SIMEC Newport Environmental Support

Air Quality Impact Assessment

SIMEC

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1. Introduction

1.1 Overview

The assessment provides an impact assessment of the potential emissions from the operation of a facility to generate electricity for the Newport Steelworks, on an as required basis. The facility would not have fixed hours of operation, but it is anticipated that the majority of operating hours would occur during the colder winter months of the year and be restricted to periods of greatest power demand. The extent of the demand in future years will be largely dependent on weather conditions that occur and consequently there will be considerable variation in the number of hours per year during which emissions occur.

1.2 Scope of Assessment

The predicted impacts of emissions from the operation of the proposed facility is quantified through the use of the atmospheric dispersion model ADMS (v5.2). The assessment considers the dispersion of emissions under all the meteorological conditions that have been experienced at a representative location during a period of 5 years. The spatial extent of the modelled domain is an area of 3km by 3km, centred on the facility. The Severn Estuary Ramsar, Special Area of Conservation (SAC), Special Protection Area (SPA) and Site of Special Scientific Interest (SSSI), Newport Wetlands SAC, SSSI and National Nature Reserve (NNR), River Usk SSSI, a Local Nature Reserve located east and south of the site, and Gwent Levels Nash and Goldcliff SSSI are all located within 2km of the application site. The ecological receptors are shown in Annex A Figure A.3.

The assessment considers the impact on the local air quality at relevant receptor locations including residential properties and designated ecological sites. The assessment focusses on the likely changes in the long term and short term concentrations of:

- Oxides of nitrogen (NO_X);
- Nitrogen dioxide (NO_2);
- Carbon monoxide (CO); and
- Particulate matter (PM_{10}).

2. Assessment Criteria

2.1 Environmental Standards

2.1.1 Environmental Standards for the Protection of Human Health

The Environmental Standards criteria for the protection of human health, against which impacts from the proposed facility have been evaluated, are set out in Table 1. The criteria are taken from the Environmental Benchmarks contained within Environment Agency's air emissions risk assessment guidance.

The Clean Air for Europe (CAFE) programme revisited the management of Air Quality within the EU and replaced the EU Framework Directive 96/62/EC[1], its associated Daughter Directives 1999/30/EC[2], 2000/69/EC[3], 2002/3/EC[4], and the Council Decision 97/101/EC[5] with a single legal act, the Ambient Air Quality and Cleaner Air for Europe Directive 2008/50/EC[6].

The Air Quality Directive is currently transcribed into UK legislation by the Air Quality Standards Regulations 2010 SI No. 1001[7], which came into force on 11th June 2010. The Limit Values are binding on the UK and have been set with the aim of avoiding, preventing or reducing harmful effects on human health and on the environment as a whole. The Directive also lists a number of Target Values.

For substances not specified in the regulations, Environmental Assessment Level (EAL) criteria are taken from Environment Agency's air emissions risk assessment guidance.

Table 1. Environmental Standards for Air (for the Protection of Human Health)

Pollutant	Source	Concentration (µg/m^3)	Measured as
Nitrogen dioxide (NO_2)	EU Air Quality Limit Values	40	Annual Mean
		200	1-hour mean, not to be exceeded more than 18 times a year
Particulate matter (PM_{10})	EU Air Quality Limit Values	40	Annual Mean
		50	24-hour mean, not to be exceeded more than 35 times
Fine particulate matter ($PM_{2.5}$)	EU Air Quality Limit Values	25	Annual Mean
Carbon Monoxide (CO)	EU Air Quality Limit Values	10,000	Maximum daily running 8-hour mean
	Environment Agency EAL	30,000	1-hour maximum

2.1.2 Assessment Criteria for Sensitive Ecological Receptors

The UK is bound by the terms of the European Birds and Habitats Directives and the Ramsar Convention. The Conservation of Habitats and Species Regulations 2010[8] provides for the protection of European sites created under these polices, i.e. Special Areas of Conservation (SACs) designated pursuant to the Habitats Directive, Special Protection Areas (SPAs) classified under the Birds Directive, and Ramsar Sites designated as wetlands of international importance. The 2010

[1] Council of European Communities (1996), Framework Directive ambient air quality assessment and management, European Council, 96/62/EC
[2] Council of European Communities (1999), First Daughter Directive on limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air, 1999/30/EC
[3] Council of European Communities (2000), Second Daughter Directive on limit values for benzene, carbon monoxide in ambient air, 2000/69/EC
[4] Council of European Communities (2002), Third Daughter Directive on ozone in ambient air, 2002/3/EC
[5] Council of European Communities (1997), Council Decision 97/101/EC in exchange of information and data as amended by Commission Decision 2001/752/EC
[6] Council of European Communities (2008), Directive 2008/50/EC on Ambient Air Quality and Cleaner Air for Europe
[7] H.M. Government (2010), The Air Quality Standards Regulations, SI 1001, the Stationary Office
[8] H.M. Government (2010), The Conversion of Habitats and Species Regulations 2010. SI1490, the Stationary Office

Regulations apply specific provisions of the European Directives to SACs, SPAs, candidate SACs (cSACs) and proposed SPAs (pSPAs), which require them to be given special consideration and further assessment by any development which is likely to lead to a significant effect upon them.

The legislation concerning the protection and management of designated sites and protected species within England is set out within the provisions of the 2010 Regulations, the Wildlife and Countryside Act 1981 (as amended)[9] and the Countryside and Rights of Way Act 2000 (as amended)[10].

The impact of emissions from the facility on sensitive ecological receptors are quantified within this assessment in two ways:

- As direct impacts arising due to increases in atmospheric pollutant concentrations; assessed against Critical Levels, and
- Indirect impacts arising through deposition of acids and nutrient nitrogen to the ground surface, assessed against critical loads.

The critical levels for the protection of vegetation and ecosystems are set out in Table 2, and apply regardless of habitat type. These values have been adopted as the assessment criteria for the impact of the process on designated nature sites.

Table 2. Critical Level (CLe) Environmental Assessment Levels for Air (for the Protection of Designated Habitat Sites)

Pollutant	Source	Concentration (µg/m3)	Measured as
Oxides of nitrogen (as NO_2)	Environment Agency Permit Guidance	30	Annual Mean
		75	Daily Mean

Critical load criteria for the deposition of acids and nutrient nitrogen are dependent on the habitat type and species present, and are specific to the sensitive receptors considered within the assessment. The critical loads are set out on the Air Pollution Information System website[11].

The critical load criteria adopted for the sensitive ecological receptors considered by the assessment are presented in the model results section of this report.

2.2 Local Air Quality Management

Under the requirements of Part IV of the Environment Act (1995) Newport City Council has carried out a phased review and assessment of local air quality within their district.

The 2016 Progress Report for Newport City Council[12] reported that air quality was of a good standard within the geographical area included within the spatial scope of this impact assessment.

2.3 Air Quality Management Areas

Newport City Council has declared nine Air Quality Management Areas (AQMAs) covering areas to the north of the city. All AQMAs have been declared for exceedance of the annual mean nitrogen dioxide objective. The AQMAs are described below:

- Newport City Council Chepstow Air Quality Management Area Order 2011. This is located 3.9km north west of the Site;
- Newport City Council Malpas Road AQMA 2011. This is located 6.7km north west of the facility;
- Malpas Road AQMA. This is located 5.4km north west of the facility;
- Caerleon Road AQMA. This is located 4.8km north west of the facility;
- Royal Oak Hill AQMA. This is located 5.1km north east of the facility;

[9] H.M. Government (1981), Wildlife and Countryside Act 1981 (as amended)
[10] H.M. Government (2000), Countryside and Rights of Way Act 2000 (as amended)
[11] Centre for Ecology and Hydrology (CEH) (2017), Air Pollution Information System (APIS), www.apis.ac.uk, accessed on 4th January 2017
[12] Newport City Council (2016), Newport City Council 2016 Air Quality Progress Report, June 2016

- Caerleon High Street AQMA. This is located 6.1km north of the Site;
- Glasllwch AQMA. This is located 5.4 km north west of the Site;
- Shaftesbury/Crindau AQMA. This is located 5.9 km north of the Site; and
- St Julians AQMA. This is located 5.4 km north of the Site.

3. Assessment Methodology

3.1 Overview

This section describes the approach taken to the assessment of emissions associated with the operation of the facility. Based on the likely demand for energy from the facility, an assessment scenario has been development that is representative of the most likely hours of operation per day and per month of the year. This scenario represents typical hours of operation and in practice the engines could operate at other times and for more hours in total, if required.

The assessment scenario is based on all the proposed engines running at full load for 3 hours, for each day, during the period 1st November to the 28th of February. The hours of operation used in the scenario are between 16:00 hrs and 19:00 hrs during this period.

3.2 Screening Assessment Methodology and Significance Criteria

According to the EA's Risk Assessment Guidance methodology (as applied by NRW), it is possible to identify emissions that result in "insignificant" impacts and those emissions where further assessment is not required, based on the contribution to the appropriate Environmental Standard, EAL or Critical Level for each pollutant.

3.2.1 Human Health Significance Criteria

The EA's Risk Assessment screening criteria for significance of the emissions have been applied to the outcome of the dispersion modelling. The predicted PCs have been compared with the appropriate Environmental Standard or EAL to determine the significance of the pollutant emission.

The total pollutant emission is defined in the EA's Risk Assessment guidance as having an insignificant impact where:

- PC <1% of the Environmental Standard or EAL, or the PEC <70% of the Environmental Standard or EAL for long term releases;
- PC <10% of the Environmental Standard or EAL, or the PC is less than 20% of the Environmental Standard minus twice the long term background concentration, for short term releases.

The EA's Risk Assessment guidance indicates that where EU Air Quality Limits, national air quality objectives or target values are likely to be breached as a result of contributions from an installation, or where installation releases constitute a major proportion of the standard or objective, such releases are likely to be considered unacceptable.

3.2.2 Ecological Receptors Significance Criteria

For European sites (Special Protection Areas (SPA), Special Areas of Conservation (SAC) or Ramsar sites) an assessment is made as to whether the installation is "likely to have a significant effect", and whether this could lead to an "adverse effect on site integrity".

