



Atmospheric Dispersion Modelling Report, PB Gelatins, Pontypridd



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Contents

1	Introduction	4
2	Site Setting and Supporting Information	6
3	Receptors	14
4	H1 Assessment	18
5	ADMS Modelling	21
6	ADMS Results	23
7	Discussion	25
8	Summary	27
9	References	28
Appendix A	ADMS Data	
Appendix B	Contour Plots	



1 Introduction

ABB Ltd (ABB) was commissioned by Veolia Energy & Utility Services UK PLC (Veolia) to carry out an air emissions risk assessment including a site receptor survey for three emission points at the PB Gelatins, Pontypridd Site (“the Site”; grid ref: 310191, 186865).

The work was carried out in accordance with the terms and conditions of the ABB proposal ref: 300104898-004 (dated 13 December 2016).

1.1 Background

PB Gelatins have been requested by Natural Resources Wales (NRW) to include the operations of boilers and the associated stacks within the site permit. Subsequently, the atmospheric dispersion of nitrogen oxides (NO_x), carbon monoxide (CO) and sulphur oxides (SO_x) emitted from the three boiler stacks at the site are required to be assessed. This shall be undertaken using the designated H1 Assessment Tool and following the Environment Agency (EA) and DEFRA *Air Emissions Risk Assessment* guidance (Ref 1).

ABB have been commissioned by Veolia to complete the assessment initially through preliminary screening using the H1 Assessment Tool and through more detailed dispersion modelling where necessary based on the emission and Site data provided by Veolia.

This report presents the findings of the H1 screening, a site receptor survey and of the detailed air dispersion modelling.

1.2 Reliability of Information/Limitations

ABB has prepared this report with all reasonable skill, care and diligence, within the terms of the contract with Veolia Energy & Utility Services UK PLC (“the Client”), in the acquisition of information upon which the report is based. The information provided reflects the best judgement of ABB in the light of the data available at the time of the preparation of the report.

The current report has been prepared under the terms of the contract with the Client for the use of Veolia Energy & Utility Services UK PLC. The contents of the report may not



be used or relied upon by any person other than this party without the express written consent and authorisation of ABB.

ABB assumes the correctness and completeness of, and shall have no liability in respect to any inaccuracy, defect or omission in any information or materials provided by third parties to ABB. ABB does not assume any liability for misrepresentation of information or for items not visible, accessible, present or supplied at the time of the study.



2 Site Setting and Supporting Information

2.1 Veolia Data

The data used in this report have been provided by Veolia unless otherwise stated. This includes building and stack dimensions, source locations, and emission rates

The key pollutants considered in this report are nitrogen oxides (NO_x), carbon monoxide (CO) and sulphur oxides (namely sulphur dioxide; SO₂). NO_x is of particular interest here due to the proximity of an Air Quality Monitoring Area (AQMA) to the Site. To assess the potential impacts of the pollutant emissions to the surrounding areas there are a number of factors which must be considered such as sensitive receptors, source emission locations, local meteorological conditions and the background concentrations. These factors are described in more detail in the following sections.

2.2 ADMS

ADMS (Atmospheric Dispersion Modelling System) v5.1 (Ref 2) was used to undertake the detailed dispersion assessment. ADMS is the most widely used dispersion model in the UK and is accepted by industry, consultancies and regulators. It was developed by Cambridge Environmental Research Consultants (CERC) on behalf of a consortium of organisations originally including National Power, PowerGen, The Environment Agency, The Health and Safety Executive, ICI and Zeneca.

2.3 Toxicity of Discharged Pollutants

2.3.1 Nitrogen Oxides (NO_x)

Nitrogen oxides (also known as oxides of nitrogen, and abbreviated as NO_x) is a collective term used to refer to two species of oxides of nitrogen: nitrogen monoxide (NO) and nitrogen dioxide (NO₂). Nitrogen monoxide is a colourless, flammable gas with a slight odour. Although somewhat toxic, its odour is insufficient to provide warning. Nitrogen dioxide is a reddish brown, non-flammable, gas with a detectable smell. In significant concentrations it is highly toxic, causing serious lung damage with a delayed effect. Nitrogen dioxide is a strong oxidising agent that reacts in the air to form corrosive nitric



acid as well as toxic organic nitrates. It also plays a major role in the atmospheric reactions that produce ground-level ozone or photochemical smog.

Nitrogen monoxide oxidises rapidly to form nitrogen dioxide. For this study, it has been assumed that NO_x emissions from the stacks result in a conversion rate to NO₂ of 70% in the Long Term (LT) and of 35% in the Short Term (ST). This rate generally accepted as it is deemed conservative and therefore considered appropriate for this investigation.

The National Air Quality Standards (AQS; Ref 3) for NO₂ are:

- 200 µg/m³ (105 ppb) as a 1-hour mean level with a maximum of 18 exceedances per year. This is equivalent to a 99.8th percentile; and
- 40 µg/m³ (21 ppb) as an annual mean.

Conversion factor (NO₂): 1 µg/m³ = 0.52 ppb

2.3.2 Carbon Monoxide (CO)

Carbon monoxide (CO) is a product of the incomplete combustion of carbon-containing fuels and is also produced by natural processes within the human body. With external exposure to additional carbon monoxide, subtle effects can begin to occur and exposure to higher levels can result in death. The health effects of carbon monoxide are largely the result of the formation of carboxyhaemoglobin (COHb), which impairs the oxygen carrying capacity of the blood. Carbon monoxide is absorbed through the lungs, and the concentration of carboxyhaemoglobin will depend mainly on the concentrations of inspired carbon monoxide and oxygen and will also depend on the duration of exposure, pulmonary ventilation, and the concentration of carboxyhaemoglobin originally present. Occupational or accidental exposure to the products of combustion and pyrolysis, particularly indoors, may lead to acute decrements in lung function if the carboxyhaemoglobin levels are high. It is difficult, however, to separate the potential effects of carbon monoxide from those due to other respiratory irritants in the smoke and exhaust. The odour threshold for carbon monoxide is approximately 10% in air and is greater than the lethal concentration.

The national AQS for CO is 10,000 µg/m³ (8,600 ppb), as measured by a maximum daily running 8-hour mean.

Conversion factor (CO): 1 µg/m³ = 0.86 ppb



2.3.3 Sulphur Dioxide (SO₂)

Sulphur dioxide is a non-combustible colourless gas at ambient temperatures with a characteristic, strong, suffocating odour. The odour level for sulphur dioxide is approximately 8000 µg/m³ and the level for irritant effects is approximately 21000 µg/m³. Inhalation of sulphur dioxide causes irritation of the eyes, nose, and throat in the short term. Levels greater than 1000 mg/m³ can cause swelling and accumulation of fluid in throat and lungs (pulmonary oedema). Sulphur dioxide is also a key component of smog formation and can result in the creation of acidic compounds which can cause harm to soils, vegetation and buildings (including the creation of acid rain).

There is wide variation in the sensitivity of individuals to sulphur dioxide concentrations. The UK Sulphur Dioxide Air Quality Objectives are defined to protect asthmatics, who are particularly vulnerable to sulphur dioxide concentrations.

The national AQS for SO₂ are:

- 350 µg/m³ (132 ppb) as a 1 hour mean not to be exceeded more than 24 times a year. This is equivalent to a 99.7th percentile;
- 266 µg/m³ (100 ppb) as a 15 min mean not to be exceeded more than 35 times a year. This is equivalent to a 99.9th percentile; and
- 125 µg/m³ (47ppb) as a 24-hour mean not to be exceeded more than 3 times a year.

DEFRA guidance Local Air Quality Management Technical Guidance 2009 states “elevated point sources will have little impact upon the annual mean concentration, and the assessment should focus upon an accurate prediction of the shorter-term”. In addition, the World Health Organisation notes that studies on the human health effects of acute SO₂ exposure suggest that responses to exposure occur very rapidly from the first few minutes of inhalation and further exposure often does not increase the effects. Therefore, in line with current guidance, comparisons are made in this analysis only with the 15-minute 99.9th percentile standard for the short term. The long-term Environmental Assessment Level (EAL) is an annual mean for the protection of vegetation and ecosystem receptors of 20 µg/m³ only.



