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Atmospheric Dispersion Modelling Assessment of Proposed Engine Emissions from

Enviroparks Wales Ltd
Hirwaun Industrial Estate
Aberdare

Report Issue No: 1
Report Date: September 2017
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Executive Summary

Enviroparks Wales Ltd (EWL) has planning consent for the development of an eco-park at their site in Hirwaun, South Wales. Since the original consent was granted (2010), the technologies to be employed at the site have changed, and EWL now plan to install two gasifier lines which will each treat Refuse Derived Fuel (RDF) to produce gas which will fire up to thirteen Jenbacher engines. These proposals vary from information previously submitted in 2017, which intended to send the syngas produced from three gasification lines through a single gas turbine. These changes in the proposed technologies have been prompted by the need to minimise the potential impact on the local sensitive ecological receptors.

As the processes to be installed at the site have changed from those agreed under their current planning consent, EWL has requested an amendment to their planning permission, and an Addendum to the original Environmental Statement (ES Addendum) accompanied the revised planning application. A dispersion modelling assessment report(1) and an addendum to that report(2) were submitted in support of the ES Addendum and a Shadow Habitat Regulations Assessment Stage 1: Screening report. However, as the predicted contributions to, and possible impact on the nearby Special Areas of Conservation (SACs) could not necessarily be screened as insignificant for either contributions of nutrient Nitrogen or acid deposition, further efforts have been made to reduce the emissions from the site, and their potential impact.

This assessment therefore presents the results of new atmospheric dispersion modelling which accounts for the use of multiple gas engines to create power from the syngas rather than the use of a single gas turbine, and demonstrates that the potential impact on the local SACs has been reduced dramatically, and can largely be screened as insignificant. The emissions data applied are in line with proposals from a credible technology provider, which has confirmed that the engines can meet the proposed discharge rate releases proposed, using available technologies.

Where appropriate, results of the modelling exercise have been compared with the current Air Quality Standards and Objectives, or, to the relevant Environmental Assessment Level (EAL), collectively referred to as Environmental Quality Standards (EQS).

The results of the modelling exercise have demonstrated that, when using multiple gas engines to create electricity from the syngas produced within the proposed eco-park scheme, and discharging the resultant emissions through 45 m high flues, the potential impact of the emissions from the plant proposed for the Enviroparks facility are acceptable. Emissions to atmosphere from the plant, which have been considered against assessment levels both for the protection of human health and sensitive ecological receptors can almost exclusively be screened as insignificant, and are very small where insignificance cannot be demonstrated.

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1. Introduction

Enviroparks Wales Ltd (EWL) are in the process of developing a site on the Hirwaun Industrial Estate in Hirwaun, Aberdare. The company plans to operate a resource recovery and energy production plant using the concept of integrated technologies to extract recyclables from the incoming waste stream, and to create a Refuse Derived Fuel (RDF) for use in an advanced thermal treatment process. The site will include two gasification lines which will serve up to thirteen Jenbacher gas engines for the creation of electricity.

The proposed development ensures maximum efficiency by sorting the feedstock materials to extract recyclable materials before preparing the remaining feedstock for gasification. Some of the energy produced by the site will be used by a 'high energy user' – a manufacturing facility with high energy needs, occupying an industrial unit proposed in the northern part of the site, with the remainder being exported to the grid.

Point source emissions to atmosphere include thirteen engine flue discharge points which are all located within a single chimney stack, discharging at 45 m high. Additionally, a site flare will be required to be used during commissioning, engine start-up and shut-down, and in emergency situations. Other releases of warm air will occur across the site, including from air cooled condensers, and building ventilation. Consideration was given to all release points across the site in earlier reported modelling studies and demonstrated no impact from releases of warm air and ventilation sources on the main discharge point, due to the height of the release. Hence these warm air releases have not been considered again during this study. However, similarly to previous modelling reports, consideration has been given to the cumulative effects of other, third party plant in the area which are planned but not yet, or only recently in-situ.

This report details the modelling work undertaken, and presents the findings of the study.

2. Principal Objectives and Scope of Work

The principal aim of the work undertaken was to determine the nature of the dispersion of air borne pollutants from the proposed EWL site, in order to predict the environmental impact of the development on the surrounding area. The site already holds planning consent for operations originally proposed by the Company, however changes to the technologies now planned for the site, and the need to install specific technologies to ensure minimal impact on the local sensitive ecological features, will modify the pollutant releases somewhat. As such, the key concern of this study is to detail the likely impact of discharges to atmosphere from the site, when considering both human health and ecological receptors, and to demonstrate an acceptable level of potential impact on the closest European designated sites. The local area includes a number of sensitive receptors including Blaen Cynon, Coedydd Nedd a Mellte, and Cwm Cadlan which are all Special Areas of Conservation (SACs); a number of Sites of Special Scientific Interest (SSSI), ancient woodlands and the Penderyn Reservoir; as well as human workplaces and residents. As such, the impact of the proposed operations must be sufficiently small to ensure the continued protection of human health, and the protection of sensitive ecological sites.

Each of the SAC sites is located within 3 km of the Enviroparks site, with Blaen Cynon located less than 300 m from the discharge stack at the SACs nearest point. Coedydd Nedd a Mellte is located approximately 1.37 km from the discharge stack at its nearest point, and Cwm Cadlan is approximately 2.56 km distant.

The sensitive ecological status of these sites results in the designation of stringent Critical Loads. A Critical Load is defined as "a quantitative estimate of exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge"(3). A Shadow Habitat Regulations Assessment Stage 1: Screening report has been developed by Middlemarch Environmental Limited, which considers these three sensitive sites, and data from the modelling work reported here has been used to inform an update to that assessment.

It is recognised that there will always be a level of emission from an installation which is so small such that the resultant impact would constitute an ‘inconsequential effect’, and this is deemed to be 1% of the long-term Critical Level or Critical Load, or 10 % of any short-term level. Hence, in order to present a precautionary approach to the consideration of impacts on the SAC’s, the ability of the discharges from the installation to result in an inconsequential effect, is considered.

The only definitive means of quantifying the impact of process emissions on air quality and the surrounding area is to undertake a comprehensive programme of environmental monitoring around the site in question. As an alternative, atmospheric dispersion modelling provides a means of estimating the potential impacts of emissions with a reasonable degree of confidence, by modelling the dispersion of a plume or plumes exiting a chimney in relation to a number of key parameters. This enables the calculation of an estimated contribution to ground level pollutant concentrations arising from the releases, prior to the development of new, or modification of existing plant.

For the purpose of this study, the latest version of the UK Atmospheric Dispersion Modelling System was used (ADMS 5.2). The ADMS model is one of the leading atmospheric dispersion models available in the UK and can be used to assess ambient pollutant concentrations from a wide variety of emissions sources associated with an industrial installation.

3. Study Parameters

Details of the release characteristics to be considered were supplied by the technology providers, via the Enviroparks design team. The technology providers are committed to attaining the release levels stated and have demonstrated their ability to meet such levels at other sites. The majority of the emission levels stated are lower than those specified in Annex VI (Technical provisions relating to waste incineration plants and waste co-incineration plants) of the Industrial Emissions Directive (Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on Industrial Emissions (Integrated Pollution Prevention and Control) (Recast)), which otherwise provides the current regulatory standard for gasification and incineration plants. It is recognised here that the Best Available Techniques (BAT) guidance note for waste incineration plant (WI BREF) is currently in the process of review, and when issued, will essentially specify new binding requirements for site emissions, which will likely be more stringent than currently. Enviroparks is committed to operate within the emission limit values placed upon them, either through the Industrial Emissions Directive and the associated WI BREF, or through their commitment to site specific BAT which may be more stringent still.

Modelling a proposed site which is not yet built and operational enables full consideration to be given to the potential for dispersion, and thus enables the design of the chimney structure and process equipment to take the results of the modelling work into account. It does however also mean that all of the input data is calculated rather than being drawn from actual measured values, and some additional assumptions may also have to be made.

3.1 Emission Parameters

The main pollutant releases will continue to be discharged through a 45 m stack, however this will now contain the individual exhaust releases from up to 13 engines. The final number and positioning of the flues within the main stack are not yet known, however the maximum number of engines have been included and the characteristics of the individual release points have been modelled as presented in Tables 1 to 3.

Table 1 Stack Central Grid References, Enviroparks Wales Limited

Engine Number	Reference Number	Grid Reference X (m)	Grid Reference Y (m)
1	A1	293842	206821
2	A2	293841	206821
3	A3	293843	206821
4	A4	293843	206820
5	A5	293842	206820
6	A6	293843	206819
7	A7	293841	206819
8	A8	293841	206820
9	A9	293842	206819
10	A10	293842	206822
11	A11	293844	206820
12	A12	293842	206818
13	A13	293840	206820

Table 2 Emission Point Parameters, Enviroparks Wales Limited

Release Points A1 – A13	Stack Design Data
Internal Flue Diameter (m)	0.485
Stack Height (m)	45
Temperature of Release (K)	753
Actual Flow Rate (m^3/s at 5.8 % Oxygen)	6.57
Emission Velocity at Stack Exit (m/s)	35

Table 3 Modelled Emissions to Atmosphere, Enviroparks Wales Limited

Emission Concentration (Daily Average)	At 11 % O_2 (mg/Nm^3)	Emissions at stack Conditions	A1 - A13 Release Rate (g/s)
HCl	0.28	0.14011	9.2115E-04
SO_2	12.6	6.30475	4.1452E-02
NH_3	0.1	0.05004	3.2898E-04
NO_x	40	20.0151	1.3159E-01
Particulate Matter (as PM_{10})	5.6	2.80211	1.8423E-02
Total Organic Carbon (TOC)	10	5.00377	3.2898E-02
CO	9.1	4.55343	2.9938E-02
Group I (Cd, Tl)	0.000047	2.35E-05	1.5462E-07
Group II (Hg)	0.0014	0.000701	4.6058E-06
Group III (Sb, As, Pb, Cr, Co, Cu, Mn, Ni, V)	0.0068	0.003402	2.2371E-05
Dioxins and Furans (2,3,7,8 TCDD TEQ)	1.66E-09	8.31E-10	5.4611E-12
PAHs (as B[a]P)	0.00021	0.000105	6.9087E-07
PCB	0.0000063	3.15E-06	2.0726E-08

The emission concentrations provided are levels specified by the technology provider as being achievable and suitable for contractual terms. Important notes on the emissions include:

- Emissions of HF, Volatile Organic Compounds and Dioxins are not detectable.
- Emissions of Total Organic Carbon have been modelled within this study. Of these, should the sum of the limits of detection for Volatile Organic Compounds be applied, 2.12 % might be volatile. The limit of detection for Benzene specifically would suggest that up to 0.274% of the TOC could be Benzene.
- The sum of the limits of detection of Dioxin and Furan species has been included in the study, although Dioxins are not usually detectable in the engine release.

Emissions concentration data was provided as per the Industrial Emissions Directive reference conditions, although was input into the model, along with details of the emission flow rate at stack conditions, specifically as measured temperature and pressure, 9.2 % moisture and 5.8 % Oxygen. Hence, the corrected concentration appears to suggest a lower discharge than that specified at the reference conditions, but results in the same mass release (g/s) as would otherwise be calculated.

The mass release of emissions from the engines differ from the Industrial Emissions Directive requirements, and confirm the ability to attain far more stringent discharge conditions. The ability of the revised technology systems to meet the specified pollutant discharge concentrations is assured.

In addition to the main engine releases, a flare stack will be required to manage ‘other than normal’ operating conditions, such as occasional start-up and shut-down of engines, usually occurring up to twice per year once the plant is fully commissioned and operational (from year 3), and to safely flare off surplus gas in the event of any unplanned, ’emergency’ conditions should the gas engines be unable to accept the gas produced by the gasifiers. The flare will be located in the service yard in the south-western quarter of the site, and is a ground based, or enclosed, flare taking the form of a vertical steel cylinder measuring 4.2 m in diameter and 14 m in height, with internal gas burners at its base. As necessary, the flare would typically run for approximately 30 minutes, but no more than 60 minutes at a time, and is expected to be required no more than eight times per year from year 3, covering up to four full planned or unplanned start-up and / or shut-down operations. The flare would be expected to be used more frequently in years’ 1 and 2, although would only be expected to operate a maximum of sixteen times in year 1 after commissioning, covering up to eight full planned or unplanned start-up and / or shut-down operations and reducing further to twelve times in year 2.

Two sets of emissions data have been modelled for the flare release as provided by the technology providers, and the details are shown in Tables 4 and 5. As an enclosed flare, the release has been modelled as a point source rather than a jet source which would be more appropriate for assessing an un-enclosed flare. The operational flaring data is considered to represent the usual, planned start-up or shut-down conditions and assume that these vent the engine exhausts in a planned and controlled manner through a pre-heated flare to effect combustion of the release when vented. Emergency flaring includes additional gas for combustion during flaring, to ensure effective destruction of the pollutants within the flare.

Table 4 Flare Emission Point Parameters

Flare Location	X (m) 293753	Y (m) 206821
Condition	Operational	Emergency
Temperature of Release (K)	1,263	1,080
Actual Flow Rate (m^3/s at 5.8 % Oxygen)	35.39	131.72
Emission Velocity at Stack Exit (m/s)	2.6	9.6

Table 5 Modelled Emissions During Flaring Scenarios, Enviroparks Wales Limited

Emission Concentration	Operational Flaring		Emergency Flaring	
	At 11 % O_2 (mg/Nm^3)	Release Rate (g/s)	At 11 % O_2 (mg/Nm^3)	Release Rate (g/s)
HCl	5.58	0.04765	1.791	0.05600
SO_2	14.341	0.12251	26.859	0.83975
CH_4	None Detected	None Detected	1.3119	0.04102
NH_3	4.46	0.03813	5.439	0.17005
NO_x	55.761	0.47633	111.041	3.472
Particulate Matter (as PM_{10})	2.84	0.02424	1.9081	0.05966
Volatile Organic Compounds (VOC)	0.06272	0.00054	0.04506	0.00141
CO	0.47907	0.00409	0.66689	0.02085
Cadmium	0.00023	1.99E-06	0.00028	8.67E-06
Thallium	9.45E-06	8.07E-08	4.39E-05	1.37E-06
Mercury	0.00517	4.42E-05	0.00078	2.43E-05
Antimony	6.25E-05	5.34E-07	0.00019	6.00E-06
Arsenic	0.00378	3.23E-05	0.00302	9.45E-05
Chromium	0.00174	1.48E-05	0.00192	6.02E-05
Cobalt	3.78E-05	3.23E-07	4.39E-05	1.37E-06
Copper	0.00098	8.41 E-06	0.00163	5.10E-05
Lead	0.00095	8.14E-06	0.00151	4.73E-05
Manganese	0.00137	1.17E-05	0.00177	5.53E-05
Nickel	0.00074	6.28E-06	0.00089	2.79E-05
Vanadium	0.00019	1.61E-06	0.00022	6.86E-06
Dioxins and Furans (2,3,7,8 TCDD TEQ)	None Detected	None Detected	1.41E-09	4.40E-11
PAHs (as B[a]P)	0.00049	4.20E-06	0.00227	7.10E-05
Formaldehyde	0.04032	0.00034	1.532	0.04788
PCB	2.75E-05	2.35E-07	2.75E-05	8.59E-07

NO_x or NO_2

Emissions of NO_x will comprise contributions of Nitric Oxide (NO) and Nitrogen Dioxide (NO_2). Air quality assessments are made against the concentration of NO_2, although assessments for the impact on vegetation are made against the concentrations of NO_x. As emissions of NO_2 are only ever a proportion of the total emissions of NO_x, an allowance for the quantity of NO_2 in NO_x has to be made.

A phased approach to NO_x conversion is recommended by Natural Resources Wales as follows:

1. Screening / worst-case scenario:
50 % and 100 % of the modelled values should be used for short-term and long-term average concentration respectively. If the predicted environmental concentration (equating to the process contribution plus the "relevant background concentration") exceeds the relevant air quality objective, then proceed to step 2.
Long-term: "relevant background concentration" = background annual mean.
Short-term: "relevant background concentration" = 2 x background annual mean.

2. Worse-case scenario:
35 % for short-term and 70 % for long-term average concentration should be considered. If the predicted environmental concentration exceeds the relevant air quality objective, then proceed to case specific scenarios.

In the case of flaring, it is unclear what proportion of NO_2 will be produced by the system, as the majority of the NO_x formed is caused by the high temperatures within the flare transforming atmospheric Nitrogen to NO_x. As such, it is assumed that all of the NO_x formed is release as Nitrogen Dioxide, and therefore a worst-case and robust assessment is presented.

Deposition Factors

Rates of dry deposition were included and were based on the following parameters, specified by the Regulator for habitat Appropriate Assessment modelling(4).

Table 6 Recommended Deposition Factors

Pollutant	Recommended Deposition Velocity (m s^{-1})	
Nitrogen Dioxide	Grassland	0.0015
	Forest	0.003
Sulphur Dioxide	Grassland	0.012
	Forest	0.024
Hydrogen Chloride	Grassland	0.025
	Forest	0.06
Ammonia	Grassland	0.020
	Forest	0.030

The sensitive ecological receptors in the local area comprise both grassland and woodland or forest receptors, and as such, models have been run twice, applying grassland and forest deposition factors respectively, to ensure that appropriate consideration is given to the potential impact on each sensitive ecological receptor.

Where a dry deposition velocity cannot be specified, pollutants are identified as reactive or un-reactive depending on whether or not the gas will undergo a significant chemical reaction with the surface of the ground. For the purpose of this study, all pollutants without a specific deposition factor were assumed to be unreactive. Although some volatile organic compounds would generally be considered to be reactive, Benzene, which is the specific pollutant referred to by the Air Quality Standard, has a low solubility and hence was assumed to be a less reactive compound.

Information from Cambridge Environmental Research Consultants (CERC), the company which developed the ADMS model, specifies that for SO_2, NO_2, and NH_3, wet deposition from a short-range plume is much less significant compared with dry deposition, and therefore does not usually need to be considered. Wet deposition due to a primary release of Sulphur Trioxide or Sulphuric Acid would need to be considered if the release were significant, however this does not apply in this instance. This is supported by the Regulators guidance(4) which states that "It is considered that the wet deposition of SO_2, NO_2 and NH_3 is not significant within a short range. However, wet deposition for HCl and HNO_3 should be considered where a process emits these species." In the absence of any additional data, it is generally considered acceptable that total deposition (wet and dry) comprises 3 x dry deposition, where it is required to be included, and this is the methodology applied in this study when considering deposition from HCl.

Pollutant Combinations

Where different pollutants are listed together, the emission stated is the total release of all of the specified pollutants. For example, the release of emissions of Cadmium and Thallium from the engines are combined, not 1.5462E-07 g s^{-1} Cadmium and 1.5462E-07 g s^{-1} Thallium. Where the resultant concentrations of these pollutants are reported in Appendix A, the concentration stated is the total pollutant level of the group, and not the pollutant concentration of any one of the substances, unless otherwise calculated and stated as such.

3.2 Background

Background concentrations of pollution have been included within the assessment where these are available in order that the new ground level concentration of each pollutant, can be assessed. By including a background concentration of pollution, existing facilities in the area are accounted for by the modelling exercise, although it is noted that a number of newer installations are expected in the vicinity of the Enviroparks site in due course, and the cumulative effect of these has also been considered by the modelling assessment.

Background data was sourced from the UK Air Quality Archive (https://uk-air.defra.gov.uk)(5), which provides estimates of background levels of pollution across the country. Data from the heavy metals monitoring network, which consists of a number of rural, urban and industrial monitoring sites around the country, have been taken from the Pontardawe Brecon Road (urban background) site. Where more than one source of data is available, the background data considered to be most appropriate has been applied within the study and is highlighted in Table 7.

Data in Table 7 is presented as the annual average concentrations. As monitoring sites only measure specific pollutants, it is not possible to use a single site for all background data, and the data has been drawn from the following locations:

- Mercury and Heavy Metals data is taken from the Pontardawe Brecon Road, suburban industrial monitoring site.
- National Ammonia data is taken from the Llyn Brianne rural background monitoring site in Wales, the nearest Ammonia monitoring site to the Enviroparks development.
- PAH data is taken from the Newport urban background monitoring site.
- PCB and Dioxin data is taken from the High Muffles rural background site.

Predicted data taken from the Air Quality Archive Background Pollution Maps, comprise 2016 data for Nitrogen Dioxide and Particulate Matter (PM_{10}), year adjusted 2001 data (to 2016) for Carbon Monoxide and Benzene, and 2001 data for Sulphur Dioxide, as per the instruction in the use of the maps(5). The chosen data point for the general area background levels to be taken from, is national grid reference 293500 206500, and is representative of the nearest upwind data record from the discharge points.

Where detailed assessment is made within this study to the contributions to Critical Levels and Critical Loads, background data specific to the sensitive ecological receptor is drawn from the Air Pollution Information System website (http://www.apis.ac.uk/)(6).

Table 7 Background Pollutant Concentrations Applied in the Enviroparks Study

Pollutant	Pollution Maps Data	Measured Network Data
NO_x as NO_2 (µg m^{-3}) 2016	8.692	
PM_{10} (µg m^{-3}) 2016	13.157	
$PM_{2.5}$ (µg m^{-3}) 2016	9.335	
SO_2 (µg m^{-3}) 2001	2.79	
CO (mg m^{-3}) 2016	0.095	
Benzene (µg m^{-3}) 2016	0.207	
Mercury (ng m^{-3}) - 2013		0.0217 (Mercury in PM10)
Cadmium (ng m^{-3}) – 2015		0.155 (Heavy Metals)
Arsenic (µg m^{-3}) – 2015		0.00104 (Heavy Metals)
Chromium (µg m^{-3}) – 2015		0.0199 (Heavy Metals)
Cobalt (µg m^{-3}) – 2015		0.00024 (Heavy Metals)
Copper (µg m^{-3}) – 2015		0.0050 (Heavy Metals)
Lead (µg m^{-3}) – 2015		0.00643 (Heavy Metals)
Manganese (µg m^{-3}) – 2015		0.00357 (Heavy Metals)
Nickel (µg m^{-3}) – 2015		0.00923 (Heavy Metals)
Vanadium (µg m^{-3}) – 2015		0.000654 (Heavy Metals)
Ammonia (µg m^{-3}) 2015	0.64*	0.299 (National Ammonia)
PAH (ng m-3) 2015		0.188 (PAH)
PCBs (pg m-3) 2015		46.2 (TOMPS)
Dioxins (fg m-3) 2010		2.76 (TOMPS)

*2016 data as identified by Natural Resources Wales.

3.3 Nearby Buildings and Structures

For processes which have a stack or stacks located on top of a building, or adjacent to a tall building, the effect of surrounding structures may need to be taken into account. As a general guide, building downwash problems (where emissions are caught in the turbulent wake of the wind blowing around a building), may occur if the stack height is less than 2.5 times the height of the building upon which it sits. Buildings which sit adjacent to stacks may need to be considered if they are within 5 stack heights of the point of release. Although the main stack height of 45 m would suggest minimal impact from the site buildings, the most significant buildings and structures around the site were included in the model to ensure a robust approach. Additionally, the introduction of the flare stack at 14 m high, increases the number of structures which are to be considered within the assessment. Building shapes must be simplified for incorporation into the ADMS model, and hence a series of shapes denote the site buildings. The data included in the model were obtained from the proposed site plans, and are presented in Table 8. Building dimensions are specified in metres.

Table 8 Details of the Building Data Applied to the Enviroparks Study

Building Data	Shape	X (m)	Y (m)	Height	Length	Width
Gasifier Building 1	Rectangular	293811	206770	18.385	14.585	34.6
Gasifier Building 2	Rectangular	293836	206760	23.385	40.59	34.6
Gasifier Building 3	Rectangular	293866	206748	18.385	22.965	34.6
Engine Bay	Rectangular	293854	206790	18.385	78.14	34.6
Biomax Building	Rectangular	293949	206875	14	36.2	64.46
Fuel Preparation	Rectangular	293923	206737	14	36	132
Fuel Store	Rectangular	293839	206720	16	105	36
High Energy User	Rectangular	293843	206893	14	151.54	61
Air Cooled Condensers	Rectangular	293797	206775	15	10	56
Firewater Pumphouse	Rectangular	293773	206805	3.5	8	8
Process Water Pumphouse	Rectangular	293753	206785	3.5	6	4
Firewater Tank 1	Circular	293746	206815	7.8	10	
Firewater Tank 2	Circular	293760	206815	7.8	10	
Firewater Tank 3	Circular	293746	206795	7.8	10	
Firewater Tank 4	Circular	293760	206795	7.8	10	
Process Water Tank	Circular	293746	206785	8.3	4	

3.4 Meteorological Data

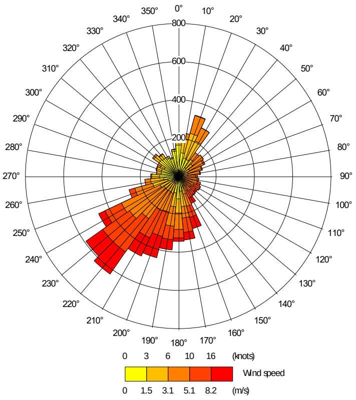
One of the key factors affecting the dispersion characteristics of a plume is the height it can gain above the release point, as a result of momentum and buoyancy. The higher the plume rises, the greater the volume of the atmosphere in which it can disperse, and the lower the potential contribution to ground level concentrations of pollutants. This in turn results in a lower potential impact on the environment. Additionally, meteorological conditions affect the dispersion of a plume, and thus the ADMS model uses comprehensive data to determine the impact of the weather on emissions. As a minimum requirement for modelling plume dispersion, details of wind speed, direction, stability conditions and mixing height are required.

A total of five years' worth of meteorological data has been employed in this modelling exercise. The data used has been drawn from the closest suitable meteorological station at Sennybridge, which is situated approximately 35 km North of the subject site, close to Tirabad in Powys. However as approximately 10% of the cloud cover data is missing from that site, additional cloud data has been included from the next most local station at St. Athan (approximately 39 km South of the Enviroparks site). Although some distance from the study site, it is considered that data from Sennybridge is the most appropriate to be used for a site in this location and in the absence of any more local, appropriate data. Five full years of data (2011 – 2015) have been applied to the modelling exercise.

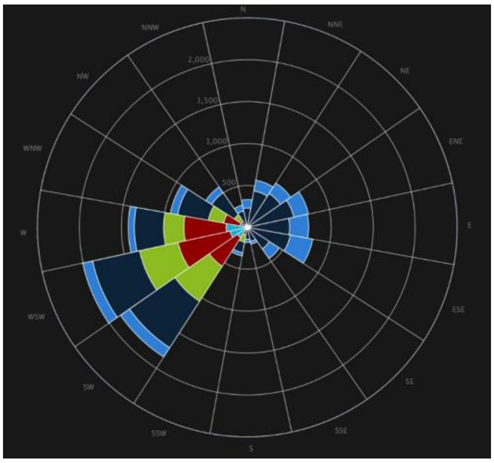
During the preparation of the modelling exercises for the original Environmental Statement, a sensitivity analysis was run on the meteorological data used, which also came from Sennybridge. Whilst a prevailing wind from the North or North East was suggested as possibly giving rise to higher pollutant concentrations, the actual measured meteorological data was still deemed to be appropriate. The Sennybridge data is from a relatively local site, and includes data of the prevailing wind direction as well as any other wind direction detected over the course of a year. Manipulating a data set to give a differing prevailing wind direction, was therefore considered to provide a less robust approach to the modelling, unless firm evidence should exist to suggest that the prevailing wind is likely to differ significantly. Additionally, prevailing wind from the South West quarter (as per that from Sennybridge) is most likely to impact on the sensitive receptors in the immediate vicinity of the site, including Cors Bryn-y-Gaer, Woodland Park and the Welsh Water Reservoirs, thereby providing a worst-case scenario for the assessment of this particular site.

