CELSA STEEL, ROVER WAY

Air Emissions Risk Assessment
Prepared for: Harsco Metals Group Limited

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1.0 INTRODUCTION

SLR Consulting Limited (SLR) has been commissioned by Harsco Metals Group Limited to undertake an Air Emission Risk Assessment (AERA) in support of their application for an Environmental Permit (EP) under the Environmental Permitting (England and Wales) Regulations. The EP will cover the Asphalt Plant ('the Site') located on land to the south of Rover Way, Cardiff.

This report presents the AERA undertaken to support the EP application.

1.1 Background

The supporting statement to the EP application should be referred to for a comprehensive background and description of the installation, this report is concerned with emissions to air only.

The main emission point to air is Stack A5 associated with emissions of particulate matter with an aerodynamic diameter of less than 10µm (PM_{10}) from process activities and emissions of oxides of nitrogen (NO_x) from the gas fired burners.

1.2 Scope and Objective

The scope of the assessment has been defined on the basis of correspondence with Natural Resource Wales (NRW) and is limited to the point source emissions to air at the installation. Consistent with Environment Agency (EA) guidance, NO_x and PM_{10} have been assessed.

The objective of the study is to assess the impact of NO_x and PM_{10} emissions against the relevant Air Quality Standards for nitrogen dioxide (NO_2) and PM_{10} for the protection of human health and the relevant Critical Levels (C_{Le}) (for NO_x) and Critical Loads (C_{Lo}) (for N and acid deposition) for the protection of designated ecological receptors.

This report presents the approach, detailed methodology and findings of the AERA.

2.0 POLICY, LEGISLATION AND RELEVANT GUIDANCE

2.1 National Legislation and Guidance

2.1.1 Air Quality Regulations

The Air Quality Standards (Wales) Regulations 2010 (the Regulations) provide a transposition of the Air Quality Directive (2008/50/EC), and transpose the Fourth Daughter Directive (2004/107/EC) within the UK. The Regulations include Limit Values, Target Values, Objectives, Critical Levels and Exposure Reduction Targets for the protection of human health and the environment (collectively termed Air Quality Assessment Levels (AQALs) throughout this report). The standards applied in this assessment are provided in Table 2-1.

Table 2-1
Applied AQALs

Pollutant	Standard (µg/m^3)	Measured as	
Nitrogen dioxide (NO_2)	40	Annual mean	-
	200	1 hour mean	Not to be exceeded more than 18 times per year
Nitrogen oxides* (NO_x)	30	Annual mean	-
Particulate matter with an aerodynamic diameter of less than 10µm (PM_{10}) (gravimetric)	40	Annual mean	-
	50	24-hour mean	Not to be exceeded more than 35 times a calendar year
Particulate matter with an aerodynamic diameter of less than 2.5µm ($PM_{2.5}$) (gravimetric)	25	Annual mean	-
Table note: *C_{Le} for protection of vegetation.			

Defra has published Technical Guidance (TG) for use in Local Air Quality Management (LAQM)[1]. According to LAQM.TG(16) air quality standards should only apply to locations where *'members of the public are likely to be regularly present and are likely to be exposed for a period of time appropriate to the averaging period of the objective. Authorities should not consider exceedances of the objectives at any location where relevant public exposure would not be realistic'* (examples are provided in Table 2-2).

This is emphasised in the EA modelling guidance which states that the 1-hour mean should apply (but may not be limited to) '*residential properties, schools, hospitals, care homes, hotels, gardens, busy shopping streets, bus stations and railway stations that are not fully enclosed, and car parks where the public are reasonably expected to spend an hour or more'*. Longer term standards such as annual means, should apply at houses or other locations where the public can be expected to occupy on a continuous basis. These standards do not apply to exposure at the workplace.

[1] Defra, Local Air Quality Management Review and Assessment Technical Guidance LAQM.TG(16), 2016.

Table 2-2
Relevant Public Exposure

Averaging Period	Relevant Locations	AQAL's should apply at:	AQAL's don't apply at:
Annual mean	Where individuals are exposed for a cumulative period of 6 months in a year	Building facades of residential properties, schools, hospitals etc.	Facades of offices Hotels Gardens of residences Kerbside sites
1-hour mean	Where individuals might reasonably be expected to spend one hour or longer	As above together with locations of regular access, car parks, bus stations etc.	Locations not publicly accessible or where occupation is not regular

2.1.2 Air Quality Strategy

The United Kingdom Air Quality Strategy (AQS) 2007 for England, Scotland, Wales and Northern Ireland[2] sets out a comprehensive strategic framework within which air quality policy will be taken forward in the short to medium term, and the roles that Government, industry, the Environment Agency, local government, business, individuals and transport have in protecting and improving air quality. The AQS contains air quality objectives based on the protection of both human health and vegetation (ecosystems). Those relevant to this assessment are presented within Table 2-1.

2.1.3 Local Air Quality Management

Section 82 of the Environment Act 1995 (Part IV) requires Local Authorities (LAs) to periodically review and assess the quality of air within their administrative area. The reviews have to consider the present and future air quality and whether the AQALs prescribed in the Regulations are being achieved or are likely to be achieved in the future.

Where any of the prescribed AQALs are not likely to be achieved the authority concerned must designate an Air Quality Management Area (AQMA). For each AQMA the local authority has a duty to draw up an Air Quality Action Plan (AQAP) setting out the measures the authority intends to introduce to deliver improvements in local air quality in pursuit of the AQAL. As such, LAs have formal powers to control air quality through a combination of LAQM and by use of their wider planning policies.

Defra has published technical guidance for use by LAs in their LAQM work[3]. This guidance, referred to in this report as LAQM.TG(16), has been used where appropriate in the assessment presented here.

2.1.4 Protection of Nature Conservation Sites

Sites of nature conservation importance at a European, national and local level, are provided environmental protection from developments, including from atmospheric emissions.

The Conservation of Habitats and Species Regulations 2010 introduces the precautionary principle for protected European sites, i.e. that projects can only be permitted to proceed; having ascertained that there will be no adverse effect on the integrity of the designated site. It requires an assessment to determine if significant effects (alone or in combination) are likely, followed by an 'appropriate assessment' by the competent authority, if necessary.