Conversion factor (SO_2): $1 \mu\text{g}/\text{m}^3 = 0.35 \text{ ppb}$

2.4 Site Location

The Site is located South East of Pontypridd in the Treforest Industrial estate, it is surrounded by other commercial and industrial buildings and backs on to a National Grid transformer station to the west. The location is shown in Figure 2-1.

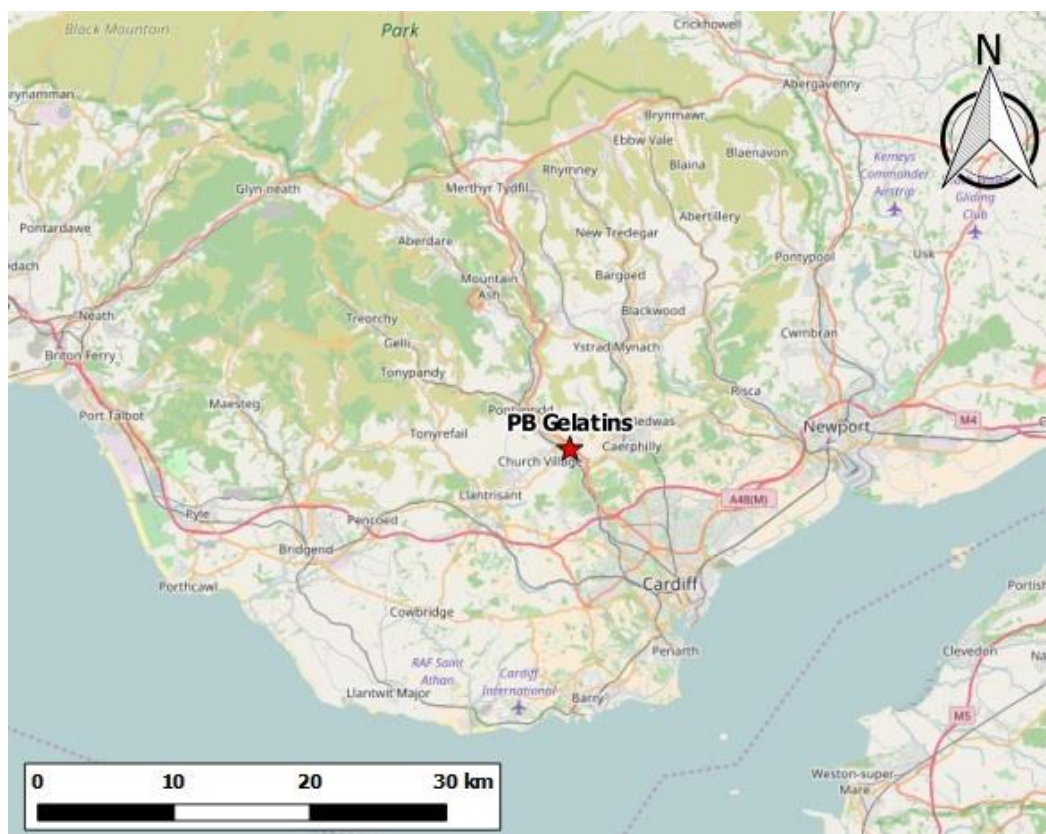


Figure 2-1: Site location plan

2.5 Source Emission Locations

The approximate Site boundaries are shown in Figure 2-2 along with the location of the stacks used in the modelling, taken from plans provided by Veolia. The source coordinates and locations are described in Table 2-1.

Table 2-1: Source location and details

Name	Easting	Northing	Height (m)	Diameter
Boiler Stack 1 (A1)	310083	186859	23.8	1.0
Boiler Stack 2 (A2)	310080	186854	23.8	1.0
Boiler Stack 3 (A3)	310070	186850	23.8	0.6



Figure 2-2: Source location plan

2.6 Meteorology

Hourly sequential meteorological (Met.) data recorded at Cardiff Airport between the years 2012 and 2016 have been used in the assessment, provided by ADM Ltd (Ref 4). This data has been selected as it was the most recent, proximal and consecutive set of data available for the Site. A wind rose showing the average wind conditions for the 5 years is present in Figure 2-3.

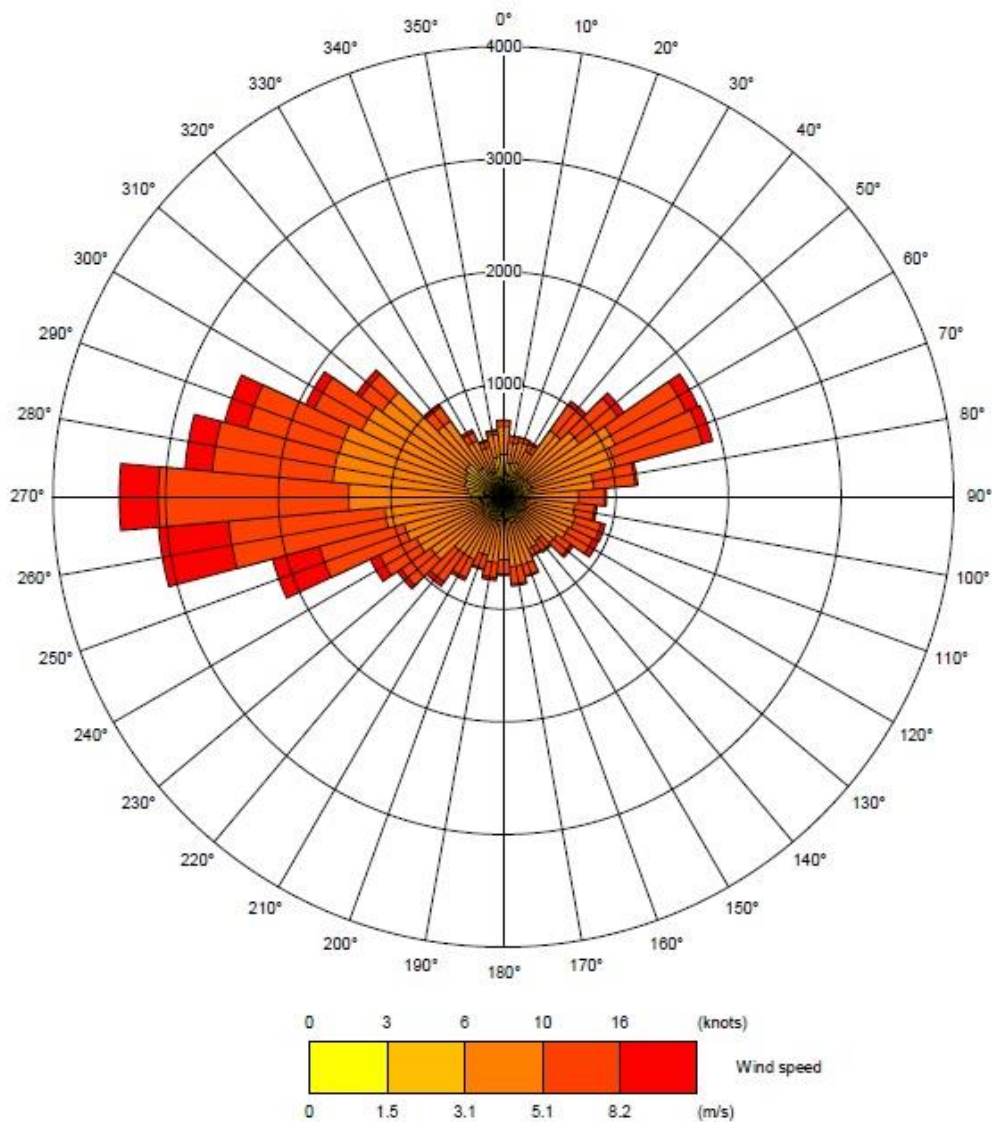


Figure 2-3: Composite wind rose for Cardiff Airport (Rhoose) for 2012-2016

2.7 Background Concentrations

Data from DEFRA's Air Information Resource (UK-AIR; Ref 3) has been used to gather background concentrations for the assessment area. This has been established by taking the average of the annual mean concentrations for the 1km quadrant within which the Site is located over a 5 year period. Nitrogen dioxide and sulphur dioxide background data for 2016 was not available at the time of writing so the most recent range of 2011–2015 has been used. It is assumed that these data are annual averages of hourly data. As the data also overlap the meteorological data for the area it is considered suitable for use as the underlying background concentration. As per the Environment Agency (EA) and DEFRA *Air Emissions Risk Assessment* guidance short-term (ST) background concentrations of each substance is assumed to be twice its long-term (LT) concentration