Since the original Environmental Statement and from September 2013, Enviroparks have undertaken their own meteorological monitoring for the site using a weather station which they have installed at the Dwr Cymru Welsh Water service reservoir compound. Whilst the information collected is insufficient for use in running the dispersion models, consideration of the average monthly wind directions from this data reveals that over 28 months, a single month (3.6 % of the period) had prevailing winds of South East, South South-East, or East South-East directions, Easterly and South South-Westerly winds prevailed over two months each (7.1 % of the period each), and winds from the South West, West, and West South-West prevailed generally, accounting for a total of 75 % of the period, with the overall prevailing wind being West South-Westerly (39 %).

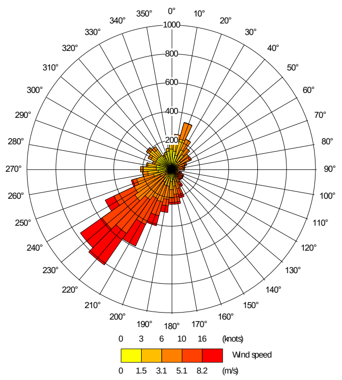
The wind-roses of the meteorological conditions reported at Sennybridge in 2014 and 2015 are presented below alongside the wind-roses from the Enviroparks weather station. Although slight differences are seen in the predominant wind directions recorded at the two sites throughout the course of a year, the wind at both sites predominates from the South West quarter, and hence the use of Sennybridge data to support modelling at the Enviroparks site is considered to be acceptable.



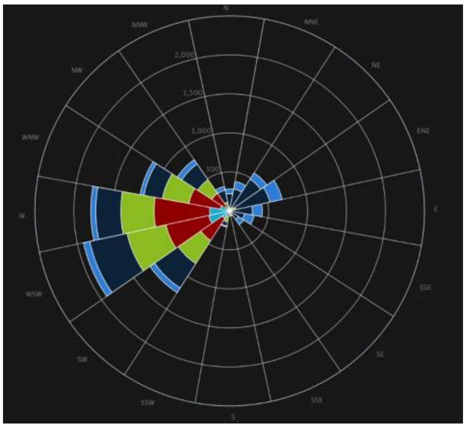
Sennybridge Wind-Rose 2014



Enviroparks Wind-Rose 2014



Sennybridge Wind-Rose 2015



Enviroparks Wind-Rose 2015

3.5 Surface Roughness

For the purpose of running the ADMS model, it is necessary to assign a surface roughness figure to the area to be modelled. This describes the degree of ground turbulence caused by the passage of winds across surface structures. The degree of ground turbulence is much greater in urban areas than in rural areas due to the presence of tall buildings increasing disturbance of wind and plume flow. ADMS requires the selection of a surface roughness factor to be input into the model, or for a complex surface roughness file to be produced to identify different areas of ground turbulence. As most of the site structures will be housed within buildings which have either been input into the model directly, or which have previously been screened as inconsequential for the modelling exercise, a surface roughness factor of 0.5 was chosen to represent the site and its local area, which is characteristic of parkland or open suburbia. The same surface roughness was applied to the area surrounding the meteorological station at Sennybridge, which is located at a site with an open aspect, although with some buildings and woodland nearby.

3.6 Terrain Data

The use of terrain data was considered prior to running the model. Although the necessity of using detailed terrain data can generally be assessed using a screening model which utilises worst-case emission rates to undertake a simplified calculation, and subsequently assessing the results against the relevant air quality standards or environmental assessment levels, it was considered that due to the location of the site, which is situated in the shadow of the Penderyn Reservoir embankment, terrain data would need to be incorporated. Thus, Landform Panorama digital data was included in the model in order to map the terrain local to the Enviroparks site.

3.7 Model Output Parameters

The ADMS 5.2 model calculates the likely contribution to ground level concentrations within a definable grid system, which is pre-determined by the user. For the purpose of this study a Cartesian co-ordinate grid system was chosen, to cover an area of 5 square kilometres, with a point representing the main emission points identified at the approximate centre of the grid. The Cartesian style grid has regular, pre-defined increments in both northerly and easterly directions from the specified bottom left corner of the grid, and ground level concentrations are specified at the intersections of these grid lines. Each grid modelled was based on a 100 x 100-point system, giving a total of 10,000 points (or intersections) across the grid, or a result at every 50 m. The use of the grid in this way aids the generation of pollutant contours. When considering the combined potential impact of other local developments, the area of the grid was increased to 8 square kilometres in order to ensure that any increase in the main area of discharge was observed. Although the area assessed was increased, the grid system was retained at 100 x 100 points, or a result at every 80 m.

A selection of points have also been included in the model to represent sensitive receptors in the area, and consideration of the requirements of the Part IV of the Environment Act 1995: Local Air Quality Management Technical Guidance LAQM.TG(16)[(7)], was made in choosing these receptors. With regards to air quality for human health, this states that an assessment of the quality of the air should be made 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.

Additionally, other key areas have been included, such as the Dwr Cymru service reservoir located close to the site, which is covered but which would draw air in from the local environment as the reservoir empties, and sensitive ecological receptors such as Special Areas of Conservation or Sites of Special Scientific Interest, where these are located within 10 km of the site. Ancient woodlands within 2 km of the Enviroparks site boundary have also been included, as have 5 points within the Enviroparks site boundary, to assess the potential impact on areas within the site which may subsequently be used for ecological enhancement.

Details of the sensitive receptors included in this study are presented below in Table 9, and the models have considered both the contribution to the ground level concentration of each pollutant, and the dry deposition of pollutants across the grid and at the receptor locations.

Table 9 Sensitive Receptors Modelled in the Enviroparks Study

Receptor Number	Receptor Name	Grid Reference		Location from Stack	
		X (m)	Y (m)	m	Direction
1	Blaen Cynon Cors Bryn-Y-Gaer SSSI / SAC	294099	206960	290	E
2	Cwm Cadlan SAC	294970	209125	2,560	NNE
3	Coedydd Nedd a Mellte SAC	292525	207199	1,370	N
4	Dyffrynoedd Nedd a Mellte a Moel Penderyn SSSI	293790	208448	1,630	NW
5	Cwm Gwrelych and Nant Llynfach Streams SSSI	289980	206868	3,865	W
6	Craig-y-Llyn SSSI	291083	203873	4,038	SSW
7	Bryn Bwch SSSI	291990	210505	4,126	NNW
8	Caeau Nant-y-Llechau SSSI	290235	210177	4,930	NW
9	Gweunedd Dyffern Nedd SSSI	291341	210980	4,856	NNW
10	Bryncarnau Grasslands Llwyncoed SSSI	299424	206366	5,597	E
11	Blaenrhondda Road Cutting SSSI	292768	201528	5,400	S
12	Blaen Nedd SSSI	291234	212551	6,299	NNW
13	Ogof Ffynnon Ddu Pant Mawr SSSI	290258	213083	7,218	NNW
14	Caeau Ton-y-Fildre SSSI	286882	210448	7,852	WNW
15	Penmoelallt SSSI	301892	209166	8,382	NE
16	Mynydd Ty-Isaf Rhondda SSSI	292688	198555	8,345	S
17	Plas-y-Gors SSSI	292223	215231	8,567	NNW
18	Daren Fach SSSI	301984	210048	8,756	NE
19	Cwm Glo a Glyndyrys SSSI	302548	205327	8,830	E
20	Waun Ton-y-Spyddaden SSSI	286406	211980	9,054	NW
21	Gorsllwyn Onllwyn SSSI	285547	210323	9,007	W
22	Cwm Taf Fechan Woodlands SSSI	303358	208182	9,610	NE
23	Nant Llech SSSI	285246	211804	9,939	NW
24	Caeau Nant Y Groes SSSI	302672	202490	9,831	SE
25	Tir Mawr A Dderi Hir, Llwydcoed SSSI	297977	206236	4,173	E
26	Penderyn Reservoir	293890	207015	201	N
27	Eden UK	294020	206800	176	E
28	House at Penderyn Reservoir	294100	207270	516	N
29	Ty Newydd Hotel	294600	206940	764	ENE
30	Caer Llwyn Cottage	293253	207151	678	NW
31	Rhombic Farm	292958	206712	894	W
32	Castell Farm	292871	206783	975	W
33	TY Newydd Cottage	294514	207025	699	NE
34	Residence Woodland Park	294824	207560	1,227	NE
35	Pontbren Llwyd School	295057	208264	1,884	NNE
36	Ffynnon Ddu (spring)	292273	208364	2,203	NNW
37	Ton-Y-Gilfach	289565	208712	4,679	NNW
38	Rose Cottage	291284	208150	2,885	NNW
39	The Don Bungalow	291512	207044	2,344	W
40	Werfa Farm	291944	206721	1,904	SW
41	Willows Farm	294129	205879	984	SSE
42	Trebanog Uchaf Farm	294063	207416	634	NE
43	Tai-Cwpla Farm	293519	207024	384	NNW

Receptor Number	Receptor Name	Grid Reference		Location from Stack	
		X (m)	Y (m)	m	Direction
44	Neuadd Farm	294906	207282	1,157	NE
45	John Street Allotments, Hirwaun	296180	205605	2,633	SE
46	Dwr Cymru Service Reservoir	294068	206939	252	NE
47	Ancient Woodland Site 6686	293520	207166	472	NW
48	Ancient Woodland Site 7652	292255	207548	1,746	NW
49	Ancient Woodland Site 7730	292350	208036	1,924	NW
50	Ancient Woodland Site 10113	295132	207478	1,448	NE
51	Ancient Woodland Site 10232	295491	206845	1,649	E
52	Ancient Woodland Site 10297	295930	207308	2,144	NE
53	Ancient Woodland Site 10323	293604	207328	560	NW
54	Ancient Woodland Site 10450	295888	206925	2,049	E
55	Ancient Woodland Site 11240	294570	207902	1,303	NE
56	Ancient Woodland Site 11255	292098	207655	1,933	NW
57	Ancient Woodland Site 13252	293704	207271	471	NW
58	Ancient Woodland Site 17279	294678	207487	1,069	NE
59	Ancient Woodland Site 17280	294640	207804	1,266	NE
60	Ancient Woodland Site 17307	293510	207339	615	NW
61	Ancient Woodland Site 17308	293904	207366	549	N
62	Ancient Woodland Site 17326	295073	207097	1,262	NE
63	Ancient Woodland Site 17327	295595	207159	1,785	NE
64	Ancient Woodland Site 17359	295701	206840	1,859	E
65	Ancient Woodland Site 17368	293686	207530	726	NW
66	Ancient Woodland Site 17369	294549	207568	1,029	NE
67	Ancient Woodland Site 17396	292255	207410	1,693	NW
68	Ancient Woodland Site 17397	291757	207848	2,324	NW
69	Ancient Woodland Site 17487	292422	207302	1,499	NW
70	Ancient Woodland Site 18190	293864	207751	930	N
71	Ancient Woodland Site 18191	294493	207883	1,246	NE
72	Ancient Woodland Site 18192	295014	207354	1,288	NE
73	Ancient Woodland Site 18212	295502	206353	1,725	SE
74	Ancient Woodland Site 18215	295240	207412	1,518	NE
75	Ancient Woodland Site 18235	294855	208369	1,850	NE
76	Ancient Woodland Site 18296	295870	206531	2,049	E
77	Ancient Woodland Site 18297	295400	206579	1,577	SE
78	Ancient Woodland Site 18347	295654	207338	1,884	NE
79	Ancient Woodland Site 18348	295336	207555	1,665	NE
80	Ancient Woodland Site 18417	294509	208048	1,397	NE
81	Ancient Woodland Site 18418	293731	208107	1,291	NW
82	Ancient Woodland Site 18954	292627	206855	1,215	W
83	Ancient Woodland Site 18955	294701	207247	959	NW
84	Ancient Woodland Site 18956	292957	207163	949	NW
85	Ancient Woodland Site 21799	294095	207765	977	NE
86	Ancient Woodland Site 21855	292363	207227	1,534	NW
87	Ancient Woodland Site 21976	292243	207896	1,927	NW
88	Ancient Woodland Site 42098	292807	206878	1,037	W
89	Ancient Woodland Site 43706	293633	207515	725	NW
90	Onsite Receptor 1	293750	206910	128	NW
91	Onsite Receptor 2	293750	206952	160	NW
92	Onsite Receptor 3	293823	206948	128	N
93	Onsite Receptor 4	293881	206944	129	NE
94	Onsite Receptor 5	293952	206940	162	NE

It should be noted, that although only a selection of receptors has been chosen, such as key commercial or residential sites, or a single grid reference to represent a sensitive ecological area, the purpose of the Cartesian grid is to comprehensively model the pollutant dispersion across a designated area, and thus other residential properties within the area of the modelled grids, and the wider industrial estate are considered by the model. The concentration contour plots presented in the Figures section at the end of this report demonstrate the process contribution of pollutants to the local area.

The output for the model was set as 'long-term', which provides a single concentration averaged over all of the lines of meteorological data, for each point on the grid, that is, providing an annual average concentration for each pollutant at each grid point or receptor. Pollutants were modelled over 15-minute, 1-hour, 8-hour (rolling), or 24-hour averaging periods, in line with their respective air quality limits, as presented in Table 10. Additionally, percentile concentrations were calculated to demonstrate the worst predicted contribution to ground level concentrations (the 100th percentile), minus any allowable exceedances (other percentile values). In running the model this way, all lines of meteorological data are considered in the calculations, and any allowable number of exceedances can be taken into account. Where the model output is set as 'short-term', only the first 24 lines of the meteorological file are considered (that is, data for 1st January on any given year), and the model cannot give consideration to any relevant percentile values.

Part IV of The Environment Act 1995 sets provisions for protecting air quality in the UK and for local air quality management. The Air Quality Standards (Wales) Regulations 2010[(8)] which came into force on 11 June 2010, implement Directive 2008/50/EC on ambient air quality and cleaner air for Europe, and Directive 2004/107/EC relating to Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in ambient air. The Regulations specify a number of limit values, target values, and objectives for key pollutants, which must be adhered to or aimed at, and where these pollutants are considered by this modelling exercise, the relevant limit, target or objective is summarised in Table 10.

Table 10 Welsh / UK Air Quality Limits, Targets and Objectives for Pollutants Modelled

Pollutant	Objective Concentration	Averaging Period
Nitrogen Dioxide (Limit Value)	200 µg m^{-3} not to be exceeded more than 18 times a year (99.79 percentile)	1 Hour Mean
Nitrogen Dioxide (Limit Value)	40 µg m^{-3}	Calendar Year
Oxides of Nitrogen (Critical level for the protection of vegetation)	30 µg m-3	Calendar Year
Sulphur Dioxide (UK Objective)	266 µg m^{-3} not to be exceeded more than 35 times a year (99.90 percentile)	15 Minute Mean
Sulphur Dioxide (Limit Value)	350 µg m^{-3} not to be exceeded more than 24 times a year (99.73 percentile)	1 Hour Mean
Sulphur Dioxide (Limit Value)	125 µg m^{-3} not to be exceeded more than 3 times a year (99.18 percentile)	1 Day Mean
Sulphur Dioxide (Critical level for the protection of vegetation)	20 µg m-3	Calendar Year
Particulate (PM_{10}) (Limit Value)	50 µg m^{-3} not to be exceeded more than 35 times a year (90.4 percentile)	1 Day Mean
Particulate (PM_{10}) (Limit Value)	40 µg m^{-3}	Calendar Year
Carbon Monoxide (Limit Value)	10 mg m^{-3}	Max 8 Hour Mean
Benzene (Limit Value)*	5 µg m^{-3}	Calendar Year
PAH (as B[a]P) (EU Target Value)	1 ng m^{-3}	Annual Mean
PAH (as B[a]P) (UK Target Value)	0.25 ng m^{-3}	Annual Mean
Lead (Limit Value)	0.5 µg m^{-3}	Calendar Year
Lead (UK Target Value)	0.25 µg m^{-3}	Annual Mean
Arsenic (Target Value)	0.006 µg m^{-3}	Calendar Year
Cadmium (Target Value)	0.005 µg m^{-3}	Calendar Year
Nickel (Target Value)	0.020 µg m^{-3}	Calendar Year

* Benzene limit is applied to TOC and VOC emissions in this study.

Air Quality Standards (AQS) are considered to be the relevant Environmental Quality Standards (EQS) when considering the protection of human health and the environment as a whole and are used to define the upper bound concentration of a substance in the environment that is considered tolerable. For pollutants which do not have AQS', the modelling results have been compared to Environmental Assessment Levels (EALs). EALs have been derived by the Environment Agency as provisional benchmarks for substances released to each environmental medium from a variety of published UK and international sources. The Natural Resources Wales website links to these EALs for use in risk assessments, as appropriate EQS levels where no AQS' are available. These benchmarks are relevant to the protection of the environment as a whole, rather than specifically for areas where people may be present in any number or for any defined period.

The EALs for the pollutants considered in this study which do not have an AQS, are presented in Table 11 below:

Table 11 Relevant Assessment Levels for Other Pollutants Modelled

Limit Type	Pollutant	Concentration	Measured As
EAL	Ammonia (Human Health)	180 µg m^{-3}	Annual Average
EAL	Ammonia (Conservation where lichens or bryophytes are present)	1 µg m^{-3}	Annual Average
EAL	Ammonia (Conservation other areas)	3 µg m^{-3}	Annual Average
EAL	Mercury	0.25 µg m^{-3}	Annual Average
EAL	Mercury	7.5 µg m^{-3}	Hourly Limit
EAL	Hydrogen Chloride	750 µg m^{-3}	Hourly Limit
EAL	Hydrogen Fluoride	160 µg m^{-3}	Hourly Limit
EAL	Hydrogen Fluoride (Conservation areas)	5 µg m^{-3}	Daily Limit
EAL	Hydrogen Fluoride (Conservation areas)	0.5 µg m^{-3}	Weekly Limit
EAL	PCBs	0.2 µg m^{-3}	Annual Mean
EAL	PCBs	6 µg m-3	Hourly Limit

3.8 Additional Model Considerations

In addition to the basic model parameters included in the study, consideration has been given to the potential for system failures, through the modelling of flare releases as detailed in Section 3.1 and Tables 4 and 5. The two-years' worth of meteorological conditions which provided the highest gridded results for the main operational releases (2014 and 2015) were applied to the flare modelling.

Models have also been run to consider potential contributions to ground level concentrations of pollutants in the local area due to planned or recently built processes which have the potential to emit the same pollutants as the Enviroparks facility. These include the Green Frog Short Term Operating Reserve (STOR) facility, which has been operational since 2012, the Hirwaun Energy Centre, which is a biomass (wood) fired pyrolysis plant, and the Hirwaun Power facility, all of which are located within the Hirwaun Industrial Estate.

Details of emission points, and discharges were largely taken from the Hirwaun Power Development Consent Order Application documentation(9), which also considered the combined effect of these processes and the Enviroparks facility from the original site planning application. The exception to this were the details for the Green Frog STOR, which were confirmed with Green Frog prior to modelling. Although the STOR includes 48 generator discharge points, these have been combined and modelled as a single release for ease of modelling. The emissions from the STOR have been calculated from the maximum annual operating hours of the site (520 hours), which have then been input as a continuous release (over 8,760 hours per year). In reality, the STOR is understood to have thus far operated for approximately 10 hours per year.

Emissions from the Hirwaun Power development were however considered differently, being input as continuous releases at the levels identified in the Development Consent Order Application, despite only being operational for a maximum of 1,500 hours per year. This was to maintain consistency with the information available, and to ensure the impact of the Hiwaun Power operation could be fully considered at all times of the year, as it can operate for approximately 1/6th of the year in total. Results have however then been manually reduced to represent the relevant operating periods, with short-term releases (less than 8-hour averaging periods) retaining the maximum modelled results, but longer-term releases reduced to represent a maximum of 8 hours in any 24-hour period, and 1,500 hours in any year. This detailed assessment of the longer term operational capacity of the Hirwaun Power facility differs from previous Enviroparks modelling, and will reduce the overall cumulative impacts reported for some pollutants.

The details included within the models to assess the cumulative effects of these processes are presented in Table 12 over page. Emissions of NO_x are understood to be total NO_x, rather than Nitrogen Dioxide.

Table 12 Local Processes Considered In-Combination with the Enviroparks Facility

Development	Emission Point Number	Grid Reference	Stack Height (m)	Diameter (m)	Temperature (oC)	Discharge Velocity (m/s)	NO_x Emission Rate (g/s)	CO Emission Rate (g/s)	SO_2 Emission Rate (g/s)	PM_{10} Emission Rate (g/s)
Hirwaun Power	HP A1	293491 206328	30	4.486	479	8.352	6.61	13.23	0	0
	HP A2	293520 206325	30	4.486	479	8.352	6.61	13.23	0	0
	HP A3	293545 206322	30	4.486	479	8.352	6.61	13.23	0	0
	HP A4	293570 206319	30	4.486	479	8.352	6.61	13.23	0	0
	HP A5	293602 206316	30	4.486	479	8.352	6.61	13.23	0	0
Hirwaun Energy Centre	HEC A1 (Pyroliser)	294327 206120	20	0.9	180	19.1	0.0706	0	0.353	0
	HEC A2 (Engine 1)	294330 206124	20	0.55	533	28.5	0.0406	0	0	0
	HEC A3 (Engine 2)	294332 206128	20	0.55	533	28.5	0.0406	0	0	0
	HEC A4 (Engine 3)	294335 206132	20	0.55	533	28.5	0.0406	0	0	0
	HEC A5 (Engine 4)	294338 206136	20	0.55	533	28.5	0.0406	0	0	0
Green Frog STOR	GF A1	293762 206107	2.26	1.38564	550	51	1.591	0.3935	0.114	0.0399

3.9 Modelling Assumptions

In addition to the parameters described in the sections above, some assumptions have had to be made for the modelling study and these are listed below:

- All normal operational emissions are assumed to be continuous although may not necessarily be running constantly, with for example time for scheduled and un-planned shut downs. Thus, the model can be seen to represent a worst-case as emissions are considered to occur on a 24 hour, 365 days per year basis, whereas in reality, the planned operations will include periods of shut-down each year for maintenance.

- Emissions data has been provided by the technology providers and are largely significantly lower than those specified in the Industrial Emissions Directive. The changes to the technologies applied in the development in order to guarantee these much-reduced emission levels have been made in order to minimise the potential impact that the site may have on the sensitive ecological receptors in the immediate vicinity of the Enviroparks site.

- The discharges from the flues have been combined within the model, to account for the fact that emissions from multiple flues within the same stack will effectively act as a single plume with combined source characteristics. Data of the individual sources and emissions were entered into the model, which was then set to calculate the combined source parameters and model all of the Enviroparks flues together as a single source.

- Although a number of wind farms have been constructed in the area or are undergoing construction currently, the potential for modified wind flow field effects on the Enviroparks plume has not been included within the model. This is because, although wake effects including velocity deficit and enhanced turbulence are thought to potentially still be noticeable after fifteen turbine diameters downstream of a wind turbine(10), and thus within a wind farm it is considered appropriate that turbines are placed at least fifteen turbine diameters apart for a cost-efficient power generation(11), the turbine dimeters in the locality are understood to be up to 101 m in diameter, but are located more than 3.5 km from the Enviroparks facility. Therefore, it is considered that, at approximately twice the distance where wake effects can impact on the operation of other turbines, there are unlikely to be significant negative effects on the dispersion of the plume from the Enviroparks site, and hence no further consideration of the local wind farms has been made.

4. Results and Discussion

Tabulated results are presented in Appendix A and consider the process contribution to ground level concentrations of pollutants, and the deposition of pollutants to sensitive infrastructure and ecological receptors.

Appendix A Table 1 presents the maximum process contribution of each pollutant for each year of meteorological data studied, with the maximum value of each species highlighted. The process contribution of all pollutants, and the predicted environmental concentrations of the pollutants across the area remain within the Air Quality Standards or Environmental Assessment Levels. This is true whether considering the impact on individual receptors, or the maximum calculated concentration across the modelled grid.

An assessment of 'insignificance' can be made by comparing the process contribution, or the predicted environmental concentration (where available), to the relevant Environmental Quality Standard. The link to risk assessment guidance from the Natural Resources Wales website, specifies that, in order to screen out the process contribution of a substance as insignificant:

- the short-term process contribution must be less than 10% of the short-term environmental standard; and
- the long-term process contribution must be less than 1% of the long-term environmental standard.

Where process contributions cannot immediately be screened as insignificant, Natural Resources Wales propose a second stage of screening whereby results which meet both of the following requirements are insignificant:

- the short-term process contribution is less than 20 % of the short-term environmental standards minus twice the long-term background concentration; and
- the long-term predicted environmental concentration is less than 70 % of the long-term environmental standards.

Appendix A Table 2 demonstrates that process contributions of most pollutants are screened as insignificant in terms of their impact during the initial assessment, with annual average NO_x (as total Oxides of Nitrogen), Total Organic Carbon when assessed against the Environmental Quality Standard for Benzene, and PAH, being carried onto the secondary assessment. Continuing the assessment of total NO_x and TOC as Benzene, which is recognised as an over-estimate, these pollutants are screened at the second stage, and only the annual average predicted environmental concentration of PAH is not screened as insignificant when assessed against the most stringent of the two target values. The process contribution of total PAH equates to less than 1.25 % of the UK target value for Benzo(a)Pyrene (0.25 ng m^{-3}), whilst the current background represents approximately 75 % of this level.

Table 13 below is reproduced from the Institute of Air Quality Management (IAQM) Land-Use Planning & Development Control: Planning For Air Quality(12). The guidance note suggests that changes in air quality due to new or revised processes can be considered and described according to their percentage contribution to the air quality assessment level as follows:

Table 13 IAQM Descriptions of Impact for Changes in Contribution

Long-term average concentration (PAH Background = 0.188 ng m^{-3})	**Percentage change in the contribution caused by the development, relative to the air quality assessment level**			
	1	**2 - 5**	**6 – 10**	**> 10**
75 % or less of AQS	Negligible	Negligible	Slight	Moderate
76 – 94 % of AQS	Negligible	Slight	Moderate	Moderate
95 – 102 % of AQS	Slight	Moderate	Moderate	Substantial
103 – 109 % of AQS	Moderate	Moderate	Substantial	Substantial
110 % or more of AQS	Moderate	Substantial	Substantial	Substantial

The process contribution of 1.25 % of the target EAL, with a background level of just more than 75 % of the target would be considered to have a negligible impact applying the IAQM descriptions detailed above. Additionally, the Ambient Air Directive target value for PAH as Benzo(a)Pyrene is 1 ng m^{-3}, and when compared against this level, both the process contribution and the predicted environmental concentration, which would equate to less than 20 % of the target value, would be screened as insignificant.

Considering the comparison of process contributions of total PAH against a target value set for Benzo(a)Pyrene, which will likely only form a small part of the overall release, it is considered more appropriate to assess the predicted environmental concentration against this higher target for ambient air. Coupled with the alternative assessment methodology identified above which also defines the impact as negligible against the more stringent target assessment level, the potential impact of PAH release from the Enviroparks (Wales) Limited facility during normal operations, can be screened as insignificant.

Appendix A Table 3 considers combined metal releases in more detail, dividing them by the number of pollutants considered in each group to estimate the possible impact of each individual species. Although noting that two of the eleven species considered, Thallium and Cobalt, do not have Environmental Quality Standards to make an assessment against, the process contributions of all species are screened as insignificant due to their very low release rates, and despite some very low Environmental Quality Standards.

Appendix A Table 4 considers the potential impact of releases from the flare system, and the maximum result from the two-years' worth of modelled data (2014 or 2015) is reported for each pollutant parameter and condition. The modelled results have been calculated to represent the likely actual contributions at any one time as follows:

- Short-term (hourly or less) averaging periods are reported as the maximum modelled result.
- Annual average figures assume a maximum operation of 16 hours per year for operational flaring, and 6 hours per year for emergency flaring. Both of these assessments represent maximum likely operations.
- 24 hourly results are also re-calculated to represent 1 hour in 24, as the flare should operate for no longer than 60 minutes, and generally much less.
- NO_x is assumed to be 100 % NO_2 as the actual proportions of NO and NO_2 are unknown.