For Sites of Special Scientific Interest (SSSIs) the assessment needs to determine whether the installation is "likely to damage" the site.

The EA's Risk Assessment guidance screening criteria for significance of the emission have been applied to the outcome of the dispersion modelling for both European and SSSIs. The predicted PCs have been compared with the appropriate Critical Level to determine the significance of the pollutant emission.

The total pollutant emission is defined in the EA's Risk Assessment guidance as being insignificant where:

- PC <1% of the Critical Level, or the PEC <70% of Critical Level for long term releases;

· PC <10% of the Critical Level for short term releases.

For all other nature conservation sites, i.e. Local Nature Reserves, the assessment needs to determine whether the installation will result in "significant pollution" i.e. where Critical Levels are exceeded. Therefore if the long and short term PC is less than 100% of the relevant standard, it is considered to be not significant.

The assessment against Critical Loads has been carried out in accordance with AQTAG06 '*Technical guidance on detailed modelling approach for an appropriate assessment for emissions to air.*'[13] However, it should be noted that this does not provide definitive advice on interpreting the likely effects on different habitats of changes in air quality.

As with Critical Levels of atmospheric pollutants it has been agreed between the EA and Natural England, that process contributions of less than 1% of the Critical Load for pollutant deposition (nitrogen and acid) can be considered to be insignificant, and that PCs greater than 1% have the potential to be significant, depending upon the context.

3.3 Dispersion Model Selection

The assessment of emissions from the facility has been undertaken using the latest version of ADMS (V5.2), supplied by Cambridge Environmental Research Consultants Limited (CERC)[14]. ADMS is a modern dispersion model that has an extensive published validation history for use in the UK. This model has been extensively used throughout the UK to demonstrate regulatory compliance.

3.4 Modelling of Emissions from the Facility Stacks

3.4.1 Model Inputs

The general model conditions used in the assessment are summarised in Table 3. Other more detailed data used to model the dispersion of emissions is considered below.

Table 3. General ADMS 5.2 Model Conditions

Variable	Input
Surface Roughness at source	0.3m
Receptors	X, Y coordinates determined by GIS (Table 10)
Emissions	Oxides of nitrogen, carbon monoxide and particulate matter
Stack Height	2.6m
Stack Diameter	0.406m
Flue temperature	539^{o}C
Actual Volumetric Flow	5.15 m^3/sec
Reference Volumetric Flow (dry, 0°C, 1 atm, 5% O_2)	1.58 Nm^3/sec
Stack Locations	See Annex B (Table 14)
Meteorological data	5 years of hourly sequential data from Filton Airport meteorological station (2011-2015)

3.4.2 Emissions Data

There are nine generators on the Newport Site which have been considered in the assessment as point source emissions. The mass emission rates for each of these sources are listed in

[13] Environment Agency. 2014. AQTAG06 Technical guidance of detailed modelling approach for an appropriate assessment for emissions to air.
[14] Cambridge Environmental Research Council (CERC) (2016), ADMS 5 Validation Papers, Cambridge Environmental Research Consultants Limited, accessed 20th December 2016, http://www.cerc.co.uk/environmental-software/model-validation.html

Table 4. These data have been provided by the energy plant supplier.

Table 4. Source Emission Rates

Pollutant	Emission Concentration (mg/Nm^3)	Emission Rate (g/s) (per engine)
NO_2	400	0.63
CO	650	1.02
Particulate matter	130	0.20

3.4.3 Use of Measurement Data

Table 5 and

Table 6 display measurement data from the nearest available NO_2 diffusion tubes and continuous monitors located in the vicinity of the site, operated by Newport City Council. The continuous monitors are located adjacent to the M4 so the concentration of pollutants are representative of conditions near to the motorway, and higher than residential locations set back from the M4.

All of the diffusion tubes display annual mean NO_2 concentrations for 2015 which are below the air quality objective of $40\mu g/m^3$. The pattern across southern Newport is of annual mean concentrations of NO_2 that are below $32\mu g/m^3$ in 2015.

Table 5. Newport City Council Nitrogen Dioxide Diffusion Tube Data

Diffusion Tube Identification	National Grid Reference		Type	Distance from Site	Annual Mean Nitrogen Dioxide Concentration ($\mu g/m^3$)		
	Eastings	Northings			2015	2014	2013
NCC 55 (116 Alexandra Road)	331536	186222	Kerbside	2.6km North West	31.1	33.4	36.4
NCC37 (St Julian School 1)	332499	189569	Urban Background	5.1km North	20.1	21.5	24.3
NCC38 (St Julian School 2)	332499	189569	Urban Background	5.1km North	20.7	19.7	23.5
NCC39 (St Julian School)	332499	189569	Urban Background	5.1km North	20.8	21.4	23.5
Air Quality Objective					40	40	40

Table 6. Newport City Council Continuous Monitor Data for Nitrogen Dioxide

Continuous Monitor Identification	National Grid Reference		Type	Distance from Site	Annual Mean Nitrogen Dioxide Concentration ($\mu g/m^3$)		
	Eastings	Northings			2015	2014	2013
St Julians	332418	189603	Urban Background	5.1km North	21.0	22.4	23.1
Junction 25A M4	332685	189613	Roadside	5.2km North	**54.0**	**56.0**	**59.0**
Air Quality Objective					40	40	40

Error! Not a valid bookmark self-reference. displays annual mean particulate matter at the St Julians site near to the M4. Annual mean concentrations in the vicinity of this site are well below the $40\mu g/m^3$ objective.

Table 7. Newport City Council Continuous Monitor Data for Particulate Matter

Continuous Monitor Identification	National Grid Reference		Type	Distance from Site	Annual Mean Particulate Matter Concentration (µg/m^3)		
	Eastings	Northings			2015	2014	2013
St Julians	332418	189603	Urban Background	5.1km North	-	16	-

3.4.4 Summary of Background Air Quality

Background annual mean concentrations of NO_2 and particulate matter have been taken from Defra's 2013 based background concentration maps[15]. NO_2 diffusion tube concentration data from locations within the Air Quality Management Areas have been selected to be used for the background nitrogen dioxide concentrations for the AQMA_1 to AQMA_10 receptors.

The background annual mean concentration for carbon monoxide (for a base year of 2001) has been taken from Defra's 2001-based 1x1 km projected background maps[16].

Where Defra data have been used in the assessment, short-term background concentrations have been calculated by multiplying the selected annual mean background concentration by a factor of two, as detailed in the EA's Air Risk Assessment Guidance. For these data, the values for the grid square in which the site lies are presented in Table 8 and Table 9.

Table 8. Long Term Background Concentrations

Location	Source of Data	Long-Term Background Concentration (µg/m^3)				
		oxides of nitrogen (NO_X)[17]	nitrogen dioxide (NO_2)	carbon monoxide (CO)[17]	particulate matter(PM_{10})[17]	fine particulate matter ($PM_{2.5}$)[17]
Site (333500, 184500) R1 to R19	Defra 2013 based background maps	20.0	14.3	-	14.2	10.1
Site (333500, 184500) R1 to R19	Defra 2001 based background maps	-	-	252	-	-
AQMA_1	Newport City Council Diffusion Tube NCC46B	-	48.9	-	-	-
AQMA_2	Newport City Council Diffusion Tube NCC50	-	39.1	-	-	-
AQMA_3	Newport City Council Diffusion Tube NCC40	-	32.5	-	-	-
AQMA_4	Newport City Council Diffusion Tube NCC6B	-	41.1	-	-	-
AQMA_5	Newport City Council Diffusion Tube NCC16A	-	36.0	-	-	-
AQMA_6	Newport City Council Diffusion Tube NCC14A	-	40.5	-	-	-
AQMA_7	Newport City Council Diffusion Tube	-	26.4	-	-	-

[15] Defra (2016), Background Mapping Data for Local Authorities -2013, Available from: https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2013 accessed on 20th December 2016
[16] Defra (2016), Background Mapping data for Local Authorities – 2001, Available from: https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2001, accessed 20th December 2016
[17] The same value for long-term oxides of nitrogen, carbon monoxide and particulate matter was used for all local receptors.

Location	Source of Data	Long-Term Background Concentration (µg/m^3)				
		oxides of nitrogen (NO_X)[17]	nitrogen dioxide (NO_2)	carbon monoxide (CO)[17]	particulate matter(PM_{10})[17]	fine particulate matter ($PM_{2.5}$)[17]
	NCC28B					
AQMA_8	Newport City Council Diffusion Tube NCC31	-	45.6	-	-	-
AQMA_9	Newport City Council Diffusion Tube NCC27B	-	48.0	-	-	-
AQMA_10	Newport City Council Diffusion Tube NCC32D	-	35.8	-	-	-

Table 9. Short Term Background Concentrations

Location	Source of Data	Short-Term Background Concentration (µg/m^3)	
		nitrogen dioxide (NO_2)	particulate matter (PM_{10})[18]
Site (333500, 184500) R1 to R19	Defra 2013 based background maps multiplied by two	28.6	28.4
AQMA_1	Newport City Council Diffusion Tube NCC46B multiplied by two	97.8	-
AQMA_2	Newport City Council Diffusion Tube NCC50 multiplied by two	78.2	-
AQMA_3	Newport City Council Diffusion Tube NCC40 multiplied by two	65.0	-
AQMA_4	Newport City Council Diffusion Tube NCC6B multiplied by two	82.2	-
AQMA_5	Newport City Council Diffusion Tube NCC16A multiplied by two	72.0	-
AQMA_6	Newport City Council Diffusion Tube NCC14A multiplied by two	81.0	-
AQMA_7	Newport City Council Diffusion Tube NCC28B multiplied by two	52.8	-
AQMA_8	Newport City Council Diffusion Tube NCC31 multiplied by two	91.2	-
AQMA_9	Newport City Council Diffusion Tube NCC27B multiplied by two	96.0	-
AQMA_10	Newport City Council Diffusion Tube NCC32D multiplied by two	71.6	-

3.5 Modelled Domain – Discrete Receptors

3.5.1 Sensitive Human Receptors

Ground-level concentrations of the modelled pollutants relevant to human health have been predicted at discrete air quality sensitive receptors, as listed in Table 10. The locations of the sensitive human receptors are displayed in Annex A Figure A.1. The locations of the sensitive Air Quality Management Area receptors are displayed in Annex A Figure A.2. The receptors have been selected to be representative of residential dwellings and recreational areas around the facility. For sensitive human receptors, the flagpole height has been set at 0m.