Similarly, the Countryside and Rights of Way (CRoW) Act 2000 provides protection to Sites of Special Scientific Interest (SSSIs) to ensure that developments are not likely to cause them damage.

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[2] The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, DEFRA. July 2007.
[3] Defra, Local Air Quality Management Review and Assessment Technical Guidance LAQM.TG(16), 2016.

Environmental Quality Standards exist for nature conservation sites known as C_{Le}'s (for airborne concentrations) and C_{Lo}'s (for deposition of nitrogen or acid forming compounds). C_{Lo}'s are site specific, being a function of soil chemistry. The C_{Le}'s relevant to this assessment are set out in Table 2-3 and C_{Lo}'s in Table 4-5.

Table 2-3
Relevant Critical Levels for the Protection of Vegetation and Ecosystems

Pollutant	C_{Le} (µg/m³)	Averaging Period
Nitrogen oxides (NO_x)	30	Annual mean (all ecosystems)
	75	24-hour mean (all ecosystems)

2.1.5 Environmental Permitting Regulations

The installation will be regulated under the Environmental Permitting (England and Wales) Regulations 2016 (as amended) (EPR). The EPR implement European Union Directives including 2010/75/EU (the Industrial Emissions Directive, IED). The EPR prescribes emission limit values for certain pollutants into the air from certain plant as a result. Guidance produced by the EA in relation to EPR that is of relevance to this assessment is discussed below.

2.2 Assessment Guidance Documents

The key guidance documents consulted in undertaking this air quality assessment are described below.

2.2.1 Environment Agency AERA Guidance

The 'Air emissions risk assessment for your environmental permit'[4] guidance (termed the 'AERA guidance' throughout the remainder of the report) produced by the Environment Agency is intended to assist operators in assessing risks to air when applying for a permit under the EP Regulations. This is part of the 'Risk assessments for specific activities: environmental permits' collection.

The EA also provides specific guidance for assessing impacts on ecological sites known as AQTAG.06[5].

2.2.2 Defra Local Air Quality Management Technical Guidance

Defra LAQM.TG(16) was published for use by LAs in their LAQM review and assessment work. The document provides key guidance in aspects of air quality assessment, including screening, use of monitoring data, and use of background data that are applicable to all air quality assessments.

2.2.3 Welsh Government, 'Local Air Quality Management in Wales', Policy Guidance, June 2017

The Welsh Government's LAQM in Wales Policy Guidance details the approach that Local Authorities should follow in carrying out their functions under Part IV of the Environment Act 1995. It states that they should adopt the five ways of working set out in the Well-being for Future Generations (Wales) Act 2015.

[4] https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit (accessed November 2019)
[5] AQTAG06 – Technical Guidance on detailed modelling approach for an appropriate assessment for emissions to air. Environment Agency, March 2014 version.

3.0 ASSESSMENT METHODOLOGY

The dispersion modelling has been undertaken with due consideration to the EA's AERA guidance. The modelling approach is based upon the following stages:

- review of plant specification and operational envelope to define emission sources, pollutant emission rates and characteristics;
- identification of sensitive receptors;
- compilation of the existing air quality baseline and review of LAQM status; and
- calculation of process contribution to ground level concentrations and evaluation against relevant environmental standards for both human and ecological receptors.

3.1 Quantification of Emissions

The emission parameters applied in the modelling are provided in Table 3-1 below and are based on stack NO_x monitoring undertaken at the Rotherham plant in November 2019[6]. Emissions of PM_{10} were based on monitoring undertaken at the Rotherham plant in September 2019[7].

Table 3-1
Emission Parameters

Parameter / Source	Stack A5
Stack Location (NGR x,y)	321483, 176275
Stack Height (m)	22
Stack Diameter (m)	1.5
Velocity (m/s)	12.7
Emission Temperature (C)	102
NO_x Emission rate (g/s)	0.09
PM_{10} Emission rate (g/s)	0.04

3.2 Model Setup

For this assessment the ADMS 5 model has been applied; this model is widely used and accepted by the EA for undertaking such assessments and is considered a suitable model for this type of assessment.

3.2.1 Model Domain / Receptors

The modelling has been undertaken using a receptor grid across a map of the study area. This allows for the maximum ground level concentration to be assessed.

A regular gridded output was applied as follows:

- x-coordinate: Start x320500, Finish x322500, Number of points: 101; and
- y-coordinate: Start y175500, Finish y177500, Number of points: 101.

[6] Socotec, Stack Emissions Monitoring Report. Harsco Metals Group Limited, Steelphalt Slag Reduction Co, The Ickles, Sheffield Road, Rotherham, November 2019.
[7] Socotec, Stack Emissions Monitoring Report. Harsco Metals Group Limited, Steelphalt Slag Reduction Co, The Ickles, Sheffield Road, Rotherham, September 2019.

In addition, the modelling of discrete sensitive receptor locations as described in Section 4.1 was undertaken to assess the impact at relevant exposure locations and facilitate the discussion of results.

3.2.2 Building Downwash

Building downwash occurs when turbulence, induced by nearby structures, causes pollutants emitted from an elevated source to be displaced and dispersed rapidly towards the ground, resulting in elevated ground level concentrations.

There are no significant solid structures in the vicinity of Stack A5 or between the stack and the Severn Estuary designated conservation sites which are approximately 320m to the south-east of the Site. As such, no buildings have been included in the model.

3.2.3 Meteorological Data and Preparation

The meteorological data provider was consulted for the closest and most representative dataset appropriate to the study area recording all the parameters necessary for dispersion modelling. The observation site selected for use in this assessment was Cardiff Airport approximately 17.5km to the south-west of the Site. Dispersion modelling has been undertaken using a 5-year dataset (2013, 2014, 2015, 2016 and 2018) to allow for the maximum predicted impacts to be presented. The 2018 windrose is presented in Figure 4-3.

Surface Roughness Length

A roughness length z_0 of 0.3m was used within the assessment area of this dispersion modelling study. This value of z_0 is comparable to 'agricultural areas (max)' and therefore considered appropriate for the morphology of the dispersion modelling assessment area. It also represents a worst-case assessment, as the surface roughness for open water (which largely surrounds the Site to the south) is significantly lower. In addition, this roughness length is the same as that used to represent the meteorological station that is also located within a coastal area.