As might be expected with such limited operational hours, only the short-term process contributions of some pollutants cannot be screened as insignificant, specifically Oxides of Nitrogen and Sulphur Dioxide from both operational and emergency flaring. Contributions of all other pollutants are screened and insignificant and, with the exception of the hourly process contribution of NO_x from operational flaring, all remain within the specified environmental quality standard. Table 5 in Appendix A goes on to provide a secondary screening assessment, which results in only the hourly average contribution of NO_x not being screened as insignificant.

Considering the operational hours of the flare, the process contributions to hourly NO_x could potentially exceed the EQS up to a maximum of 16 hours per year, although likely significantly less. This is within the allowable 18 exceedances specified for the hourly average, and hence the standard should not be breached. Additionally, and most importantly the isopleth plots in Figures 8 and 9 demonstrate that, although the maximum process contribution of some pollutants from flaring cannot be screened as insignificant and can be substantial when compared against the ground level concentrations specified by the standards, the impact of flaring is very localised, with emissions concentrations reducing significantly with distance. Indeed, the isopleths in Figures 8 and 9 demonstrate that the process contributions reach levels of insignificance just beyond the site boundary, with the higher concentrations remaining within the site. As such, and bearing in mind the limited potential impact on human health or ecological receptors by such localised, short-term and occasional operation, the potential impact of the flared release is considered to be acceptable.

Table 6 in Appendix A summarises the results of models assessing the cumulative effects of other local third-party emissions. The process contributions from the Enviroparks facility when modelled in combination with emissions from Hirwaun Power for a maximum of 1,500 hour per year, Hirwaun Energy, and the Green Frog STOR for a maximum of 520 hours per year are presented. Table 7 goes on to consider whether or not contributions can be screened as insignificant.

The results of the cumulative discharge modelling confirm that, with the exception of the maximum short-term (24-hour) contribution of Oxides of Nitrogen which is compared to the short-term standard for impacts on vegetation, predicted environmental concentrations of all pollutants remain below 70 % of their relevant Environmental Quality Standard. The Environmental Quality Standards for the protection of vegetation will only be relevant at sensitive ecological receptors, and hence are considered in detail later in this section, when the results of modelling at the specified receptor locations are provided. It should also be noted that estimates have had to be made as to the releases from the third-party operations, with data drawn from planning documentation and other information available. Where possible and relevant, the modelling in this assessment has mirrored the assessments made by the third parties considered for their own sites. Sites which do not operated continually, that is the Green Frog STOR and the Hirwaun Power peaking plant, have been modelled to represent their maximum capacity. In reality, it is recognised that the Green Frog STOR operates for a fraction of this period.

Tables 8 A - H in Appendix A present the process contribution results at sensitive receptors, and are highlighted to show pollutants which represent more than 1 % of the long-term, or more than 10 % of the short-term assessment level, and which therefore cannot immediately be screened as insignificant. In reality, this accounts for contributions of annual average NO_x to Blaen Cynon only, which amounts to 1.22 % of the protection standard for vegetation. Although not immediately screened as insignificant, the predicted environmental concentration calculated in Table 9 is confirmed to remain within 70 % of the vegetation standard and is therefore screened at the secondary assessment stage. It is noted that the background level applied in Table 9 is specific to the Blaen Cynon SAC and represents the average background level across the site. Tables 8 G and H also highlight contributions of Total Organic Carbon which amount to more than 1 % of the Benzene Air Quality Standard. However, as concentrations of Volatile Organic Compounds measured from the processes now proposed at the Enviroparks site were not detected above the laboratory level of detection at other facilities, and the level of detection for Benzene equates to less than 0.3 % of the TOC concentration, assessment of TOC against the Air Quality Standard for Benzene is considered to be overly conservative and is therefore discounted. Any contributions of Benzene, which are so small as to be undetectable by laboratory analysis methods, will be minimal and insignificant, where any contribution might exist at all.

Contributions of Dioxins to local receptors are not included in the receptor tables as there is no direct assessment level to compare the contributions to. The results of Dioxin contributions at human health receptors have been considered in previous Health Impact Assessment reports for this proposed development, and an updated summary report(13), which compares the results now obtained with those previously modelled, has been produced to support the further environmental information now being submitted to the Local Planning Authorities.

Due to the ecological sensitivity of the local area which, amongst others, includes three Special Areas of Conservation (SACs) within 10 km of the site, further consideration has been given to the impact on the SACs of the Enviroparks site when modelled in-combination with other local developments. Appendix A Table 10 considers the maximum likely process contributions of the combined local releases, to the Blaen Cynon, Cwm Cadlan, and Coedydd Nedd a Mellte SACs. The results demonstrate that, even cumulatively, only contributions of NO_x at Blaen Cynon cannot immediately be screened as insignificant when applying the 1 % of the long-term and 10 % of the short-term screening methodology, and both long and short-term impacts are screened as insignificant at the secondary stage. Again, the average background concentration of NO_x for the Blaen Cynon SAC is applied.

Appendix A Tables 11 and 12 consider the potential for nutrient Nitrogen and acid deposition to the SACs. Assessment has consistently been made against the lower end of any identified Critical Loads and, includes discharge rates which have been confirmed in line with proposals from a credible technology provider. These are the emission levels against which the Enviroparks scheme will be limited within their Environmental Permit in due course, and hence can be considered to represent a worst-case assessment. Table 11 sets out the calculations which determine the quantities of nutrient Nitrogen (kg/ha/year) and levels of acid deposition which comprise keq/ha/year emissions taking contributions from emissions of Nitrogen Dioxide, Ammonia, Sulphur Dioxide and Hydrogen Chloride.

Table 12 demonstrates that the deposition of nutrient Nitrogen is screened at all three receptors when considering contributions from the Enviroparks scheme in isolation, and at Cwm Cadlan and Coedydd Nedd a Mellte when considering in-combination effects. However, the in-combination effects cannot be screened as insignificant at Blaen Cynon, representing 1.3 % of the Critical Load for nutrient Nitrogen deposition.

With regard to acid deposition, impacts are screened as insignificant at both Cwm Cadlan and Coeddyd Nedd a Mellte whether considering the Enviroparks scheme alone or in combination with other local developments. However, at Blaen Cynon, contributions cannot be screened, representing 1.7 % of the Critical Load for acid deposition from Enviroparks alone, and 2.8 % of the Critical Load in combination with other local developments.

It is important to note here that, by definition, a Critical Load is "a quantitative estimate of exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge"[(3)]. It is not a quantitative estimate of damage to a particular habitat, but represents the potential for damage to occur. There appears to be no evidence in the available literature to indicate that the sensitive ecological habitats at Blaen Cynon are suffering as a consequence of acid deposition from nearby sources, although air pollution is identified as a ‘threat’ to the SAC in the Natura 2000 Standard Data Forms from 2015. It is also important to note that the current minimum background acid deposition identified for the Blaen Cynon site from the UK APIS website (http://www.apis.ac.uk/)[(6)] is 2.19 keq/ha/year, which represents approximately 215 % of the lower Critical Load, and indeed the current background concentrations at all three local SACs are above the lower Critical Loads for both nutrient Nitrogen and acid deposition. Therefore, whilst the calculated contributions to acid deposition of less than 2 % from Enviroparks, and less than 3 % of the Critical Load in combination with other developments cannot be screened as insignificant, they amount to a tiny fraction of the total loadings currently experienced by the sites.

Finally, an assessment has been made of the potential impact of emissions on the Penderyn Reservoir, and the Dwr Cymru service reservoir, which comprise two critical infrastructure items. Previous detailed studies provided to Dwr Cymru Welsh Water highlighted that compliance with the Air Quality Objectives ensures that the majority of releases are incapable of putting the quality of the water either within or transferred from the Penderyn Reservoir system, at risk.

A number of species were however, potentially more significant than others, and these were Nitrite, Benzene, Fluoride, Mercury, and Antimony. Hence, further modelling of the releases anticipated from the plant, which are substantially less than those required for compliance with the Air Quality Standards or Environmental Quality Standards, demonstrated that each of these substances presents no substantive risk to the reservoir and its systems (see Appendix A, Table 13). Annual contributions of Nitrite, Benzene, Mercury and Antimony to the Penderyn Reservoir and in each volume of the Dwr Cymru service reservoir are calculated, and for all species are predicted to contribute less than 1 % of the Water Quality Standard[(14)], and hence are considered to be insignificant. As there is no anticipated emission of Hydrogen Fluoride from the engine processes now proposed at the Enviroparks facility, there is no potential contribution of Fluoride to the reservoir.

The assessment of the effects on the Dwr Cymru Welsh Water infrastructure assumes that all of the deposited NO_x is Nitric Oxide, and suggests a higher level of Nitrite than if all of the NO_x were modelled as Nitrogen Dioxide. However, as noted previously, Nitric Oxide does not deposit in significant quantities, and at least a small portion of the NO_x will comprise Nitrogen Dioxide. Hence this can be considered a robust assessment, which takes a worst-case approach. It is also noted that, although other heavy metals have limits within the Drinking Water Quality Standards, Antimony has the lowest limit of those combined metals which may be discharged and deposited, and hence has been applied in this assessment.

5. Conclusions

Enviroparks Wales Limited holds planning consent for their proposed eco-park facility to treat waste using a number of different technologies, in order to recover and recycle wastes where possible, and to create energy from the remaining Refuse Derived Fuel. Since receiving their original planning consent, various changes have been made to the plans for the facility, and these include changes to layout and the technologies to be applied. As such, a revision to the existing planning consent is currently being considered and, various iterations of modelling works have been provided as the scheme has developed through discussion with consultees to the process. Initial suggestions were that the predicted contributions to, and possible impact on the nearby Special Areas of Conservation (SACs) could not necessarily be screened as insignificant for either contributions of nutrient Nitrogen or acid deposition, and thus further efforts have been made, utilising technological solutions within the project design, to reduce the emissions from the site and their potential impact.

This assessment report therefore presents the results of further atmospheric dispersion modelling which demonstrates that, with the exception of contributions to acid deposition, the potential impact on the local SACs can be screened as insignificant. The emissions data applied are in line with proposals from a credible technology provider, which has confirmed that they can meet the proposed discharge rate releases stated, by gasifying the waste before creating electricity in up to 13 Jenbacher engines, which will each discharge through the 45 m high chimney stack.

The process contribution of all pollutants, and the predicted environmental concentrations of the pollutants across the area remain within the Air Quality Standards or Environmental Assessment Levels. This is true whether considering the impact on individual receptors, or the maximum calculated concentration across the modelled grid.

Not all of the process contributions of emissions from the Enviroparks facility can immediately be screened as insignificant, however the predicted environmental concentration of most species remain within 70 % of the Standards, and are therefore screened at the secondary stage. The one exception is the contribution of PAH when considered against the most stringent target value. However, as the modelled release represents total PAH rather than a discharge of Benzo[a]Pyrene specifically, and as the background concentration already represents approximately 75 % of the target value, further consideration of the likely impact of the contribution was given using the IAQM assessment methodology and confirms that the contribution can be described as negligible.

As the revised scheme now includes a flare for occasional use in the management of 'other than normal' and 'emergency' conditions, consideration has been given to the potential impact of flaring. The majority of process contributions are screened as insignificant either at the primary or secondary screening stage, the exception being the hourly average contribution of NO_x. However, as the flare should operate for a maximum of 16 hours per year, and usually substantially less than this, any significant contributions from flaring which may exceed the Air Quality Standard should remain within the allowable 18 exceedances specified for the hourly average, and hence the standard should not be breached. It is also noted that the impact of flaring is very localised, with emission concentrations reducing significantly with distance, and reaching levels of insignificance either within, or just beyond the site boundary. As such, and bearing in mind the limited potential impact on human health or ecological receptors by such localised, short-term and occasional operation, the potential impact of the flared release is considered to be acceptable.

With the exception of the long-term process contribution of Oxides of Nitrogen at Blaen Cynon, contributions to Critical Levels at local sensitive receptor sites are immediately screened as insignificant. As the predicted environmental concentration of annual average NO_x remains well within 70 % of the standard for the protection of vegetation, the potential impact from these emissions are screened as insignificant at the secondary stage.

When considering the cumulative impacts of the Enviroparks and other local new, or proposed developments, contributions of annual and 24-hour NO_x cannot immediately be screened as insignificant when assessing the maximum gridded values against the standard for the protection of vegetation. Further assessment of the cumulative contribution of NO_x at the local SACs is screened as insignificant however, either at the primary or secondary stage.

An assessment against the Critical Loads for the SACs calculates that deposition of nutrient Nitrogen is screened at all three receptors when considering contributions from the Enviroparks scheme in isolation, and at Cwm Cadlan and Coedydd Nedd a Mellte when considering in-combination effects. In-combination effects cannot be screened as insignificant at Blaen Cynon, representing 1.3 % of the Critical Load for nutrient Nitrogen deposition. Acid deposition impacts are screened as insignificant at both Cwm Cadlan and Coeddyd Nedd a Mellte whether considering the Enviroparks scheme alone or in combination with other local developments. However, at Blaen Cynon, contributions cannot be screened, representing 1.7 % of the Critical Load for acid deposition from Enviroparks alone, and 2.8 % of the Critical Load in combination with other local developments.

A Critical Load sets the point below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge. However, it does not automatically follow that significant harmful effects will occur should the Critical Load be exceeded and the identified potential contributions remain very small despite not necessarily being screened as insignificant.

Finally, the assessment of the potential impact on the Dwr Cymru infrastructure in the locality screened all key species as contributing less than 1 % of the Water Quality Standard, and are therefore considered to represent an insignificant potential impact.

The results of the modelling exercise have demonstrated that, by amending the proposed scheme to incorporate a series of Jenbacher engines to produce electricity from the syngas produced by the gasification process proposed by the eco-park scheme, and discharging the resultant emissions through 45 m high flues, the potential impact of the emissions from the plant now proposed for the Enviroparks facility are acceptable. Emissions to atmosphere from the plant, which have been considered against assessment levels both for the protection of human health and sensitive ecological receptors can almost exclusively be screened as insignificant, and are very small where insignificance cannot be demonstrated.

The results from this modelling report have been used to produce an updated Shadow Habitat Regulations Assessment and a comparison report against earlier Health Impact Assessments to consider the potential for any risk to health or significant adverse impact on local European designated sites from the Enviroparks releases to air.

6. References

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APPENDIX A
MODELLING RESULTS TABLES

Notes:

Within the tables the concentration units vary by pollutant. Please refer to each individual table for details.

Grid references specified in the tables denote the location on the modelled grid which predicted the maximum concentration of each pollutant.

Highlighted cells denote the maximum reported value.

The insignificance test tables compare all relevant concentrations to an assessment level, however the reporting period of the pollutant and limit concentrations may not be directly comparable.

Table 1 Range of Maximum Process Contributions When Modelling Maximum Emissions and Five Years of Meteorological Data (2011 - 2015)

POLLUTANT PARAMETER	2011	2012	2013	2014	2015
Annual Average NOx as NO2 (ug/m3)	0.556	0.431	0.401	0.438	0.586
Maximum Hourly NOx as NO2 (ug/m3)	26.68	26.36	27.75	23.91	30.40
99.79 Percentile Hourly NOx as NO2 (ug/m3)	7.52	7.27	7.65	8.05	7.77
Dry Deposition NOx as NO2 (ug/m2/s)	0.00083	0.00065	0.00060	0.00066	0.00088
Maximum 24 Hour NOx as NO2 (ug/m3)	4.73	4.16	5.80	6.07	5.76
Maximum 15 Minute SO2 (ug/m3)	7.78	7.01	7.07	6.94	8.78
99.9 Percentile 15 Minute SO2 (ug/m3)	2.48	2.42	2.52	2.62	2.57
Annual Average SO2 (ug/m3)	0.170	0.132	0.122	0.134	0.180
Maximum Hourly SO2 (ug/m3)	7.52	6.65	6.93	6.71	8.68
99.73 Percentile Hourly SO2 (ug/m3)	2.29	2.20	2.30	2.44	2.31
Dry Deposition SO2 (ug/m2/s)	0.0020	0.0016	0.0015	0.0016	0.0022
Maximum 24 Hour SO2 (ug/m3)	1.47	1.29	1.80	1.88	1.78
99.18 Percentile 24 Hour SO2 (ug/m3)	1.27	0.98	1.07	1.30	1.31
Annual Average 24 Hour PM10 (ug/m3)	0.0514	0.0406	0.0364	0.0403	0.0528
Maximum 24 Hour PM10 (ug/m3)	0.423	0.373	0.513	0.521	0.513
90.41 Percentile 24 Hour PM10 (ug/m3)	0.153	0.130	0.128	0.141	0.166
Annual Average PM10 (ug/m3)	0.055	0.043	0.039	0.042	0.056
Maximum Hourly PM10 (ug/m3)	2.77	2.39	2.17	2.74	3.17
Dry Deposition PM10 (ug/m2/s)	0.0106	0.0073	0.0081	0.0092	0.0131
8 Hour Rolling Average CO (mg/m3)	0.00012	0.00009	0.00008	0.00009	0.00012
Maximum 8 Hour Rolling Average CO (mg/m3)	0.00272	0.00163	0.00212	0.00176	0.00376
Dry Deposition 8 Hour Rolling CO (ug/m2/s)	0.00023	0.00017	0.00016	0.00018	0.00024
Annual Average TOC (ug/m3)	0.139	0.108	0.100	0.109	0.146
Maximum Hourly TOC (ug/m3)	6.64	6.54	6.88	5.95	7.57
Dry Deposition TOC (ug/m2/s)	0.00027	0.00021	0.00020	0.00021	0.00029
Annual Average Hg (ug/m3)	0.00002	0.00002	0.00001	0.00002	0.00002
Maximum Hourly Hg (ug/m3)	0.00093	0.00091	0.00096	0.00083	0.00106
Dry Deposition Hg (ug/m2/s)	3.80E-08	2.94E-08	2.75E-08	3.00E-08	4.02E-08
Annual Average Cd / Tl as Cd (ng/m3)	0.00065	0.00051	0.00047	0.00051	0.00069
Maximum Hourly Cd / Tl as Cd (ng/m3)	0.0312	0.0307	0.0323	0.0280	0.0356
Dry Deposition Cd / Tl as Cd (ng/m2/s)	1.28E-09	9.88E-10	9.21E-10	1.01E-09	1.35E-09
Annual Average Heavy Metals as Pb (ug/m3)	9.43E-05	7.32E-05	6.81E-05	7.43E-05	9.96E-05
Maximum Hourly Heavy Metals as Pb (ug/m3)	0.0045	0.0044	0.0047	0.0040	0.0051
Dry Deposition Heavy Metals as Pb (ug/m2/s)	1.85E-07	1.43E-07	1.33E-07	1.46E-07	1.95E-07
Annual Average HCl (ug/m3)	0.00366	0.00282	0.00263	0.00289	0.00388
Maximum Hourly HCl (ug/m3)	0.156	0.138	0.136	0.139	0.175
Dry Deposition HCl (ug/m2/s)	0.00009	0.00007	0.00007	0.00007	0.00010
Annual Average Dioxins (ug/m3)	2.30E-11	1.79E-11	1.66E-11	1.81E-11	2.43E-11
Maximum Hourly Dioxins (ug/m3)	1.10E-09	1.08E-09	1.14E-09	9.88E-10	1.26E-09
Dry Deposition Dioxins (ug/m2/s)	4.50E-14	3.49E-14	3.25E-14	3.55E-14	4.77E-14
Maximum 24 Hour Dioxins (ug/m3)	1.96E-10	1.73E-10	2.41E-10	2.52E-10	2.39E-10
Annual Average PAH (ng/m3)	0.00291	0.00226	0.00210	0.00230	0.00308
Maximum Hourly PAH (ng/m3)	0.140	0.137	0.145	0.125	0.159
Dry Deposition PAH (ng/m2/s)	5.70E-09	4.41E-09	4.12E-09	4.50E-09	6.04E-09
Annual Average PCB (ug/m3)	8.74E-08	6.78E-08	6.31E-08	6.89E-08	9.23E-08
Maximum Hourly PCB (ug/m3)	4.19E-06	4.12E-06	4.34E-06	3.75E-06	4.77E-06
Dry Deposition PCB (ug/m2/s)	1.71E-10	1.32E-10	1.24E-10	1.35E-10	1.81E-10
Annual Average NH3 (ug/m3)	0.00132	0.00102	0.00095	0.00104	0.00140
Maximum Hourly NH3 (ug/m3)	0.05602	0.04962	0.04929	0.04989	0.06433
Dry Deposition NH3 (ug/m2/s)	0.000026	0.000020	0.000019	0.000021	0.000028

Note: Total NO_x is reported above.

Table 2 Assessment of the Potential for Contributions to be Insignificant

POLLUTANT PARAMETER	Environmental Quality Standard	Background Concentration	Maximum Concentration	Predicted Environmental Concentration	Assessment of Significance		Secondary Assessment of Significance		Maximum Concentration	Predicted Environmental Concentration	Assessment of Significance	
			Long Term		LT PC % of EQS	< 1 %?	LT PEC % of EQS	< 70 %?	Short Term		ST PC % of EQS	< 10 %?
NOx (ug/m3) Annual Hourly Average	40	8.69	0.586	9.28	**1.47%**	**No**	23.20%	Yes				
NOx (ug/m3) Annual Hourly Average (Vegetation)	30	8.69	0.586	9.28	**1.95%**	**No**	30.93%	Yes				
NOx 99.79%ile (ug/m3) Hourly Average	200	8.69							8.05	25.43	4.02%	Yes
NOx (ug/m3) Maximum 24 Hour Average (Vegetation)	75	8.69							6.07	23.45	8.09%	Yes
SO2 99.90%ile (ug/m3) 15 Minute Average	266	2.79							2.62	8.20	0.99%	Yes
SO2 (ug/m3) Annual Hourly Average (Vegetation)	20	2.79	0.180	2.97	0.90%	Yes						
SO2 99.73%ile (ug/m3) Hourly Average	350	2.79							2.44	8.02	0.70%	Yes
SO2 99.18%ile (ug/m3) 24 Hour Average	125	2.79							1.88	7.46	1.50%	Yes
PM10 90.41%ile (ug/m3) 24 Hour Average	50	13.16							1.31	27.63	2.62%	Yes
PM10 (ug/m3) Annual Hourly Average	40	13.16	0.056	13.21	0.14%	Yes						
Maximum 8 Hour Rolling Average CO (mg/m3)	10	0.0953							1.24E-04	0.19	0.0012%	Yes
TOC (ug/m3) Annual Hourly Average (Benzene EQS)	5	0.2070	0.15	0.35	**2.93%**	**No**	7.07%	Yes				
Heavy Metals as Lead (ug/m3) Annual Hourly Average	0.25	0.0064	9.96E-05	0.01	0.04%	Yes						
Cadmium (ng/m3) Annual Hourly Average	5	0.155	6.88E-04	0.16	0.01%	Yes						
Mercury (ug/m3) Annual Hourly Average	0.25	2.17E-05	2.05E-05	0.00004	0.01%	Yes						
HCl (ug/m3) Maximum Hourly Average	750								0.175	0.18	0.0233%	Yes
PAH (ng/m3) Annual Hourly Average (Ambient Air Target)	1	0.188	0.00308	0.19	0.31%	Yes						
PAH (ng/m3) Annual Hourly Average (Target)	0.25	0.188	0.00308	0.19	**1.23%**	**No**	**76.43%**	**No**				
PCBs (ug/m3) Annual Hourly Average	0.2	4.62E-05	9.23E-08	0.00	0.00005%	Yes						
PCBs (ug/m3) Maximum Hourly Average	6	4.62E-05							4.77E-06	9.72E-05	0.0001%	Yes
Ammonia (ug/m3) Annual Average	180	0.64	0.0014	0.64	0.0008%	Yes						
Ammonia (ug/m3) Annual Average (Vegetation)	1	0.64	0.0014	0.64	0.14%	Yes						

Note: Maximum concentrations of pollutants are taken from Table 1, and total NO_x is considered.
Emissions of Total Organic Carbon are assessed against the Environmental Quality Standard for Benzene.
All emissions are assumed to be discharged at the maximum rate.
Results in bold cannot be screened as insignificant.