[18] The same value for short-term particulate matter was used for all receptors.

Table 10. Modelled Domain, Selected Discrete Human Receptor Locations

Receptor	Description	National Grid Reference	
		Eastings	Northings
R1	Hart Farm	334283	185087
R2	Property on Nash Road	334481	185070
R3	Pye Corner Farm	334524	185156
R4	Fair Orchard	334540	184816
R5	Campsite	334714	184969
R6	Ty Du Farm	334686	184579
R7	Property on Nash Road	334666	184507
R8	Old Farm House	334695	184415
R9	Property on Nash Road	334795	184095
R10	Property on West Nash Road	334719	183925
R11	Nash Hall/School	334326	183771
R12	Property on West Nash Road	334420	183754
R13	Farm North of Nash	334187	183989
R14	Ty-Porta	333920	183710
R15	Great House	333701	183431
R16	Sailing Club	333039	184187
R17	Property on Watch House Parade	331490	186201
R18	Property on Alexandra Road	331563	186239
R19	Property on Stephenson Street	332018	186114
AQMA_1	Newport City Chepstow Road AQMgt Order 2011	332671	188237
AQMA_2	Newport City Chepstow Road AQMgt Order 2011	331320	188434
AQMA_3	Glasllwch AQMA	328596	186995
AQMA_4	Shaftesbury/Crindau AQMA	330559	189590
AQMA_5	St Julians AQMA	332335	189678
AQMA_6	Malpas Road AQMA	330907	189210
AQMA_7	Caerleon Road AQMA	332042	189049
AQMA_8	Royal Oak Hill AQMA	334946	189219
AQMA_9	Caerleon High Street AQMA	334137	190425
AQMA_10	Newport City Council Malpass Road AQMA 2011	330376	190453

3.5.2 Sensitive Ecological Receptors

In accordance with Environment Agency guidance[19], the impacts associated with emissions from the facility on statutory sensitive ecological sites have been quantified. Sites of Special Scientific Interest within 2km and European designated sites within 10km of the facility have been considered. The Severn Estuary Ramsar, Special Area of Conservation (SAC), Special Protection Area (SPA) and Site of Special Scientific Interest (SSSI), Newport Wetlands SAC, SSSI and NNR, River Usk SSSI, Local Nature Reserve located east and south of the site, and Gwent Levels Nash and Goldcliff SSSI are the ecological sites which have been included in the assessment.

Ground-level concentrations of the modelled pollutants relevant to sensitive ecological receptors have been predicted at the locations outlined in Table 11. The location of these receptors is also shown in Annex A Figure A.3. For sensitive ecological receptors, the flagpole height has been set at 0m.

[19] Environment Agency (2016), Air emissions risk assessment for your environmental permit, https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit, accessed on 20th December 2016

Table 11. Modelled Domain, Selected Discrete Ecological Receptor Locations

Receptor	Designated Ecological Site	Description	National Grid Reference	
			Eastings	Northings
SE_1	Severn Esturary SAC, SAC and SSSI	The ecological receptor has been designated for being an estuary, having many mudflats and sandflats not covered by seawater at low tide and Atlantic salt meadow habitat.	332313	183786
SE_2			332238	183752
SE_3			332150	183692
SE_4			332096	183603
SE_5			332061	183523
SE_6			332056	183441
SE_7			332044	183369
SE_8			332150	183324
SE_9			332290	183298
SE_10			332421	183224
SE_11			332538	183144
SE_12			332629	183015
SE_13			332769	182901
SE_14			332935	182819
SE_15			333080	182753
SE_16			333260	182673
SE_17			333431	182458
SE_18			333563	182475
SE_19			333705	182358
SE_20			333862	182349
NW_1	Newport Wetlands National Nature Reserve (Newport Wetlands SAC, SSSI, NNR)	Wide variety of habitats including 865 hectares of inter-tidal foreshore. Cetti's warblers and bearded tits birds live in the reed beds.	333127	183598
NW_2			333201	183603
NW_3			333249	183575
NW_4			333335	183543
NW_5			333424	183506
NW_6			333523	183501
NW_7			333752	183475
NW_8			333837	183512
NW_9			333932	183444
NW_10			334691	183418
NW_11			334685	183495
RU_1	River Usk SSSI and SAC	Water course of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation and several fish species and otters which live in that environment.	333055	185059
RU_2			333118	184965
RU_3			333164	184965
RU_4			333198	184859
RU_5			333212	184754
RU_6			333207	184691
RU_7			333138	184637
RU_8			333175	184494
RU_9			333184	184394
RU_10			333198	184308
RU_11			333261	184254
RU_12			333315	184246
RU_13			333304	184206

Receptor	Designated Ecological Site	Description	National Grid Reference	
			Eastings	Northings
RU_14			333247	184129
RU_15			333192	184094
RU_16			333132	184194
RU_17			333015	184237
RU_18			332930	184140
RU_19			332816	184040
RU_20			332682	183972
RU_21			332513	183895
RU_22			332379	183837
LNR_S_1	Local Nature Reserve to the South of the Site	Specific information about this Local Nature Reserve is currently not available.	333320	184222
LNR_S_2			333361	184195
LNR_S_3			333407	184154
LNR_S_4			333444	184116
LNR_E_1	Local Nature Reserve to the East of the Site	Specific information about this Local Nature Reserve is currently not available	333507	185220
LNR_E_2			333541	185145
LNR_E_3			333597	185075
LNR_E_4			333625	184986
LNR_E_5			333643	184891
LNR_E_6			333623	184737
LNR_E_7			333620	184661
LNR_E_8			333600	184573
LNR_E_9			333595	184485
LNR_E_10			333589	184380
LNR_E_11			333589	184289
LNR_E_12			333563	184207
LNR_E_13			333524	184127
GLN_1	Gwent Levels- Nash and Goldcliff SSSI	Three features such as reen and ditch habitat, many insects and invertebrates and shrill carder bees.	334502	185113
GLN_2			334513	185056
GLN_3			334527	184972
GLN_4			334524	184943
GLN_5			334547	184896
GLN_6			334597	184829
GLN_7			334610	184786
GLN_8			334542	184741
GLN_9			334517	184704
GLN_10			334476	184647
GLN_11			334410	184599
GLN_12			334293	184574
GLN_13			334285	184532
GLN_14			334275	184477
GLN_15			334259	184395
GLN_16			334215	184358
GLN_17			334199	184295
GLN_18			334209	184250
GLN_19			334196	184174

Receptor	Designated Ecological Site	Description	National Grid Reference	
			Eastings	Northings
GLN_20			334202	184130
GLN_21			334185	184067
GLN_22			334099	184039
GLN_23			334085	183974
GLN_24			333898	183993
GLN_25			333894	183932
GLN_26			333914	183862
GLN_27			333954	183746
GLN_28			334044	183596
GLN_29			334034	183518
GLN_30			334021	183432

3.5.3 Modelled Domain – Receptor Grid

The dispersion model output is reported at specific receptors and as a nested grid of values. The inner grid extends 300 m at a resolution of 20m x 20m. The middle grid extends from 30 m to 1,300m at a resolution of 50m x 50m. The outer grid extends from 1,300m to 4,300m at a resolution of 100m x 100m. Details of the receptor grid are summarised in Table 12. All gridded model outputs are reported at a height of 0m.

Table 12. Modelled Domain, Receptor Grid

Grid Spacing (m)	Dimensions	Number of nodes in each direction	National Grid Reference of South West Corner
20	300 x 300	16	333115, 183953
50	1000 x 1000	21	332415, 183253
100	3000 x 3000	31	330415, 181653

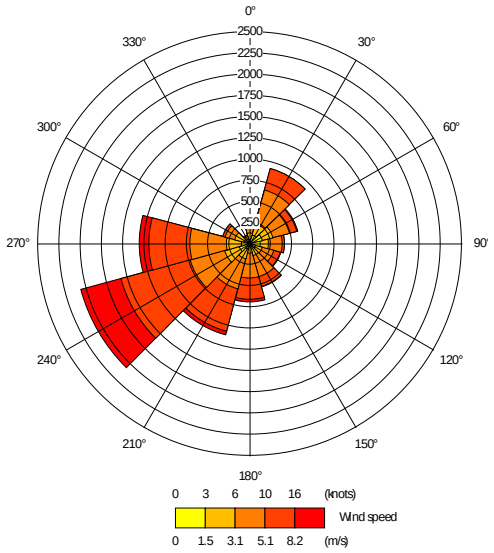
3.5.4 Meteorological Data

Hourly sequential data from Bristol Filton Airport for the years 2011 to 2015 inclusive were used in this study. The station is situated approximately 26km to the east of the site and is considered to be representative of meteorological conditions at the point of release.

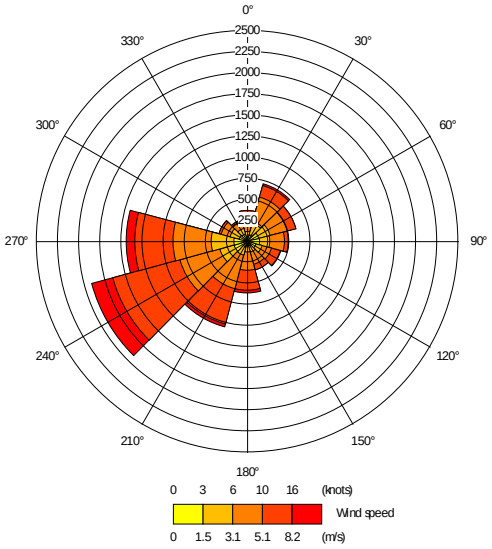
A visual representation of the meteorological data used in the assessment is shown in the wind roses presented in Table 13.