2.7.1 NO₂

The average of the annual values was chosen due to an observable decreasing trend of NO₂ over time and thus presents both a conservative and environmentally applicable value. Due to the presence of a local AQMA (designated for NO₂ only) the relevant background concentration at that location is also considered. The average LT NO₂ background concentrations are as follows:

- Site quadrant (1km²) – 16.8 µg/m³
- Church Village AQMA – 13.9 µg/m³

The higher, and thus more conservative, background value (16.8 µg/m³) shall be used in this assessment to analyse the relative impact of the site emissions as the background NO₂ concentration recorded at the AQMA is less than that of the Site quadrant

2.7.2 SO₂

The average of the annual values was again chosen due to an observable decreasing trend in SO₂ over the period. The average LT SO₂ background concentration for the 1km quadrant of the Site is 3.04 µg/m³.



2.7.3 CO

Background carbon monoxide concentrations were only available for 2006-2010. For conservatism and due to the age and varying trend of the data the maximum value observed in the dataset shall be used as the reference LT background concentration recorded for the quadrant. This value is 0.23 mg/m³.



3 Receptors

As part of the air emissions risk assessment it is necessary to screen the local area surrounding the Site for ecological receptors and AQMAs. The following conservation areas are relevant within 10km of the site:

- Special Protection Areas (SPAs)
- Special Areas of Conservation (SACs)
- Ramsar sites

And 2km of the site:

- Sites of Special Scientific Interest (SSSIs)
- Local nature sites

3.1 Ecological Receptors

The details of conservation areas identified through a site receptor survey are displayed in Table 3-1. No applicable sensitive receptors were identified within 2km of the Site.

Table 3-1: Identified protected conservation areas from receptor survey

Within 10km of site		
Receptor Type	Approx. Location	Description
Special Protection Areas (SPAs):	-	N/A
Special Areas of Conservation (SACs):	4.3km SE	Cardiff Beech Woods: Approximately 115ha in size it is one of the largest concentrations of <i>Asperulo-Fagetum</i> beech forests in Wales. Characteristic and notable species in the ground flora include ramsons <i>Allium ursinum</i> , sanicle <i>Sanicula europaea</i> , bird's-nest orchid <i>Neottia nidus-avis</i> and yellow bird's-nest <i>Monotropa hypopitys</i> .
Ramsar sites (protected wetlands):	-	N/A



3.2 Air Quality Management Areas (AQMAs)

To ensure that the national air quality objectives are being achieved Local Authorities must measure air pollution to protect human health and the environment. Local Authorities must identify areas where the objectives are not likely to be achieved and declare them Air Quality Management Areas. As part of the sensitive receptor survey AQMAs within 10km and 2km of the site were identified and are presented in Table 3-2.

Table 3-2: Identified AQMAs from receptor survey

Within 10km of site			
AQMA Reference	Approx. Location	Substance	Description
623	8.7km NW	Annual NO ₂	Cymmer AQMA: Including all roadside properties from 30 High Street and 227 High Street, Porth via High Street and Trebanog Road to 37 Trebanog Road and 247 Trebanog Road, Trebanog.
532	7km SW	Annual and 1hr NO ₂	Mwyndy AQMA: An area surrounding Lakeside Court, Penstowe.
569	5.3km E	Annual NO ₂	Caerphilly Town Centre AQMA: An area encompassing a number of properties along Clifton Street, White Street, Bartlett Street, Nantgarw Road and Ton-Y-Felin Road in Caerphilly.
531	4.7km NW	Annual and 1hr NO ₂	Cilfynydd AQMA: An area encompassing properties along Belgrave Terrace, Coronation Terrace, Evans Square, Merthyr Road and Pontshonnorton Road in Cilfynydd.
534	4.4km NW	Annual and 1hr NO ₂	Pontypridd Town Centre AQMA: An area in Pontypridd Town Centre encompassing properties along Broadway and the High Street, and extended in 2009 to include Taff Street down to Sardis Road.
622	3.5km NW	Annual NO ₂	Nightingales Bush AQMA: An area encompassing all roadside properties from 5 Nightingales Bush to 46 Pentrebach Road (alongside the A470).
1604	3.4km SW	Annual NO ₂	Llantwit Fardre AQMA: All roadside properties from 2 Balmoral Cottages east to Bryn House within the township of Llantwit Fardre.
530	3.2km NW	Annual NO ₂	Broadway AQMA: An area encompassing roadside properties along Broadway, Fothergill Street and Park Street.
533	2.9km SE	Annual and 1hr NO ₂	Nantgarw AQMA: An area in Nantgarw encompassing the properties at Graig View along the western edge of the A468.
Within 2km of site			
AQMA Reference	Approx. Location	Substance	Description
1608	1.8km SW	Annual NO ₂	Church Village AQMA: All roadside properties from 9 Dyffryn Terrace east to 5b Main Road within the township of Church Village.



3.3 Selected Receptors

Given the scale of the Site operation and the absence of any sensitive ecological receptors identified within 2km of the site none have been considered in this assessment. Only one AQMA has been identified within 2km of the site (Church Village) this is therefore included in the assessment.

Two residential areas are also included which represent the two closest human health receptors, these are Cheriton Grove and Heol Ty Maen. Four site boundary locations are also included in the assessment.

A coordinates of the receptors is presented in Table 3-3 and they are displayed in Figure 3-1.