Monin-Obukhov Length

The minimum Monin-Obukhov (MO) length is an important variable for dispersion models. The minimum MO length allows for the effect of heat production from the surrounding area. The larger the city, the larger the heat production (from buildings and traffic etc.) and the less stable the atmosphere. This effect is not taken into account within the meteorological data and therefore is input separately in to the model.

A minimum MO length of 10m was used within the assessment area of this dispersion modelling study. This value is considered to be appropriate for 'small towns <50,000 [population]' and considered to be representative of the immediate locale surrounding the Site and modelled receptors.

3.3 Assessment of Impacts on Air Quality

3.3.1 Operational Envelope

The processing of the model outputs has assumed that the plant operates 82% of the year.

3.3.2 Treatment of Model Output

The assessment of impacts against the standards as defined in Table 2-1 was undertaken using model output as described in Table 3-2 below.

With respect to NO_x emissions, it is considered given the nature of the generators and fuel that the primary NO_2 to NO_x ratio will be <10%[8]; therefore as per the EA Air Quality Modelling and Assessment Unit (AQMAU)

[8] https://www3.epa.gov/scram001/no2_isr_database.htm

guidance[9] on conversion ratio for NO_x and NO_2 it has been assumed that 70% of NO_x is present as NO_2 in relation to long term impacts and 35% of NO_x is present as NO_2 in relation to short-term impacts.

Table 3-2
Model Outputs

Averaging Period	Model Output – Process Contribution (PC)	Predicted Environmental Concentration (PEC)
1 hour mean (not to be exceeded more than 18 times a calendar year)	99.79%ile of 1-hour means for NO_2	PC + 2x annual mean background
Calendar year	Annual mean from 5 met. years	PC + annual mean background

3.3.3 Assessment of Impact and Significance

To assess the potential impact on air quality, the predicted exposure is compared to the standards and the results of the dispersion modelling have been presented in the form of:

- tabulated concentrations at discrete receptor locations to facilitate the discussion of results; and
- illustrations of the impact as isopleths (contours of concentration) for the criteria selected enabling determination of impact at any locations within the study area.

In accordance with the EA's AERA guidance, the impact is considered to be insignificant or negligible if:

- the long-term process contribution is <1% of the long term AQAL; and
- the short-term process contribution is <10% of the short term AQAL.

For process contributions that cannot be considered insignificant further assessment has been undertaken and the Predicted Environmental Concentration (PEC: PC + existing background pollutant concentration) determined for comparison as a percentage of the relevant EAL. The EA's AERA guidance indicates that no further assessment is required if the resulting PEC is below the EAL and the applied emission levels comply with the BAT requirements.

3.4 Assessment of Impacts on Vegetation and Ecosystems

3.4.1 Calculation of Contribution to Critical Loads

Deposition rates were calculated using empirical methods recommended by the EA AQTAG06[10]. Dry deposition flux was calculated using the following equation:

Dry deposition flux ($\mu g/m^2/s$) = ground level concentration ($\mu g/m^3$) x deposition velocity (m/s)

Wet deposition occurs via the incorporation of the pollutant into water droplets which are then removed in rain or snow and is not considered significant over short distances[10] compared with dry deposition and therefore for the purposes of this assessment, wet deposition has not been considered. The applied deposition velocities are as shown in Table 3-3.

[9] Environment Agency, Air Quality Modelling and Assessment Unit, 'Conversion Ratios for NO_x and NO_2' (no date)
[10] Environment Agency, AQTAG06 – Technical Guidance on detailed modelling approach for an appropriate assessment for emissions to air, March 2014 version.

Table 3-3
Applied Deposition Velocities

Chemical Species	Recommended deposition velocity (m/s)	
NO_2	Grassland	0.0015
	Woodland	0.0030

Critical Loads – Eutrophication

The C_{Lo}'s for nitrogen deposition (N) are recorded in units of kgN/ha/yr. The deposition PC is converted from µg/m^2/s to units of kgN/ha/year by multiplying the dry deposition flux by the standard conversion factor of 95.9.

Critical Loads – Acidification

The predicted deposition rates are converted to units of equivalents (k_{eq}/ha/year), which is a measure of how acidifying the chemical species can be, by multiplying the dry deposition flux (µg/m^2/s) by standard conversion factor of 6.84.

Calculation of PC as a percentage of Acid Critical Load Function

The calculation of the process contribution of N to the acid C_{Lo} function has been carried out according to the guidance on APIS, which is as follows:

> *'The potential impacts of additional sulphur and/or nitrogen deposition from a source are partly determined by PEC, because only if PEC of nitrogen deposition is greater than CLminN will the additional nitrogen deposition from the source contribute to acidity. Consequently, if PEC is less that CLminN only the acidifying affects of sulphur from the process need to be considered:*
>
> *Where PEC N Deposition < CLminN*
>
> *PC as % CL function = (PC S deposition/CLmaxS)*100*
>
> *Where PEC is greater than CLminN (the majority of cases), the combined inputs of sulphur and nitrogen need to be considered. In such cases, the total acidity input should be calculated as a proportion of the CLmaxN.*
>
> *Where PEC N Deposition > CLminN*
>
> *PC as %CL function = ((PC of S+N deposition)/CLmaxN)*100'*

3.4.2 Significance of Effect on Ecological Receptors

In addition to the AERA guidance, the EA's Operational Instruction 66_12[11] details how the air quality impacts on ecological sites should be assessed. This guidance provides risk-based screening criteria to determine whether impacts will have 'no likely significant effects (alone and in-combination)' for European sites, or 'no likely damage' for SSSI's, as follows:

- PC does not exceed 1% long-term C_{Le} and/or C_{Lo} or that the PEC does not exceed 70% long-term C_{Le} and/or C_{Lo} for European sites and SSSIs; and
- PC does not exceed 10% short-term C_{Le} for NO_x for European sites and SSSIs;

Where impacts cannot be classified as resulting in 'no likely significant effect', more detailed assessment may be required depending on the sensitivity of the feature in accordance with the EA's Operational Instruction 67_12

[11] EA Working Instruction 66_12 – Simple assessment of the impact of aerial emissions from new or expanding IPPC regulated industry for impacts on nature conservation

('*Detailed assessment of the impact of aerial emissions from new or expanding IPPC regulated industry for impacts on nature conservation*'). This can require the consideration of the potential for in-combination effects, the actual distribution of sensitive features within the site, and local factors (such as the water table).