Table 3 Assessment of Individual Species from Combined Results

METALS BREAKDOWN	Process Contribution Per Species	Background Concentration	Predicted Environmental Concentration Per Species	Environmental Quality Standard	LT PC % of EQS	LT PEC % of EQS
Cadmium (ng/m3)	0.000344	0.155	0.15528	5	0.0069%	3.11%
Thalium (ng/m3)	0.000344		0.00034			
Antimony (ug/m3)	0.000011		0.00001	5	0.0002%	0.0002%
Arsenic (ug/m3)	0.000011	0.00104	0.00105	0.006	0.1844%	17.47%
Lead (ug/m3)	0.000011	0.00643	0.00645	0.25	0.0044%	2.58%
Chromium (ug/m3)	0.000011	0.0199	0.0199	5	0.0002%	0.40%
Cobalt (ug/m3)	0.000011	0.000241	0.00025			
Copper (ug/m3)	0.000011	0.00500	0.00501	10	0.0001%	0.05%
Manganese (ug/m3)	0.000011	0.00357	0.00358	0.15	0.0074%	2.39%
Nickel (ug/m3)	0.000011	0.00923	0.0092	0.02	0.0553%	46.20%
Vanadium (ug/m3)	0.000011	0.000654	0.00067	5	0.0002%	0.01%

Table 4 Assessment of the Impact of Flaring Scenarios

POLLUTANT PARAMETER	Operational Flaring				Emergency Flaring			
	Maximum Concentration	EQS	% of EQS	Insignificant?	Maximum Concentration	EQS	% of EQS	Insignificant?
Annual Average NOx as NO2 (ug/m3)	0.06596	40	0.2%	Yes	0.00795	40	0.02%	Yes
99.79 Percentile Hourly NOx as NO2 (ug/m3)	523.59	200	**261.8%**	**No**	161.32	200	**81%**	**No**
Maximum 24 Hour NOx as NO2 (ug/m3)	18.50	75	**24.7%**	**No**	3.49	75	5%	Yes
99.9 Percentile 15 Minute SO2 (ug/m3)	130.77	266	**49.2%**	**No**	40.47	266	**15%**	**No**
Annual Average SO2 (ug/m3)	0.02	20	0.1%	Yes	0.00465	20	0.02%	Yes
99.73 Percentile Hourly SO2 (ug/m3)	127.56	350	**36.4%**	**No**	36.62	350	**10.5%**	**No**
99.18 Percentile 24 Hour SO2 (ug/m3)	3.75	125	3.0%	Yes	11.68	125	9%	Yes
90.41 Percentile 24 Hour PM10 (ug/m3)	0.16	50	0.3%	Yes	0.01109	50	0.02%	Yes
Annual Average PM10 (ug/m3)	0.00201	40	0.005%	Yes	0.00007	40	0.00018%	Yes
Maximum 8 Hour Rolling Average CO (mg/m3)	0.00465	10	0.046%	Yes	0.00125	10	0.01%	Yes
Annual Average TOC (ug/m3)	0.00007	5	0.001%	Yes	3.25E-06	5	0.00006%	Yes
Maximum Hourly TOC (ug/m3)	0.60819				0.08470			
Annual Average Methane (ug/m3)	0.00				0.00025			
Maximum Hourly Methane (ug/m3)	0.00				2.46572			
Annual Average Ammonia (ug/m3)	0.00494	1	0.5%	Yes	0.00034	1	0.03%	Yes
Maximum Hourly Ammonia (ug/m3)	40.44				9.58155			
Annual Average HCl (ug/m3)	0.0058				0.00027			
Maximum Hourly HCl (ug/m3)	47.21	750	6.3%	Yes	3.04818	750	0.41%	Yes
Annual Average Dioxins (ug/m3)	< LOD				2.70E-13			
Maximum Hourly Dioxins (ug/m3)	< LOD				2.65E-09			
Annual Average PAH (ng/m3)	5.83E-04	0.25	0.2%	Yes	0.00016	0.25	0.07%	Yes
Maximum Hourly PAH (ng/m3)	4.76				4.27			
Annual Average PCB (ug/m3)	3.26E-08	0.20	0.00002%	Yes	1.98E-09	0.20	0.0000010%	Yes
Maximum Hourly PCB (ug/m3)	0.00027	6	0.004%	Yes	0.00005	6	0.0009%	Yes
Annual Average Antimony (ug/m3)	7.41E-08	5	0.000001%	Yes	1.38E-08	5	0.0000003%	Yes
Maximum Hourly Antimony (ug/m3)	0.00061	150	0.0004%	Yes	3.61E-04	150	0.0002%	Yes
Annual Average Arsenic (ng/m3)	0.00449	6	0.075%	Yes	2.18E-04	6	0.0036%	Yes
Annual Average Chromium (ug/m3)	2.06E-06	5	0.0000%	Yes	1.39E-07	5	0.0000028%	Yes
Maximum Hourly Chromium (ug/m3)	0.01685	150	0.011%	Yes	0.00362	150	0.0024%	Yes
Annual Average Copper (ug/m3)	1.167E-06	10	0.000012%	Yes	1.175E-07	10	0.0000012%	Yes
Maximum Hourly Copper (ug/m3)	0.0095	200	0.0048%	Yes	0.00307	200	0.0015%	Yes
Annual Average Lead (ug/m3)	1.13E-06	0.3	0.0005%	Yes	1.09E-07	0.3	0.0000436%	Yes
Annual Average Manganese (ug/m3)	1.63E-06	0.2	0.001%	Yes	1.27E-07	0.2	0.0001%	Yes
Maximum Hourly Manganese (ug/m3)	0.01329	1500	0.001%	Yes	0.00332	1500	0.0002%	Yes
Annual Average Mercury (ug/m3)	6.13E-06	0	0.002%	Yes	5.60E-08	0	0.0000224%	Yes
Maximum Hourly Mercury (ug/m3)	0.05013	8	0.67%	Yes	0.00146	8	0.0195%	Yes
Annual Average Nickel (ug/m3)	8.72E-07	0.02	0.004%	Yes	6.43E-08	0.02	0.0003%	Yes
Annual Average Vanadium (ug/m3)	2.24E-07	1	0.00002%	Yes	1.58E-08	1	0.0000016%	Yes
Maximum Hourly Vanadium (ug/m3)	0.00183	5	0.04%	Yes	0.00041	5	0.0082%	Yes
Annual Average Formaldehyde (ug/m3)	0.00005	5	0.001%	Yes	0.00011	5	0.0022%	Yes
Maximum Hourly Formaldehyde (ug/m3)	0.39098	100	0.39%	Yes	2.88	100	3%	Yes

Table 5 Secondary Screening of Insignificance of Flaring Operations

POLLUTANT PARAMETER	Operational Flaring							Emergency Flaring						
	Maximum Concentration	ST Background = LT Background x 2	EQS - ST Background	% of EQS	< 20 %	Predicted Environmental Concentration	PEC < 70 % EQS?	Maximum Concentration	ST Background = LT Background x 2	EQS - ST Background	% of EQS	< 20 %	Predicted Environmental Concentration	PEC < 70 % EQS?
99.79 Percentile Hourly NOx as NO2 (ug/m3)	523.59	17.38	183	**287%**	**No**	540.97	**No**	161.32	17.38	183	**88%**	**No**	178.70	**No**
Maximum 24 Hour NOx as NO2 (ug/m3)	18.50	17.38	58	**32%**	**No**	35.88	Yes							
99.9 Percentile 15 Minute SO2 (ug/m3)	130.77	5.58	260	**50%**	**No**	136.35	Yes	40.47	5.58	260	16%	Yes	46.05	Yes
99.73 Percentile Hourly SO2 (ug/m3)	127.56	5.58	344	**37%**	**No**	133.14	Yes	36.62	5.58	344	11%	Yes	42.20	Yes

Table 6 Assessment of Cumulative Effects of Enviroparks and New or Committed Developments Within the Hirwaun Industrial Estate

POLLUTANT PARAMETER	2011	2012	2013	2014	2015
NOx (ug/m3) Annual Hourly Average	10.40	7.57	6.38	8.23	13.05
NOx 99.79%ile (ug/m3) Hourly Average	149.46	133.10	142.85	146.62	151.85
NOx (ug/m3) Maximum 24 Hour Average (Vegetation)	130.14	70.07	100.96	109.76	111.18
SO2 99.90%ile (ug/m3) 15 Minute Average	10.24	9.40	9.83	9.85	10.40
SO2 (ug/m3) Annual Hourly Average (Vegetation)	0.740	0.539	0.461	0.587	0.923
SO2 99.73%ile (ug/m3) Hourly Average	9.85	8.41	8.56	9.25	9.86
SO2 99.18%ile (ug/m3) 24 Hour Average	7.86	3.80	4.47	5.92	7.03
PM10 90.41%ile (ug/m3) 24 Hour Average	0.540	0.428	0.363	0.479	0.668
PM10 (ug/m3) Annual Hourly Average	0.191	0.143	0.126	0.154	0.235
Maximum 8 Hour Rolling Average CO (mg/m3)	0.483	0.618	0.427	0.161	0.217
TOC (ug/m3) Annual Hourly Average (Benzene EQS)	0.142	0.109	0.101	0.112	0.148
Heavy Metals as Lead (ug/m3) Annual Hourly Average	0.00384	0.00337	0.00268	0.00294	0.00352
Cadmium (ng/m3) Annual Hourly Average	0.383	0.336	0.267	0.293	0.351
Mercury (ug/m3) Annual Hourly Average	0.00038	0.00034	0.00027	0.00029	0.00035
HCl (ug/m3) Maximum Hourly Average	1.84	2.44	1.86	2.02	2.88
HF (ug/m3) Maximum Hourly Average	0.10	0.14	0.10	0.11	0.15
Ammonia (ug/m3) Annual Average	0.00481	0.00422	0.00341	0.00373	0.00450
Annual Average Dioxins (ug/m3)	7.65E-10	6.73E-10	5.34E-10	5.86E-10	7.03E-10
Maximum Hourly Dioxins (ug/m3)	2.42E-08	3.31E-08	2.08E-08	2.24E-08	3.29E-08
Maximum 24 Hour Dioxins (ug/m3)	4.26E-09	5.02E-09	5.05E-09	4.60E-09	4.10E-09

Table 7 Screening of Cumulative Impacts for Insignificance

POLLUTANT - Long Term Contributions	Environmental Quality Standard	Background Concentration	Maximum Concentration	Predicted Environmental Concentration	LT PC % of EQS	< 1 %?	LT PEC % of EQS	< 70 %?
NOx (ug/m3) Annual Hourly Average	40	8.69	13.046	21.74	**32.61%**	**No**	54.34%	Yes
NOx (ug/m3) Annual Hourly Average (Vegetation)	30	8.69	13.046	21.74	**43.49%**	**No**	**72.46%**	**No**
SO2 (ug/m3) Annual Hourly Average (Vegetation)	20	2.79	0.923	3.71	**4.61%**	**No**	18.56%	Yes
TOC (ug/m3) Annual Hourly Average (Benzene EQS)	5	0.2070	0.15	0.35	**2.95%**	**No**	7.09%	Yes
Heavy Metals as Lead (ug/m3) Annual Hourly Average	0.25	0.0064	3.84E-03	0.01	**1.53%**	**No**	4.11%	Yes
Cadmium (ng/m3) Annual Hourly Average	5	0.155	3.83E-01	0.54	**7.66%**	**No**	10.76%	Yes
POLLUTANT - Short Term Contributions	**Environmental Quality Standard**	**Background Concentration**	**Maximum Concentration**	**ST PC % of EQS**	**< 10 %?**	**% of EQS where ST NO2 = 50 % NOx**	**% of EQS where ST NO2 = 35 % NOx**	**Insignificant?**
NOx 99.79%ile (ug/m3) Hourly Average	200	8.69	151.85	**75.93%**	**No**	38%	27%	**No**
NOx (ug/m3) Maximum 24 Hour Average (Vegetation)	75	8.69	130.14	**173.51%**	**No**	87%	61%	**No**

POLLUTANT - Short Term Contributions (Continued)	ST PC % of EQS - LT Background x 2	< 20 %?	Predicted Environmental Concentration	PEC < 70 % EQS?
NOx 99.79%ile (ug/m3) Hourly Average	29%	**No**	70.53	Yes
NOx (ug/m3) Maximum 24 Hour Average (Vegetation)	79%	**No**	62.93	**No**

Table 8 A Process Contributions of Oxides of Nitrogen and Particulate to Sensitive Receptors (1 – 46)

Receptor name	NOx (ug/m3) Annual Hourly Average	% of EQS	NOx 99.79%ile (ug/m3) Hourly Average	% of EQS	NOx (ug/m3) Maximum 24 Hour Average (Vegetation)	% of EQS	PM10 90.41%ile (ug/m3) 24 Hour Average	% of EQS	PM10 (ug/m3) Annual Hourly Average	% of EQS
Blaen Cynon Cors Bryn-Y-Gaer SSSI / SAC	0.36480	1.22%	5.033	2.52%	4.088	5.45%	0.0990	0.198%	0.0354	0.089%
Cwm Cadlan SAC	0.05486	0.18%	0.912	0.46%	0.381	0.51%	0.0135	0.027%	0.0044	0.011%
Coedydd Nedd a Mellte SAC	0.03481	0.12%	1.394	0.70%	0.797	1.06%	0.0125	0.025%	0.0036	0.009%
Dyffrynoedd Nedd a Mellte a Moel Penderyn SSSI	0.04453	0.15%	1.309	0.65%	0.619	0.83%	0.0140	0.028%	0.0040	0.010%
Cwm Gwrelych and Nant Llynfach Streams SSSI	0.01095	0.04%	0.438	0.22%	0.232	0.31%	0.0034	0.007%	0.0009	0.002%
Craig-y-Llyn SSSI	0.01023	0.03%	0.450	0.22%	0.182	0.24%	0.0034	0.007%	0.0009	0.002%
Bryn Bwch SSSI	0.01290	0.04%	0.531	0.27%	0.167	0.22%	0.0036	0.007%	0.0010	0.002%
Caeau Nant-y-Llechau SSSI	0.00569	0.02%	0.341	0.17%	0.100	0.13%	0.0019	0.004%	0.0004	0.001%
Gweunedd Dyffern Nedd SSSI	0.00917	0.03%	0.459	0.23%	0.118	0.16%	0.0026	0.005%	0.0007	0.002%
Bryncarnau Grasslands Llwyncoed SSSI	0.01574	0.05%	0.671	0.34%	0.167	0.22%	0.0048	0.010%	0.0013	0.003%
Blaenrhondda Road Cutting SSSI	0.01017	0.03%	0.430	0.22%	0.345	0.46%	0.0032	0.006%	0.0009	0.002%
Blaen Nedd SSSI	0.00712	0.02%	0.305	0.15%	0.096	0.13%	0.0019	0.004%	0.0005	0.001%
Ogof Ffynnon Ddu Pant Mawr SSSI	0.00481	0.02%	0.274	0.14%	0.067	0.09%	0.0012	0.002%	0.0003	0.001%
Caeau Ton-y-Fildre SSSI	0.00564	0.02%	0.316	0.16%	0.117	0.16%	0.0014	0.003%	0.0004	0.001%
Penmoelallt SSSI	0.01160	0.04%	0.344	0.17%	0.088	0.12%	0.0027	0.005%	0.0008	0.002%
Mynydd Ty-Isaf Rhondda SSSI	0.00430	0.01%	0.300	0.15%	0.130	0.17%	0.0020	0.004%	0.0004	0.001%
Plas-y-Gors SSSI	0.00478	0.02%	0.209	0.10%	0.082	0.11%	0.0012	0.002%	0.0003	0.001%
Daren Fach SSSI	0.01210	0.04%	0.376	0.19%	0.106	0.14%	0.0026	0.005%	0.0009	0.002%
Cwm Glo a Glyndyrys SSSI	0.01137	0.04%	0.416	0.21%	0.146	0.19%	0.0029	0.006%	0.0007	0.002%
Waun Ton-y-Spyddaden SSSI	0.00303	0.01%	0.173	0.09%	0.056	0.07%	0.0009	0.002%	0.0002	0.001%
Gorsllwyn Onllwyn SSSI	0.00557	0.02%	0.302	0.15%	0.111	0.15%	0.0014	0.003%	0.0004	0.001%
Cwm Taf Fechan Woodlands SSSI	0.00914	0.03%	0.334	0.17%	0.090	0.12%	0.0024	0.005%	0.0007	0.002%
Nant Llech SSSI	0.00359	0.01%	0.204	0.10%	0.066	0.09%	0.0009	0.002%	0.0002	0.001%
Caeau Nant Y Groes SSSI	0.00670	0.02%	0.352	0.18%	0.104	0.14%	0.0019	0.004%	0.0005	0.001%
Tir Mawr A Dderi Hir, Llwydcoed SSSI	0.02052	0.07%	0.853	0.43%	0.232	0.31%	0.0068	0.014%	0.0018	0.004%
Penderyn Reservoir	0.23538	0.59%	7.323	3.66%	5.592	7.46%	0.0693	0.139%	0.0215	0.054%
Eden UK	0.04238	0.11%	2.682	1.34%	0.960	1.28%	0.0188	0.038%	0.0053	0.013%
House at Penderyn Reservoir	0.38252	0.96%	4.527	2.26%	3.119	4.16%	0.1109	0.222%	0.0360	0.090%
Ty Newydd Hotel	0.15619	0.39%	2.572	1.29%	1.349	1.80%	0.0576	0.115%	0.0171	0.043%
Caer Llwyn Cottage	0.07248	0.18%	2.748	1.37%	1.890	2.52%	0.0248	0.050%	0.0074	0.018%
Rhombic Farm	0.07550	0.19%	2.166	1.08%	1.217	1.62%	0.0287	0.057%	0.0078	0.020%
Castell Farm	0.06199	0.15%	2.012	1.01%	1.061	1.41%	0.0211	0.042%	0.0064	0.016%
TY Newydd Cottage	0.25236	0.63%	2.823	1.41%	1.715	2.29%	0.0814	0.163%	0.0257	0.064%
Residence Woodland Park	0.22847	0.57%	1.689	0.84%	1.584	2.11%	0.0626	0.125%	0.0216	0.054%
Pontbren Llwyd School	0.12384	0.31%	1.154	0.58%	0.637	0.85%	0.0297	0.059%	0.0108	0.027%
Ffynnon Ddu (spring)	0.01941	0.05%	0.821	0.41%	0.399	0.53%	0.0068	0.014%	0.0017	0.004%
Ton-Y-Gilfach	0.01103	0.03%	0.483	0.24%	0.211	0.28%	0.0031	0.006%	0.0008	0.002%
Rose Cottage	0.01760	0.04%	0.645	0.32%	0.363	0.48%	0.0057	0.011%	0.0015	0.004%
The Don Bungalow	0.02056	0.05%	0.836	0.42%	0.453	0.60%	0.0056	0.011%	0.0018	0.005%
Werfa Farm	0.02903	0.07%	0.975	0.49%	0.475	0.63%	0.0086	0.017%	0.0028	0.007%
Willows Farm	0.04080	0.10%	2.068	1.03%	0.746	1.00%	0.0206	0.041%	0.0045	0.011%
Trebanog Uchaf Farm	0.24895	0.62%	3.606	1.80%	2.450	3.27%	0.0776	0.155%	0.0232	0.058%
Tai-Cwpla Farm	0.06421	0.16%	3.502	1.75%	2.591	3.46%	0.0230	0.046%	0.0066	0.016%
Neuadd Farm	0.19199	0.48%	1.860	0.93%	1.287	1.72%	0.0553	0.111%	0.0187	0.047%
John Street Allotments, Hirwaun	0.02956	0.07%	0.961	0.48%	0.393	0.52%	0.0129	0.026%	0.0031	0.008%
Dwr Cymru Service Reservoir	0.27605	0.69%	4.456	2.23%	3.552	4.74%	0.0760	0.152%	0.0269	0.067%

Process contributions over 1 % of the long-term or 10 % of the short-term assessment level are highlighted in yellow.

Table 8 B   Process Contributions of Oxides of Nitrogen and Particulate to Sensitive Receptors (47 - 94)

Receptor name	NOx (ug/m3) Annual Hourly Average	% of EQS	NOx 99.79%ile (ug/m3) Hourly Average	% of EQS	NOx (ug/m3) Maximum 24 Hour Average (Vegetation)	% of EQS	PM10 90.41%ile (ug/m3) 24 Hour Average	% of EQS	PM10 (ug/m3) Annual Hourly Average	% of EQS
Ancient Woodland Site 6686	0.09778	0.33%	3.598	1.80%	2.037	2.72%	0.0334	0.067%	0.0097	0.024%
Ancient Woodland Site 7652	0.03288	0.11%	1.091	0.55%	0.640	0.85%	0.0115	0.023%	0.0031	0.008%
Ancient Woodland Site 7730	0.02423	0.08%	0.927	0.46%	0.459	0.61%	0.0082	0.016%	0.0022	0.006%
Ancient Woodland Site 10113	0.15303	0.51%	1.491	0.75%	0.990	1.32%	0.0432	0.086%	0.0146	0.036%
Ancient Woodland Site 10232	0.05129	0.17%	1.202	0.60%	0.543	0.72%	0.0192	0.038%	0.0055	0.014%
Ancient Woodland Site 10297	0.06463	0.22%	1.209	0.60%	0.401	0.53%	0.0192	0.038%	0.0062	0.016%
Ancient Woodland Site 10323	0.15813	0.53%	4.564	2.28%	2.558	3.41%	0.0475	0.095%	0.0152	0.038%
Ancient Woodland Site 10450	0.04728	0.16%	1.194	0.60%	0.455	0.61%	0.0170	0.034%	0.0048	0.012%
Ancient Woodland Site 11240	0.16675	0.56%	1.662	0.83%	1.003	1.34%	0.0422	0.084%	0.0152	0.038%
Ancient Woodland Site 11255	0.02912	0.10%	0.961	0.48%	0.578	0.77%	0.0101	0.020%	0.0027	0.007%
Ancient Woodland Site 13252	0.20122	0.67%	5.623	2.81%	3.442	4.59%	0.0624	0.125%	0.0194	0.048%
Ancient Woodland Site 17279	0.27626	0.92%	1.918	0.96%	1.874	2.50%	0.0787	0.157%	0.0265	0.066%
Ancient Woodland Site 17280	0.20327	0.68%	1.644	0.82%	1.009	1.35%	0.0523	0.105%	0.0186	0.047%
Ancient Woodland Site 17307	0.11936	0.40%	3.907	1.95%	1.940	2.59%	0.0370	0.074%	0.0115	0.029%
Ancient Woodland Site 17308	0.20304	0.68%	4.378	2.19%	2.956	3.94%	0.0670	0.134%	0.0194	0.048%
Ancient Woodland Site 17326	0.12051	0.40%	1.774	0.89%	0.851	1.13%	0.0389	0.078%	0.0122	0.030%
Ancient Woodland Site 17327	0.07457	0.25%	1.364	0.68%	0.524	0.70%	0.0233	0.047%	0.0074	0.019%
Ancient Woodland Site 17359	0.04620	0.15%	1.178	0.59%	0.453	0.60%	0.0173	0.035%	0.0049	0.012%
Ancient Woodland Site 17368	0.12473	0.42%	3.451	1.73%	1.836	2.45%	0.0431	0.086%	0.0119	0.030%
Ancient Woodland Site 17369	0.28541	0.95%	2.046	1.02%	1.474	1.96%	0.0743	0.149%	0.0270	0.067%
Ancient Woodland Site 17396	0.03152	0.11%	1.143	0.57%	0.631	0.84%	0.0112	0.022%	0.0031	0.008%
Ancient Woodland Site 17397	0.02307	0.08%	0.776	0.39%	0.465	0.62%	0.0076	0.015%	0.0021	0.005%
Ancient Woodland Site 17487	0.03438	0.11%	1.327	0.66%	0.677	0.90%	0.0118	0.024%	0.0034	0.009%
Ancient Woodland Site 18190	0.09933	0.33%	2.432	1.22%	1.471	1.96%	0.0342	0.068%	0.0092	0.023%
Ancient Woodland Site 18191	0.16111	0.54%	1.745	0.87%	1.030	1.37%	0.0428	0.086%	0.0147	0.037%
Ancient Woodland Site 18192	0.17058	0.57%	1.677	0.84%	1.137	1.52%	0.0491	0.098%	0.0166	0.041%
Ancient Woodland Site 18212	0.03672	0.12%	0.962	0.48%	0.353	0.47%	0.0183	0.037%	0.0041	0.010%
Ancient Woodland Site 18215	0.13256	0.44%	1.493	0.75%	0.856	1.14%	0.0382	0.076%	0.0128	0.032%
Ancient Woodland Site 18235	0.10434	0.35%	1.114	0.56%	0.608	0.81%	0.0250	0.050%	0.0091	0.023%
Ancient Woodland Site 18296	0.03310	0.11%	1.073	0.54%	0.366	0.49%	0.0149	0.030%	0.0035	0.009%
Ancient Woodland Site 18297	0.03937	0.13%	1.057	0.53%	0.420	0.56%	0.0178	0.036%	0.0045	0.011%
Ancient Woodland Site 18347	0.08244	0.27%	1.264	0.63%	0.499	0.66%	0.0251	0.050%	0.0080	0.020%
Ancient Woodland Site 18348	0.12357	0.41%	1.267	0.63%	0.796	1.06%	0.0339	0.068%	0.0117	0.029%
Ancient Woodland Site 18417	0.12442	0.41%	1.454	0.73%	0.822	1.10%	0.0334	0.067%	0.0112	0.028%
Ancient Woodland Site 18418	0.05681	0.19%	1.615	0.81%	0.808	1.08%	0.0171	0.034%	0.0052	0.013%
Ancient Woodland Site 18954	0.04546	0.15%	1.571	0.79%	0.884	1.18%	0.0136	0.027%	0.0046	0.011%
Ancient Woodland Site 18955	0.26038	0.87%	2.179	1.09%	1.722	2.30%	0.0739	0.148%	0.0254	0.064%
Ancient Woodland Site 18956	0.05593	0.19%	2.012	1.01%	1.122	1.50%	0.0206	0.041%	0.0058	0.014%
Ancient Woodland Site 21799	0.13281	0.44%	2.213	1.11%	1.192	1.59%	0.0399	0.080%	0.0122	0.030%
Ancient Woodland Site 21855	0.03042	0.10%	1.226	0.61%	0.732	0.98%	0.0108	0.022%	0.0031	0.008%
Ancient Woodland Site 21976	0.02621	0.09%	0.972	0.49%	0.496	0.66%	0.0087	0.017%	0.0025	0.006%
Ancient Woodland Site 42098	0.05154	0.17%	1.825	0.91%	1.013	1.35%	0.0148	0.030%	0.0052	0.013%
Ancient Woodland Site 43706	0.12608	0.42%	3.498	1.75%	2.035	2.71%	0.0403	0.081%	0.0120	0.030%
Onsite Receptor 1	0.00739	0.02%	0.986	0.49%	0.965	1.29%	0.0007	0.001%	0.0009	0.002%
Onsite Receptor 2	0.06143	0.20%	5.150	2.58%	3.080	4.11%	0.0102	0.020%	0.0056	0.014%
Onsite Receptor 3	0.03793	0.13%	2.839	1.42%	1.190	1.59%	0.0095	0.019%	0.0034	0.009%
Onsite Receptor 4	0.04444	0.15%	3.021	1.51%	2.104	2.81%	0.0103	0.021%	0.0040	0.010%
Onsite Receptor 5	0.10173	0.34%	3.461	1.73%	1.928	2.57%	0.0260	0.052%	0.0091	0.023%

Process contributions over 1 % of the long-term or 10 % of the short-term assessment level are highlighted in yellow.

Table 8 C Process Contributions of Sulphur Dioxide and Hydrogen Chloride to Sensitive Receptors (1 – 46)

Receptor name	SO2 (ug/m3) Annual Hourly Average (Vegetation)	% of EQS	SO2 99.73%ile (ug/m3) Hourly Average	% of EQS	SO2 99.18%ile (ug/m3) 24 Hour Average	% of EQS	SO2 99.90%ile (ug/m3) 15 Minute Average	% of EQS	HCl (ug/m3) Maximum Hourly Average	% of EQS
Blaen Cynon Cors Bryn-Y-Gaer SSSI / SAC	0.1119	0.560%	1.555	0.444%	0.8689	0.695%	1.6146	0.607%	0.14861	0.0198%
Cwm Cadlan SAC	0.0161	0.080%	0.245	0.070%	0.1047	0.084%	0.4316	0.162%	0.01332	0.0018%
Coedydd Nedd a Mellte SAC	0.0100	0.050%	0.405	0.116%	0.1802	0.144%	0.4718	0.177%	0.00952	0.0013%
Dyffrynoedd Nedd a Mellte a Moel Penderyn SSSI	0.0125	0.063%	0.333	0.095%	0.1201	0.096%	0.4547	0.171%	0.01977	0.0026%
Cwm Gwrelych and Nant Llynfach Streams SSSI	0.0031	0.016%	0.120	0.034%	0.0450	0.036%	0.1917	0.072%	0.00712	0.0009%
Craig-y-Llyn SSSI	0.0029	0.014%	0.113	0.032%	0.0300	0.024%	0.1811	0.068%	0.01517	0.0020%
Bryn Bwch SSSI	0.0034	0.017%	0.120	0.034%	0.0388	0.031%	0.2008	0.075%	0.00826	0.0011%
Caeau Nant-y-Llechau SSSI	0.0016	0.008%	0.092	0.026%	0.0238	0.019%	0.1416	0.053%	0.00904	0.0012%
Gweunedd Dyffern Nedd SSSI	0.0026	0.013%	0.116	0.033%	0.0258	0.021%	0.1897	0.071%	0.00997	0.0013%
Bryncarnau Grasslands Llwyncoed SSSI	0.0042	0.021%	0.177	0.051%	0.0411	0.033%	0.2962	0.111%	0.00589	0.0008%
Blaenrhondda Road Cutting SSSI	0.0026	0.013%	0.102	0.029%	0.0572	0.046%	0.2667	0.100%	0.02138	0.0029%
Blaen Nedd SSSI	0.0018	0.009%	0.068	0.019%	0.0213	0.017%	0.1315	0.049%	0.00529	0.0007%
Ogof Ffynnon Ddu Pant Mawr SSSI	0.0013	0.007%	0.066	0.019%	0.0138	0.011%	0.1304	0.049%	0.00468	0.0006%
Caeau Ton-y-Fildre SSSI	0.0015	0.007%	0.075	0.021%	0.0216	0.017%	0.1273	0.048%	0.00284	0.0004%
Penmoelallt SSSI	0.0028	0.014%	0.080	0.023%	0.0172	0.014%	0.1807	0.068%	0.00268	0.0004%
Mynydd Ty-Isaf Rhondda SSSI	0.0011	0.005%	0.067	0.019%	0.0129	0.010%	0.1171	0.044%	0.00291	0.0004%
Plas-y-Gors SSSI	0.0013	0.006%	0.050	0.014%	0.0152	0.012%	0.0846	0.032%	0.00276	0.0004%
Daren Fach SSSI	0.0030	0.015%	0.082	0.023%	0.0179	0.014%	0.1457	0.055%	0.00263	0.0004%
Cwm Glo a Glyndyrys SSSI	0.0025	0.013%	0.080	0.023%	0.0224	0.018%	0.1440	0.054%	0.00214	0.0003%
Waun Ton-y-Spyddaden SSSI	0.0008	0.004%	0.044	0.013%	0.0126	0.010%	0.0719	0.027%	0.00219	0.0003%
Gorsllwyn Onllwyn SSSI	0.0014	0.007%	0.065	0.019%	0.0231	0.018%	0.1896	0.071%	0.00320	0.0004%
Cwm Taf Fechan Woodlands SSSI	0.0021	0.011%	0.072	0.021%	0.0172	0.014%	0.1501	0.056%	0.00221	0.0003%
Nant Llech SSSI	0.0009	0.005%	0.046	0.013%	0.0141	0.011%	0.0700	0.026%	0.00210	0.0003%
Caeau Nant Y Groes SSSI	0.0018	0.009%	0.081	0.023%	0.0230	0.018%	0.1671	0.063%	0.00292	0.0004%
Tir Mawr A Dderi Hir, Llwydcoed SSSI	0.0057	0.028%	0.220	0.063%	0.0543	0.043%	0.3798	0.143%	0.00790	0.0011%
Penderyn Reservoir	0.0723	0.361%	2.248	0.642%	0.9896	0.792%	2.3566	0.886%	0.09269	0.0124%
Eden UK	0.0130	0.065%	0.784	0.224%	0.2355	0.188%	1.1605	0.436%	0.07973	0.0106%
House at Penderyn Reservoir	0.1167	0.584%	1.352	0.386%	0.9221	0.738%	1.5222	0.572%	0.12893	0.0172%
Ty Newydd Hotel	0.0470	0.235%	0.764	0.218%	0.3413	0.273%	0.8574	0.322%	0.10116	0.0135%
Caer Llwyn Cottage	0.0220	0.110%	0.824	0.236%	0.3552	0.284%	0.9243	0.347%	0.02003	0.0027%
Rhombic Farm	0.0228	0.114%	0.651	0.186%	0.2784	0.223%	0.7337	0.276%	0.01935	0.0026%
Castell Farm	0.0187	0.094%	0.594	0.170%	0.2804	0.224%	0.6863	0.258%	0.01448	0.0019%
TY Newydd Cottage	0.0766	0.383%	0.855	0.244%	0.4443	0.355%	0.9507	0.357%	0.09956	0.0133%
Residence Woodland Park	0.0692	0.346%	0.501	0.143%	0.3274	0.262%	0.6015	0.226%	0.05631	0.0075%
Pontbren Llwyd School	0.0370	0.185%	0.327	0.093%	0.1727	0.138%	0.5698	0.214%	0.02422	0.0032%
Ffynnon Ddu (spring)	0.0058	0.029%	0.238	0.068%	0.0849	0.068%	0.2993	0.113%	0.01171	0.0016%
Ton-Y-Gilfach	0.0030	0.015%	0.124	0.035%	0.0447	0.036%	0.2050	0.077%	0.00528	0.0007%
Rose Cottage	0.0051	0.025%	0.181	0.052%	0.0747	0.060%	0.2501	0.094%	0.00656	0.0009%
The Don Bungalow	0.0060	0.030%	0.232	0.066%	0.0987	0.079%	0.3169	0.119%	0.00823	0.0011%
Werfa Farm	0.0086	0.043%	0.285	0.081%	0.1371	0.110%	0.3535	0.133%	0.01427	0.0019%
Willows Farm	0.0119	0.060%	0.510	0.146%	0.1531	0.123%	0.9365	0.352%	0.03394	0.0045%
Trebanog Uchaf Farm	0.0757	0.379%	1.087	0.311%	0.7251	0.580%	1.1916	0.448%	0.11877	0.0158%
Tai-Cwpla Farm	0.0196	0.098%	0.995	0.284%	0.3047	0.244%	1.3298	0.500%	0.03045	0.0041%
Neuadd Farm	0.0580	0.290%	0.549	0.157%	0.2978	0.238%	0.6542	0.246%	0.04873	0.0065%
John Street Allotments, Hirwaun	0.0087	0.043%	0.263	0.075%	0.0912	0.073%	0.4328	0.163%	0.00996	0.0013%
Dwr Cymru Service Reservoir	0.0847	0.423%	1.368	0.391%	0.7275	0.582%	1.4662	0.551%	0.16346	0.0218%

Process contributions over 1 % of the long-term or 10 % of the short-term assessment level are highlighted in yellow.