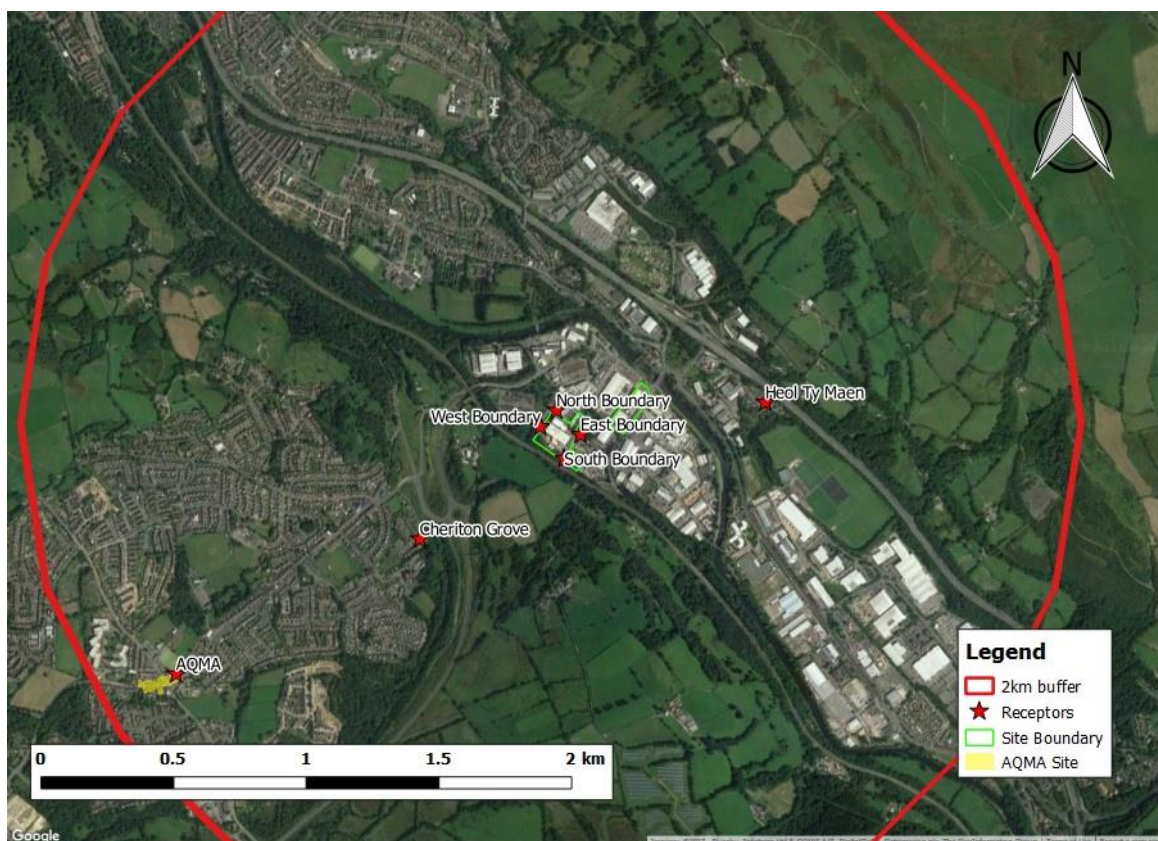


Figure 3-1: Receptor location plan

Table 3-3: Receptor coordinates

Receptor	X	Y
AQMA	308664	185910
Cheriton Grove	309583	186419
Heol Ty Maen	310886	186934
North Boundary	310098	186904
East Boundary	310189	186813
West Boundary	310037	186843
South Boundary	310128	186722

4 H1 Assessment

An initial assessment of the emission data was carried out using the Environment Agency's H1 calculation method. The following two scenarios based on two available fuel types for the boiler operations were modelled using the software:

1. Boilers running on Gas
2. Boilers running on Oil

4.1.1 Test of Significance

In general terms, the significance of atmospheric emissions are assessed by comparison of the predicted ground level concentrations (GLCs) of the specific pollutant to published Environmental Assessment Levels (EALs), atmospheric EALs typically comprise AQS.

EALs provide a means of defining acceptable air quality on a long-term basis where the effects of pollutants are cumulative (or 'chronic') e.g. annual average concentrations, and on a short-term basis, where the effects of pollutants are considered 'acute', e.g. 15 minute or hourly peak concentrations. EALs provide a basis for assessment of potential impacts of emissions on human health receptors and ecologically sensitive receptors.

In general terms, the assessment criteria employed by the Regulator to assess the significance of emissions is to compare the predicted maximum GLC of pollutants associated with emissions from the site (termed the Process Contribution, PC) to short term and long term EALs.

The environmental impact may be considered significant where greater than:

- 1% of the AQS/EAL for the annual average calculations; and
- 10% of the AQS/EAL for the short-term calculations.

Where the PC exceeds this significance threshold then the total Predicted Environmental Concentration (PEC) of that substance is calculated by summing the background concentration and the process contributions. The PEC may then be compared to the AQS. It should be noted that the background concentrations used will often already include contributions from existing site sources and is therefore a pessimistic approach.



The next stage of the screening determines if further, more detailed modelling is required (i.e. ADMS). This is necessary if the following requirements are not met:

- The LT PEC is <70% of the long-term environmental standards; and
- The ST PC is <20% of the short-term environmental standards minus twice the long-term background concentration (i.e. 'headroom').

The above secondary screening thresholds may also be used as a metric by which to review the significance of results from detailed modelling.

4.2 H1 Assessment Results

The results of the H1 Assessment are presented in Tables Table 4-1 to Table 4-4 and the H1 model input tables are included in Appendix A.

Table 4-1: H1 Results for Gas fired boilers (Long-term)

Gas Long-term Impacts							
Substance	Background Contribution (BG) $\mu\text{g}/\text{m}^3$	EAL $\mu\text{g}/\text{m}^3$	PC $\mu\text{g}/\text{m}^3$	%PC of EAL	% PEC of EAL	%PC >1% of EAL	%PEC >70% of EAL
Sulphur Dioxide (15 min mean)	3.04	-	0.05	-	-	-	-
Nitrogen Dioxide	16.3	40	2.43	6.08	46.8	Yes	No
Carbon Monoxide	230	-	0.11	-	-	-	-

Table 4-2: H1 Results for Gas fired boilers (Short-term)

Gas Short-term Impacts								
Substance	Adjusted background contribution (ABG) $\mu\text{g}/\text{m}^3$	EAL $\mu\text{g}/\text{m}^3$	PC $\mu\text{g}/\text{m}^3$	PEC $\mu\text{g}/\text{m}^3$	%PC of EAL-BG	% PEC of EAL	%PC >10% of EAL	%PC >20% of EAL-ABG
Sulphur Dioxide (15 min mean)	6.07	266	1.92	7.99	0.738	3.00	No	No
Nitrogen Dioxide	32.5	200	89.7	122	53.5	61.1	Yes	Yes
Carbon Monoxide	460	10,000	3.87	463	0.0405	4.64	No	No



Table 4-3: H1 Results for Oil fired boilers (Long-term)

Oil Long-term Impacts							
Substance	Background Contribution (BG) $\mu\text{g}/\text{m}^3$	EAL $\mu\text{g}/\text{m}^3$	PC $\mu\text{g}/\text{m}^3$	%PC of EAL	% PEC of EAL	%PC >1% of EAL	%PEC >70% of EAL
Sulphur Dioxide (15 min mean)	3.04	-	3.55	-	-	-	-
Nitrogen Dioxide	16.3	40	3.12	7.80	48.5	Yes	No
Carbon Monoxide	230	-	0.01	-	-	-	-

Table 4-4: H1 Results for Oil fired boilers (Short-term)

Oil Short-term Impacts								
Substance	Adjusted background contribution (ABG) $\mu\text{g}/\text{m}^3$	EAL $\mu\text{g}/\text{m}^3$	PC $\mu\text{g}/\text{m}^3$	PEC $\mu\text{g}/\text{m}^3$	%PC of EAL-BG	% PEC of EAL	%PC >10% of EAL	%PC >20% of EAL-ABG
Sulphur Dioxide (15 min mean)	6.07	266	131	137	50.3	51.5	Yes	Yes
Nitrogen Dioxide	32.5	200	115	148	68.6	73.8	Yes	Yes
Carbon Monoxide	460	10,000	3.18	463	0.0333	4.63	No	No

The Environment Agency (EA) and DEFRA *Air Emissions Risk Assessment* guidance requires that detailed dispersion modelling is undertaken where the long-term PEC >70% of the EAL and/or if the short-term PC >20% of EAL–2*background concentration (presented here as the adjusted background concentration ‘ABG’). Based on the guidance, detailed modelling of atmospheric dispersion is considered necessary for nitrogen dioxide (for both long and short-term impacts) in both scenarios and sulphur dioxide (short-term only) for the oil fuel scenario.

5 ADMS Modelling

ADMS (Atmospheric Dispersion Modelling System) v5.1 was used to undertake the detailed dispersion assessment. The analysis has been undertaken using the two fuel scenarios (Gas fuelled and Oil fuelled boilers) described earlier in Section 3.3.

Predicted NO_x concentrations have been calculated assuming that 70% of NO_x is converted to NO₂ for the long-term (annual) average. The short-term 99.8th percentile (hourly mean) was derived assuming a 35% conversion of NO_x to NO₂.

Detailed modelling was completed for the two emissions scenarios as described above and the results are presented in Section 6. The substances modelled were those not screened out in the above H1 assessment.

5.1 Buildings

Buildings and structures located close to emission sources can impact on the dispersion of pollutants through the wake effect, which may result in increased retention nearby the source.

There are a number of proximal buildings to the various sources at the Site which have been included in the assessment. Only buildings considered large and/or close enough to significantly affect dispersion were entered into the model.