The guidance provides the following further criteria:

- if the PEC does not exceed 100% of the appropriate limit it can be assumed there will be no adverse effect;
- if the background is below the limit, but a small PC leads to an exceedence – decision based on local considerations;
- if the background is currently above the limit and the additional PC will cause a small increase – decision based on local considerations;
- if the background is below the limit, but a significant PC leads to an exceedence – cannot conclude no adverse effect; and
- if the background is currently above the limit and the additional PC is large – cannot conclude no adverse effect.

4.0 BASELINE ENVIRONMENT

4.1 Site Setting and Sensitive Receptors

The Site is located in a heavily industrialised area, where air quality is influenced by emissions from existing industrial facilities, including the Celsa Steel works, as well as traffic along Rover Way. The Welsh Water Waste Water Treatment Works (WwTW) is located approximately 250m west from the operational area of the Site.

The Site setting and assessed receptor locations (as described in the following sections) are presented in Figure 4-1.

4.1.1 Human Receptors

According to LAQM.TG(16), air quality standards should only apply to locations where members of the public may be reasonably likely to be exposed to air pollution for the duration of the relevant limit value. As such, three nearby locations have been selected to inform the risk assessment in terms of relevant annual mean exposure (presented in Table 4-1 and Figure 4-1 as R1 to R3). Further, the dispersion modelling has been completed using a receptor grid to allow potential short-term exposure to be assessed at all locations surrounding the Site.

Table 4-1
Modelled Discrete Human Receptor Locations

Reference	NGR (x, y)	Description
R1	321899, 176750	Caravan Site
R2	321069, 176556	Residential – Willows Avenue
R3	321237, 176648	School – Willows High School

Figure 4-1
Site Setting

4.1.2 Ecological Receptors

The EA's guidance requires that designated ecological sites should be screened against relevant standards if they are located within the following set distances:

- Special Protection Areas (SPAs), Special Areas of Conservation (SACs) or Ramsar sites within 10km of the installation; and
- Sites of Special Scientific Interest (SSSIs), Local Nature Reserves (LNR), National Nature Reserves (NNR), Ancient Woodland (AW) and Sites of Interest for Nature Conservation (SINC) within 2km of the installation.

There are three designated sites within the relevant screening distances from the Site: the Severn Estuary Ramsar/SAC/SPA/SSSI which is approximately 320m to the south-east, Gwent Levels – Rumney and Peterstone SSSI which is approximately 1.8km north-east and Cardiff Beech Woods SAC which is approximately 9.9km to the north-west; details of which are presented in Table 4-2. The Severn Estuary designated sites were modelled as a receptor grid whilst the Gwent Levels SSSI and Cardiff Beech Woods SAC were modelled by selection of discrete receptors at the nearest boundary to the Site.

There are no designated LNR, NNR or Ancient Woodland AW within 2km of the installation[12]. However, there are nine SINCs within 2km of the Site boundary[13]. These have been represented in the model as discrete receptors on the nearest boundary of each SINC; as displayed in Figure 4-2.

[12] Lle – Map Browser, http://lle.gov.wales/map, accessed December 2019
[13] Cardiff Council, https://ishare.cardiff.gov.uk/, accessed December 2019

Table 4-2
Designated Ecological Sites

Interest Status	Site and Designation	Most Sensitive Interest Features
European	Severn Estuary Ramsar/SAC/SPA/SSSI	Valley mires, poor fens and transition mires
		Atlantic salt meadows
European	Cardiff Beech Woods SAC	Fagus woodland
National	Gwent Levels – Rumney and Peterstone SSSI	Standing open water and canals
Local	Tidal Sidings SINC	Rank calcareous grassland and budlia scrub
Local	Ocean Park South SINC	Rank calcareous grassland and budlia scrub
Local	Cardiff Heliport Fields SINC	Calcareous grassland
Local	Beach Sidings SINC	Calcareous grassland and scrub
Local	Pengam Moors SINC	Artificial habitat with strong maritime influences
Local	River Rhymney SINC	Important for migratory fish, otters, wildfowl and bankside vegetation
Local	Lamby Salt Marsh SINC	Remnant edges of the Lamby Saltings
Local	Lamby North SINC	Inland Salt Marsh
Local	Roath Brook SINC	Unimproved tributary with diverse bankside vegetation