Table 8 D   Process Contributions of Sulphur Dioxide and Hydrogen Chloride to Sensitive Receptors (47 - 94)

Receptor name	SO2 (ug/m3) Annual Hourly Average (Vegetation)	% of EQS	SO2 99.73%ile (ug/m3) Hourly Average	% of EQS	SO2 99.18%ile (ug/m3) 24 Hour Average	% of EQS	SO2 99.90%ile (ug/m3) 15 Minute Average	% of EQS	HCl (ug/m3) Maximum Hourly Average	% of EQS
Ancient Woodland Site 6686	0.0290	0.145%	1.056	0.302%	0.4115	0.329%	1.2100	0.455%	0.05647	0.0075%
Ancient Woodland Site 7652	0.0092	0.046%	0.308	0.088%	0.1374	0.110%	0.3759	0.141%	0.00731	0.0010%
Ancient Woodland Site 7730	0.0069	0.034%	0.256	0.073%	0.0941	0.075%	0.3243	0.122%	0.01189	0.0016%
Ancient Woodland Site 10113	0.0444	0.222%	0.413	0.118%	0.2272	0.182%	0.5357	0.201%	0.04450	0.0059%
Ancient Woodland Site 10232	0.0143	0.071%	0.323	0.092%	0.1122	0.090%	0.4600	0.173%	0.01963	0.0026%
Ancient Woodland Site 10297	0.0179	0.089%	0.299	0.085%	0.0933	0.075%	0.4898	0.184%	0.01971	0.0026%
Ancient Woodland Site 10323	0.0466	0.233%	1.312	0.375%	0.7277	0.582%	1.4623	0.550%	0.08535	0.0114%
Ancient Woodland Site 10450	0.0128	0.064%	0.311	0.089%	0.0991	0.079%	0.4362	0.164%	0.01875	0.0025%
Ancient Woodland Site 11240	0.0483	0.242%	0.446	0.127%	0.2427	0.194%	0.5655	0.213%	0.04193	0.0056%
Ancient Woodland Site 11255	0.0081	0.041%	0.267	0.076%	0.1199	0.096%	0.3288	0.124%	0.00682	0.0009%
Ancient Woodland Site 13252	0.0594	0.297%	1.612	0.461%	0.8775	0.702%	1.7675	0.664%	0.09922	0.0132%
Ancient Woodland Site 17279	0.0811	0.405%	0.553	0.158%	0.3921	0.314%	0.6352	0.239%	0.05804	0.0077%
Ancient Woodland Site 17280	0.0590	0.295%	0.465	0.133%	0.2804	0.224%	0.5671	0.213%	0.04798	0.0064%
Ancient Woodland Site 17307	0.0352	0.176%	1.130	0.323%	0.5527	0.442%	1.2298	0.462%	0.07053	0.0094%
Ancient Woodland Site 17308	0.0596	0.298%	1.259	0.360%	0.5688	0.455%	1.3962	0.525%	0.11398	0.0152%
Ancient Woodland Site 17326	0.0341	0.171%	0.483	0.138%	0.2030	0.162%	0.6063	0.228%	0.03382	0.0045%
Ancient Woodland Site 17327	0.0207	0.103%	0.338	0.097%	0.1164	0.093%	0.5111	0.192%	0.02060	0.0027%
Ancient Woodland Site 17359	0.0127	0.063%	0.307	0.088%	0.0989	0.079%	0.4539	0.171%	0.01913	0.0026%
Ancient Woodland Site 17368	0.0364	0.182%	0.992	0.283%	0.4833	0.387%	1.1676	0.439%	0.07477	0.0100%
Ancient Woodland Site 17369	0.0836	0.418%	0.588	0.168%	0.4063	0.325%	0.6726	0.253%	0.06840	0.0091%
Ancient Woodland Site 17396	0.0089	0.044%	0.324	0.093%	0.1311	0.105%	0.3996	0.150%	0.00791	0.0011%
Ancient Woodland Site 17397	0.0063	0.032%	0.211	0.060%	0.0938	0.075%	0.2790	0.105%	0.00600	0.0008%
Ancient Woodland Site 17487	0.0098	0.049%	0.381	0.109%	0.1368	0.109%	0.4567	0.172%	0.00854	0.0011%
Ancient Woodland Site 18190	0.0286	0.143%	0.659	0.188%	0.2836	0.227%	0.8272	0.311%	0.07469	0.0100%
Ancient Woodland Site 18191	0.0467	0.233%	0.472	0.135%	0.2557	0.205%	0.5761	0.217%	0.04498	0.0060%
Ancient Woodland Site 18192	0.0496	0.248%	0.470	0.134%	0.2551	0.204%	0.5770	0.217%	0.04466	0.0060%
Ancient Woodland Site 18212	0.0105	0.053%	0.276	0.079%	0.0928	0.074%	0.3525	0.133%	0.00830	0.0011%
Ancient Woodland Site 18215	0.0378	0.189%	0.409	0.117%	0.1940	0.155%	0.6354	0.239%	0.03825	0.0051%
Ancient Woodland Site 18235	0.0297	0.149%	0.287	0.082%	0.1472	0.118%	0.4091	0.154%	0.01313	0.0018%
Ancient Woodland Site 18296	0.0094	0.047%	0.278	0.079%	0.0961	0.077%	0.3957	0.149%	0.00966	0.0013%
Ancient Woodland Site 18297	0.0113	0.057%	0.303	0.086%	0.1012	0.081%	0.3902	0.147%	0.00907	0.0012%
Ancient Woodland Site 18347	0.0231	0.116%	0.330	0.094%	0.1192	0.095%	0.4714	0.177%	0.02392	0.0032%
Ancient Woodland Site 18348	0.0354	0.177%	0.346	0.099%	0.1805	0.144%	0.6595	0.248%	0.03635	0.0048%
Ancient Woodland Site 18417	0.0358	0.179%	0.396	0.113%	0.2379	0.190%	0.5016	0.189%	0.02989	0.0040%
Ancient Woodland Site 18418	0.0163	0.081%	0.436	0.124%	0.1729	0.138%	0.5780	0.217%	0.03498	0.0047%
Ancient Woodland Site 18954	0.0131	0.065%	0.458	0.131%	0.2133	0.171%	0.5263	0.198%	0.01528	0.0020%
Ancient Woodland Site 18955	0.0765	0.383%	0.631	0.180%	0.3850	0.308%	0.7104	0.267%	0.03871	0.0052%
Ancient Woodland Site 18956	0.0162	0.081%	0.598	0.171%	0.2535	0.203%	0.6769	0.254%	0.01398	0.0019%
Ancient Woodland Site 21799	0.0386	0.193%	0.619	0.177%	0.3259	0.261%	0.7118	0.268%	0.07253	0.0097%
Ancient Woodland Site 21855	0.0087	0.043%	0.349	0.100%	0.1563	0.125%	0.4216	0.158%	0.00842	0.0011%
Ancient Woodland Site 21976	0.0074	0.037%	0.266	0.076%	0.1191	0.095%	0.3287	0.124%	0.01078	0.0014%
Ancient Woodland Site 42098	0.0149	0.075%	0.535	0.153%	0.2342	0.187%	0.6039	0.227%	0.01385	0.0018%
Ancient Woodland Site 43706	0.0369	0.184%	0.980	0.280%	0.5285	0.423%	1.1133	0.419%	0.06534	0.0087%
Onsite Receptor 1	0.0023	0.011%	0.224	0.064%	0.1773	0.142%	1.1605	0.436%	0.07973	0.0106%
Onsite Receptor 2	0.0189	0.094%	1.457	0.416%	0.4147	0.332%	1.8680	0.702%	0.07973	0.0106%
Onsite Receptor 3	0.0116	0.058%	0.821	0.235%	0.2184	0.175%	1.2649	0.476%	0.07973	0.0106%
Onsite Receptor 4	0.0137	0.068%	0.828	0.236%	0.3134	0.251%	1.2303	0.463%	0.10129	0.0135%
Onsite Receptor 5	0.0312	0.156%	1.064	0.304%	0.4565	0.365%	1.2265	0.461%	0.16124	0.0215%

Process contributions over 1 % of the long-term or 10 % of the short-term assessment level are highlighted in yellow.

Table 8 E   Process Contributions of Carbon Monoxide and Metals to Sensitive Receptors (1 – 46)

Receptor name	Maximum 8 Hour Rolling Average CO (mg/m3)	% of EQS	Cadmium (ng/m3) Annual Hourly Average	% of EQS	Annual Average Mercury (ug/m3)	% of EQS	Maximum Hourly Mercury (ug/m3)	% of EQS	Annual Average Heavy Metals as Pb (ug/m3)	% of EQS
Blaen Cynon Cors Bryn-Y-Gaer SSSI / SAC	0.001224	0.0122%	4.28E-04	0.0086%	1.28E-05	0.0051%	9.11E-04	0.0122%	6.19E-05	0.0248%
Cwm Cadlan SAC	0.000263	0.0026%	6.42E-05	0.0013%	1.91E-06	0.0008%	9.12E-05	0.0012%	9.30E-06	0.0037%
Coedydd Nedd a Mellte SAC	0.000281	0.0028%	4.11E-05	0.0008%	1.23E-06	0.0005%	5.62E-05	0.0007%	5.95E-06	0.0024%
Dyffrynoedd Nedd a Mellte a Moel Penderyn SSSI	0.000303	0.0030%	5.28E-05	0.0011%	1.57E-06	0.0006%	1.77E-04	0.0024%	7.64E-06	0.0031%
Cwm Gwrelych and Nant Llynfach Streams SSSI	0.000165	0.0017%	1.28E-05	0.0003%	3.81E-07	0.0002%	4.53E-05	0.0006%	1.85E-06	0.0007%
Craig-y-Llyn SSSI	0.000174	0.0017%	1.20E-05	0.0002%	3.56E-07	0.0001%	1.07E-04	0.0014%	1.73E-06	0.0007%
Bryn Bwch SSSI	0.000167	0.0017%	1.53E-05	0.0003%	4.57E-07	0.0002%	5.96E-05	0.0008%	2.22E-06	0.0009%
Caeau Nant-y-Llechau SSSI	0.000200	0.0020%	6.65E-06	0.0001%	1.98E-07	0.0001%	5.59E-05	0.0007%	9.63E-07	0.0004%
Gweunedd Dyffern Nedd SSSI	0.000083	0.0008%	1.07E-05	0.0002%	3.20E-07	0.0001%	7.02E-05	0.0009%	1.55E-06	0.0006%
Bryncarnau Grasslands Llwyncoed SSSI	0.000138	0.0014%	1.84E-05	0.0004%	5.49E-07	0.0002%	3.93E-05	0.0005%	2.66E-06	0.0011%
Blaenrhondda Road Cutting SSSI	0.000744	0.0074%	1.19E-05	0.0002%	3.54E-07	0.0001%	1.86E-04	0.0025%	1.72E-06	0.0007%
Blaen Nedd SSSI	0.000094	0.0009%	8.48E-06	0.0002%	2.53E-07	0.0001%	4.86E-05	0.0006%	1.23E-06	0.0005%
Ogof Ffynnon Ddu Pant Mawr SSSI	0.000046	0.0005%	5.62E-06	0.0001%	1.67E-07	0.0001%	3.24E-05	0.0004%	8.13E-07	0.0003%
Caeau Ton-y-Fildre SSSI	0.000087	0.0009%	6.60E-06	0.0001%	1.96E-07	0.0001%	1.96E-05	0.0003%	9.54E-07	0.0004%
Penmoelallt SSSI	0.000122	0.0012%	1.40E-05	0.0003%	4.17E-07	0.0002%	2.71E-05	0.0004%	2.02E-06	0.0008%
Mynydd Ty-Isaf Rhondda SSSI	0.000110	0.0011%	5.23E-06	0.0001%	1.56E-07	0.0001%	2.17E-05	0.0003%	7.56E-07	0.0003%
Plas-y-Gors SSSI	0.000051	0.0005%	5.58E-06	0.0001%	1.66E-07	0.0001%	2.08E-05	0.0003%	8.07E-07	0.0003%
Daren Fach SSSI	0.000107	0.0011%	1.45E-05	0.0003%	4.32E-07	0.0002%	4.90E-05	0.0007%	2.10E-06	0.0008%
Cwm Glo a Glyndyrys SSSI	0.000102	0.0010%	1.36E-05	0.0003%	4.04E-07	0.0002%	2.17E-05	0.0003%	1.96E-06	0.0008%
Waun Ton-y-Spyddaden SSSI	0.000045	0.0004%	3.55E-06	0.0001%	1.06E-07	0.0000%	1.46E-05	0.0002%	5.14E-07	0.0002%
Gorsllwyn Onllwyn SSSI	0.000122	0.0012%	6.50E-06	0.0001%	1.94E-07	0.0001%	3.43E-05	0.0005%	9.41E-07	0.0004%
Cwm Taf Fechan Woodlands SSSI	0.000073	0.0007%	1.14E-05	0.0002%	3.39E-07	0.0001%	1.89E-05	0.0003%	1.65E-06	0.0007%
Nant Llech SSSI	0.000045	0.0004%	4.21E-06	0.0001%	1.25E-07	0.0001%	1.32E-05	0.0002%	6.09E-07	0.0002%
Caeau Nant Y Groes SSSI	0.000079	0.0008%	7.85E-06	0.0002%	2.34E-07	0.0001%	2.01E-05	0.0003%	1.14E-06	0.0005%
Tir Mawr A Dderi Hir, Llwydcoed SSSI	0.000188	0.0019%	2.40E-05	0.0005%	7.16E-07	0.0003%	4.94E-05	0.0007%	3.48E-06	0.0014%
Penderyn Reservoir	0.001601	0.0160%	2.76E-04	0.0055%	8.23E-06	0.0033%	5.66E-04	0.0075%	4.00E-05	0.0160%
Eden UK	0.000753	0.0075%	4.97E-05	0.0010%	1.48E-06	0.0006%	4.09E-04	0.0055%	7.20E-06	0.0029%
House at Penderyn Reservoir	0.001184	0.0118%	4.49E-04	0.0090%	1.34E-05	0.0053%	9.11E-04	0.0121%	6.49E-05	0.0260%
Ty Newydd Hotel	0.001402	0.0140%	1.83E-04	0.0037%	5.46E-06	0.0022%	5.95E-04	0.0079%	2.65E-05	0.0106%
Caer Llwyn Cottage	0.000572	0.0057%	8.50E-05	0.0017%	2.53E-06	0.0010%	1.09E-04	0.0015%	1.23E-05	0.0049%
Rhombic Farm	0.000460	0.0046%	8.85E-05	0.0018%	2.64E-06	0.0011%	1.36E-04	0.0018%	1.28E-05	0.0051%
Castell Farm	0.000430	0.0043%	7.27E-05	0.0015%	2.17E-06	0.0009%	1.02E-04	0.0014%	1.05E-05	0.0042%
TY Newydd Cottage	0.001384	0.0138%	2.96E-04	0.0059%	8.82E-06	0.0035%	5.88E-04	0.0078%	4.28E-05	0.0171%
Residence Woodland Park	0.000932	0.0093%	2.68E-04	0.0054%	7.98E-06	0.0032%	4.02E-04	0.0054%	3.88E-05	0.0155%
Pontbren Llwyd School	0.000598	0.0060%	1.45E-04	0.0029%	4.32E-06	0.0017%	1.68E-04	0.0022%	2.10E-05	0.0084%
Ffynnon Ddu (spring)	0.000243	0.0024%	2.28E-05	0.0005%	6.78E-07	0.0003%	8.27E-05	0.0011%	3.29E-06	0.0013%
Ton-Y-Gilfach	0.000153	0.0015%	1.29E-05	0.0003%	3.84E-07	0.0002%	3.11E-05	0.0004%	1.86E-06	0.0007%
Rose Cottage	0.000203	0.0020%	2.06E-05	0.0004%	6.14E-07	0.0002%	3.92E-05	0.0005%	2.98E-06	0.0012%
The Don Bungalow	0.000191	0.0019%	2.41E-05	0.0005%	7.17E-07	0.0003%	5.18E-05	0.0007%	3.48E-06	0.0014%
Werfa Farm	0.000306	0.0031%	3.40E-05	0.0007%	1.01E-06	0.0004%	1.01E-04	0.0013%	4.92E-06	0.0020%
Willows Farm	0.000745	0.0075%	4.78E-05	0.0010%	1.42E-06	0.0006%	2.68E-04	0.0036%	6.92E-06	0.0028%
Trebanog Uchaf Farm	0.001041	0.0104%	2.92E-04	0.0058%	8.70E-06	0.0035%	8.14E-04	0.0108%	4.23E-05	0.0169%
Tai-Cwpla Farm	0.000813	0.0081%	7.53E-05	0.0015%	2.24E-06	0.0009%	1.58E-04	0.0021%	1.09E-05	0.0044%
Neuadd Farm	0.000780	0.0078%	2.25E-04	0.0045%	6.71E-06	0.0027%	3.24E-04	0.0043%	3.26E-05	0.0130%
John Street Allotments, Hirwaun	0.000283	0.0028%	3.46E-05	0.0007%	1.03E-06	0.0004%	6.79E-05	0.0009%	5.01E-06	0.0020%
Dwr Cymru Service Reservoir	0.001326	0.0133%	3.24E-04	0.0065%	9.65E-06	0.0039%	9.96E-04	0.0133%	4.69E-05	0.0187%

Process contributions over 1 % of the long-term or 10 % of the short-term assessment level are highlighted in yellow.

Table 8 F Process Contributions of Carbon Monoxide and Metals to Sensitive Receptors (47 - 94)

Receptor name	Maximum 8 Hour Rolling Average CO (mg/m3)	% of EQS	Cadmium (ng/m3) Annual Hourly Average	% of EQS	Annual Average Mercury (ug/m3)	% of EQS	Maximum Hourly Mercury (ug/m3)	% of EQS	Annual Average Heavy Metals as Pb (ug/m3)	% of EQS
Ancient Woodland Site 6686	0.000757	0.0076%	1.15E-04	0.0023%	3.43E-06	0.0014%	3.35E-04	0.0045%	1.67E-05	0.0067%
Ancient Woodland Site 7652	0.000235	0.0023%	3.90E-05	0.0008%	1.16E-06	0.0005%	4.49E-05	0.0006%	5.64E-06	0.0023%
Ancient Woodland Site 7730	0.000276	0.0028%	2.86E-05	0.0006%	8.53E-07	0.0003%	9.35E-05	0.0012%	4.14E-06	0.0017%
Ancient Woodland Site 10113	0.000785	0.0079%	1.81E-04	0.0036%	5.38E-06	0.0022%	3.26E-04	0.0043%	2.61E-05	0.0105%
Ancient Woodland Site 10232	0.000387	0.0039%	6.09E-05	0.0012%	1.82E-06	0.0007%	1.74E-04	0.0023%	8.82E-06	0.0035%
Ancient Woodland Site 10297	0.000359	0.0036%	7.66E-05	0.0015%	2.28E-06	0.0009%	1.32E-04	0.0018%	1.11E-05	0.0044%
Ancient Woodland Site 10323	0.000880	0.0088%	1.86E-04	0.0037%	5.55E-06	0.0022%	5.32E-04	0.0071%	2.70E-05	0.0108%
Ancient Woodland Site 10450	0.000430	0.0043%	5.63E-05	0.0011%	1.68E-06	0.0007%	1.46E-04	0.0020%	8.14E-06	0.0033%
Ancient Woodland Site 11240	0.000713	0.0071%	1.97E-04	0.0039%	5.86E-06	0.0023%	4.03E-04	0.0054%	2.85E-05	0.0114%
Ancient Woodland Site 11255	0.000206	0.0021%	3.45E-05	0.0007%	1.03E-06	0.0004%	4.06E-05	0.0005%	5.00E-06	0.0020%
Ancient Woodland Site 13252	0.001190	0.0119%	2.37E-04	0.0047%	7.07E-06	0.0028%	6.11E-04	0.0081%	3.43E-05	0.0137%
Ancient Woodland Site 17279	0.000942	0.0094%	3.26E-04	0.0065%	9.71E-06	0.0039%	5.08E-04	0.0068%	4.71E-05	0.0189%
Ancient Woodland Site 17280	0.000809	0.0081%	2.40E-04	0.0048%	7.15E-06	0.0029%	4.55E-04	0.0061%	3.47E-05	0.0139%
Ancient Woodland Site 17307	0.000698	0.0070%	1.41E-04	0.0028%	4.19E-06	0.0017%	4.39E-04	0.0058%	2.04E-05	0.0081%
Ancient Woodland Site 17308	0.001415	0.0141%	2.39E-04	0.0048%	7.13E-06	0.0029%	8.92E-04	0.0119%	3.46E-05	0.0139%
Ancient Woodland Site 17326	0.000618	0.0062%	1.43E-04	0.0029%	4.25E-06	0.0017%	2.75E-04	0.0037%	2.06E-05	0.0082%
Ancient Woodland Site 17327	0.000330	0.0033%	8.83E-05	0.0018%	2.63E-06	0.0011%	1.42E-04	0.0019%	1.28E-05	0.0051%
Ancient Woodland Site 17359	0.000350	0.0035%	5.50E-05	0.0011%	1.64E-06	0.0007%	1.43E-04	0.0019%	7.95E-06	0.0032%
Ancient Woodland Site 17368	0.001052	0.0105%	1.47E-04	0.0029%	4.39E-06	0.0018%	5.93E-04	0.0079%	2.13E-05	0.0085%
Ancient Woodland Site 17369	0.000887	0.0089%	3.37E-04	0.0067%	1.00E-05	0.0040%	6.01E-04	0.0080%	4.87E-05	0.0195%
Ancient Woodland Site 17396	0.000239	0.0024%	3.73E-05	0.0007%	1.11E-06	0.0004%	4.64E-05	0.0006%	5.40E-06	0.0022%
Ancient Woodland Site 17397	0.000185	0.0019%	2.74E-05	0.0005%	8.15E-07	0.0003%	3.61E-05	0.0005%	3.96E-06	0.0016%
Ancient Woodland Site 17487	0.000257	0.0026%	4.07E-05	0.0008%	1.21E-06	0.0005%	5.07E-05	0.0007%	5.88E-06	0.0024%
Ancient Woodland Site 18190	0.000896	0.0090%	1.17E-04	0.0023%	3.50E-06	0.0014%	6.00E-04	0.0080%	1.70E-05	0.0068%
Ancient Woodland Site 18191	0.000679	0.0068%	1.90E-04	0.0038%	5.67E-06	0.0023%	4.28E-04	0.0057%	2.75E-05	0.0110%
Ancient Woodland Site 18192	0.000787	0.0079%	2.01E-04	0.0040%	6.00E-06	0.0024%	3.35E-04	0.0045%	2.92E-05	0.0117%
Ancient Woodland Site 18212	0.000239	0.0024%	4.35E-05	0.0009%	1.30E-06	0.0005%	4.68E-05	0.0006%	6.29E-06	0.0025%
Ancient Woodland Site 18215	0.000682	0.0068%	1.57E-04	0.0031%	4.67E-06	0.0019%	3.08E-04	0.0041%	2.27E-05	0.0091%
Ancient Woodland Site 18235	0.000523	0.0052%	1.23E-04	0.0025%	3.67E-06	0.0015%	1.04E-04	0.0014%	1.78E-05	0.0071%
Ancient Woodland Site 18296	0.000233	0.0023%	3.93E-05	0.0008%	1.17E-06	0.0005%	6.91E-05	0.0009%	5.69E-06	0.0023%
Ancient Woodland Site 18297	0.000241	0.0024%	4.66E-05	0.0009%	1.39E-06	0.0006%	6.00E-05	0.0008%	6.75E-06	0.0027%
Ancient Woodland Site 18347	0.000375	0.0037%	9.76E-05	0.0020%	2.91E-06	0.0012%	1.71E-04	0.0023%	1.41E-05	0.0056%
Ancient Woodland Site 18348	0.000676	0.0068%	1.46E-04	0.0029%	4.35E-06	0.0017%	2.89E-04	0.0038%	2.11E-05	0.0085%
Ancient Woodland Site 18417	0.000583	0.0058%	1.47E-04	0.0029%	4.38E-06	0.0018%	2.96E-04	0.0040%	2.13E-05	0.0085%
Ancient Woodland Site 18418	0.000485	0.0049%	6.72E-05	0.0013%	2.00E-06	0.0008%	3.11E-04	0.0041%	9.72E-06	0.0039%
Ancient Woodland Site 18954	0.000335	0.0033%	5.37E-05	0.0011%	1.60E-06	0.0006%	1.13E-04	0.0015%	7.77E-06	0.0031%
Ancient Woodland Site 18955	0.000813	0.0081%	3.07E-04	0.0061%	9.15E-06	0.0037%	3.20E-04	0.0043%	4.44E-05	0.0178%
Ancient Woodland Site 18956	0.000425	0.0043%	6.60E-05	0.0013%	1.97E-06	0.0008%	8.03E-05	0.0011%	9.55E-06	0.0038%
Ancient Woodland Site 21799	0.000837	0.0084%	1.57E-04	0.0031%	4.67E-06	0.0019%	6.00E-04	0.0080%	2.27E-05	0.0091%
Ancient Woodland Site 21855	0.000244	0.0024%	3.60E-05	0.0007%	1.07E-06	0.0004%	5.07E-05	0.0007%	5.21E-06	0.0021%
Ancient Woodland Site 21976	0.000241	0.0024%	3.10E-05	0.0006%	9.24E-07	0.0004%	8.38E-05	0.0011%	4.49E-06	0.0018%
Ancient Woodland Site 42098	0.000391	0.0039%	6.08E-05	0.0012%	1.81E-06	0.0007%	1.02E-04	0.0014%	8.80E-06	0.0035%
Ancient Woodland Site 43706	0.000852	0.0085%	1.49E-04	0.0030%	4.43E-06	0.0018%	5.07E-04	0.0068%	2.15E-05	0.0086%
Onsite Receptor 1	0.000753	0.0075%	8.67E-06	0.0002%	2.58E-07	0.0001%	4.09E-04	0.0055%	1.25E-06	0.0005%
Onsite Receptor 2	0.001316	0.0132%	7.21E-05	0.0014%	2.15E-06	0.0009%	4.09E-04	0.0055%	1.04E-05	0.0042%
Onsite Receptor 3	0.000753	0.0075%	4.45E-05	0.0009%	1.33E-06	0.0005%	4.09E-04	0.0055%	6.44E-06	0.0026%
Onsite Receptor 4	0.000795	0.0079%	5.22E-05	0.0010%	1.55E-06	0.0006%	6.11E-04	0.0081%	7.55E-06	0.0030%
Onsite Receptor 5	0.001272	0.0127%	1.19E-04	0.0024%	3.56E-06	0.0014%	9.76E-04	0.0130%	1.73E-05	0.0069%

Process contributions over 1 % of the long-term or 10 % of the short-term assessment level are highlighted in yellow.