An ADMS Mapper view of the structures included in the modelling is shown in Figure 5-1 where the red points are source locations.

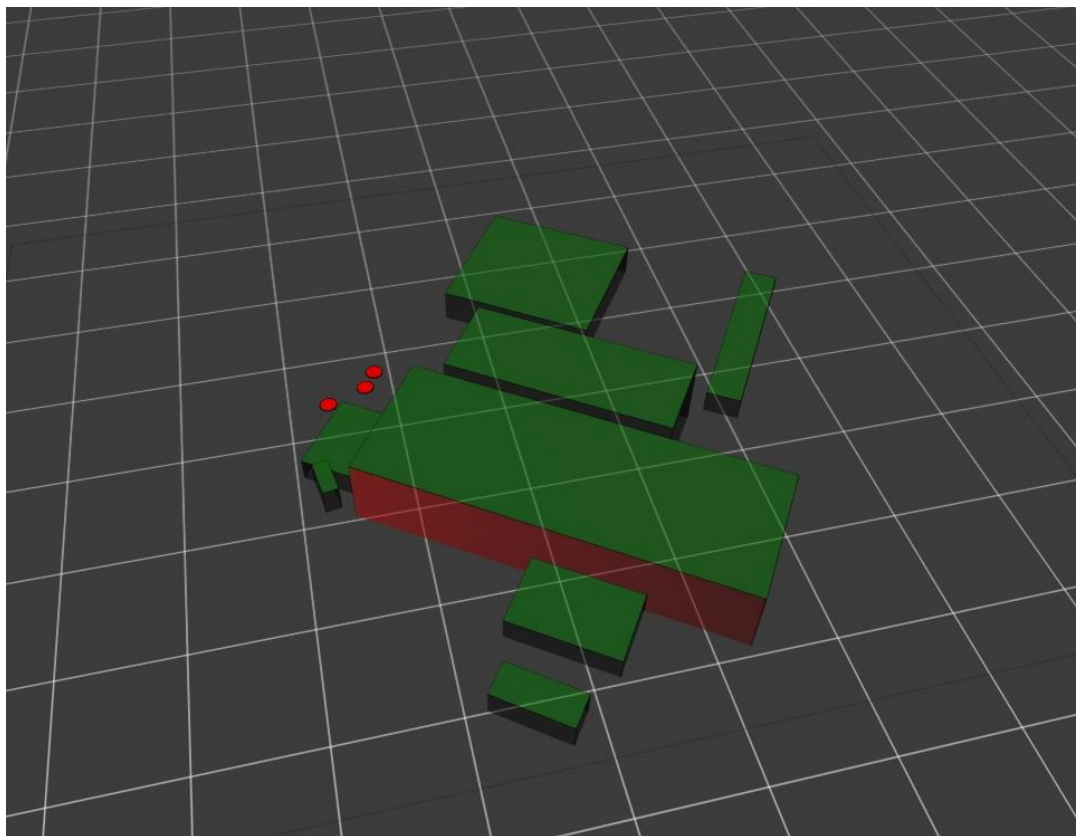


Figure 5-1: Modelled buildings plan

6 ADMS Results

Each scenario (Gas fuelled and Oil fuelled) has been modelled for each of the yearly meteorological datasets giving 5 sets of GLCs. The maximum pollutant concentration modelled at each identified receptor from all 5 years of Met. data has been calculated to give worst case annual concentrations. This provides a conservative overview of the predicted dispersion characteristics for the Site based on emissions and typical weather conditions.

The results of the ADMS modelling are presented in Tables Table 6-1 to Table 6-3, which show maximum predicted GLC for each receptor. In addition the percentage contributions corresponding to the significance thresholds as described in Section 4.1.1 are displayed. PCs and PECs which may not be deemed insignificant are highlighted in bold.

The ADMS software models the dispersion of a parcel of gas emitted from a source as it undergoes numerous physical and physio-chemical interactions. Meteorological factors such as wind direction and boundary layer height play a large role on the mixing and dispersion of pollutants from a source. Using 5 years of historical Met. data allows assumptions to be made of the expected weather conditions at the site, which facilitates an estimation of typical future conditions. The values presented are theoretical and conservative but appropriately serve to predict detailed environmental concentrations.

Site emission parameters (as provided by Veolia) are included in Appendix A. Contour plots showing predicted NO₂ and SO₂ dispersion patterns are included in Appendix B.

Table 6-1: Gas - NO₂ ADMS results

Gas – NO ₂	Long-term			Short-term		
Receptor	NO ₂ Annual Average (LT) PC µg/m ³	%PC of EAL	%PEC of EAL	NO ₂ 1-Hour Mean 99.8 %ile (ST) PC µg/m ³	%PC of EAL	%PC >20% of EAL- ABG
AQMA	0.06	0.15%	41%	0.85	0.42%	0.51%
Cheriton Grove	0.23	0.57%	41%	2.83	1.4%	1.69%
Heol Ty Maen	0.25	0.62%	41%	1.63	0.81%	0.97%
North Boundary	0.42	1.04%	42%	7.39	3.69%	4.41%
East Boundary	3.10	7.75%	48%	12.3	6.14%	7.34%
West Boundary	3.12	7.79%	48%	14.4	7.19%	8.59%
South Boundary	0.62	1.67%	42%	11.3	5.64%	6.73%

Table 6-2: Oil - NO₂ ADMS results

Oil – NO ₂	Long-term			Short-term		
Receptor	NO ₂ Annual Average (LT) PC µg/m ³	%PC of EAL	%PEC of EAL	NO ₂ 1-Hour Mean 99.8 %ile (ST) PC µg/m ³	%PC of EAL	%PC >20% of EAL- ABG
AQMA	0.08	0.21%	41%	1.17	0.58%	0.70%
Cheriton Grove	0.31	0.78%	41%	3.99	2.00%	2.38%
Heol Ty Maen	0.33	0.83%	42%	2.35	1.17%	1.40%
North Boundary	0.71	1.79%	42%	12.3	6.16%	7.36%
East Boundary	4.34	10.9%	52%	17.3	8.6%	10.3%
West Boundary	5.22	13.1%	54%	23.3	11.7%	13.9%
South Boundary	0.97	2.42	43%	16.3	8.16%	9.74%



Table 6-3: Oil - SO₂ ADMS results

Oil – SO ₂	Short-term		
	SO ₂ 15min Mean 99.9 %ile (ST) PC µg/m ³	%PC of EAL	%PC >20% of EAL- ABG
AQMA	6.17	2.32%	2.37%
Cheriton Grove	17.4	6.54%	6.69%
Heol Ty Maen	13.3	5.00%	5.12%
North Boundary	41.4	15.6%	15.9%
East Boundary	56.8	21.4%	21.9%
West Boundary	73.3	27.6%	28.2%
South Boundary	59.6	22.4%	22.9%

7 Discussion

The results for the Gas fuelled scenario indicate that all modelled boundary receptor locations are receiving LT NO₂ PCs which cannot be deemed insignificant. However, with further screening (of PECs, and of ST PCs against ‘headroom’) no exceedances of the significance thresholds are observed anywhere in the ADMS results (including identified receptors). Thus, the environmental concentrations for both long and short-term NO₂ emissions from the stacks may be considered insignificant.

The modelled concentrations in the Oil fuelled scenario are seen to be higher than those for the Gas fuelled scenario across the board. The boundary receptors are again observed to receive LT NO₂ PCs in excess of the significance threshold, however only the West Boundary is modelled to receive ST PCs above the threshold. Further screening of PECs and of PCs against ‘headroom’ does not present any NO₂ concentrations above the secondary significance thresholds and as such the site NO₂ emissions may be viewed as insignificant.

Sulphur dioxide PCs (modelled only for the short-term) are seen to exceed the initial significance threshold at all boundary receptors. Screening of the PCs against ‘headroom’



identifies concentrations at the East, West and South Boundary receptors marginally above the 20% of EAL-Background secondary screening threshold. Ground level concentrations at these locations cannot therefore be ruled out as insignificant. The maximum modelled SO₂ concentration (93.6 µg/m³ which equates to 36% of EAL-background) is therefore also above this threshold, the location of this observed concentration is off-site immediately North West of the site boundary, roughly in the location of the National Grid transformer site.