Table 13. Wind Roses for Filton Airport (2011-2015)

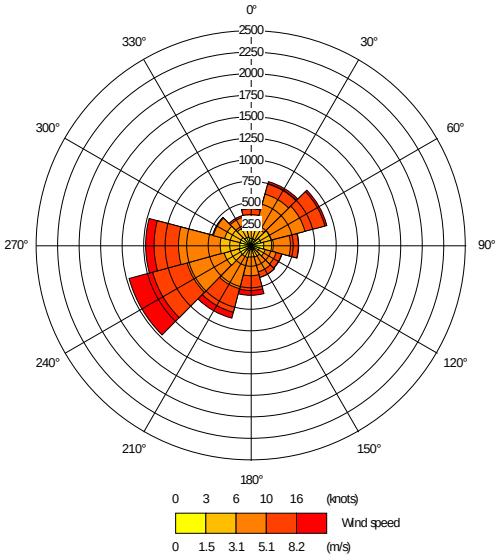
2011



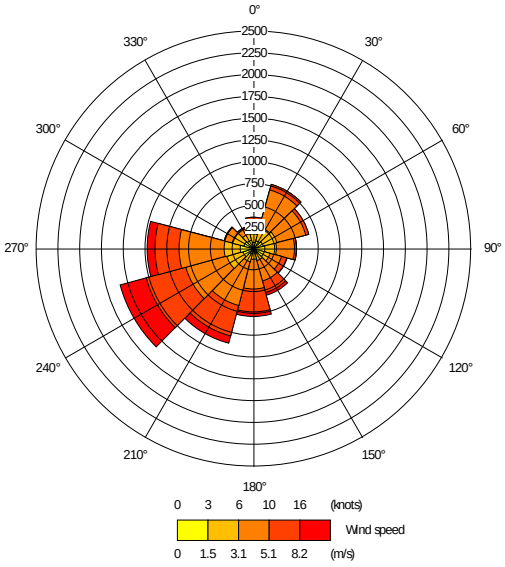
2012



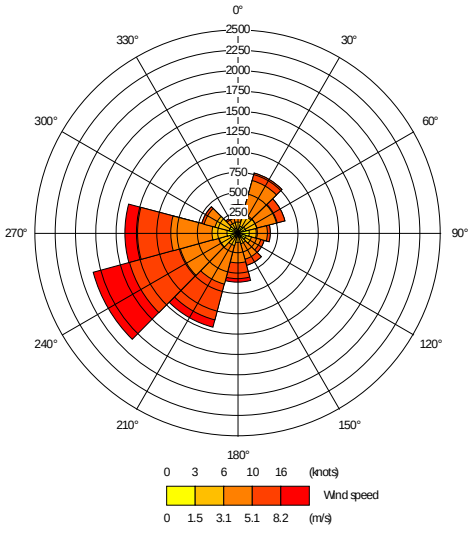
2013



2014



2015



3.6 Building Downwash Effects

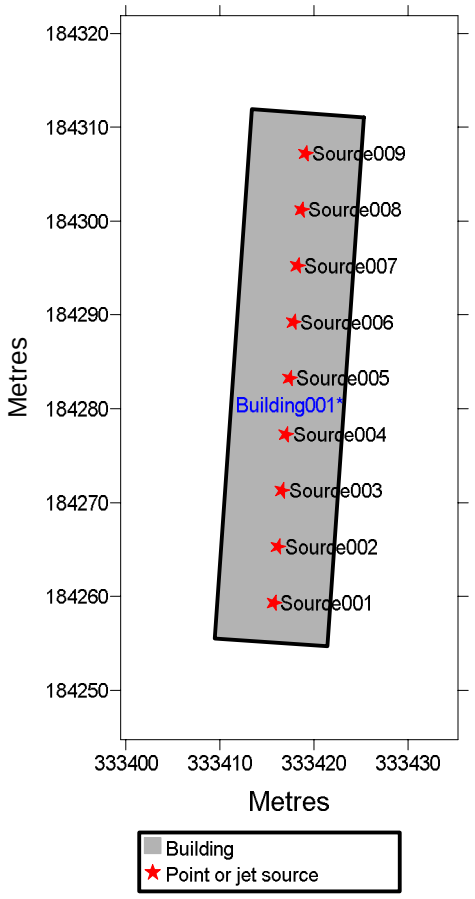
The buildings that make up the facility have the potential to generate turbulence into the flow of air across the Site. The net effect of such turbulence can be to entrain emissions and to reduce the effective release height of the emission. The ADMS buildings effect module has therefore been used to include consideration of building downwash effects as part of the modelling procedure.

The combined downwash effect of the engine enclosures has been represented within the model as a single virtual structure ('Building001') with the dimensions presented in Table 14, and illustrated in Figure 1.

Table 14. Building Parameters

Building	National Grid Reference of Centre Point (x,y)	Length (m)	Width (m)	Height (m)	Angle (°)
Building 001	333417, 184283	56.5	12	2.6	4

Figure 1: Layout of Buildings Included Within the Model



3.7 Terrain

The land surrounding the facility is relatively flat and gently undulating, there are no large terrain features or sharp changes of gradient. For this reason the terrain type has been set as flat or simple terrain within the model.

3.8 Surface Roughness

A surface roughness of 0.3m was used to represent the conditions of the land surrounding the application site and fits the description of the landscape between the emission points and the closest sensitive receptors. A surface roughness value of 0.2m was used to represent conditions at the meteorological observation site (an airfield).

3.9 Oxides of nitrogen to nitrogen dioxide conversion

Emissions of oxides of nitrogen (NO_X) from the main stack will consist mainly of nitric oxide (NO) at the point of release. A number of mechanisms are known that result in an increasing proportion of the oxides of nitrogen being in the form of nitrogen dioxide with increasing distance from the point of release.

The approach undertaken in the assessment of effects from continuously operating power plant is to use default values from Environment Agency risk assessment methods, which are:

- to assume 70% of oxides of nitrogen present as NO_2 at ground level, plus the background NO_2 concentration in the calculation of long-term annual mean calculations; and
- to assume 35% oxides of nitrogen present as NO_2 at ground level, plus double the background NO_2 concentration in the calculation of short-term hourly concentrations.

3.10 Specialised Model Treatments

Emissions have been modelled such that they are not subject to dry and wet deposition or depleted through chemical reactions. The assumption of continuity of mass is likely to result in an overestimation of impacts at receptors.

4. Impact Assessment

4.1 Human Health Impact

This section presents the results of the atmospheric dispersion modelling on human health receptors. Table 15 to Table 20 report the predicted concentrations of the impacts at representative receptor locations in terms of the process contribution (PC) from the facility on human receptors. The predicted environmental concentration (PEC) is the sum of the contribution from background sources and the PC and is also reported at all receptors.

A discussion of the significance of the resultant effect arising from the predicted impacts is set out in Section 5 after the tabulated results.

4.1.1 Annual Mean Nitrogen Dioxide

Table 15. Predicted Annual Mean Nitrogen Dioxide Concentrations, with Comparison Against Environmental Standard Criteria

Receptor	Background ($\mu g/m^3$)	PC of NO_2 ($\mu g/m^3$)					Maximum PC ($\mu g/m^3$)	PC (% Env Std)	Maximum PEC ($\mu g/m^3$)	PEC (% Env Std)
		2011	2012	2013	2014	2015				
R1	14.3	0.1	0.1	0.1	0.1	0.1	0.1	0.2	14.4	36
R2	14.3	0.1	0.1	0.1	<0.1	0.1	0.1	0.2	14.4	36
R3	14.3	0.1	0.1	0.1	<0.1	0.1	0.1	0.2	14.4	36
R4	14.3	0.1	0.1	0.1	0.1	0.1	0.1	0.3	14.4	36
R5	14.3	0.1	0.1	0.1	0.1	0.1	0.1	0.2	14.4	36
R6	14.3	0.1	0.1	0.1	0.1	0.1	0.1	0.3	14.4	36
R7	14.3	0.1	0.1	0.1	0.1	0.1	0.1	0.3	14.4	36
R8	14.3	0.1	0.1	0.1	0.1	0.1	0.1	0.2	14.4	36
R9	14.3	<0.1	<0.1	<0.1	<.0.1	<0.1	<0.1	0.1	14.3	36
R10	14.3	<0.1	0.1	<0.1	<0.1	<0.1	0.1	0.1	14.4	36
R11	14.3	<0.1	<0.1	<0.1	<0.1	0.1	0.1	0.1	14.4	36
R12	14.3	<0.1	<0.1	<0.1	<0.1	0.1	0.1	0.1	14.4	36
R13	14.3	<0.1	0.1	<0.1	<0.1	0.1	0.1	0.2	14.4	36
R14	14.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	14.3	36
R15	14.3	<0.1	<0.1	0.1	<0.1	<0.1	0.1	0.1	14.4	36
R16	14.3	0.1	0.1	0.1	<0.1	<0.1	0.1	0.3	14.4	36
R17	14.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	14.3	36
R18	14.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	14.3	36
R19	14.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	14.3	36
AQMA_1	48.9	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	48.9	122
AQMA_2	39.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	39.1	98
AQMA_3	32.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	32.5	81
AQMA_4	41.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	41.1	103
AQMA_5	36.0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	36.0	90
AQMA_6	40.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	40.5	101
AQMA_7	26.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	26.4	66
AQMA_8	45.6	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	45.6	114
AQMA_9	48.0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	48.0	120
AQMA_10	35.8	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	35.8	90

4.1.2 Hourly Mean Nitrogen Dioxide

Table 16: Predicted 99.79th Percentile Nitrogen Dioxide 1 hour Concentrations, with Comparison Against Environmental Standard Criteria