Table 8 G Process Contributions of Ammonia, TOC, PAH, and PCBs to Sensitive Receptors (1 – 46)

Receptor name	Ammonia (ug/m3) Annual Average	% of EQS	TOC (ug/m3) Annual Hourly Average (Benzene EQS)	% of EQS	Annual Average PAH (ng/m3)	% of EQS	Annual Average PCB (ug/m3)	% of EQS	Maximum Hourly PCB (ug/m3)	% of EQS
Blaen Cynon Cors Bryn-Y-Gaer SSSI / SAC	0.0008714	0.087%	0.09110	1.82%	1.91E-03	0.765%	5.74E-08	0.0000287%	4.10161E-06	0.0000684%
Cwm Cadlan SAC	0.0001216	0.012%	0.01367	0.27%	2.87E-04	0.115%	8.61E-09	0.0000043%	4.10354E-07	0.0000068%
Coedydd Nedd a Mellte SAC	0.0000775	0.008%	0.00876	0.18%	1.84E-04	0.074%	5.52E-09	0.0000028%	2.53159E-07	0.0000042%
Dyffrynoedd Nedd a Mellte a Moel Penderyn SSSI	0.0000967	0.010%	0.01123	0.22%	2.36E-04	0.094%	7.08E-09	0.0000035%	7.96945E-07	0.0000133%
Cwm Gwrelych and Nant Llynfach Streams SSSI	0.0000232	0.002%	0.00272	0.05%	5.72E-05	0.023%	1.72E-09	0.0000009%	2.04026E-07	0.0000034%
Craig-y-Llyn SSSI	0.0000211	0.002%	0.00254	0.05%	5.34E-05	0.021%	1.60E-09	0.0000008%	4.82944E-07	0.0000080%
Bryn Bwch SSSI	0.0000260	0.003%	0.00326	0.07%	6.85E-05	0.027%	2.06E-09	0.0000010%	2.68433E-07	0.0000045%
Caeau Nant-y-Llechau SSSI	0.0000123	0.001%	0.00142	0.03%	2.97E-05	0.012%	8.92E-10	0.0000004%	2.51432E-07	0.0000042%
Gweunedd Dyffern Nedd SSSI	0.0000193	0.002%	0.00228	0.05%	4.80E-05	0.019%	1.44E-09	0.0000007%	3.15751E-07	0.0000053%
Bryncarnau Grasslands Llwyncoed SSSI	0.0000310	0.003%	0.00392	0.08%	8.23E-05	0.033%	2.47E-09	0.0000012%	1.76842E-07	0.0000029%
Blaenrhondda Road Cutting SSSI	0.0000190	0.002%	0.00253	0.05%	5.31E-05	0.021%	1.59E-09	0.0000008%	8.39153E-07	0.0000140%
Blaen Nedd SSSI	0.0000137	0.001%	0.00180	0.04%	3.79E-05	0.015%	1.14E-09	0.0000006%	2.18891E-07	0.0000036%
Ogof Ffynnon Ddu Pant Mawr SSSI	0.0000098	0.001%	0.00120	0.02%	2.51E-05	0.010%	7.53E-10	0.0000004%	1.45678E-07	0.0000024%
Caeau Ton-y-Fildre SSSI	0.0000106	0.001%	0.00140	0.03%	2.95E-05	0.012%	8.84E-10	0.0000004%	8.80466E-08	0.0000015%
Penmoelallt SSSI	0.0000213	0.002%	0.00298	0.06%	6.25E-05	0.025%	1.87E-09	0.0000009%	1.22033E-07	0.0000020%
Mynydd Ty-Isaf Rhondda SSSI	0.0000081	0.001%	0.00111	0.02%	2.34E-05	0.009%	7.01E-10	0.0000004%	9.77983E-08	0.0000016%
Plas-y-Gors SSSI	0.0000093	0.001%	0.00119	0.02%	2.49E-05	0.010%	7.48E-10	0.0000004%	9.3745E-08	0.0000016%
Daren Fach SSSI	0.0000223	0.002%	0.00309	0.06%	6.49E-05	0.026%	1.95E-09	0.0000010%	2.20675E-07	0.0000037%
Cwm Glo a Glyndyrys SSSI	0.0000182	0.002%	0.00288	0.06%	6.06E-05	0.024%	1.82E-09	0.0000009%	9.75848E-08	0.0000016%
Waun Ton-y-Spyddaden SSSI	0.0000061	0.001%	0.00076	0.02%	1.59E-05	0.006%	4.76E-10	0.0000002%	6.56781E-08	0.0000011%
Gorsllwyn Onllwyn SSSI	0.0000100	0.001%	0.00138	0.03%	2.91E-05	0.012%	8.72E-10	0.0000004%	1.5446E-07	0.0000026%
Cwm Taf Fechan Woodlands SSSI	0.0000161	0.002%	0.00242	0.05%	5.08E-05	0.020%	1.52E-09	0.0000008%	8.49543E-08	0.0000014%
Nant Llech SSSI	0.0000067	0.000004%	0.00090	0.02%	1.88E-05	0.008%	5.64E-10	0.0000003%	5.92313E-08	0.0000010%
Caeau Nant Y Groes SSSI	0.0000131	0.000007%	0.00167	0.03%	3.51E-05	0.014%	1.05E-09	0.0000005%	9.04662E-08	0.0000015%
Tir Mawr A Dderi Hir, Llwydcoed SSSI	0.0000424	0.000024%	0.00511	0.10%	1.07E-04	0.043%	3.22E-09	0.0000016%	2.22349E-07	0.0000037%
Penderyn Reservoir	0.0005628	0.000313%	0.05878	1.18%	1.23E-03	0.494%	3.70E-08	0.0000185%	2.54847E-06	0.0000425%
Eden UK	0.0001006	0.000056%	0.01058	0.21%	2.22E-04	0.089%	6.67E-09	0.0000033%	1.84295E-06	0.0000307%
House at Penderyn Reservoir	0.0009060	0.000503%	0.09550	1.91%	2.01E-03	0.802%	6.02E-08	0.0000301%	4.09846E-06	0.0000683%
Ty Newydd Hotel	0.0003614	0.000201%	0.03897	0.78%	8.18E-04	0.327%	2.46E-08	0.0000123%	2.67763E-06	0.0000446%
Caer Llwyn Cottage	0.0001698	0.000094%	0.01809	0.36%	3.80E-04	0.152%	1.14E-08	0.0000057%	4.89868E-07	0.0000082%
Rhombic Farm	0.0001760	0.000098%	0.01884	0.38%	3.96E-04	0.158%	1.19E-08	0.0000059%	6.14207E-07	0.0000102%
Castell Farm	0.0001442	0.000080%	0.01547	0.31%	3.25E-04	0.130%	9.75E-09	0.0000049%	4.58299E-07	0.0000076%
TY Newydd Cottage	0.0005925	0.000329%	0.06299	1.26%	1.32E-03	0.529%	3.97E-08	0.0000198%	2.64591E-06	0.0000441%
Residence Woodland Park	0.0005339	0.000297%	0.05702	1.14%	1.20E-03	0.479%	3.59E-08	0.0000180%	1.81085E-06	0.0000302%
Pontbren Llwyd School	0.0002832	0.000157%	0.03089	0.62%	6.49E-04	0.259%	1.95E-08	0.0000097%	7.54108E-07	0.0000126%
Ffynnon Ddu (spring)	0.0000440	0.000024%	0.00484	0.10%	1.02E-04	0.041%	3.05E-09	0.0000015%	3.72307E-07	0.0000062%
Ton-Y-Gilfach	0.0000222	0.000012%	0.00274	0.05%	5.76E-05	0.023%	1.73E-09	0.0000009%	1.39773E-07	0.0000023%
Rose Cottage	0.0000381	0.000021%	0.00438	0.09%	9.21E-05	0.037%	2.76E-09	0.0000014%	1.76316E-07	0.0000029%
The Don Bungalow	0.0000453	0.000025%	0.00512	0.10%	1.08E-04	0.043%	3.23E-09	0.0000016%	2.32909E-07	0.0000039%
Werfa Farm	0.0000657	0.000037%	0.00724	0.14%	1.52E-04	0.061%	4.56E-09	0.0000023%	4.52743E-07	0.0000075%
Willows Farm	0.0000904	0.000050%	0.01017	0.20%	2.14E-04	0.085%	6.41E-09	0.0000032%	1.20781E-06	0.0000201%
Trebanog Uchaf Farm	0.0005863	0.000326%	0.06214	1.24%	1.31E-03	0.522%	3.92E-08	0.0000196%	3.66231E-06	0.0000610%
Tai-Cwpla Farm	0.0001518	0.000084%	0.01603	0.32%	3.37E-04	0.135%	1.01E-08	0.0000051%	7.1068E-07	0.0000118%
Neuadd Farm	0.0004475	0.000249%	0.04791	0.96%	1.01E-03	0.402%	3.02E-08	0.0000151%	1.45853E-06	0.0000243%
John Street Allotments, Hirwaun	0.0000660	0.000037%	0.00737	0.15%	1.55E-04	0.062%	4.64E-09	0.0000023%	3.05586E-07	0.0000051%
Dwr Cymru Service Reservoir	0.0006591	0.000366%	0.06893	1.38%	1.45E-03	0.579%	4.34E-08	0.0000217%	4.48461E-06	0.0000747%

Process contributions over 1 % of the long-term or 10 % of the short-term assessment level are highlighted in yellow.

Process contributions of Total Organic Carbon which exceed 1 % of the annual assessment level for Benzene are highlighted in orange. However, concentrations of Benzene in emissions are below the level of detection and hence are considered to be insignificant.

Table 8 H Process Contributions of Ammonia, TOC, PAH, and PCBs to Sensitive Receptors (47 - 94)

Receptor name	Ammonia (ug/m3) Annual Average	% of EQS	TOC (ug/m3) Annual Hourly Average (Benzene EQS)	% of EQS	Annual Average PAH (ng/m3)	% of EQS	Annual Average PCB (ug/m3)	% of EQS	Maximum Hourly PCB (ug/m3)	% of EQS
Ancient Woodland Site 6686	0.0002268	0.023%	0.02452	0.49%	5.15E-04	0.206%	1.55E-08	0.0000077%	1.50889E-06	0.0000251%
Ancient Woodland Site 7652	0.0000713	0.007%	0.00829	0.17%	1.74E-04	0.070%	5.22E-09	0.0000026%	2.02202E-07	0.0000034%
Ancient Woodland Site 7730	0.0000533	0.005%	0.00610	0.12%	1.28E-04	0.051%	3.84E-09	0.0000019%	4.20728E-07	0.0000070%
Ancient Woodland Site 10113	0.0003454	0.035%	0.03843	0.77%	8.07E-04	0.323%	2.42E-08	0.0000121%	1.46781E-06	0.0000245%
Ancient Woodland Site 10232	0.0001110	0.011%	0.01297	0.26%	2.72E-04	0.109%	8.17E-09	0.0000041%	7.81759E-07	0.0000130%
Ancient Woodland Site 10297	0.0001378	0.014%	0.01630	0.33%	3.42E-04	0.137%	1.03E-08	0.0000051%	5.93614E-07	0.0000099%
Ancient Woodland Site 10323	0.0003639	0.036%	0.03968	0.79%	8.33E-04	0.333%	2.50E-08	0.0000125%	2.39278E-06	0.0000399%
Ancient Woodland Site 10450	0.0000993	0.010%	0.01197	0.24%	2.51E-04	0.101%	7.55E-09	0.0000038%	6.58621E-07	0.0000110%
Ancient Woodland Site 11240	0.0003757	0.038%	0.04189	0.84%	8.80E-04	0.352%	2.64E-08	0.0000132%	1.81351E-06	0.0000302%
Ancient Woodland Site 11255	0.0000626	0.006%	0.00735	0.15%	1.54E-04	0.062%	4.63E-09	0.0000023%	1.82579E-07	0.0000030%
Ancient Woodland Site 13252	0.0004640	0.046%	0.05048	1.01%	1.06E-03	0.424%	3.18E-08	0.0000159%	2.74805E-06	0.0000458%
Ancient Woodland Site 17279	0.0006321	0.063%	0.06933	1.39%	1.46E-03	0.582%	4.37E-08	0.0000218%	2.28449E-06	0.0000381%
Ancient Woodland Site 17280	0.0004591	0.046%	0.05105	1.02%	1.07E-03	0.429%	3.22E-08	0.0000161%	2.0494E-06	0.0000342%
Ancient Woodland Site 17307	0.0002745	0.027%	0.02995	0.60%	6.29E-04	0.252%	1.89E-08	0.0000094%	1.97385E-06	0.0000329%
Ancient Woodland Site 17308	0.0004652	0.047%	0.05096	1.02%	1.07E-03	0.428%	3.21E-08	0.0000161%	4.01578E-06	0.0000669%
Ancient Woodland Site 17326	0.0002649	0.026%	0.03033	0.61%	6.37E-04	0.255%	1.91E-08	0.0000096%	1.23661E-06	0.0000206%
Ancient Woodland Site 17327	0.0001599	0.016%	0.01880	0.38%	3.95E-04	0.158%	1.18E-08	0.0000059%	6.4123E-07	0.0000107%
Ancient Woodland Site 17359	0.0000984	0.010%	0.01170	0.23%	2.46E-04	0.098%	7.37E-09	0.0000037%	6.42114E-07	0.0000107%
Ancient Woodland Site 17368	0.0002838	0.028%	0.03132	0.63%	6.58E-04	0.263%	1.97E-08	0.0000099%	2.6696E-06	0.0000445%
Ancient Woodland Site 17369	0.0006514	0.065%	0.07164	1.43%	1.50E-03	0.602%	4.51E-08	0.0000226%	2.70374E-06	0.0000451%
Ancient Woodland Site 17396	0.0000686	0.007%	0.00794	0.16%	1.67E-04	0.067%	5.01E-09	0.0000025%	2.08676E-07	0.0000035%
Ancient Woodland Site 17397	0.0000488	0.005%	0.00582	0.12%	1.22E-04	0.049%	3.67E-09	0.0000018%	1.62396E-07	0.0000027%
Ancient Woodland Site 17487	0.0000758	0.008%	0.00865	0.17%	1.82E-04	0.073%	5.45E-09	0.0000027%	2.28088E-07	0.0000038%
Ancient Woodland Site 18190	0.0002224	0.022%	0.02497	0.50%	5.24E-04	0.210%	1.57E-08	0.0000079%	2.70073E-06	0.0000450%
Ancient Woodland Site 18191	0.0003630	0.036%	0.04047	0.81%	8.50E-04	0.340%	2.55E-08	0.0000128%	1.9242E-06	0.0000321%
Ancient Woodland Site 18192	0.0003859	0.039%	0.04287	0.86%	9.00E-04	0.360%	2.70E-08	0.0000135%	1.50692E-06	0.0000251%
Ancient Woodland Site 18212	0.0000825	0.008%	0.00925	0.19%	1.94E-04	0.078%	5.83E-09	0.0000029%	2.10707E-07	0.0000035%
Ancient Woodland Site 18215	0.0002932	0.029%	0.03333	0.67%	7.00E-04	0.280%	2.10E-08	0.0000105%	1.38464E-06	0.0000231%
Ancient Woodland Site 18235	0.0002304	0.023%	0.02624	0.52%	5.51E-04	0.220%	1.65E-08	0.0000083%	4.68423E-07	0.0000078%
Ancient Woodland Site 18296	0.0000730	0.007%	0.00837	0.17%	1.76E-04	0.070%	5.27E-09	0.0000026%	3.11034E-07	0.0000052%
Ancient Woodland Site 18297	0.0000887	0.009%	0.00993	0.20%	2.08E-04	0.083%	6.25E-09	0.0000031%	2.69903E-07	0.0000045%
Ancient Woodland Site 18347	0.0001789	0.018%	0.02077	0.42%	4.36E-04	0.174%	1.31E-08	0.0000065%	7.71203E-07	0.0000129%
Ancient Woodland Site 18348	0.0002740	0.027%	0.03107	0.62%	6.53E-04	0.261%	1.96E-08	0.0000098%	1.29916E-06	0.0000217%
Ancient Woodland Site 18417	0.0002783	0.028%	0.03127	0.63%	6.57E-04	0.263%	1.97E-08	0.0000099%	1.33377E-06	0.0000222%
Ancient Woodland Site 18418	0.0001260	0.013%	0.01429	0.29%	3.00E-04	0.120%	9.01E-09	0.0000045%	1.39757E-06	0.0000233%
Ancient Woodland Site 18954	0.0001016	0.010%	0.01142	0.23%	2.40E-04	0.096%	7.20E-09	0.0000036%	5.08678E-07	0.0000085%
Ancient Woodland Site 18955	0.0005966	0.060%	0.06535	1.31%	1.37E-03	0.549%	4.12E-08	0.0000206%	1.44134E-06	0.0000240%
Ancient Woodland Site 18956	0.0001262	0.013%	0.01405	0.28%	2.95E-04	0.118%	8.85E-09	0.0000044%	3.61473E-07	0.0000060%
Ancient Woodland Site 21799	0.0003001	0.030%	0.03335	0.67%	7.00E-04	0.280%	2.10E-08	0.0000105%	2.69989E-06	0.0000450%
Ancient Woodland Site 21855	0.0000673	0.007%	0.00765	0.15%	1.61E-04	0.064%	4.82E-09	0.0000024%	2.28296E-07	0.0000038%
Ancient Woodland Site 21976	0.0000572	0.006%	0.00660	0.13%	1.39E-04	0.055%	4.16E-09	0.0000021%	3.77056E-07	0.0000063%
Ancient Woodland Site 42098	0.0001159	0.012%	0.01295	0.26%	2.72E-04	0.109%	8.16E-09	0.0000041%	4.57963E-07	0.0000076%
Ancient Woodland Site 43706	0.0002872	0.029%	0.03166	0.63%	6.65E-04	0.266%	1.99E-08	0.0000100%	2.28313E-06	0.0000381%
Onsite Receptor 1	0.0000177	0.002%	0.00184	0.04%	3.87E-05	0.015%	1.16E-09	0.0000006%	1.84295E-06	0.0000307%
Onsite Receptor 2	0.0001472	0.015%	0.01534	0.31%	3.22E-04	0.129%	9.67E-09	0.0000048%	1.84295E-06	0.0000307%
Onsite Receptor 3	0.0000905	0.009%	0.00947	0.19%	1.99E-04	0.080%	5.97E-09	0.0000030%	1.84295E-06	0.0000307%
Onsite Receptor 4	0.0001064	0.011%	0.01110	0.22%	2.33E-04	0.093%	6.99E-09	0.0000035%	2.75069E-06	0.0000458%
Onsite Receptor 5	0.0002429	0.024%	0.02540	0.51%	5.33E-04	0.213%	1.60E-08	0.0000080%	4.39051E-06	0.0000732%

Process contributions over 1 % of the long-term or 10 % of the short-term assessment level are highlighted in yellow.

Process contributions of Total Organic Carbon which exceed 1 % of the annual assessment level for Benzene are highlighted in orange. However, concentrations of Benzene in emissions are below the level of detection and hence are considered to be insignificant.

Table 9 Screening of Long-Term Contribution of Oxides of Nitrogen at Blaen Cynon SAC

POLLUTANT	Environmental Quality Standard	Background Concentration	Maximum Concentration	Predicted Environmental Concentration	Assessment of Significance		Secondary Assessment of Significance	
			Long Term		LT PC % of EQS	< 1 %?	LT PEC % of EQS	< 70 %?
NOx (ug/m3) Annual Hourly Average	30	9.03	0.365	9.39	**1.22%**	**No**	31.32%	Yes

Table 10 Cumulative Contributions at the Local Special Areas of Conservation

POLLUTANT PARAMETER	Blaen Cynon	% of EQS	Background	Predicted Environmental Concentration	PEC < 70 % EQS?
NOx (ug/m3) Annual Hourly Average	1.23	**4.1%**	9.03	10.26	Yes
NOx (ug/m3) Maximum 24 Hour Average	11.31	**15%**	9.03	20.34	Yes
SO2 (ug/m3) Annual Hourly Average	0.12866	0.6%			
HF (ug/m3) Maximum Daily Average	0.00263	0.1%			
HF (ug/m3) Maximum Weekly Average	0.00121	0.2%			
Ammonia (ug/m3) Annual Average	0.00112	0.04%			
POLLUTANT PARAMETER	**Cwm Cadlan**	**% of EQS**			
NOx (ug/m3) Annual Hourly Average	0.17727	0.6%			
NOx (ug/m3) Maximum 24 Hour Average	1.79	2.4%			
SO2 (ug/m3) Annual Hourly Average	0.01941	0.2%			
HF (ug/m3) Maximum Daily Average	0.00052	0.01%			
HF (ug/m3) Maximum Weekly Average	0.00019	0.04%			
Ammonia (ug/m3) Annual Average	0.00020	0.02%			
POLLUTANT PARAMETER	**Coeddyd Nedd a Mellte**	**% of EQS**			
NOx (ug/m3) Annual Hourly Average	0.13763	0.5%			
NOx (ug/m3) Maximum 24 Hour Average	3.20	4.3%			
SO2 (ug/m3) Annual Hourly Average	0.01320	0.1%			
HF (ug/m3) Maximum Daily Average	0.001018	0.02%			
HF (ug/m3) Maximum Weekly Average	0.000375	0.1%			
Ammonia (ug/m3) Annual Average	0.000172	0.02%			

Table 11 Calculating Nutrient Nitrogen and Acid Deposition Rates at Local Special Areas of Conservation

Receptor Enviroparks Process Contribution	Dry Deposition NOx (ug/m2/s)	Rate of Deposition as N (kg N/ha/yr)	Ammonia Deposition (ug/m2/s)	Rate of Deposition as N (kg N/ha/yr)	Rate of Total N Deposition from NOx and NH3 (kg N/ha/yr)	Rate of Total Deposition as N (keq/ha/yr)	Dry Deposition SO2 (ug/m2/s)	Rate of Total S Deposition from SO2 (kg S/ha/yr)	Rate of Total Deposition as S (keq/ha/yr)	Dry Deposition HCl (ug/m2/s)	Rate of Total Deposition from HCl (kg H/ha/yr)	Rate of Total S Deposition from SO2 and HCl (keq/ha/yr)
Blaen Cynon	0.000383044	0.036764182	0.000017429	0.004526377	0.04129	0.002949326	0.0013432	0.2118021	0.0132376	0.0000603	0.0015648	0.014802
Cwm Cadlan	0.000057603	0.005528686	0.000002432	0.000631540	0.00616	0.000440016	0.0001929	0.0304114	0.0019007	0.0000083	0.0002150	0.002116
Coed Nedd a Mellte	0.000073105	0.007016506	0.000002326	0.000604190	0.00762	0.000544335	0.0002399	0.0378233	0.0023640	0.0000120	0.0003119	0.002676
Receptor Cumulative Local Contributions	**Dry Deposition NOx (ug/m2/s)**	**Rate of Deposition as N (kg N/ha/yr)**	**Ammonia Deposition (ug/m2/s)**	**Rate of Deposition as N (kg N/ha/yr)**	**Rate of Total N Deposition from NOx and NH3 (kg N/ha/yr)**	**Rate of Total Deposition as N (keq/ha/yr)**	**Dry Deposition SO2 (ug/m2/s)**	**Rate of Total S Deposition from SO2 (kg S/ha/yr)**	**Rate of Total Deposition as S (keq/ha/yr)**	**Dry Deposition HCl (ug/m2/s)**	**Rate of Total Deposition from HCl (kg H/ha/yr)**	**Rate of Total S Deposition from SO2 and HCl (keq/ha/yr)**
Blaen Cynon	0.001288014	0.123622511	0.000022468	0.005835099	0.12946	0.009246972	0.0015439	0.2434374	0.0152148	0.0001517	0.0039362	0.019151
Cwm Cadlan	0.000186136	0.017865173	0.000004013	0.001042264	0.01891	0.001350531	0.0002329	0.0367301	0.0022956	0.0000362	0.0009395	0.003235
Coed Nedd a Mellte	0.000289019	0.027739801	0.000005165	0.001341367	0.02908	0.002077226	0.0003168	0.0499573	0.0031223	0.0000882	0.0022874	0.005410

Table 12 Contributions to Nutrient Nitrogen and Acid Deposition at Local SACs for Enviroparks Alone and In-Combination

Total Deposited Nutrient Nitrogen and Acid Contributions	Enviroparks			Cumulative		
	Blaen Cynon	Cwm Cadlan	Coedydd Nedd a Mellte	Blaen Cynon	Cwm Cadlan	Coedydd Nedd a Mellte
Rate of Total Deposition as N (kg N/ha/yr)	0.0413	0.0062	0.0076	0.1295	0.0189	0.0291
Current Minimum Background (kg N/ha/yr)	23.8	21.42	26.6	23.8	21.42	26.6
Low End of Critical Load Range (kg N/ha/yr)	10	15	10	10	15	10
Deposition as % of Lower Critical Load	0.4%	0.04%	0.08%	1.3%	0.13%	0.29%
Rate of Total Dry Deposition as N (keq/ha/yr)	0.0029	0.0004	0.0005	0.0092	0.0014	0.002077
Low End of Critical Load Range N (keq/ha/yr)	0.438	0.223	0.142	0.438	0.223	0.142
Deposition as % of Lower Critical Load	0.7%	0.2%	0.4%	2.1%	0.6%	1.5%
Current Minimum N Background (keq/ha/yr)	1.70	1.53	1.90	1.70	1.53	1.90
PEC N (keq/ha/yr)	1.703	1.530	1.901	1.709	1.531	1.902
Rate of Total Dry Deposition as S (kg S/ha/yr)	0.212	0.030	0.038	0.243	0.037	0.050
Rate of Total Dry Deposition as S (keq/ha/yr)	0.013	0.002	0.002	0.015	0.002	0.003
Rate of Total Deposition as HCl (kg H/ha/yr)	0.0016	0.0002	0.0003	0.0039	0.0009	0.0023
Rate of Total Deposition as S and H (keq/ha/yr)	0.0148	0.0021	0.0027	0.0192	0.0032	0.0054
Low End of Critical Load Range S (keq/ha/yr)	0.58	0.58	1.552	0.58	0.58	1.552
Deposition as % of Lower Critical Load	2.6%	0.4%	0.2%	3.3%	0.6%	0.3%
Current Minimum S Background (keq/ha/yr)	0.49	0.43	0.44	0.49	0.43	0.44
PEC S and H (keq/ha/yr)	0.5048	0.4321	0.4427	0.5092	0.4332	0.4454
PC Acid (keq/ha/yr)	0.0178	0.0026	0.0032	0.0284	0.0046	0.0075
% of Critical Load	1.7%	0.3%	0.19%	2.8%	0.6%	0.44%
PEC Acid (keq/ha/yr)	2.21	1.96	2.34	2.22	1.96	2.35
% of Critical Load	217%	244%	138%	218%	245%	139%