The raised concentrations observed at a number of boundary receptors seems to be a result of the clustered sources at the western extent of the Site. Surrounding these sources are a number of large structures which appear to result in the increased proximal retention and subsequently reduced dispersion in the area.

The nature of the modelling approach is inherently conservative through the selection of the maximum observed concentrations over the 5 years of modelled Met data. Therefore the marginal SO₂ exceedances modelled at the boundary receptors (1.9 - 8.2% above the significance threshold) represent worst case concentrations, thus the actual contributions from the Site would generally be expected to be lower.



8 Summary

Following the air emission dispersion assessment, the analysis that has been undertaken for Veolia in regards to the PB Gelatins Site demonstrates that predicted emissions of NO₂ and SO₂ at all modelled off-site receptors do not contribute to concentrations in excess of air quality standards.

The results of the modelling indicate that the Church Village AQMA located 1.8km south west of the Site is not expected to be significantly affected by any air emissions from the boiler stacks in either the Gas fuelled or Oil fuelled scenario.

In the Oil fuelled scenario marginal exceedances of the SO₂ significance thresholds are observed at several of the identified Site boundary receptors and also off-site in the area immediately north west of the site. As such SO₂ emissions from the site in these areas cannot be viewed as insignificant although they are not seen to exceed the relevant environmental standards. However, it should be noted, that currently given the very low likelihood of oil being used to fuel the boilers for either short or long periods that the results offer a pessimistic account of actual site operations.

While operation of the boilers using gas indicates sufficient air dispersion to present insignificant concentrations at the identified receptors, consideration should be given regarding the potential for raised ground level SO₂ concentrations when running the boilers on oil. However, exceedances of environmental standards would not be expected based on the modelling undertaken here.



9 References

1. Department for Environment, Food and Rural Affairs (DEFRA) and Environment Agency (EA): Air Emissions Risk Assessment Guidance. Available at: www.gov.uk
2. ADMS version 5.1.2.0, Cambridge Environmental Research Consultants Ltd.
3. Department for Environment, Food and Rural Affairs (DEFRA), UK-AIR: Air Information Resource. Available at: <http://uk-air.defra.gov.uk>
4. ADM Ltd, Old Chambers, 93-94 West Street, Farnham, Surrey, GU9 7EB.

Appendix A ADMS Data



Appendix A - ADMS Input Data

	Boiler 1		Boiler 2		Boiler 3	
Emission point	A1		A2		A3	
Diameter	1		1		0.6	
stack height (m)	23.8		23.8		23.8	
	Natural gas					
	g/s	mg/m3	g/s	mg/m3	g/s	mg/m3
NO2 (g/s)	0.17944	116.68	0.24333	126.32	0.26944	162.13
SO2 (g/s)	0.005	3.08	0.006	3.35	0.004	2.15
CO (g/s)	0.007	4.67	0.011	5.87	0.011	6.86
velocity (m/s, ref T, P, dry, 3% O2)	1.96		2.46		5.89	
Flow (m3/s, ref T, P, dry, 3% O2)	1.54	5544	1.93	6948	1.67	6012
Exit temperatures for the stacks (°C)	114		198		146	
	Gas Oil					
	g/s	mg/m3	g/s	mg/m3	g/s	mg/m3
NO2 (g/s)	0.30028	207.67	0.30194	213.31	0.31972	171.21
SO2 (g/s)	0.30250	209.15	0.32833	232.07	0.37917	226.88
CO (g/s)	0.006	4.05	0.008	5.20	0.011	6.73
velocity (m/s, ref T, P, dry, 3% O2)	1.84	-	1.81	-	5.93	-
Flow (m3/s, ref T, P, dry, 3% O2)	1.45	5220	1.42	5112	1.68	6048
Exit temperatures for the stacks (°C)	121	-	197	-	149	-

Modelling Assumptions

Roughness Length: 0.5 - Parkland and Open Suburbia

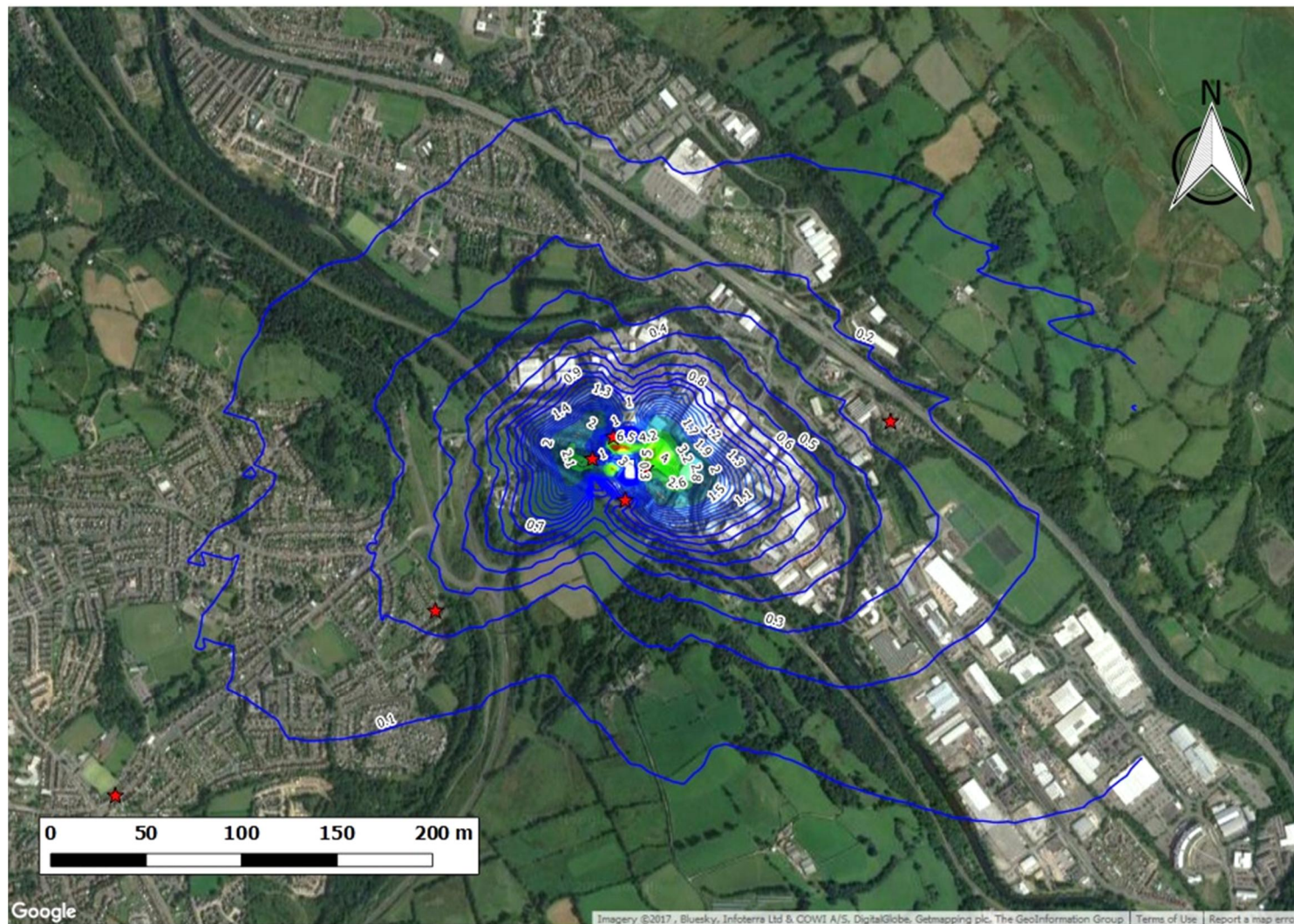
Meteorological Data from Cardiff Airport (Rhoose)

