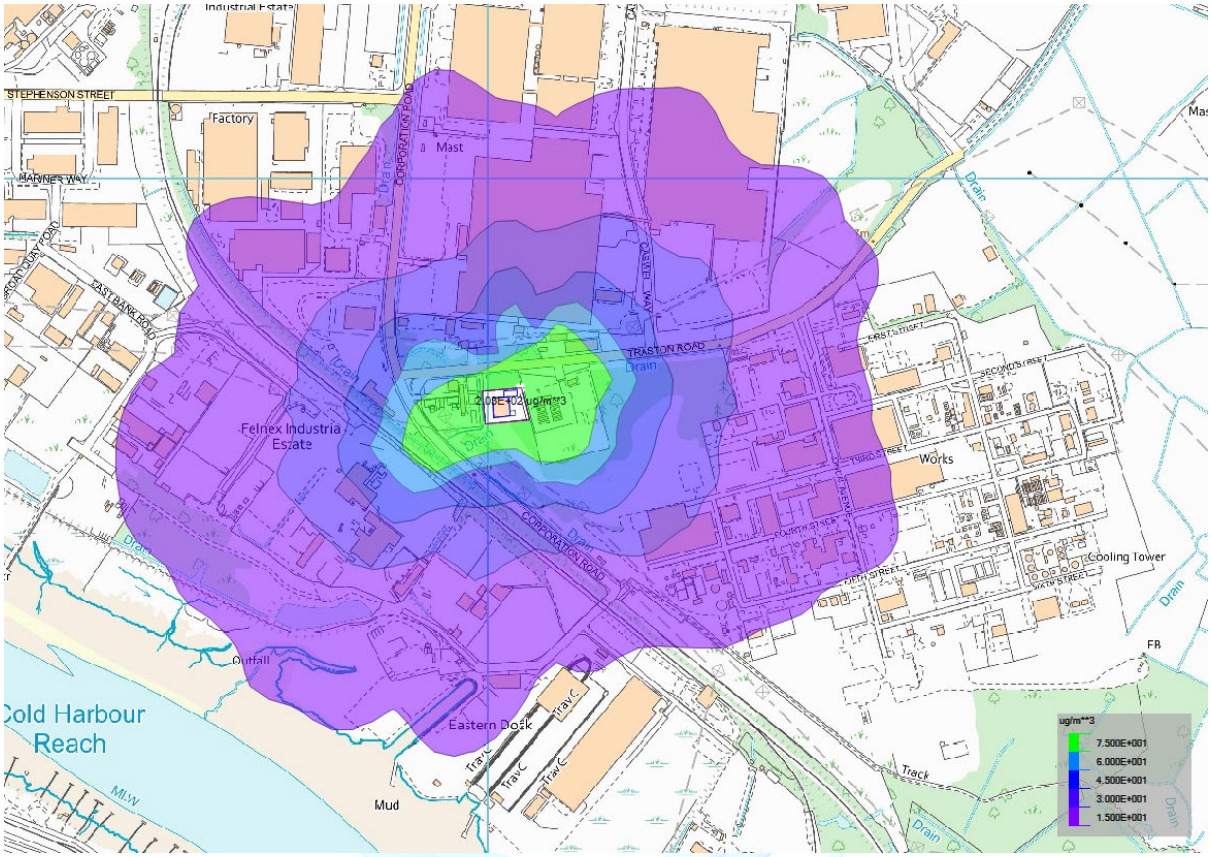
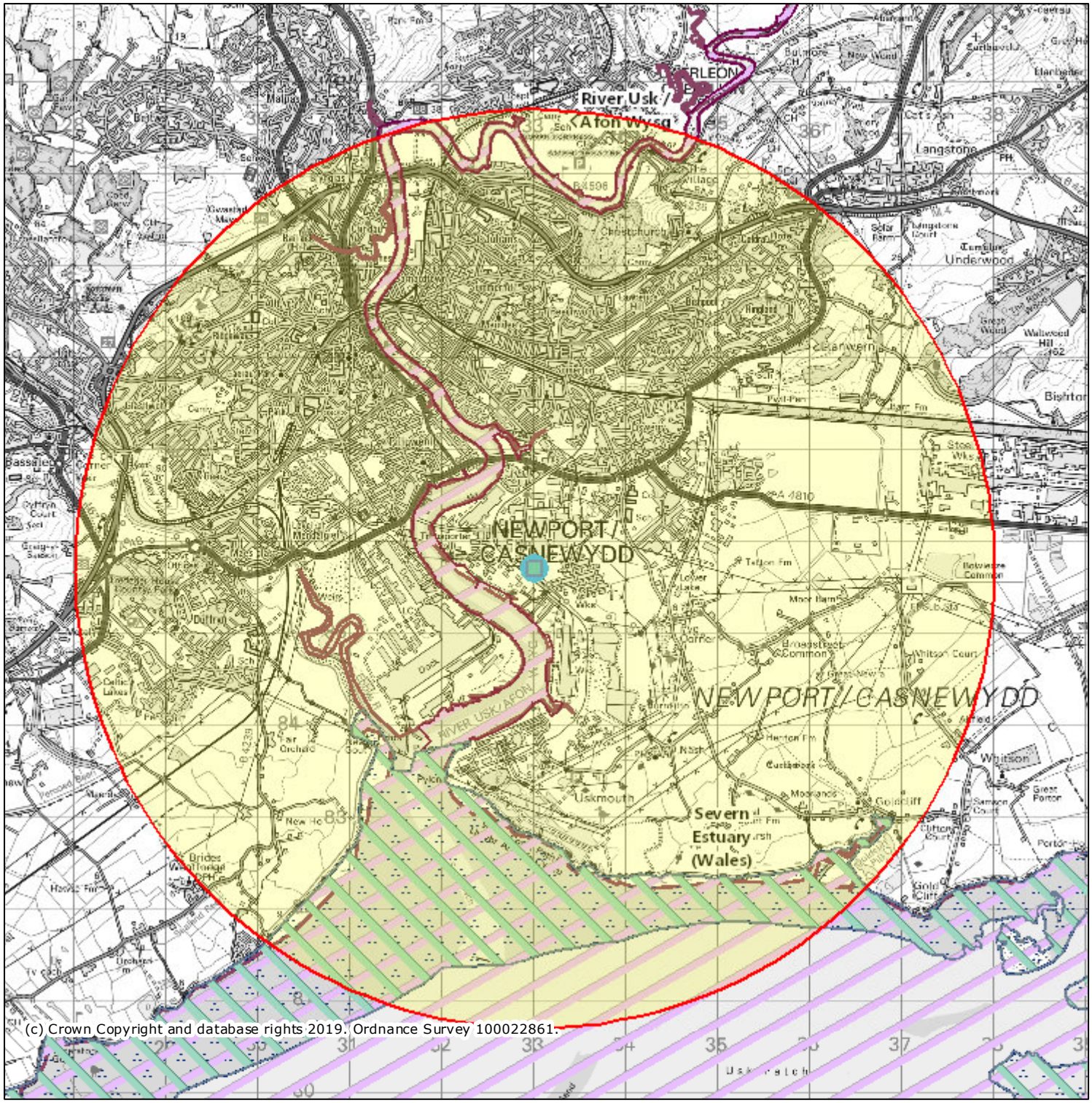


Figure D3: 24h NO_2 impact – ecological features PC



APPENDIX E: ECOLOGICAL SITES

Magic Map



Legend

- Ramsar Sites (Wales)
- Special Areas of Conservation (Wales)
- Special Protection Areas (Wales)

0 1.5 3
km

Projection = OSGB36
xmin = 319700
ymin = 179400
xmax = 346600
ymax = 192400

Magic Map

Legend

Sites of Special Scientific Interest (Wales)

0 0.75 1.5
km

Projection = OSGB36
xmin = 327300
ymin = 183300
xmax = 338500
ymax = 188400

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