Table 13 Consideration of Deposition to Drinking Water; Penderyn Reservoir and Dwr Cymru Service Reservoir

POLLUTANT	WQ Standard (mg/l)	Contribution to Penderyn Reservoir Per Year (mg/l)	Contribution to Service Reservoir Per Fill (mg/l)	Total Contribution (mg/l)	Contribution as a % of Water Quality Standard
Nitrite	0.5	0.002276	4.23281E-07	0.002277	0.46%
Benzene	0.001	1.45665E-06	2.068E-12	1.45665E-06	0.15%
Chloride	250	0.000159	1.77351E-09	0.000159	0.0001%
Mercury	0.001	6.79803E-08	9.65113E-12	6.79899E-08	0.0068%
Antimony	0.005	3.66845E-08	5.78675E-13	3.6685E-08	0.0007%

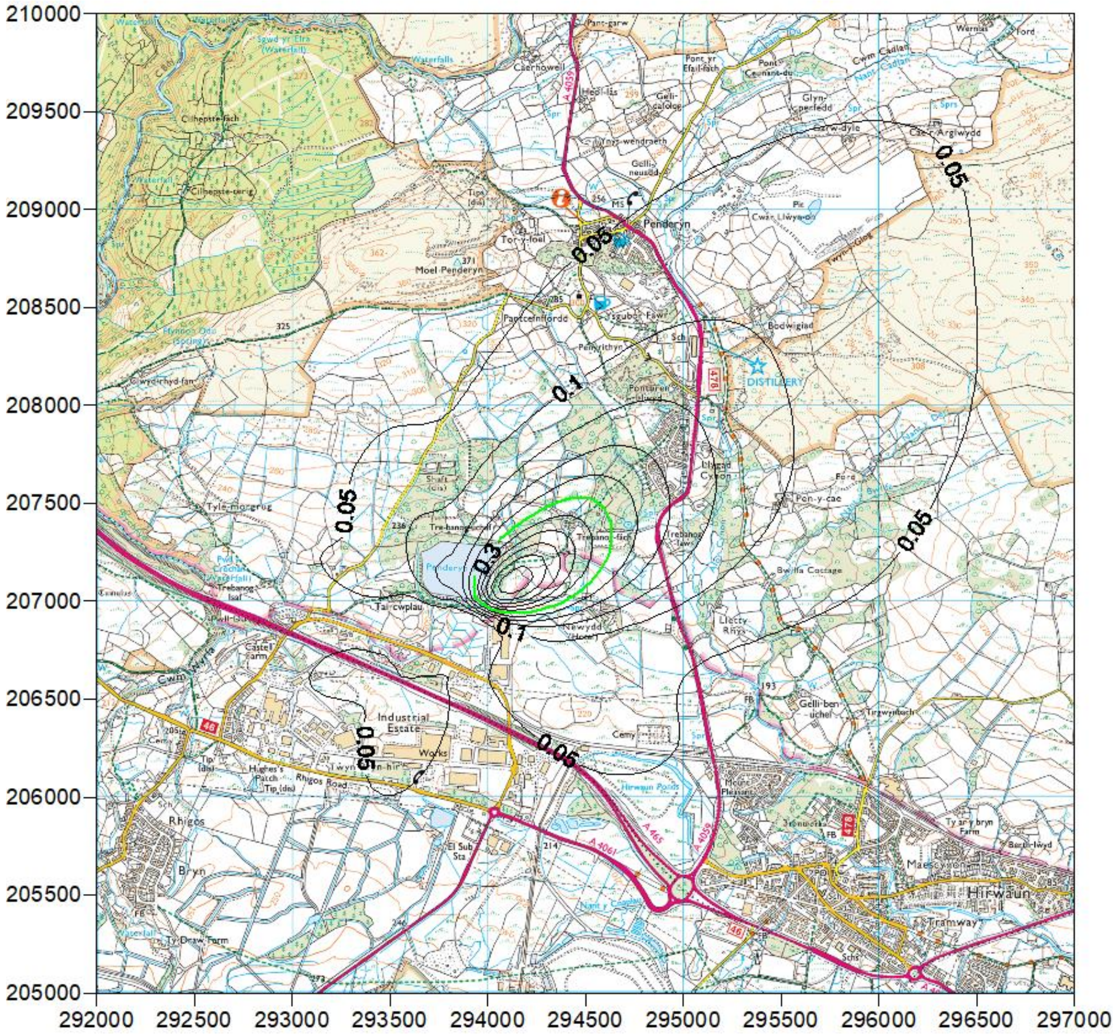
Benzene is assumed to comprise 0.3 % of the TOC deposition, and Antimony is assumed to comprise 1/9th of the combined total of heavy metal deposition.

FIGURES

Figures of normal operational conditions include results for discharges from up to 13 engines firing simultaneously and discharging through a 45 m high stack.

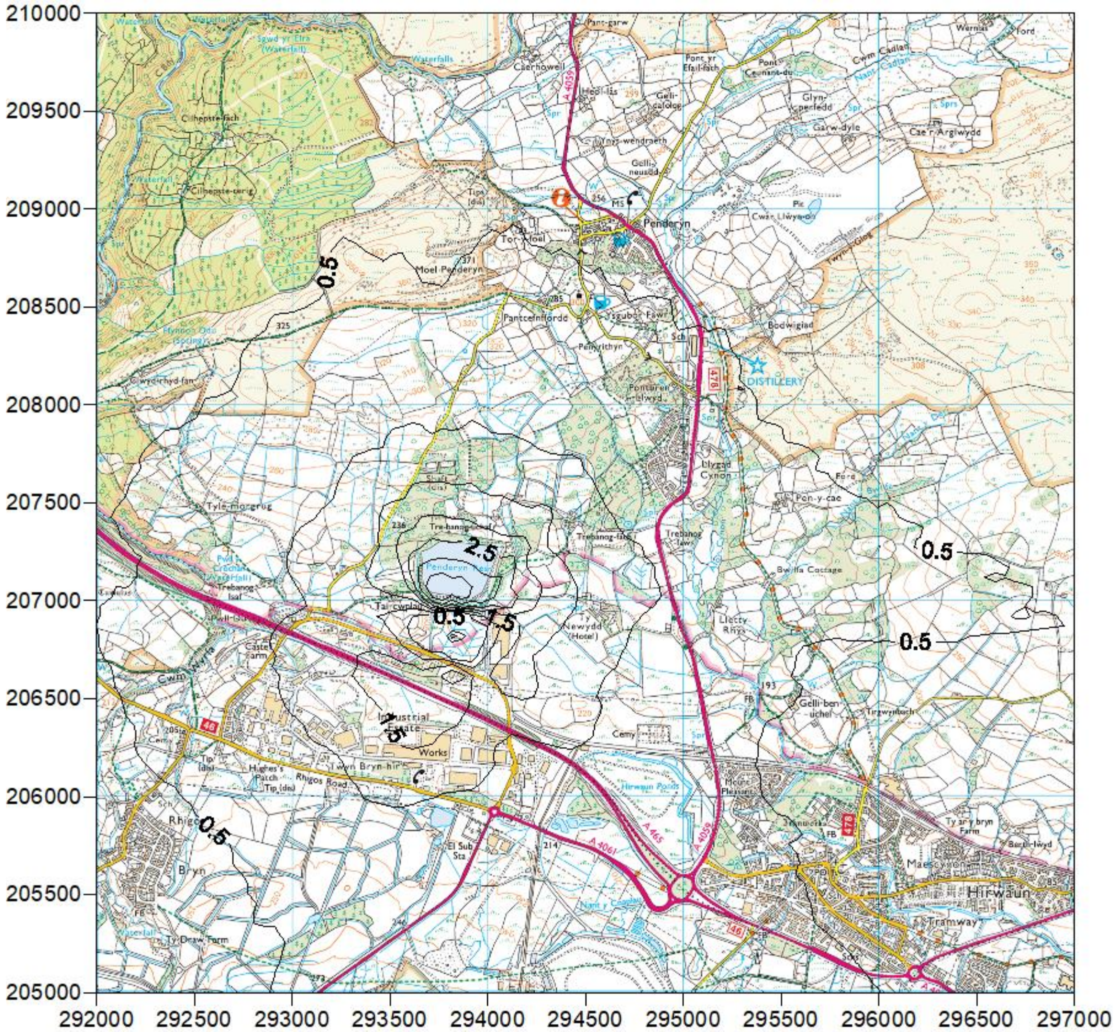
Base maps are taken from Ordnance Survey OS Select Explorer Map OL12, Brecon Beacon National Park, Western Area. 2016; 1:25,000 Scale, and OS Explorer Map 166 Rhondda and Merthyr Tydfil. 2015; 1:25,000 Scale.

FIGURE 1 Process Contribution to Annual Average Oxides of Nitrogen (as Total NO_x µg m^{-3}). Meteorological Data from 2015



Green isopleth denotes the point of insignificance when assessed against the standard for the protection of vegetation.

FIGURE 2 Process Contribution to 99.79th Percentile Hourly Average of Nitrogen Dioxide (as 50 % NO_x µg m^{-3}) Meteorological Data from 2015



FIGUE 3 Process Contribution to 24-Hour Average Oxides of Nitrogen (as Total NO_x µg m^{-3}). Short-Term Assessment Level for the Protection of Vegetation. Meteorological Data from 2015

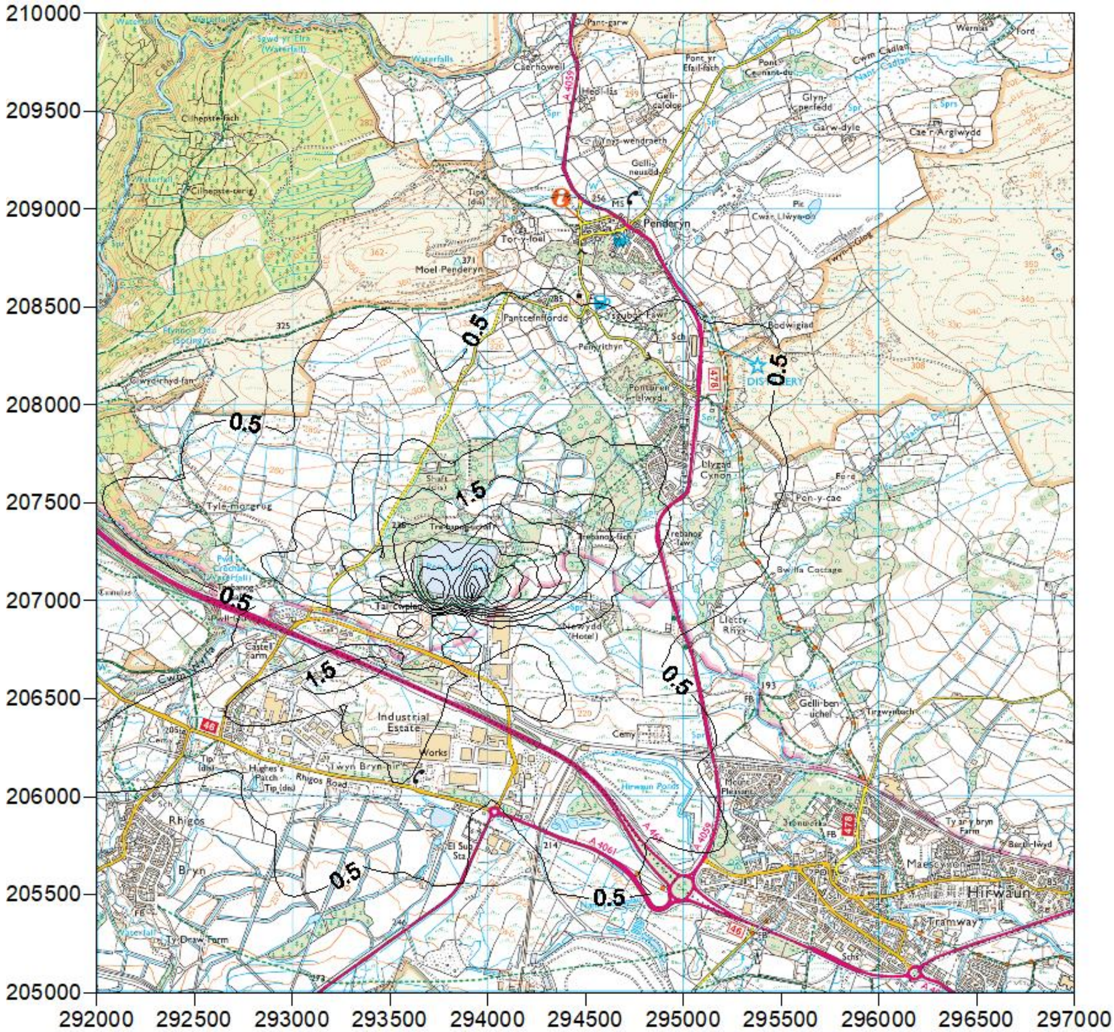


FIGURE 4 Process Contribution to Annual Average Sulphur Dioxide (µg m^{-3}). Meteorological Data from 2015

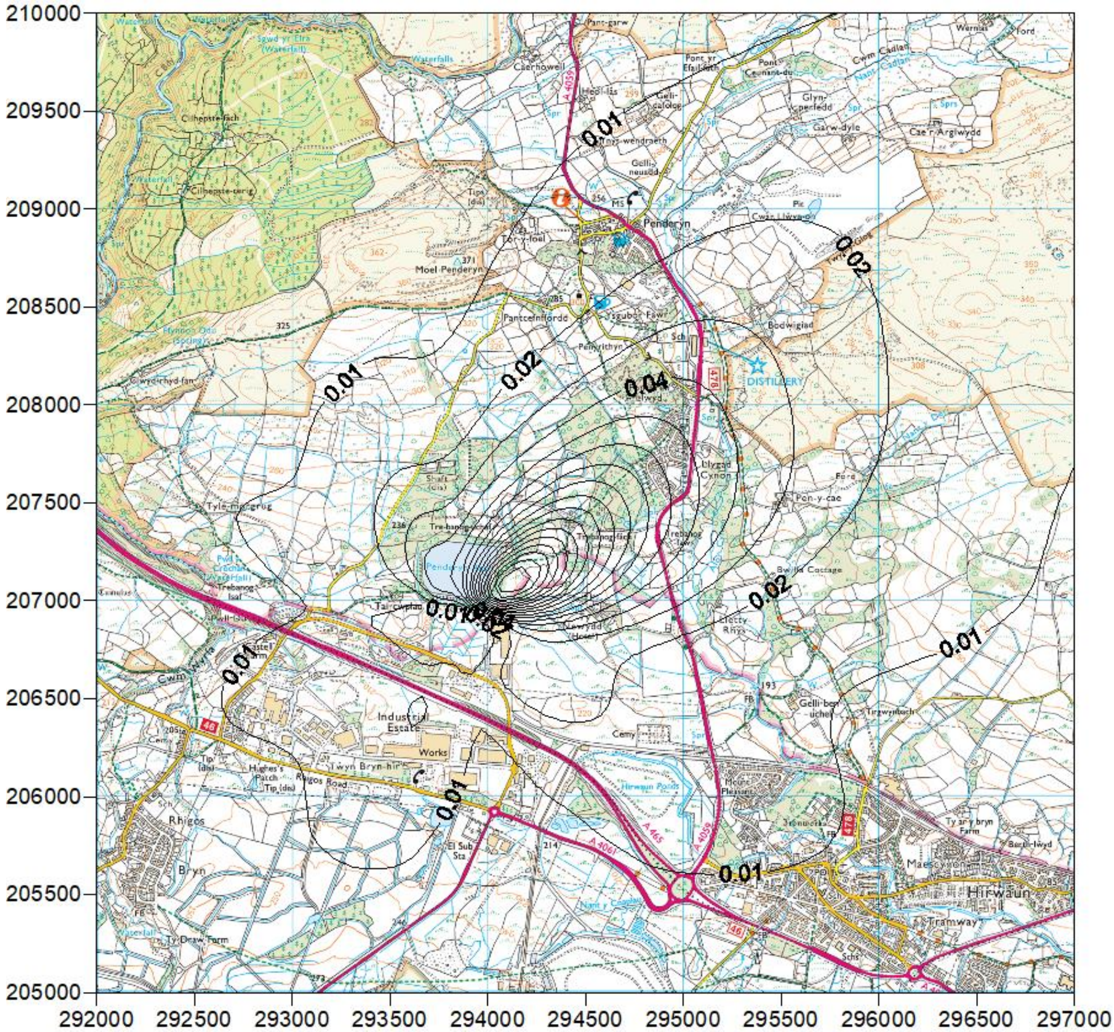


FIGURE 5 Process Contribution to 99.18 Percentile of 24-Hour Average Sulphur Dioxide (µg m^{-3}). Meteorological Data from 2015

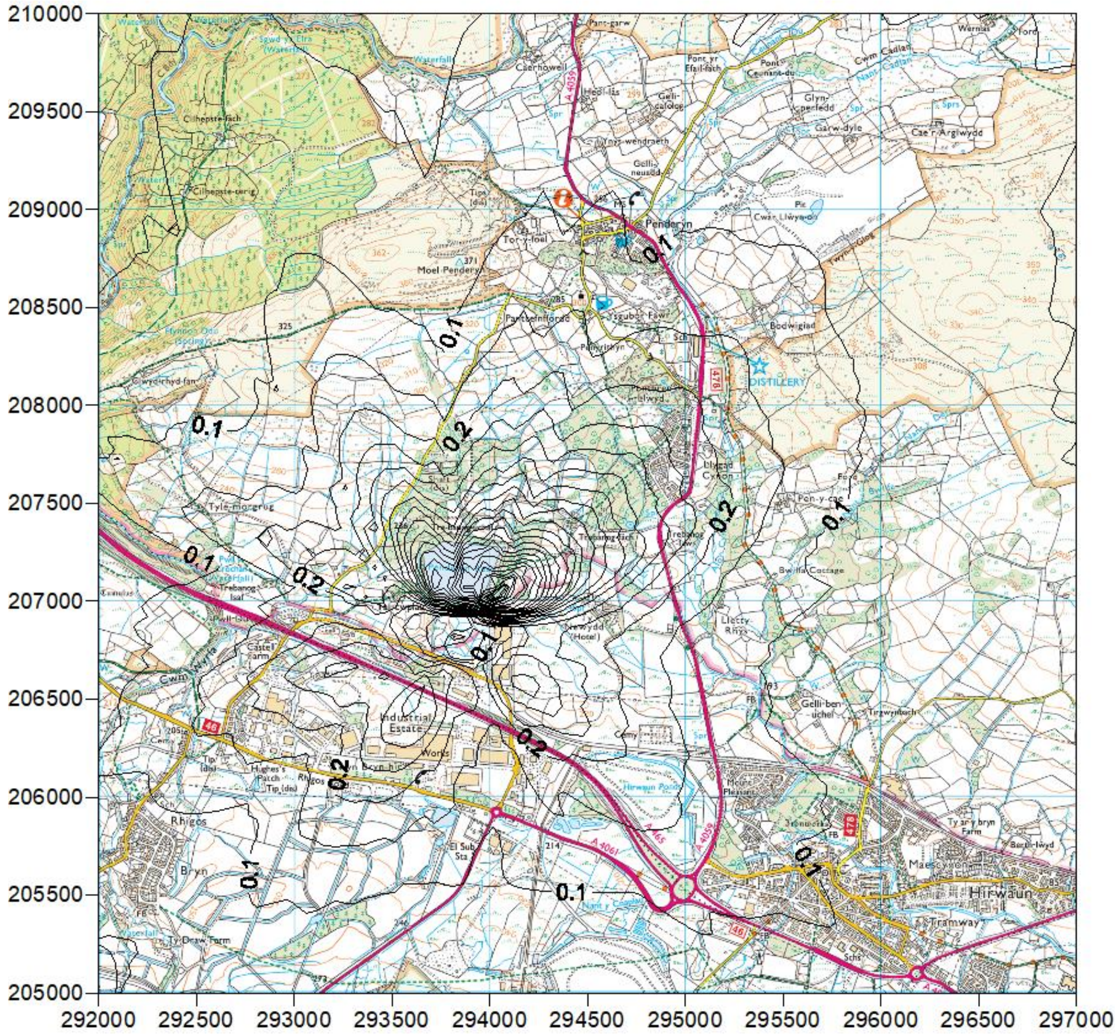


FIGURE 6 Process Contribution to 90.41 Percentile 24-Hour Average Particulate Matter (as PM_{10} µg m^{-3}). Meteorological Data from 2015

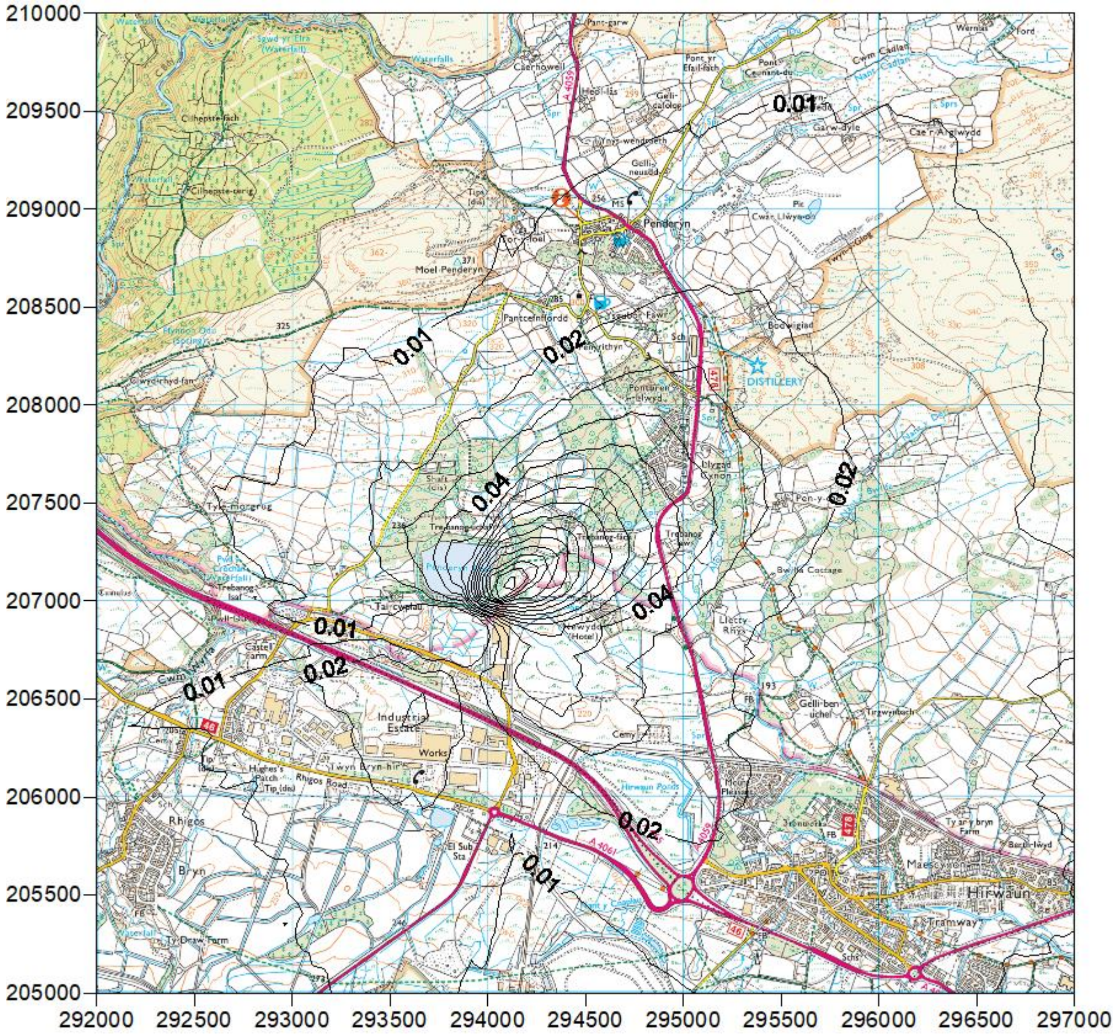


FIGURE 7 Process Contribution to Annual Average Ammonia (µg m^{-3}). Meteorological Data from 2015