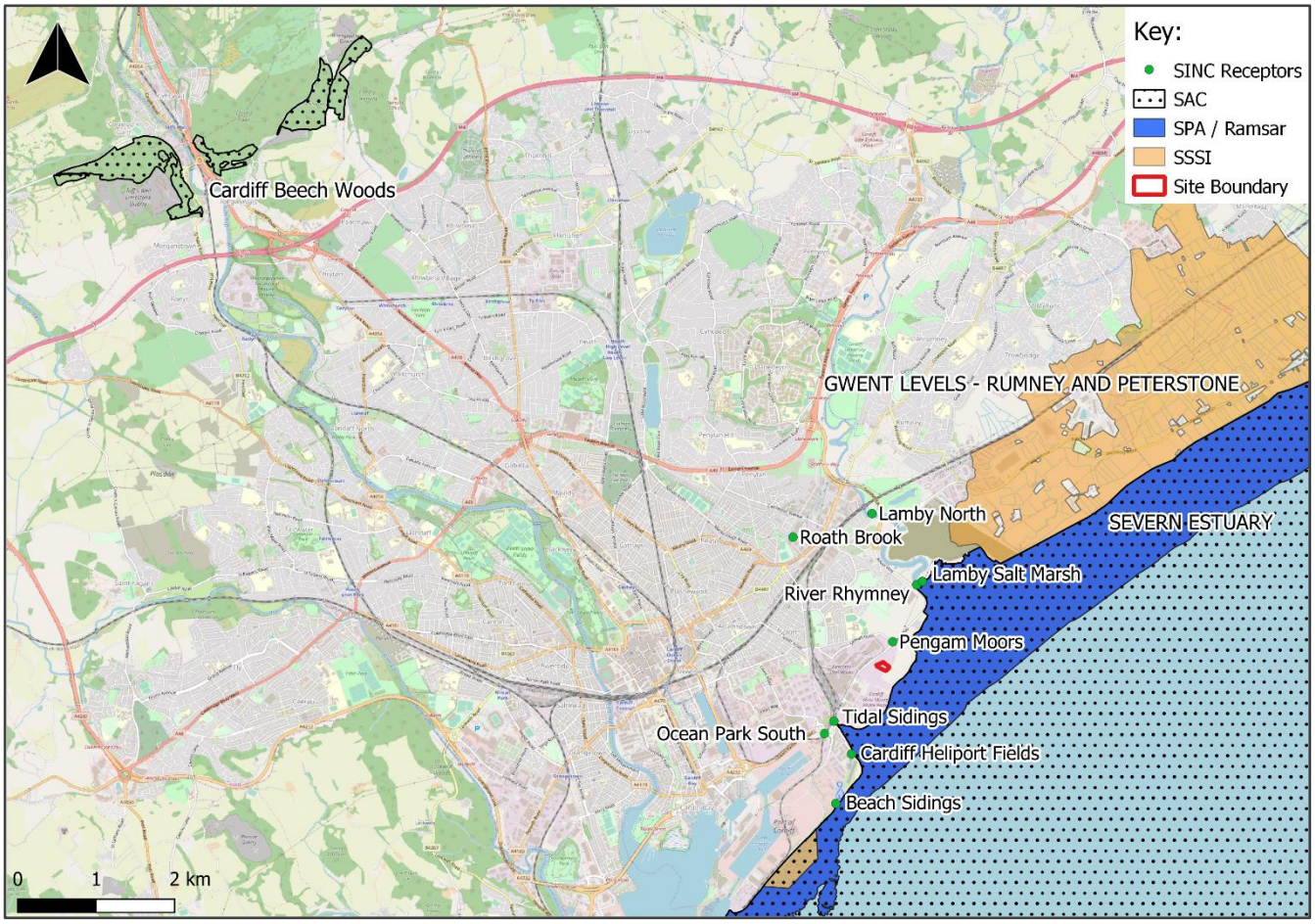

Figure 4-2
Modelled Designated Ecological Site Locations

4.2 Ambient Air Quality

4.2.1 Local Air Quality Management

The Site is within the administrative area of Cardiff Council (CC). CC has designated four AQMAs within their administrative area as part of their Review and Assessment work. The most relevant AQMAs are Stephenson Court AQMA and Cardiff City Centre AQMA, located approximately 2km and 2.8km north-east of the Site respectively. The AQMAs were designated due to exceedences of the annual mean AQS objective for NO_2.

4.2.2 Local Monitoring Data

According to CC 2018 Air Quality Progress Report[14], detailing the latest air quality monitoring in Cardiff, there are three automatic monitoring sites. However, as the Site is within an industrial area, data from the automatic monitoring station are not considered relevant as they are located either at roadside locations in the city centre or at urban traffic / urban background locations.

CC measures NO_2 concentrations with passive monitors (diffusion tubes) at 75 locations. There are three diffusion tubes located in relative proximity to the Site. A summary of the annual mean NO_2 concentrations recorded at these locations is presented in Table 4-3 and the locations of the tubes are shown in Figure 4-1.

Table 4-3
NO_2 Monitoring Results

Site	Classification	Distance from Site	Annual Mean Concentrations (µg/m³)				
			2013	2014	2015	2016	2017
169	Urban Centre	950m to the south-east	18.1	16.3	18.4	16.2	16.2
172	Roadside	750m to the west	47.8	44.5	48.8	43.5	43.5
173	Roadside	850m to the west	33.3	28.4	28.7 [(a)]	29.6	29.6

Table note:
[(a)] Data has been annualised according to the LAQM.TG(16) guidance.

4.2.3 Defra Modelled Background and Projections

Background pollutant concentration data on a 1km x 1km spatial resolution is provided by Defra through the UK Air Information Resource (UK AIR) website and is routinely used to support LAQM and Air Quality Assessments. The background pollutant concentrations are based upon a 2017 base year and projected to future years[15] (2019 is presented below). Mapped background concentrations of NO_2, PM_{10} and $PM_{2.5}$ were downloaded for the grid square containing the Site (NGR: x321500, y176500) and are displayed in Table 4-4.

Table 4-4
Defra Background Maps

National Grid Reference	Annual Mean Concentration (µg/m³)		
	2019 NO_2	2019 PM_{10}	2019 $PM_{2.5}$
x321500, y176500	16.1	14.6	10.2

[14] Cardiff Council, 2018 Annual Air Quality Progress Report for Cardiff Council, August 2018.
[15] Background mapping data for local authorities – http://uk-air.defra.gov.uk/data/laqm-background-home.

4.2.4 Application of Baseline Data in the Assessment

A range of discrete receptor locations around the Site have been modelled. The 2017 measured concentrations of NO_2 from the nearby diffusion tubes are between 16µg/m^3 and 44µg/m^3, however the tubes are located at the roadside and/or within built-up residential areas and therefore not considered representative of the background concentrations at sensitive receptor locations closest to the Site.

A cumulative assessment of impacts on the Atlantic Salt Marsh habitat of the Severn Estuary SAC presented within the air quality chapter of the ES took into account of impacts from road vehicle emissions (i.e. from the Asphalt Plant, the neighbouring committed Biomass plant and from local plan allocations). The maximum NO_x impact from traffic emissions was predicted at a location of the Severn Estuary nearest to Rover Way and therefore an area most impacted by road vehicle emissions. As the majority of the ecological designations and human receptors are located away from Rover way this assessment used the Defra 2019 predicted background concentrations.

4.3 Baseline Conditions at Ecological Receptors

The APIS website[16], a support tool for assessment of potential effects of air pollutants on habitats and species developed in partnership by the UK conservation agencies and regulatory agencies and the Centre for Ecology and Hydrology, has been used to provide information on NO_x concentrations, current deposition rates and C_{Lo} for nutrient nitrogen (Table 4-5) and C_{Lo} functions for acidity (Table 4-6) at the ecological receptors. The most sensitive habitat to nitrogen deposition and acid deposition has been selected for use in the assessment.