Receptor	Background (µg/m^3)	PC of NO_2 (µg/m^3)					Maximum PC (µg/m^3)	PC (% Env Std)	Maximum PEC (µg/m^3)	PEC (% Env Std)
		2011	2012	2013	2014	2015				
R1	28.6	5.9	5.5	5.8	4.2	6.1	6.1	3.1	34.7	17
R2	28.6	4.6	5.4	4.4	3.8	5.3	5.4	2.7	34.0	17
R3	28.6	4.1	4.6	3.6	3.5	5.1	5.1	2.5	33.7	17
R4	28.6	5.2	6.0	6.4	5.7	5.9	6.4	3.2	35.0	18
R5	28.6	4.1	4.7	5.2	3.7	4.5	5.2	2.6	33.8	17
R6	28.6	5.6	8.8	7.5	6.1	6.1	8.8	4.4	37.4	19
R7	28.6	5.8	7.1	6.0	6.3	6.2	7.1	3.6	35.7	18
R8	28.6	5.5	5.0	5.9	6.8	5.2	6.8	3.4	35.4	18
R9	28.6	2.5	5.2	3.2	3.1	2.9	5.2	2.6	33.8	17
R10	28.6	1.9	5.3	1.6	0.9	4.8	5.3	2.7	33.9	17
R11	28.6	2.3	5.2	0.7	0.3	5.8	5.8	2.9	34.4	17
R12	28.6	2.3	4.2	0.9	0.4	6.7	6.7	3.4	35.3	18
R13	28.6	4.9	10.0	2.5	1.5	9.1	10.0	5.0	38.6	19
R14	28.6	<0.1	1.3	0.3	<0.1	0.2	1.3	0.7	29.9	15
R15	28.6	<0.1	1.9	2.4	<0.1	<0.1	2.4	1.2	31.0	16
R16	28.6	7.3	7.4	3.4	1.2	<0.1	7.4	3.7	36.0	18
R17	28.6	0.1	<0.1	0.2	0.4	0.1	0.4	0.2	29.0	15
R18	28.6	0.1	<0.1	0.3	0.4	0.1	0.4	0.2	29.0	15
R19	28.6	0.4	<0.1	0.5	1.4	0.4	1.4	0.7	30.0	15
AQMA_1	97.8	0.5	0.1	0.4	1.1	0.3	1.1	0.6	98.9	50
AQMA_2	78.2	0.3	<0.1	0.2	0.6	0.1	0.6	0.3	78.8	39
AQMA_3	65.0	0.1	<0.1	0.2	<0.1	<0.1	0.2	0.1	65.2	33
AQMA_4	82.2	0.1	<0.1	0.1	0.4	0.1	0.4	0.2	82.6	41
AQMA_5	72.0	0.3	0.1	0.3	0.7	0.1	0.7	0.3	72.7	36
AQMA_6	81.0	0.2	<0.1	0.1	0.5	0.1	0.5	0.2	81.5	41
AQMA_7	52.8	0.7	<0.1	0.2	0.5	0.1	0.7	0.3	53.5	27
AQMA_8	91.2	0.7	0.3	0.2	0.7	0.7	0.7	0.4	91.9	46
AQMA_9	96.0	0.3	0.1	0.2	0.5	0.4	0.5	0.2	96.5	48
AQMA_10	71.6	0.1	0.0	0.1	0.3	0.1	0.3	0.2	71.9	36

4.1.3 Annual Mean Particulate Matter (PM_{10})

Table 17: Predicted Annual Mean Particulate Matter (PM_{10}) concentration, with Comparison Against Environmental Standard Criteria

Receptor	Background ($\mu g/m^3$)	PC of PM_{10} ($\mu g/m^3$)					Maximum PC ($\mu g/m^3$)	PC (% Env Std)	Maximum PEC ($\mu g/m^3$)	PEC (% Env Std)
		2011	2012	2013	2014	2015				
R1	14.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	14.2	36
R2	14.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	14.2	36
R3	14.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	14.2	36
R4	14.2	<0.1	0.1	<0.1	<0.1	<0.1	0.1	0.2	14.2	36
R5	14.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	14.2	36
R6	14.2	<0.1	0.1	<0.1	<0.1	<0.1	0.1	0.1	14.2	36
R7	14.2	<0.1	0.1	<0.1	<0.1	<0.1	0.1	0.1	14.2	36
R8	14.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	14.2	36
R9	14.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	14.2	36
R10	14.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	14.2	36
R11	14.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	14.2	36
R12	14.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	14.2	36
R13	14.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	14.2	36
R14	14.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	14.2	36
R15	14.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	14.2	36
R16	14.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	14.2	36
R17	14.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	14.2	36
R18	14.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	14.2	36
R19	14.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	14.2	36
AQMA_1	14.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	14.2	36
AQMA_2	14.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	14.2	36
AQMA_3	14.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	14.2	36
AQMA_4	14.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	14.2	36
AQMA_5	14.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	14.2	36
AQMA_6	14.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	14.2	36
AQMA_7	14.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	14.2	36
AQMA_8	14.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	14.2	36
AQMA_9	14.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	14.2	36
AQMA_10	14.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	14.2	36

4.1.4 24 Hour Mean Particulate Matter (PM_{10})

Table 18: Predicted 90.41st percentile 24-hour Particulate Matter (PM_{10}) concentrations, with Comparison Against Environmental Standard Criteria

Receptor	Background (µg/m³)	PC of PM_{10} (µg/m³)					Maximum PC (µg/m³)	PC (% Env Std)	Maximum PEC (µg/m³)	PEC (% Env Std)
		2011	2012	2013	2014	2015				
R1	28.4	0.1	0.1	<0.1	<0.1	0.2	0.2	0.4	28.6	57
R2	28.4	0.1	0.1	0.1	<0.1	0.1	0.1	0.3	28.5	57
R3	28.4	0.1	0.1	<0.1	<0.1	0.1	0.1	0.3	28.5	57
R4	28.4	0.1	0.3	0.1	0.1	0.2	0.3	0.6	28.7	57
R5	28.4	0.1	0.2	0.1	<0.1	0.1	0.2	0.4	28.6	57
R6	28.4	<0.1	0.2	<0.1	<0.1	0.2	0.2	0.3	28.6	57
R7	28.4	<0.1	0.1	<0.1	<0.1	0.1	0.1	0.2	28.5	57
R8	28.4	<0.1	0.1	<0.1	<0.1	<0.1	0.1	0.2	28.5	57
R9	28.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	28.4	57
R10	28.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	28.4	57
R11	28.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	28.4	57
R12	28.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	28.4	57
R13	28.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	28.4	57
R14	28.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	28.4	57
R15	28.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	28.4	57
R16	28.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	28.4	57
R17	28.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	28.4	57
R18	28.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	28.4	57
R19	28.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	28.4	57
AQMA_1	28.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	28.4	57
AQMA_2	28.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	28.4	57
AQMA_3	28.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	28.4	57
AQMA_4	28.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	28.4	57
AQMA_5	28.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	28.4	57
AQMA_6	28.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	28.4	57
AQMA_7	28.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	28.4	57
AQMA_8	28.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	28.4	57
AQMA_9	28.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	28.4	57
AQMA_10	28.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	28.4	57

4.1.5 Annual Mean Fine Particulate Matter ($PM_{2.5}$)

Table 19: Predicted Annual Mean Fine Particulate Matter ($PM_{2.5}$) concentration, with comparison Against Environmental Standard Criteria

Receptor	Background (µg/m^3)	PC of $PM_{2.5}$ (µg/m^3)					Maximum PC (µg/m^3)	PC (% Env Std)	Maximum PEC (µg/m^3)	PEC (% Env Std)
		2011	2012	2013	2014	2015				
R1	10.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	10.1	41
R2	10.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	10.1	41
R3	10.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	10.1	41
R4	10.1	<0.1	0.1	<0.1	<0.1	<0.1	0.1	0.2	10.2	41
R5	10.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	10.1	41
R6	10.1	<0.1	0.1	<0.1	<0.1	<0.1	0.1	0.2	10.2	41
R7	10.1	<0.1	0.1	<0.1	<0.1	<0.1	0.1	0.2	10.2	41
R8	10.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	10.1	41
R9	10.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	10.1	40
R10	10.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	10.1	40
R11	10.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	10.1	40
R12	10.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	10.1	40
R13	10.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	10.1	40
R14	10.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	10.1	40
R15	10.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	10.1	40
R16	10.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	10.1	40
R17	10.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	10.1	40
R18	10.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	10.1	40
R19	10.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	10.1	40
AQMA_1	10.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	10.1	40
AQMA_2	10.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	10.1	40
AQMA_3	10.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	10.1	40
AQMA_4	10.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	10.1	40
AQMA_5	10.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	10.1	40
AQMA_6	10.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	10.1	40
AQMA_7	10.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	10.1	40
AQMA_8	10.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	10.1	40
AQMA_9	10.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	10.1	40
AQMA_10	10.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	10.1	40

4.1.6 Eight Hour Running Mean Carbon Monoxide (CO)

Table 20: Predicted maximum eight hour running mean carbon monoxide concentrations, with Comparison Against Environmental Standard Criteria