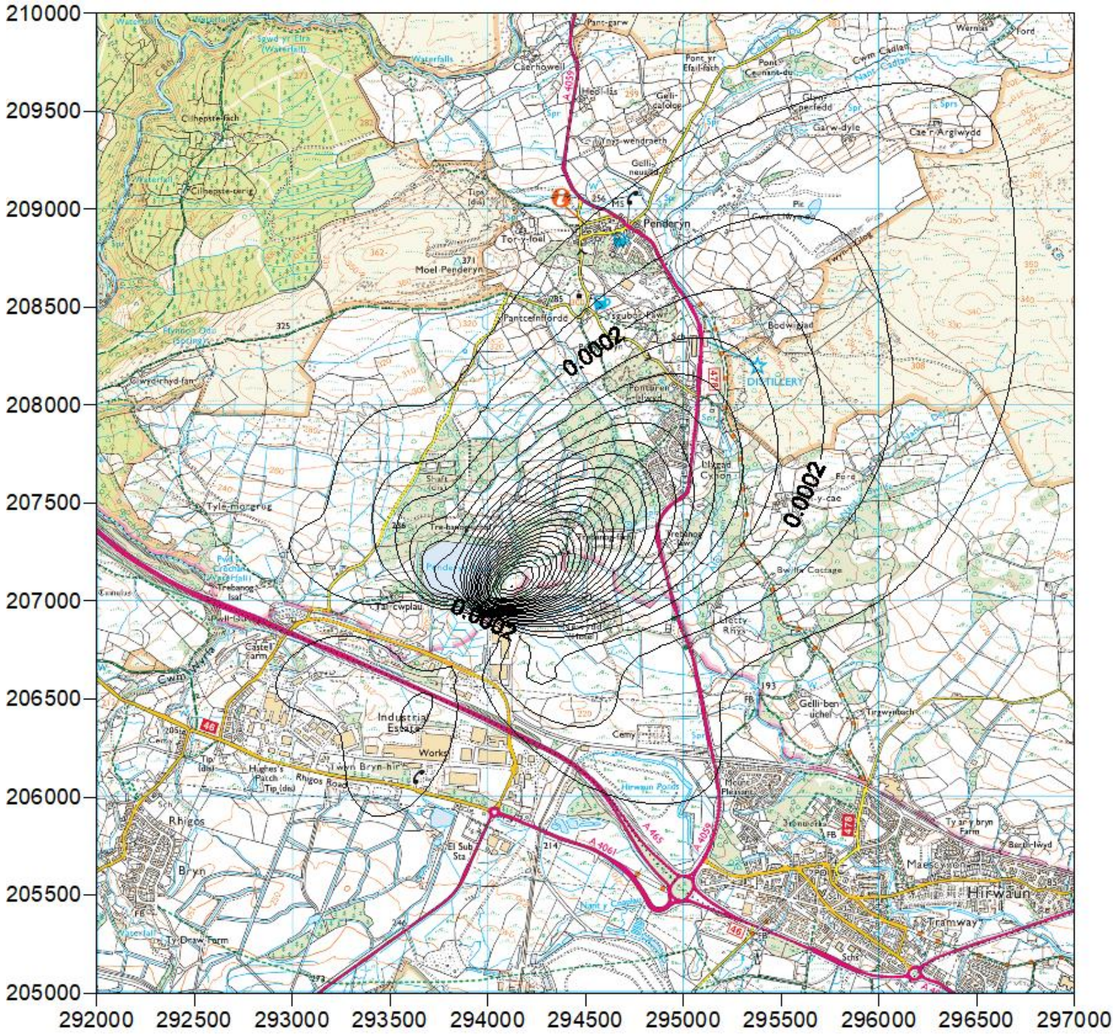
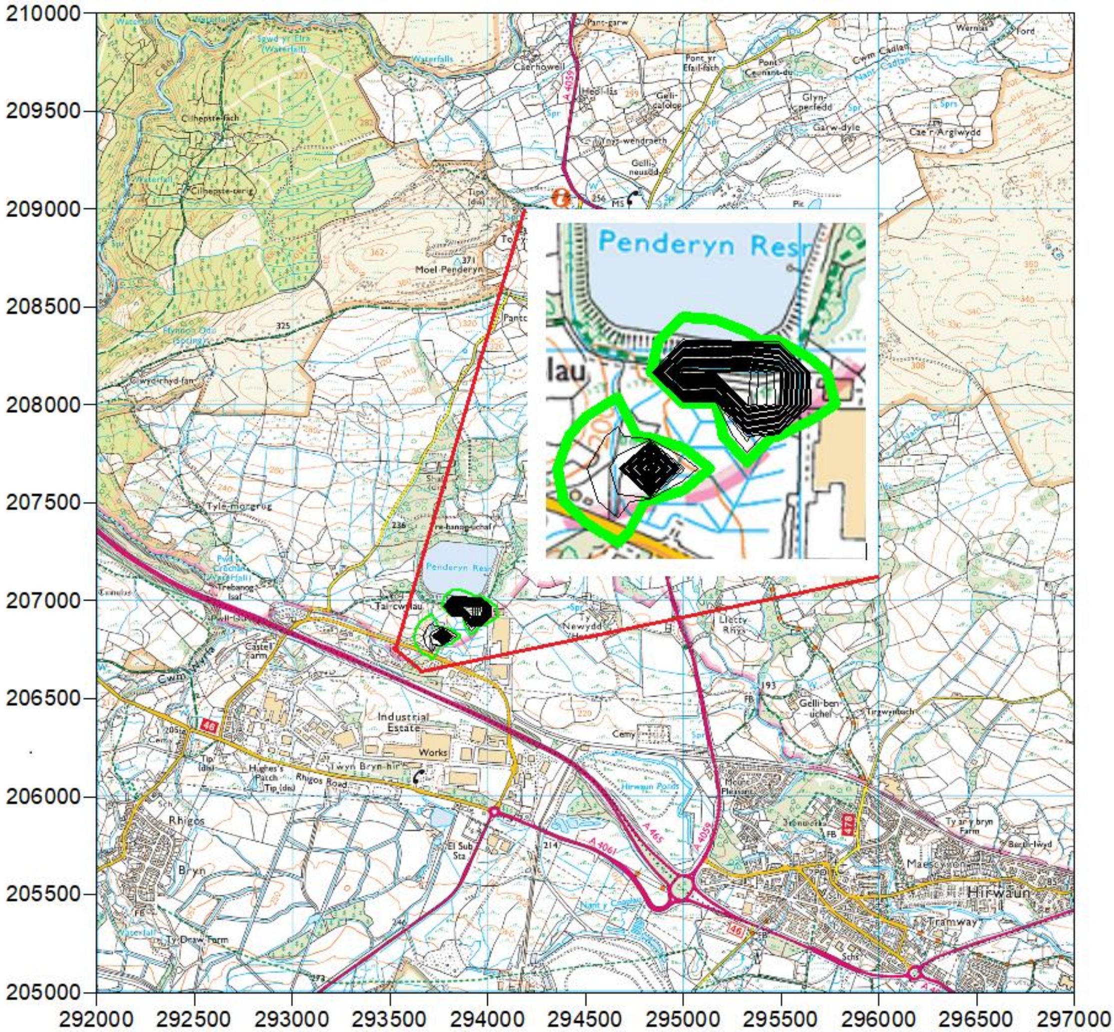
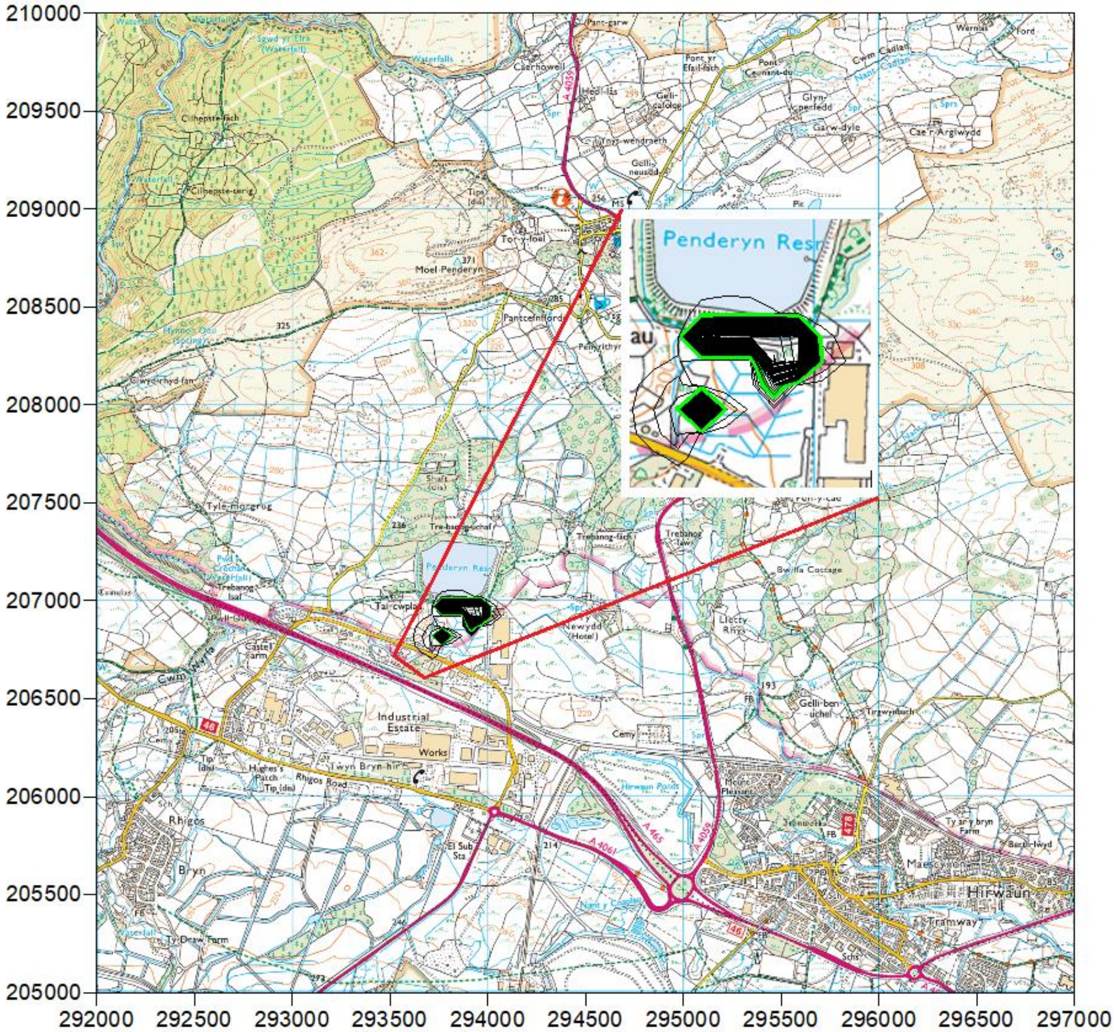


FIGURE 8 Process Contribution to 99.79 Percentile of Hourly Average Oxides of Nitrogen (µg m^{-3}) When Modelling Operational Flaring Meteorological Data from 2015



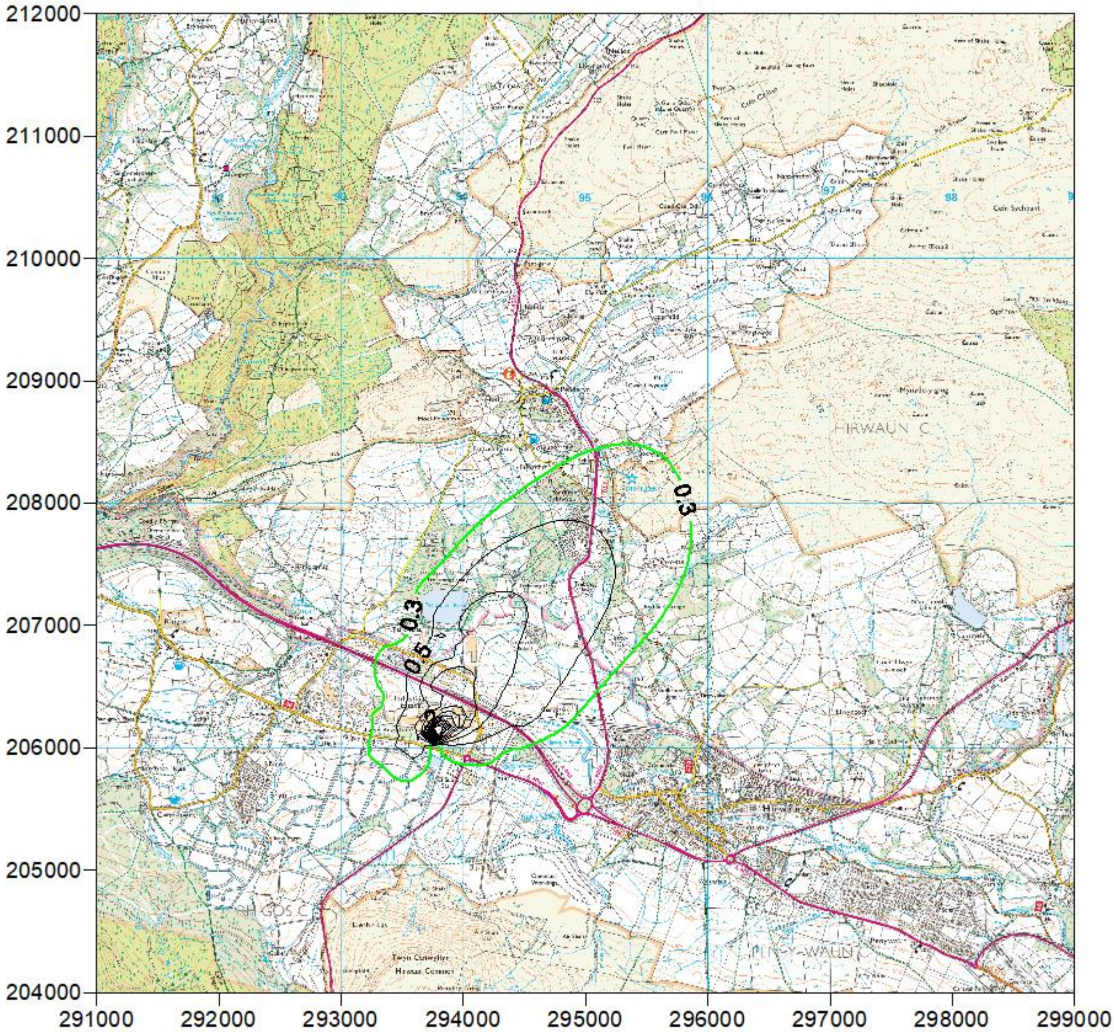
Green isopleth denotes the point of insignificance when assessed against the Air Quality Standard.

FIGURE 9 Process Contribution to 99.9 Percentile of 15 Minute Average Sulphur Dioxide (µg m^{-3}) When Modelling Operational Flaring Meteorological Data from 2015



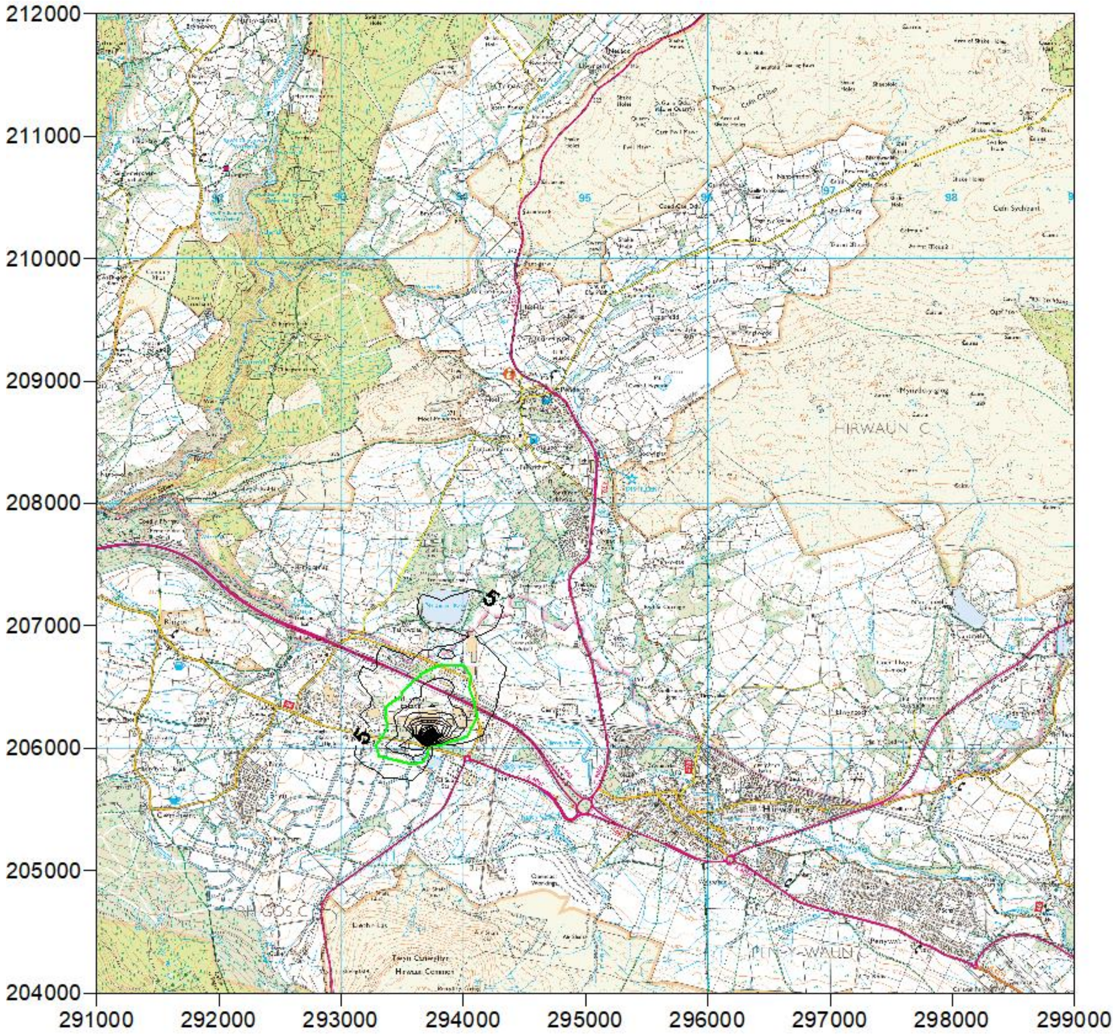
Green isopleth denotes the point of insignificance when assessed against the Air Quality Standard.

FIGURE 10 In-Combination Contributions to Annual Average Oxides of Nitrogen (µg m^{-3}). Meteorological Data from 2015



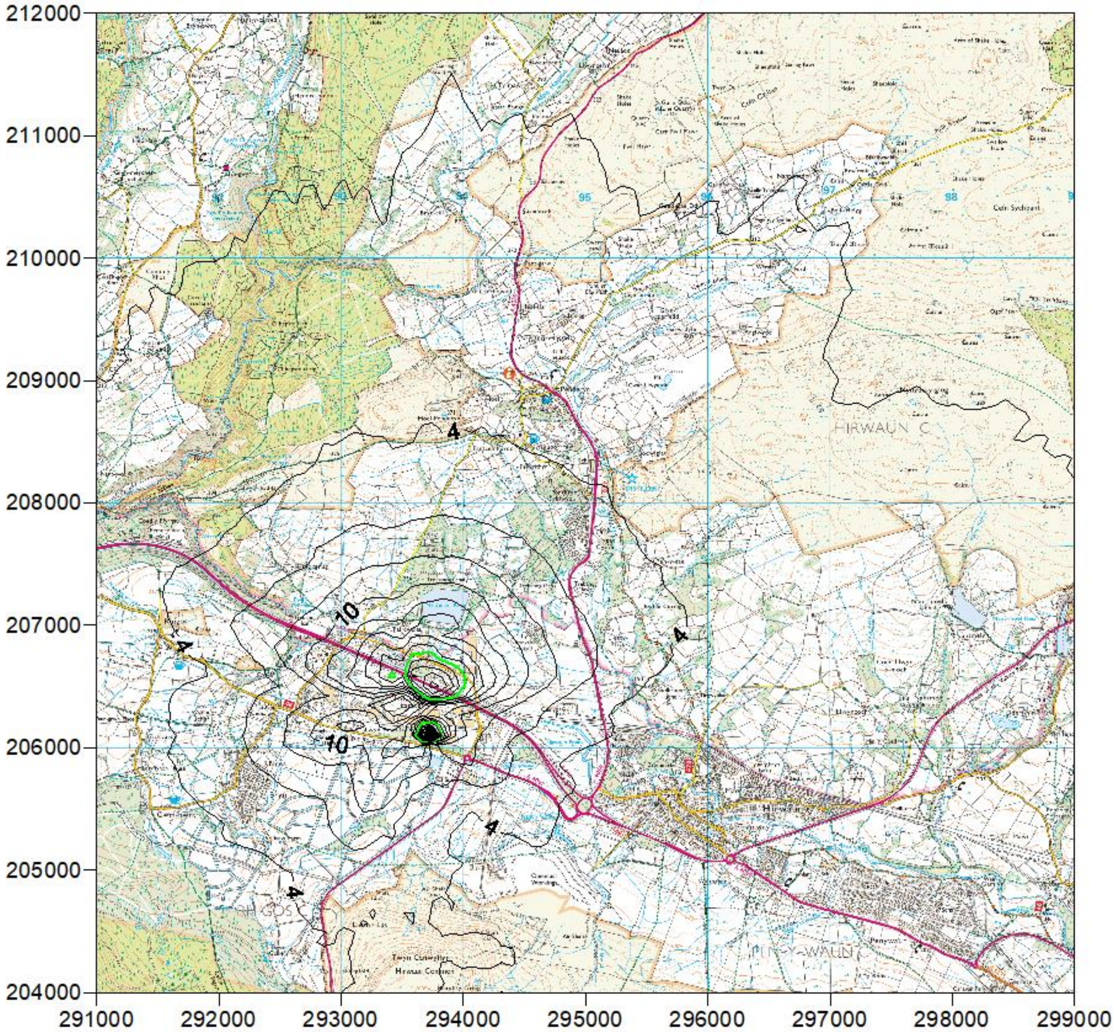
Green isopleth denotes the point of insignificance when assessed against the standard for the protection of vegetation. Highest concentrations occur to the south of the Enviroparks site.

FIGURE 11 In-Combination Contributions to 24-Hourly Average of Oxides of Nitrogen (µg m^{-3}). Meteorological Data from 2011



Green isopleth denotes the point of insignificance when assessed against the standard for the protection of vegetation. Highest concentrations occur to the south of the Enviroparks site.

FIGURE 12 In-Combination Contributions to 99.79th Percentile Hourly Average of Nitrogen Dioxide (as 35 % NO_x µg m^{-3}) Meteorological Data from 2011



Green isopleth denotes the point of insignificance when assessed against the Air Quality Standard. Highest concentrations occur to the south of the Enviroparks site.

FIGURE 13 Process Contribution to Nutrient Nitrogen Deposition (kgN/ha/year). Meteorological Data from 2015

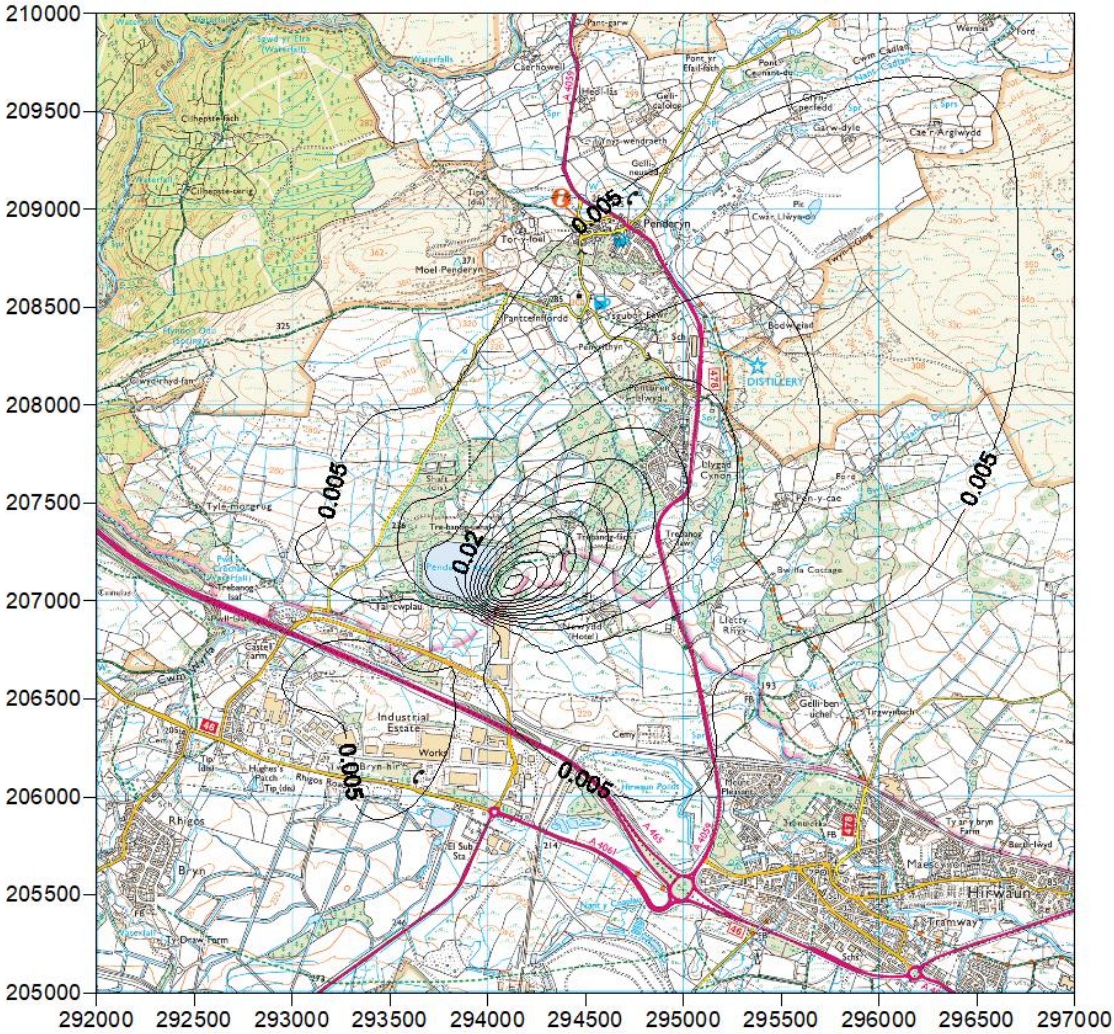
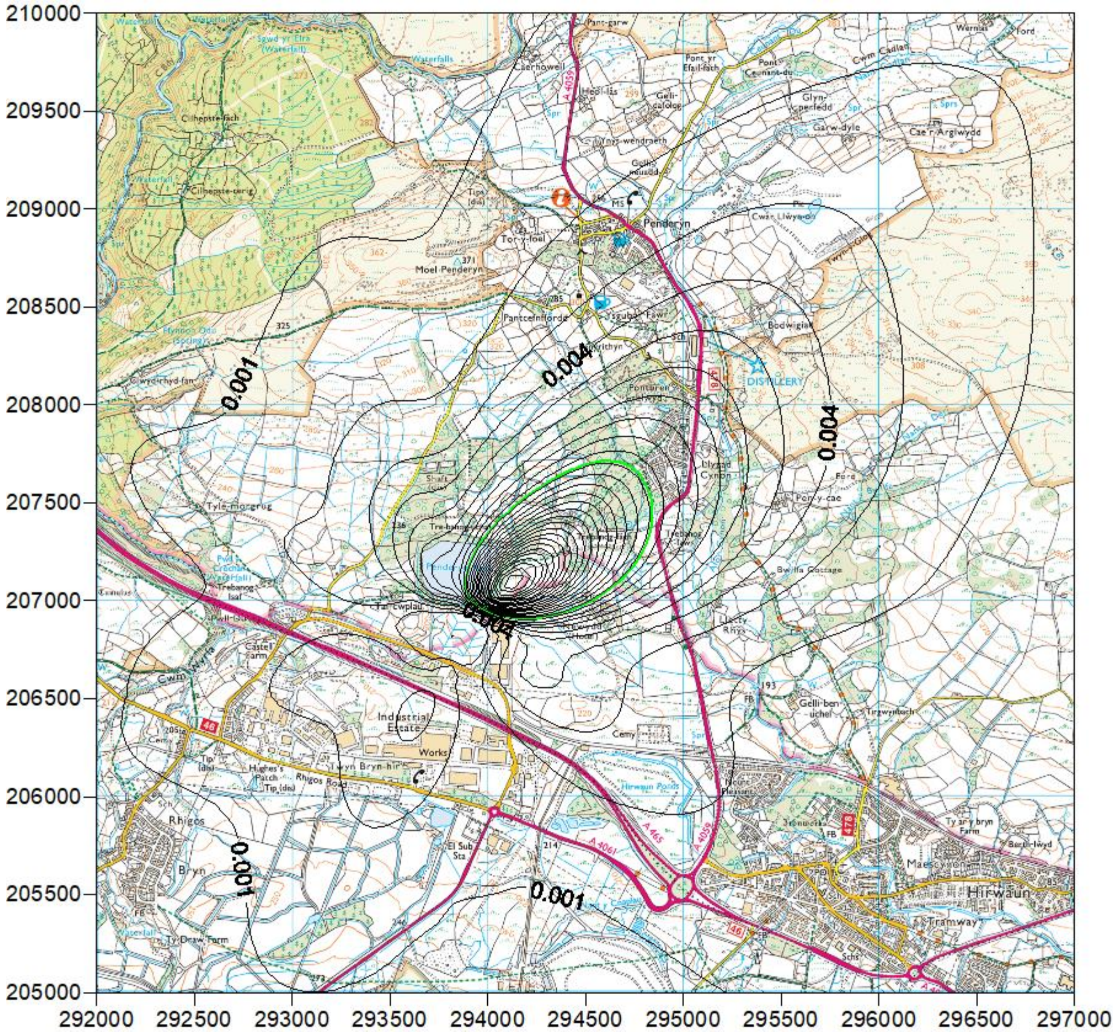


FIGURE 14 Process Contribution to Acid Deposition (keq/ha/year). Meteorological Data from 2015



Green isopleth denotes the point of insignificance when assessed against the Critical Load at Blaen Cynon SAC.

FIGURE 15 Critical Load Function Plot for Blaen Cynon SAC

Critical Load Function

CLmaxS:	0.58
CLminN:	0.438
CLmaxN:	1.161

Deposition data

Source	keq/ha/yr		
	Sulphur Deposition	Nitrogen Deposition	Total Acid Deposition (S+N)
Process Contribution (PC)	0.014802	0.002949	0.02
Background	0.49	1.7	2.19
Predicted Environmental Concentration (PEC)	0.5	1.7	2.21

Results - exceedance and deposition as a proportion of the CL function

Source	Exceedance (keq/ha/yr)	% of CL function*
Process Contribution (PC)	no exceedance of CL function	1.7
Background	1.03	188.6
Predicted Environmental Concentration (PEC)	1.05	190.4