Table 4-5
Nitrogen Critical Loads and Current Loads

Site	APIS C_{Lo} Class (most sensitive first)	NO_x Annual Mean (µg/m^3)	C_{Lo} Range (kg N/ha/yr)	C_{Lo} Applied in Assessment (kg N/ha/yr)	Current Load (kg N/ha/yr)
Severn Estuary	Valley mires, poor fens and transition mires [(a)]	24.2	10-15	10	13.7
Cardiff Beech Woods	Fagus woodland	19.0	10-20	10	26.6
SINCS	Calcareous grassland	26.4	15-25	15	13.7

Table note:
[(a)] Listed as more sensitive on APIS in terms of C_{Lo} (10-15 kg N/ha/yr) when compared to Atlantic salt meadows which has a C_{Lo} of 20-30 kg N/ha/yr. Use of the Valley mires, poor fens and transition mires C_{Lo} therefore presents a more conservative assessment.
[(b)] Values for the Gwent Levels – Rumney and Peterstone SSSI are not available on APIS.
[(c)] The SINCs were assessed collectively against the most sensitive habitat of calcareous grassland.

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

Table 4-6
Acid Critical Load Functions and Current Loads

Site	APIS C_{Lo} Class (most sensitive first)	C_{Lo} Function (k_{eq}/ha/yr)			Current Load (k_{eq}/ha/yr)	
		CLmaxS	CLminN	CLmaxN	N	S
Severn Estuary	Valley mires, poor fens and transition mires	0.84	0.22	1.06	0.98	0.45
Cardiff Beech Woods	Fagus woodland	1.29	0.14	1.43	1.90	0.50
SINCs	Calcareous grassland	4.00	1.07	5.07	1.35	0.45

Table note:
(a) Values for the Gwent Levels – Rumney and Peterstone SSSI are not available on APIS.
(b) The SINCs were assessed collectively against the most sensitive habitat of calcareous grassland.

4.4 Meteorological Conditions

The 2018 windrose from the Cardiff Airport meteorological station, approximately 17.5km south-west of the Site, is presented in Figure 4-3 and shows the frequency of wind speed and direction used in the assessment.

It is evident that the majority of winds are from the west sector with winds from the east and south-east sectors occurring least frequently. On this basis, it is locations from the east and north-east sectors which have the highest potential for impacts from any emissions originating from the Site.

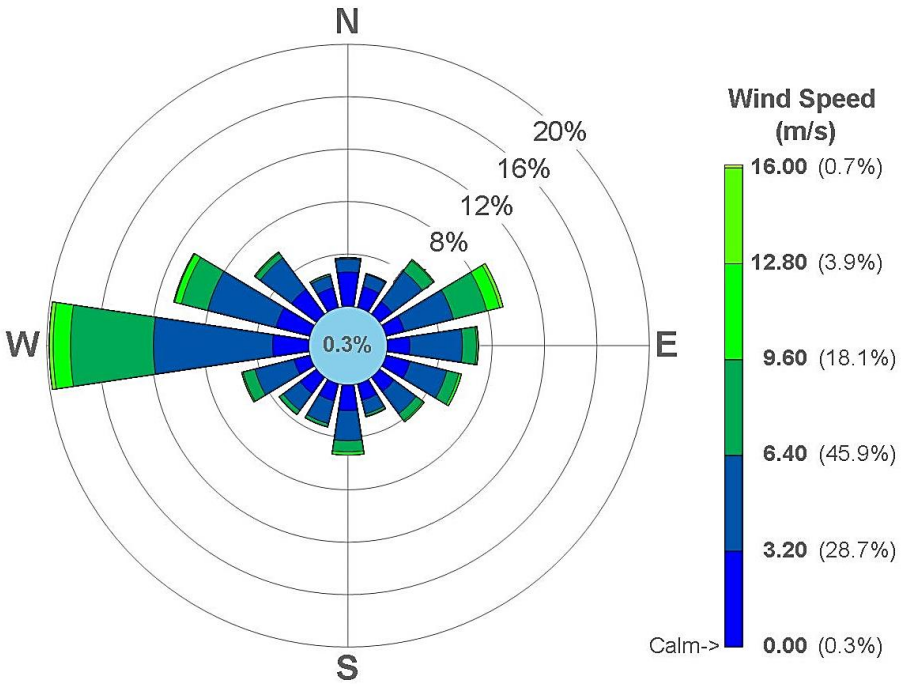

Figure 4-3
Windrose (2018)

5.0 ASSESSMENT RESULTS

5.1 NO_2 Impacts

Predicted annual mean NO_2 impacts at the modelled human receptor locations are summarised in Table 5-1 for an operational output of 82% per year. The maximum impact across the modelled receptor grid is also presented although not considered to be a location of relevant human exposure.

The PC impacts at all receptors are <1% of the standard and therefore impacts are deemed to be negligible at all receptors.

Table 5-1
Predicted NO_2 Annual Mean Impacts

Receptor	PC (µg/m³)	PC as % of Standard
Max. grid impact	0.10	0.2
R1	0.02	<0.1
R2	0.02	0.1
R3	0.02	<0.1

Predicted short-term (1 hour) impacts are summarised in Table 5-2. The PC impacts at all receptors are <1% of the standard and therefore impacts are classified as negligible. The maximum impact across the modelled receptor grid is also presented and occurs to the north of the Site at a location on Rover Way.

Table 5-2
Predicted NO_2 1-hr Mean (99.79%ile) Impacts

Receptor	PC (µg/m³)	PC as % of Standard
Max. grid impact	0.49	0.3
R1	0.18	0.1
R2	0.23	0.1
R3	0.25	0.1

5.2 PM_{10} Impacts

Predicted annual mean PM_{10} impacts at the modelled human receptor locations are summarised in Table 5-3 for an operational output of 82% per year. The maximum impact across the modelled receptor grid is also presented although not considered to be an area relevant to annual mean human exposure.

The PC impacts at all receptors are <1% of the standard and therefore impacts are deemed to be negligible at all receptors.

Table 5-3
Predicted PM_{10} Annual Mean Impacts

Receptor	PC (µg/m³)	PC as % of Standard
Max. grid impact	0.06	0.2
R1	0.01	<0.1
R2	0.01	<0.1

Receptor	PC (µg/m³)	PC as % of Standard
R3	0.01	<0.1

Predicted short-term (24 hour) impacts are summarised in Table 5-4. The PC impacts at all receptors are <1% of the standard and therefore impacts are classified as negligible. The maximum impact across the modelled receptor grid is also presented.