Receptor	Background (µg/m^3)	PC of CO (µg/m^3)					Maximum PC (µg/m^3)	PC (% Env Std)	Maximum PEC (µg/m^3)	PEC (% Env Std)
		2011	2012	2013	2014	2015				
R1	504.0	16.4	12.2	28.0	14.6	10.9	28.0	0.3	532.0	5
R2	504.0	15.2	10.6	16.2	9.5	14.7	16.2	0.2	520.2	5
R3	504.0	13.1	10.2	15.1	9.1	12.1	15.1	0.2	519.1	5
R4	504.0	18.7	16.6	24.3	33.7	20.4	33.7	0.3	537.7	5
R5	504.0	13.9	10.5	16.2	25.8	16.2	25.8	0.3	529.8	5
R6	504.0	25.0	32.1	17.3	24.3	13.9	32.1	0.3	536.1	5
R7	504.0	20.2	35.1	15.9	27.6	16.3	35.1	0.4	539.1	5
R8	504.0	12.9	31.0	14.9	28.0	17.1	31.0	0.3	535.0	5
R9	504.0	10.4	13.0	20.8	22.5	9.1	22.5	0.2	526.5	5
R10	504.0	11.6	14.5	19.1	19.6	16.5	19.6	0.2	523.6	5
R11	504.0	23.6	49.9	19.8	19.1	17.5	49.9	0.5	553.9	5
R12	504.0	20.5	40.6	16.8	18.8	17.1	40.6	0.4	544.6	5
R13	504.0	20.6	24.6	22.5	32.7	25.4	32.7	0.3	536.7	5
R14	504.0	15.9	24.8	55.6	20.2	14.8	55.6	0.6	559.6	6
R15	504.0	16.8	37.1	20.9	16.4	13.0	37.1	0.4	541.1	5
R16	504.0	56.4	49.7	44.9	23.1	24.8	56.4	0.6	560.4	6
R17	504.0	4.2	8.0	9.4	7.4	3.6	9.4	0.1	513.4	5
R18	504.0	4.2	8.8	10.5	6.8	3.7	10.5	0.1	514.5	5
R19	504.0	3.4	13.7	12.2	3.8	3.3	13.7	0.1	517.7	5
AQMA_1	504.0	2.0	1.9	2.5	5.1	1.6	5.1	0.1	509.1	5
AQMA_2	504.0	3.0	3.0	4.8	2.1	3.5	4.8	<0.1	508.8	5
AQMA_3	504.0	1.1	1.2	4.9	0.6	1.8	4.9	<0.1	508.9	5
AQMA_4	504.0	1.7	2.2	3.3	1.1	2.0	3.3	<0.1	507.3	5
AQMA_5	504.0	1.2	1.4	1.5	3.4	1.0	3.4	<0.1	507.4	5
AQMA_6	504.0	2.2	2.2	3.7	1.5	2.6	3.7	<0.1	507.7	5
AQMA_7	504.0	2.8	3.5	2.0	4.5	2.5	4.5	<0.1	508.5	5
AQMA_8	504.0	2.4	4.8	2.3	2.1	2.2	4.8	<0.1	508.8	5
AQMA_9	504.0	1.7	2.2	1.7	2.3	2.3	2.3	<0.1	506.3	5
AQMA_10	504.0	1.8	1.8	2.6	1.3	2.0	2.6	<0.1	506.6	5

4.2 Ecological Receptors

The highest PC obtained from the modelling for each specific ecological receptor (Severn Estuary SAC, SSSI, SPA, Newport Wetlands SAC, SSSI and NNR, River Usk SSSI, LNR to the south of the site, LNR to the east of the site, Gwent Levels – Nash and Goldcliff SSSI have been selected for 24-hour mean oxides of nitrogen (Table 21), annual mean oxides of nitrogen (Table 22), nutrient nitrogen deposition (Table 23) and acid deposition (Table 24).

4.2.1 24 Hour Mean Oxides of Nitrogen

Table 21. Predicted 24 hour oxides of nitrogen Concentration, with Comparison Against Critical Level Criteria

Receptor	APIS 24 hour NO_X Background ($\mu g/m^3$)	Process Contribution ($\mu g/m^3$)					Maximum Process Contribution (PC) ($\mu g/m^3$)	PC, % Critical Level	Maximum PEC ($\mu g/m^3$)	PEC % Critical Level
		2011	2012	2013	2014	2015				
SE_13	29.1	4.1	2.1	8.6	2.4	1.7	8.6	11.5	37.7	50
NW_1	29.1	8.3	3.0	16.1	6.6	4.6	16.1	21.4	45.2	60
RU_12	29.1	40.1	33.7	56.1	48.8	23.3	56.1	74.8	85.2	114
LNR_S_2	29.1	66.1	50.7	55.8	75.0	57.1	75.0	100.0	104.1	139
LNR_E_11	29.1	30.9	29.7	31.9	29.8	32.7	32.7	43.6	61.8	82
GLN_22	29.1	5.1	5.8	4.5	7.5	5.6	7.5	10.0	36.6	49

4.2.2 Annual Mean Oxides of Nitrogen

Table 22: Predicted annual mean oxides of nitrogen concentration, with Comparison Against Critical Level Criteria

Receptor	APIS Long-term NO_X Background ($\mu g/m^3$)	Process Contribution ($\mu g/m^3$)					Maximum Process Contribution (PC) ($\mu g/m^3$)	PC, % Critical Level	Maximum PEC ($\mu g/m^3$)	PEC % Critical Level
		2011	2012	2013	2014	2015				
SE_1	19.4	0.1	0.1	<0.1	<0.1	<0.1	0.1	0.2	19.5	65
NW_1	19.4	0.1	<0.1	0.1	0.1	0.1	0.1	0.5	19.6	65
RU_13	19.4	0.5	0.4	0.4	0.4	0.3	0.5	1.8	20.0	67
LNR_S_2	19.4	1.1	0.4	0.5	0.6	0.5	1.1	3.7	20.5	68
LNR_E_10	19.4	1.8	2.4	1.4	1.5	2.1	2.4	8.1	21.8	73
GLN_12	19.4	0.2	0.3	0.2	0.2	0.2	0.2	1.0	19.7	66

4.2.3 Nutrient Nitrogen Deposition Rates

Table 23. Predicted Nutrient Nitrogen Deposition Rates, with Comparison Against Critical Load Criteria

Receptor	APIS Nitrogen Deposition Background (KgN/ha/yr)	Process Contribution (KgN/ha/yr)					Maximum PC (KgN/ha/yr)	Maximum PC, % Lower Range Critical Load	Maximum PEC (KgN/ha/yr)	Maximum PEC, % Lower Range Critical Load
		2011	2012	2013	2014	2015				
SE_1	12.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	12.5	62
NW_1	12.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-[20]	12.5	-[20]
RU_13	12.5	0.1	0.1	0.1	0.1	<0.1	0.1	-[20]	12.5	-[20]
LNR_S_2	12.5	0.2	0.1	0.1	0.1	0.1	0.2	3.2[21]	12.6	252[21]
LNR_E_10	12.5	0.3	0.4	0.2	0.2	0.3	0.4	7.0[21]	12.8	256[21]
GLN_12	12.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-[22]	12.5	-[22]

[20] No comparable habitat with established critical load estimate available
[21] Critical Load chosen to be 5(KgN/ha/yr) in absence of habitat information
[22] Not sensitive to Nutrient Nitrogen

4.2.4 Acid Deposition Rates

Table 24: Predicted Acid Deposition Rates, with Comparison Against Critical Load Criteria

Receptor	APIS Acid Deposition Background N+S (Keq/ha/yr)	Lower Range Critical Load Function (CLo)	Process Contribution (KeqN/ha/yr)					Maximum PC (Keq/ha/yr)	Maximum PC as a proportion of Min Critical Load Function (%)	PEC (Keq/ha/yr)	Maximum PEC as a proportion of Min Critical Load Function (%)
			2011	2012	2013	2014	2015				
SE_13	Not Sensitive to Acid Deposition										
NW_1	1.19	CLMinN 0.438 CLMaxN 4.528 CLMaxS 4.900	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1	1.22	26
RU_12	1.19	CLMinN 0.223 CLMaxN 0.730 CLMaxS 0.480	0.01	<0.01	<0.01	<0.01	<0.01	0.01	1.4	1.30	164
LNR_S_2	1.19	CLMinN 0.438 CLMaxN 4.528 CLMaxS 4.900	0.01	<0.01	0.01	0.01	0.01	0.01	0.2	1.43	27
LNR_E_11	1.19	CLMinN 0.438 CLMaxN 4.528 CLMaxS 4.900	0.02	0.03	0.01	0.02	0.02	0.03	0.7	1.55	27
GLN_22	Not Sensitive to Acid Deposition										

5. Discussion and Conclusions

The air quality assessment has predicted the long and short term impacts on air quality at the residential properties in the area surrounding the facility, based on the meteorological conditions experienced at a representative location during a period of five years. The predicted pollutant concentrations therefore represent the range of impacts, including the variation associated with the year to year variability of weather experienced within the study area.

The emissions from the facility, under foreseen operations, would result in process contributions at all receptors for nitrogen dioxide, carbon dioxide, and particulate matter (PM_{10} or $PM_{2.5}$) that can be screened as being insignificant i.e. <1% of the relevant environmental standards for annual average impacts and less than 10% of the relevant environmental standards for short term impacts at all sensitive human receptor locations. The Air Quality Management Area receptors have background annual mean nitrogen dioxide concentrations above the objective. With the facility in operation there is an increase of less than one percent of the air quality objective. No significant air quality effects on human health receptors are therefore likely to occur for nitrogen dioxide (NO_2), particulate matter (PM_{10}), fine particulate matter ($PM_{2.5}$) and carbon monoxide.

The impact of emissions on air quality have also been considered at The Severn Estuary Ramsar, SAC, SPA and SSSI, Newport Wetlands SAC and SSSI, River Usk SSSI, Local Nature Reserves to the east and south of the Site and Gwent Levels – Nash and Goldcliff SSSI. The predicted 24 hour mean oxides of nitrogen concentration are less than the critical level at Severn Estuary Ramsar, SAC, SPA and SSSI and Gwent Levels – Nash and Goldcliff SSSI sites. However, the predicted 24-hour mean oxides of nitrogen concentration is greater than the critical level at the River Usk SSSI and the two Local Nature Reserves located to the south and east of the site.

It is reasonable to consider that the short-term (24 hour) mean for NO_x is of less importance than the annual mean, as vegetation exposed to levels of NO_x above the Critical Level will be more likely to recover from that exposure if the exceedance is for a short duration, as would be experienced through the intermittent operation of the facility. Authors from the Centre for Ecology and Hydrology in a recent book on nitrogen, NO_x concentrations and vegetation, states that 'UN/ECE Working Group on Effects strongly recommended the use of the annual mean value, as the long-term effects of NO_x are thought to be more significant than the short-term effects'[23].

Although the predicted atmospheric NO_x levels may be increased while the Installation is in operation, the facility is only anticipated to operate for a maximum of 500 hours in the year in total, and it is unlikely that the facility will operate for 24 hours consecutively. It is therefore considered that these habitats will have time to recover from any short term exposure.