Flat terrain

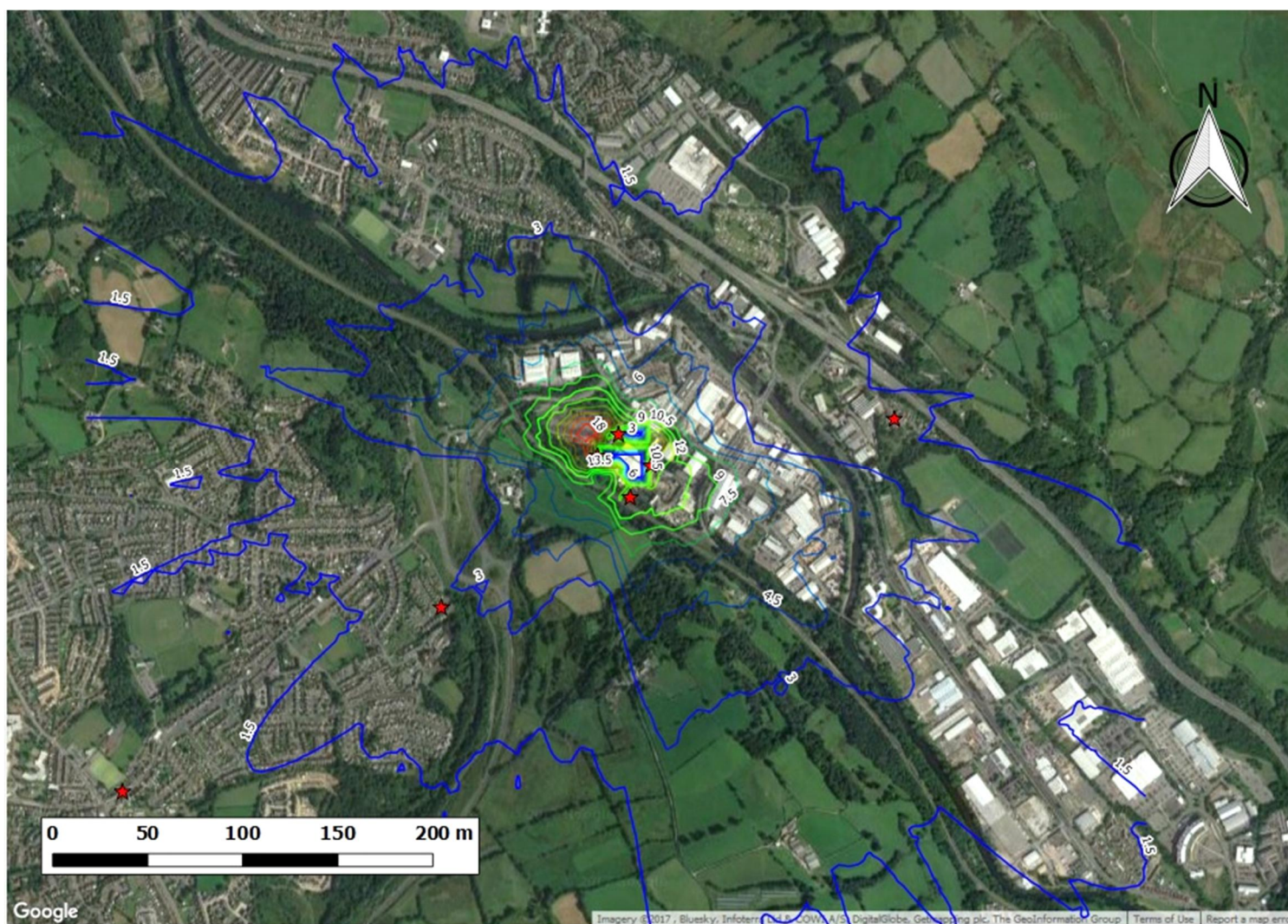
Appendix B Contour Plots



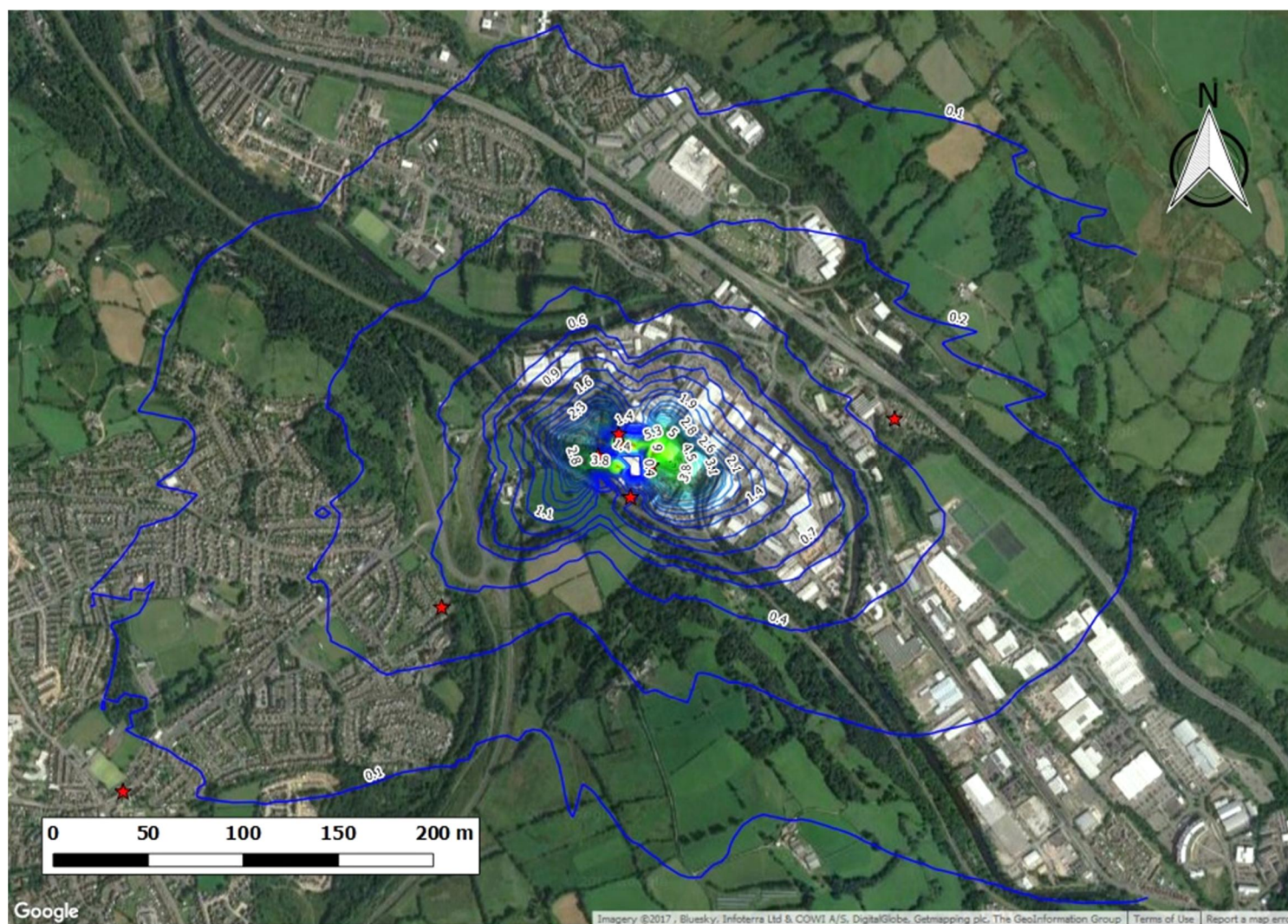
ADMS Contour Plots



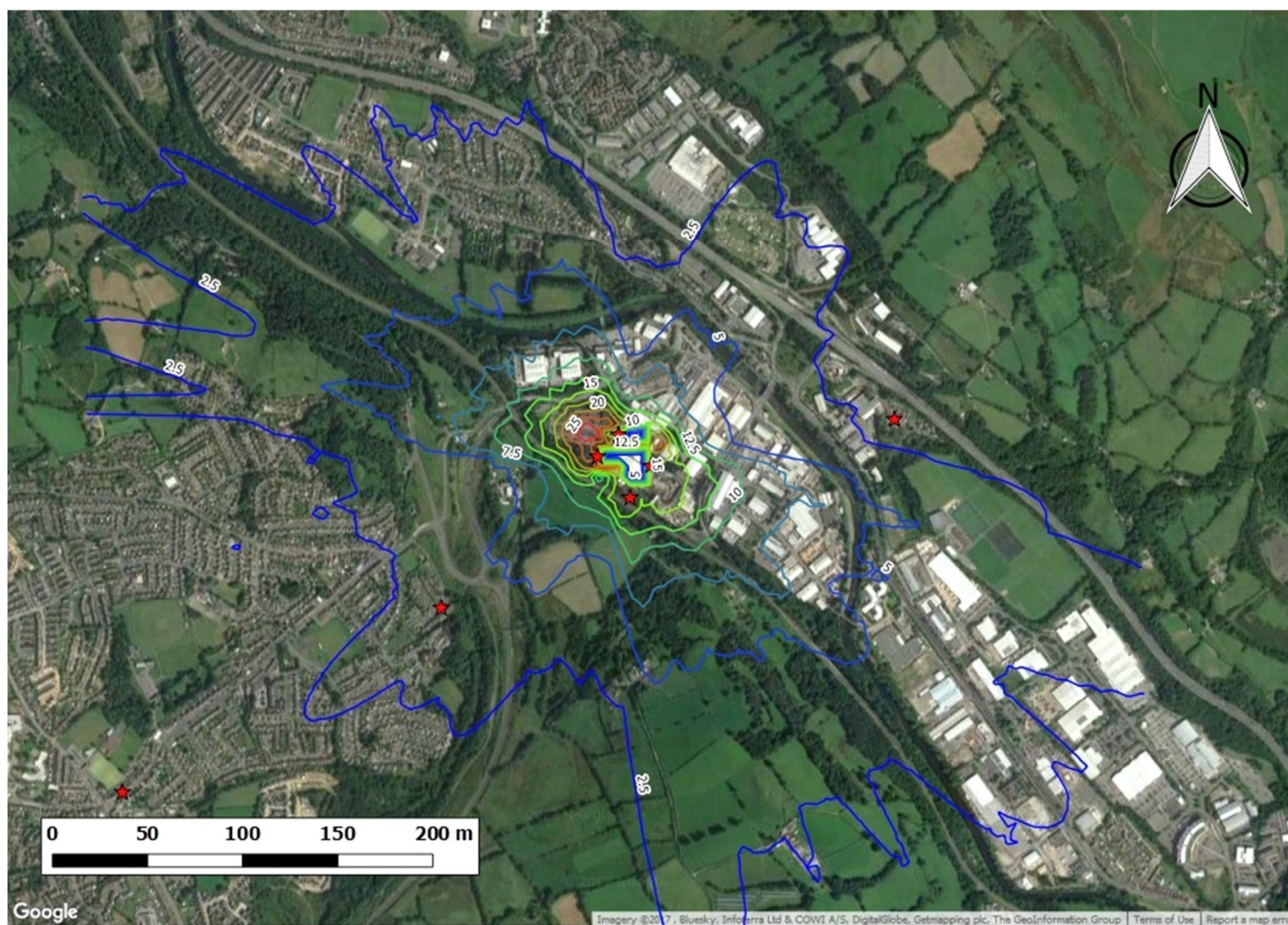
Gas Scenario: Long-term NO₂ Concentrations, 2012-2016 Maximums ($\mu\text{g}/\text{m}^3$)



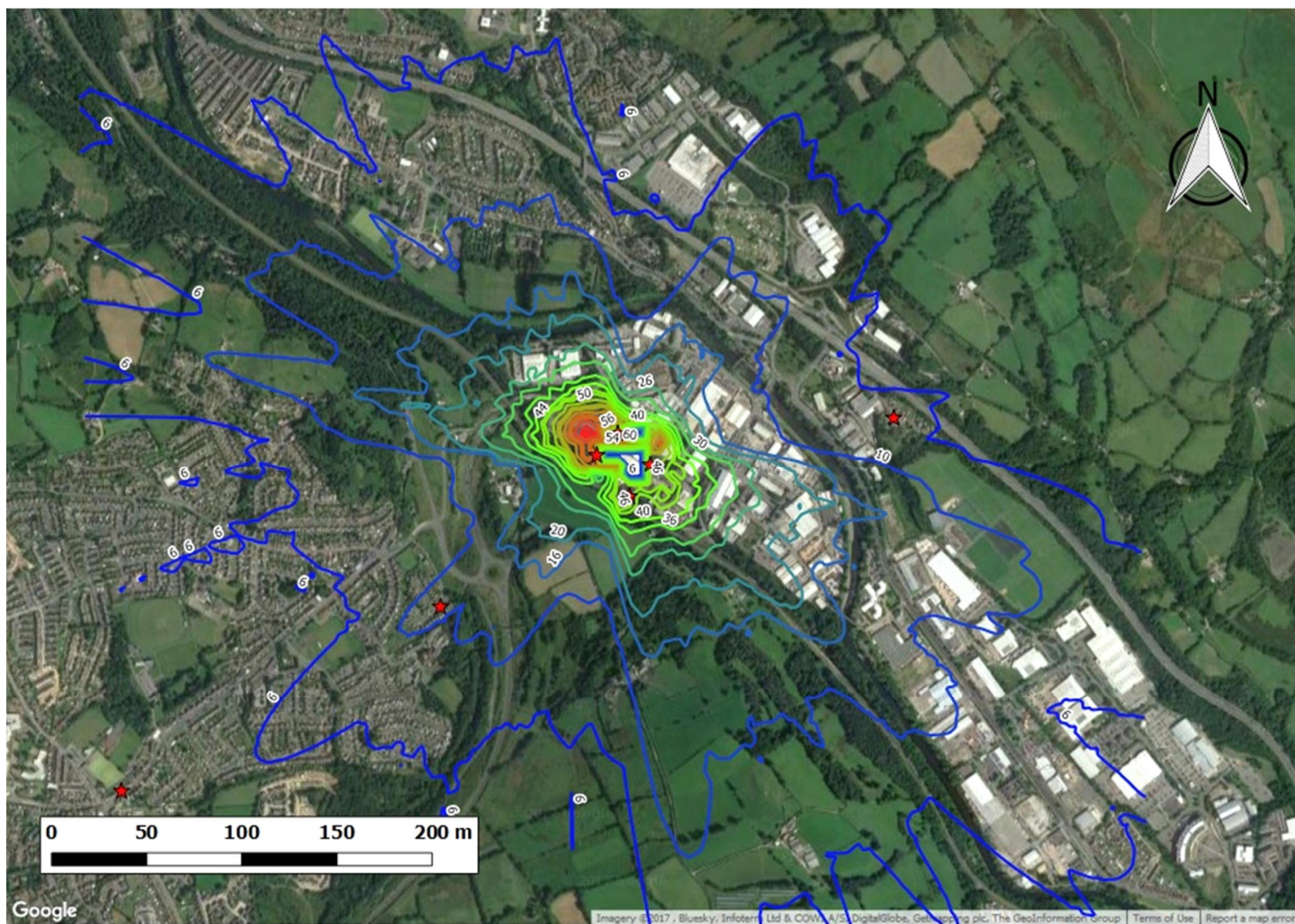
Gas Scenario: Short-term NO₂ Concentrations, 2012-2016 Maximums ($\mu\text{g}/\text{m}^3$)



Oil Scenario: Long-term NO₂ Concentrations, 2012-2016 Maximums (µg/m³)



Oil Scenario: Short-term NO₂ Concentrations, 2012-2016 Maximums (µg/m³)



Oil Scenario: Short-term SO₂ Concentrations, 2012-2016 Maximums (µg/m³)