Table 5-4
Predicted PM_{10} 24-hr Mean (90.41%ile) Impacts

Receptor	PC (µg/m³)	PC as % of Standard
Max. grid impact	0.23	0.5
R1	0.04	0.1
R2	0.06	0.1
R3	0.05	0.1

On the basis of the level of impact, the overall effect on air quality is considered 'not significant'.

5.3 Impacts on Ecological Receptors

The maximum impacts on the identified designated conservation sites from emissions to air are presented in the sections below.

5.3.1 Critical Levels

The results of the assessment of impacts on C_{Le}'s are presented in Table 5-5 below. The findings are as follows:

- the PC is <1% of the long-term C_{Le} at all ecological receptors; and
- the PC is <10% of the short-term C_{Le} at all ecological receptors.

On this basis, the impacts are considered to cause 'no likely significant effect' to the Ramsar, SPA and SAC sites and 'no likely damage' to the SSSI and SINC sites.

Table 5-5
Impact on Critical Levels

Site	C_{Le} Level	PC (µg/m³)	PC as % of C_{Le}
Severn Estuary	NO_x Annual	0.11	0.4
	NO_x 24 hour	0.69	0.9
Cardiff Beech Woods	NO_x Annual	<0.01	<0.1
	NO_x 24 hour	0.01	<0.1
Gwent Levels	NO_x Annual	<0.01	<0.1
	NO_x 24 hour	0.08	0.1
Max. SINC impact	NO_x Annual	0.03	0.1
	NO_x 24 hour	0.52	0.7

As the PC's are all <1% of the long-term C_{Le}, the PEC's have not been presented here. The maximum SINC impact occurred at Pengam Moors – the closest SINC to the Site.

A cumulative assessment of impacts on the C_{Le} of the Atlantic Salt Marsh habitat of the Severn Estuary SAC presented within the air quality chapter of the ES took into account of impacts from road vehicle emissions (i.e. from the Asphalt Plant, the neighbouring committed Biomass plant and from local plan allocations). The maximum NO_x impact was predicted at a location of the Severn Estuary nearest to Rover Way and therefore an area most impacted by road vehicle emissions. The majority of the Severn Estuary designated nature conservation site is situated away from the roadside.

5.3.2 Impacts on Critical Loads

The results of the assessment are presented in Table 5-6 and Table 5-7. The findings are that the PC's do not exceed 1% of the C_{Lo}'s for the designated nature conservation sites. It has been concluded highly unlikely that the PC as % of C_{Lo} would exceed 1% at the Gwent Levels – Rumney and Peterstone SSSI. The maximum SINC impact occurred at Pengam Moors – the closest SINC to the Site.

On this basis, the impacts are considered to cause 'no likely significant effect' to the Ramsar, SPA and SAC sites and 'no likely damage' to the SSSI and SINC sites.

Table 5-6
Impact on Nitrogen Critical Load

Site	Applied C_{Lo} (kg N/ha/yr)	PC (kg N/ha/yr)	PC as % of C_{Lo}
Severn Estuary	10	0.01	0.1
Cardiff Beech Woods	10	<0.01	<0.1
Gwent Levels	- [(a)]	<0.01	- [(a)]
Max. SINC impact	15	<0.01	<0.1

Table note:
[(a)] C_{Lo} values for the Gwent Levels SSSI 'Standing open water and canals' habitat are not listed on APIS. However, a conclusion of impacts has been based on the fact that the PC's are <0.01.

Table 5-7
Impact on Acid Critical Load

Site	Applied C_{Lo} Max N (kg $_{eq}$/ha/yr)	N PC (kg $_{eq}$/ha/yr)	PC as % of C_{Lo}
Severn Estuary	1.06	<0.01	0.1
Cardiff Beech Woods	1.43	<0.01	<0.1
Gwent Levels	- [(a)]	<0.01	- [(a)]
Max. SINC impact	5.07	<0.01	<0.1

Table note:
[(a)] C_{Lo} values for the Gwent Levels SSSI 'Standing open water and canals' habitat are not listed on APIS. However, a conclusion of impacts has been based on the fact that the PC's are <0.01.

6.0 SUMMARY AND CONCLUSIONS

This AERA assessment has quantified and assessed the potential air quality impacts associated with emissions from the Site using Environment Agency approved techniques against published standards for the protection of human health and designated ecological sites.

The conclusions of the AERA assessment are as follows:

- the overall effect on air quality is considered 'not significant'; and
- the emissions from the plant are considered to cause 'no likely significant effect' to the Ramsar, SPA and SAC sites and 'no likely damage' to the SSSI and SINC sites.