The predicted annual mean oxides of nitrogen concentration is less than 1% of the critical level for two of the receptors and therefore can be considered to be insignificant in accordance with the Environment Agency's criteria. For the remaining sites (with the exception of a small area of the local nature reserve), the predicted environmental concentrations are all less than 70% of the critical level and therefore no exceedences are predicted and no further assessment is considered necessary.

The process contributions of nutrient nitrogen is less than 1% of the lower range critical loads at the Severn Estuary SAC, and therefore can be considered to be insignificant. At the two closest local nature reserves, the PC is well below the H1 screening criteria for impacts on sites of local importance. It is therefore considered that there will be no significant air quality effects from nitrogen deposition on ecological receptors.

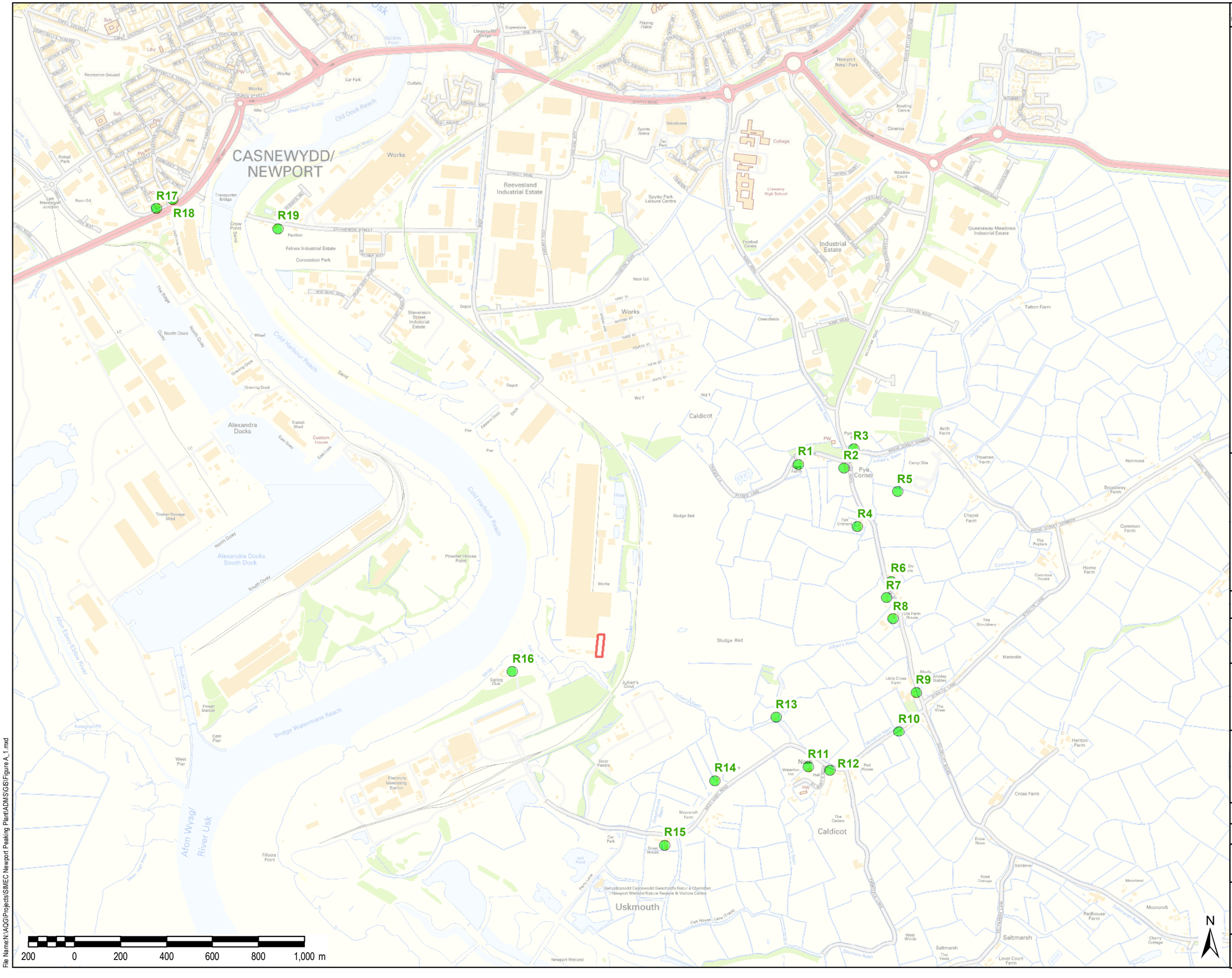
There is no acid deposition critical load criteria assigned for the Severn Estuary SAC, Ramsar, SPA and SSSI and Gwent Levels – Nash and Goldcliff SSSI. The acid deposition critical load for Newport Wetlands SAC, and the two Local Nature Reserves located to the east and south of the site would not be exceeded as a result of the operation of the facility. At the River Usk SSSI, the predicted acid deposition is in excess of the lower range critical loads, however this is largely as a result of the background deposition, with process contributions only predicted to be 1.4% of the critical load.

[23] Sutton MA, Howard CM, Erisman JW, Billen G, Bleeker A, Grennfelt P, van Grinsven H, Grizzetti B. 2013. The European Nitrogen Assessment: Sources, Effects and Policy Perspectives. Page 414. Cambridge University Press. 664pp. ISBN-10: 1107006120

It is therefore considered that due to the worst case assumptions used in the assessment, and given the location and limited running times of the facility, that the predicted impacts are considered to be acceptable.

Annex A: Air Quality Study Area Figures

Figure A.1: Sensitive Human Receptors



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LEGEND

Indicative Site Boundary

Purpose of Issue
FINAL

Client
SIMEC NEWPORT

Project Title
AIR QUALITY
IMPACT ASSESSMENT

Drawing Title
SENSITIVE
HUMAN RECEPTORS

Drawn	Checked	Approved	Date
JW	DD	RW	05/01/2017

AECOM Internal Project No.	Scale @ A3
60482599	1:15,000

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Chesterfield,
Derbyshire, S41 7SL
Telephone (01246) 209221
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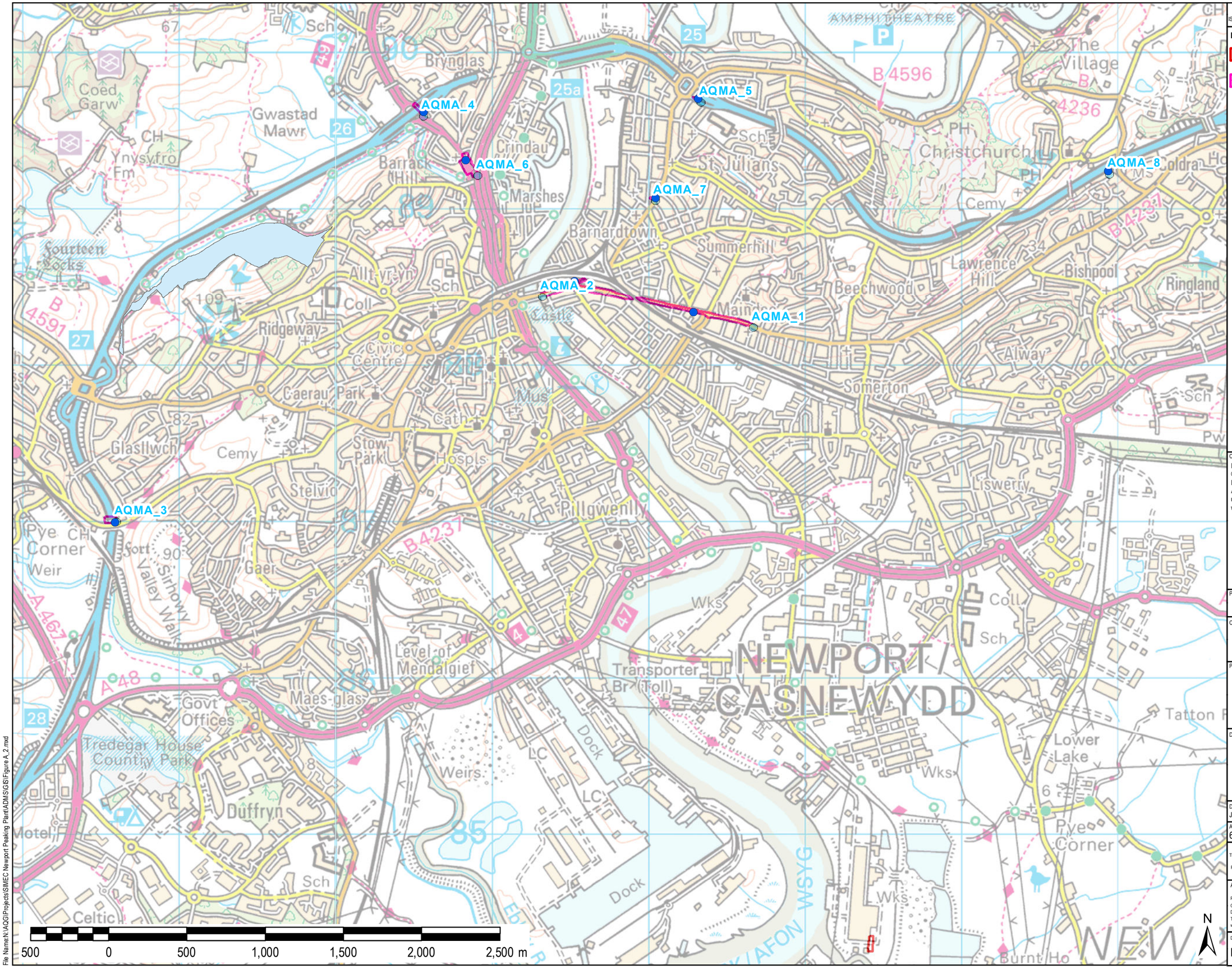
Drawing Number
FIGURE A.1

Rev

Figure A.2: Air Quality Management Area Receptors



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LEGEND

- Indicative Site Boundary
- Newport Air Quality Management Areas
- Air Quality Management Areas Receptors
- Selected Newport City Council Diffusion Tubes