APPENDIX A

Contour Plots

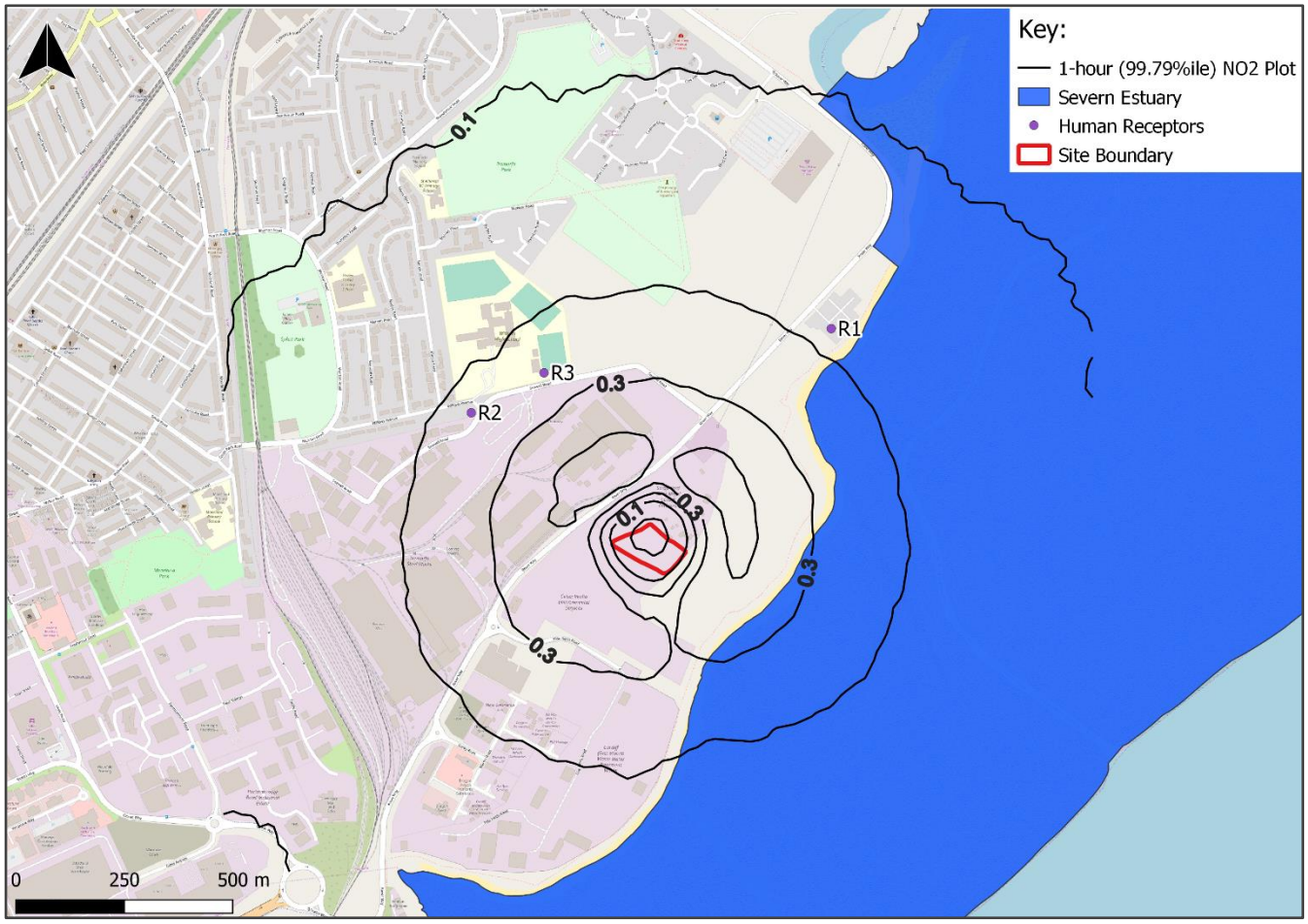

Table A-1
1-hour Mean (99.79%ile) NO_2 Contour Plot

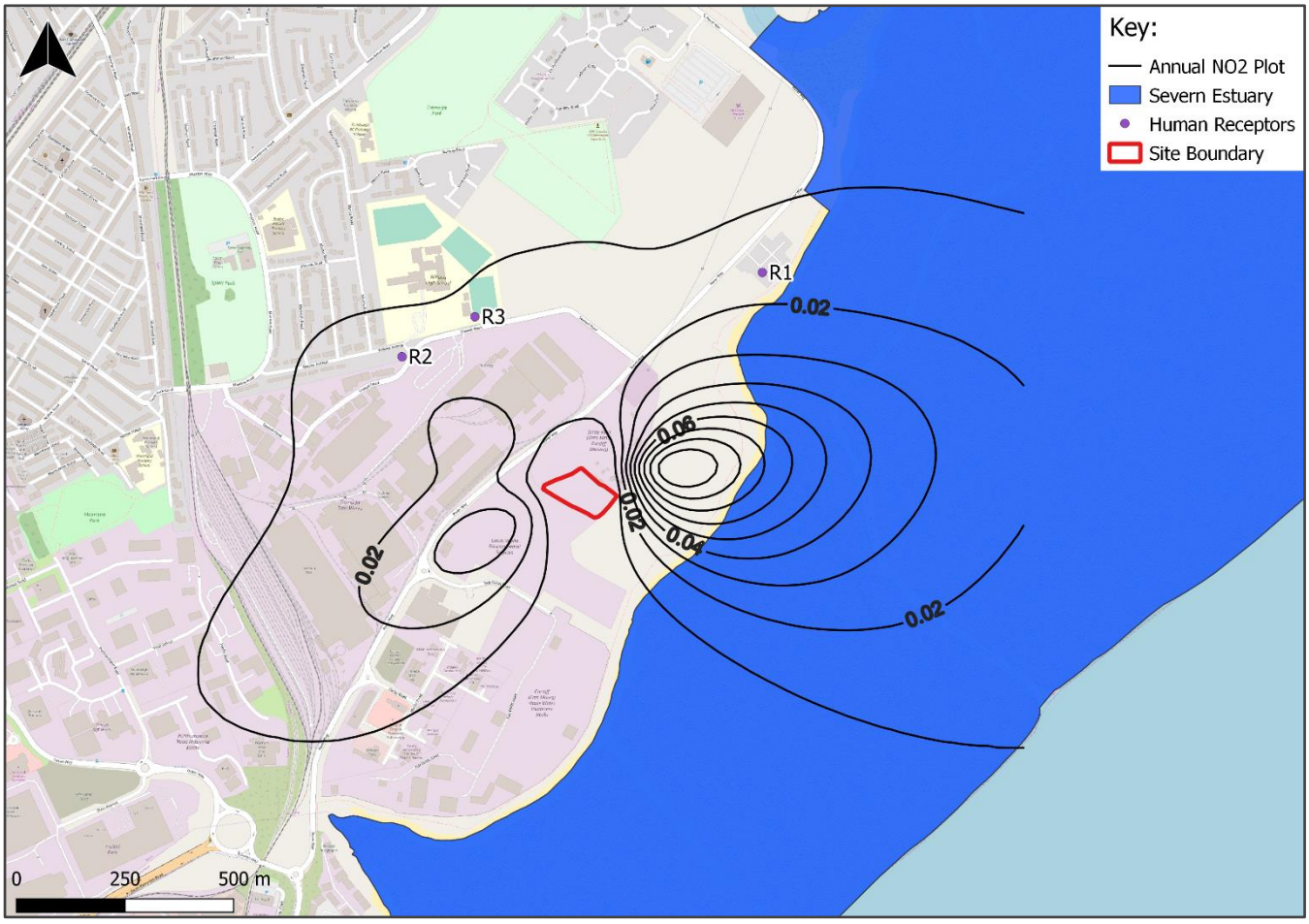

Table A-2
Annual Mean NO_2 Contour Plot

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