Purpose of Issue: FINAL

Client: SIMEC NEWPORT

Project Title: AIR QUALITY IMPACT ASSESSMENT

Drawing Title: AIR QUALITY MANAGEMENT AREAS

Drawn	Checked	Approved	Date
JW	DD	RW	05/01/2017

AECOM Internal Project No.	Scale @ A3
60482599	1:22,000

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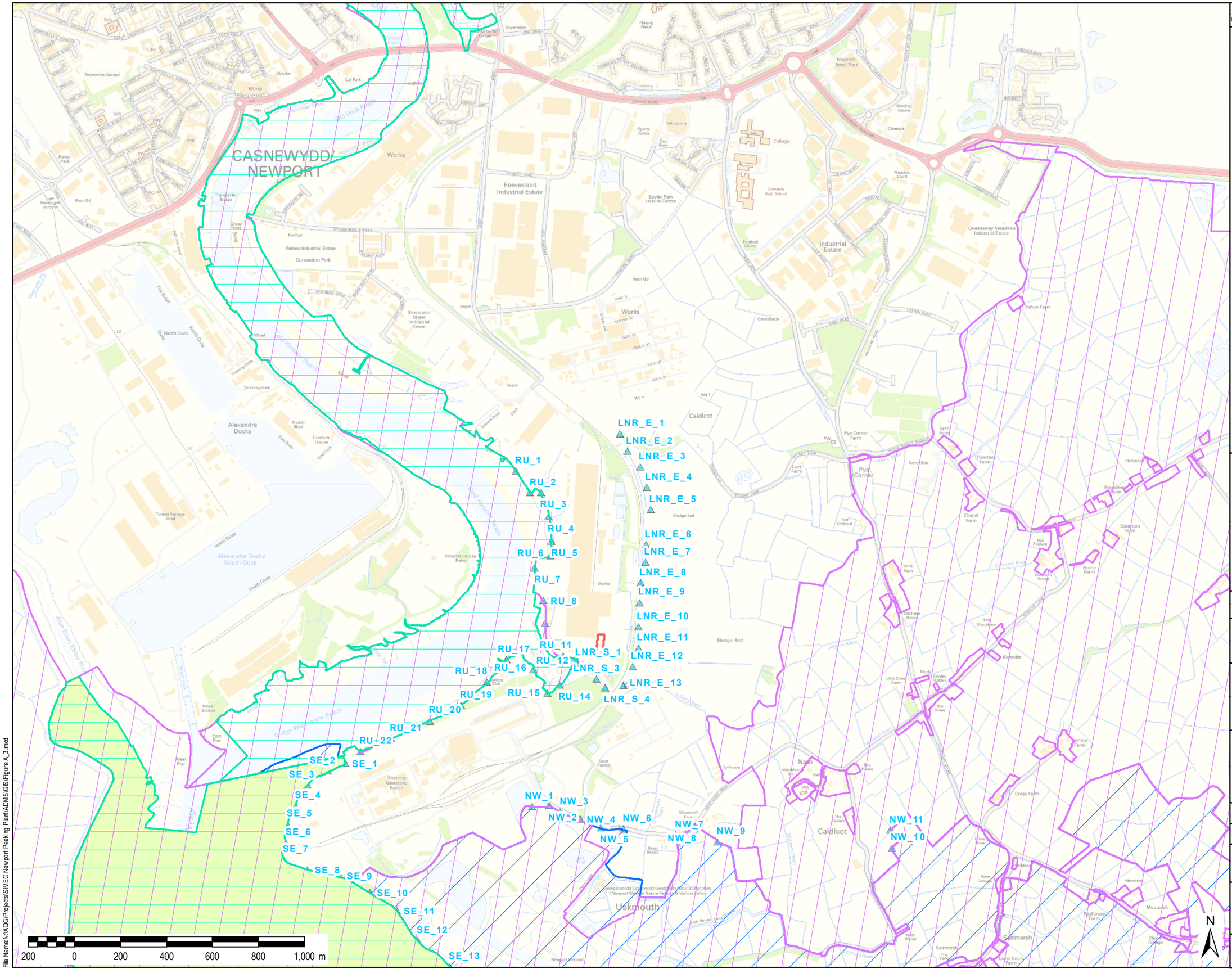
File Name:N:\AQG\Projects\SIMEC Newport Peaking Plant\ADMS\GIS\Figure A_2.mxd

Figure A.3: Sensitive Ecological Receptors



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LEGEND

- Indicative Site Boundary
- Natural Resource Wales Special Area of Conservation
- Natural Resource Wales Site of Special Scientific Interest
- Natural Resource Wales RAMSAR
- Natural Resource Wales National Nature Reserve
- Local Nature Reserve
- Ecological Receptors

Purpose of Issue
FINAL

Client
SIMEC NEWPORT

Project Title
AIR QUALITY
IMPACT ASSESSMENT

Drawing Title
SENSITIVE
ECOLOGICAL RECEPTORS

Drawn	Checked	Approved	Date
JW	DD	RW	05/01/2017

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FIGURE A.3

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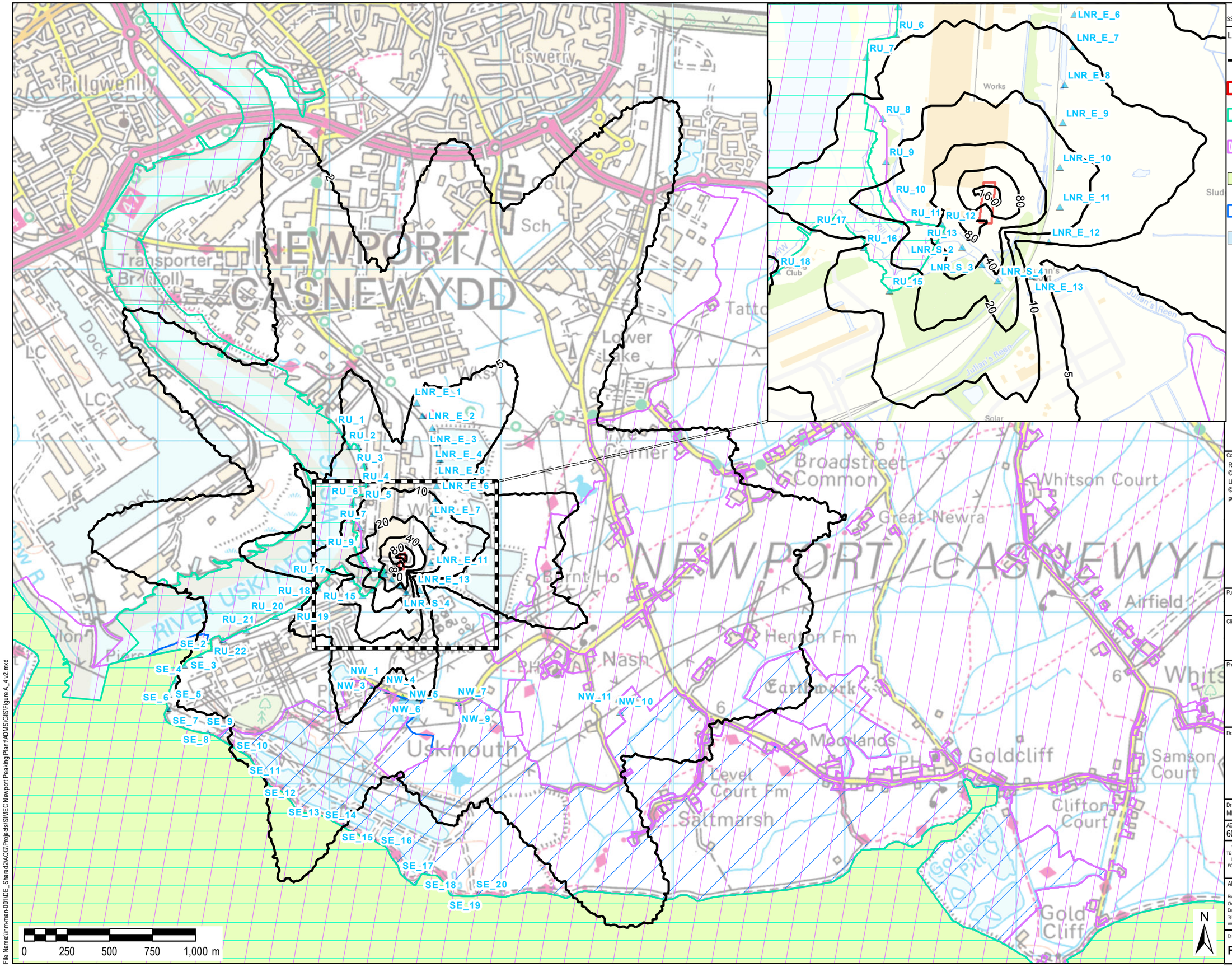

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LEGEND

- Max 24 hour NOx PC (µg/m^3)
- Indicative Site Boundary
- Natural Resource Wales Special Area of Conservation
- Natural Resource Wales Site of Special Scientific Interest
- Natural Resource Wales RAMSAR
- Natural Resource Wales National Nature Reserve
- Local Nature Reserve
- Ecological Receptors

Purpose of Issue: FINAL

Client: SIMEC NEWPORT

Project Title: AIR QUALITY IMPACT ASSESSMENT

Drawing Title: PROCESS CONTRIBUTION TO MAX. 24 HOUR NOX CONCENTRATIONS 2014 METEOROLOGICAL YEAR

Drawn	Checked	Approved	Date
MH	DD	RW	11/01/2017

AECOM Internal Project No.	Scale @ A3
60482599	1:20,000

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Drawing Number: **FIGURE A.4**

Rev:

Annex B: Emission Source Locations

Table 25. Emission Sources

Source Name	Co-ordinates	
	X	Y
Source 001	333416	184259
Source 002	333416	184265
Source 003	333417	184271
Source 004	333417	184277
Source 005	333417	184283
Source 006	333417	184289
Source 007	333418	184295
Source 008	333418	184301
Source 009	333419	184307