Celsa Steel, Rover Way

Air Emissions Risk Assessment

Harsco Metals Group Limited

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Basis of Report

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1.0 Introduction

SLR Consulting Limited (SLR) has been commissioned by Harsco Metals Group Limited to undertake an Air Emissions Risk Assessment (AERA) to support their Environmental Permit (EP) Variation application for the Celsa Steel Asphalt Plant, located on land to the south of Rover Way, Cardiff ('the Site').

1.1 Background

Reference should be made to the supporting statement to the EP Variation application for a comprehensive background and description of the installation. This report is concerned with emissions to air only.

The primary 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), in relation to the original permit application, 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 Legislation and Relevant Guidance

2.1 Environmental Permitting Regulations

The Site will be regulated under the Environmental Permitting (England and Wales) Amendment Regulations 2016 (as amended).

The Environmental Permitting Regulations include requirements on operating conditions, monitoring and ELVs that would be incorporated into the site's Permit and would be enforceable by the NRW.

Various guidance documents are provided by NRW and EA with respect the operation and assessment of impacts from facilities regulated under EP Regulation. Key to AERAs is the 'Air Emissions Risk Assessment for your Environmental Permit' (AERA) guidance.

2.2 Air Quality Legislation and Guidance

2.2.1 Air Quality Standards Regulations

The Air Quality Standards Regulations 2010[1] (AQSR) transpose both the EU Ambient Air Quality Directive (2008/50/EC), and the Fourth Daughter Directive (2004/107/EC) within UK legislation, in order to align and mirror European obligations. The regulations set Limit Values, Target Values, and Objectives for the protection of human health and the environment (collectively termed Air Quality Assessment Levels (AQALs) throughout this report). Following the UK's withdrawal from the EU, the Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020[2] was introduced to mirror revisions to supporting EU legislation. The AQALs of relevance in this assessment are provided in Table 2-1.

Table 2-1: Applied AQALs

Pollutant	AQAL (µg/m^3)	Averaging Period
Nitrogen Dioxide (NO_2)	40	Annual mean
	200	1-hour mean (not to be exceeded on more than 18 occasions 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 on more than 35 occasions per year)
Particulate matter with an aerodynamic diameter of less than 2.5µm ($PM_{2.5}$) (gravimetric)	20	Annual mean
Table note: *C_{Le} for protection of vegetation		

[1] The Air Quality Standards Regulations (England) 2010, Statutory Instrument No 1001, The Stationary Office Limited.

[2] The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020, Statutory Instrument No. 1313, The Stationary Office Limited.

Defra has published Technical Guidance (TG) for use in Local Air Quality Management (LAQM)[3]. According to LAQM.TG(22), AQALs 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).

Table 2-2: Human Health Relevant Exposure

Averaging Period	AQALs Should Apply At:	AQALs Should Not Apply At:
Annual mean	Building facades of residential properties, schools, hospitals etc.	Facades of offices or other places of work Hotels Gardens of residences Kerbside sites
24-hour mean	As above together with hotels and gardens of residential properties	Kerbside sites where public exposure is expected to be short term
1-hour mean	As above together with hotels, gardens of residential properties, kerbside sites of regular access, car parks, bus stations etc.	Kerbside sites where public would not be expected to have regular access

2.2.2 Local Air Quality Management

Part IV of the Environment Act 1995 requires local authorities to undergo a process of Local Air Quality Management (LAQM). This requires local authorities to Review and Assess air quality within their boundaries to determine the likeliness of compliance, regularly and systematically.

Where any of the prescribed AQS objectives are not likely to be achieved, the authority must designate an Air Quality Management Area (AQMA). For each AQMA, the local authority is required to prepare an Air Quality Action Plan (AQAP), which details measures the authority intends to introduce to deliver improvements in local air quality in pursuit of the objective. Local authorities therefore have formal powers to control air quality through a combination of LAQM and through application of wider planning policies.

Defra has published technical guidance for use by local authorities in their LAQM review and assessment work[4] – referred to as LAQM.TG(22) throughout this report.

2.3 Protection of Nature Conservation Sites

Sites of nature conservation importance are provided environmental protection from developments, including from atmospheric emissions. AQALs for the protection of ecological receptors are known as Critical Levels (CLe) for airborne concentrations and Critical Loads (CLo) for deposition to land from air.

The AERA guidance provides screening distances for the assessment of habitat sites. For Sites of Special Scientific Interest (SSSIs) and local nature sites, the distances extend to

[3] Defra: Local Air Quality Management Review and Assessment Technical Guidance LAQM.TG(22), 2022.

[4] Local Air Quality Management Technical Guidance 22, Published by Defra in partnership with the Scottish Government, Welsh Government and Department of Agriculture, Environment and Rural Affairs Northern Ireland. August 2022.

2km. Whilst, for Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Ramsar sites, the distances extend to 10km.

2.3.1 Critical Levels (CLe)

CLe are a quantitative estimate of exposure to one or more airborne pollutants in gaseous form, below which significant harmful effects on sensitive elements of the environment do not occur, according to present knowledge. The relevant CLe for the protection of vegetation and ecosystems are presented in Table 2-3.

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

Pollutant	CLe (µg/m^3)	Averaging Period and Habitat
NO_x	30	Annual mean (all ecosystems)
	75	Daily mean (all ecosystems)

2.3.2 Critical Loads (CLo)

CLo are a quantitative estimate of exposure to deposition of one or more pollutants, below which significant harmful effects on sensitive elements of the environment do not occur, according to present knowledge.

CLo are set for the deposition of various substances to sensitive ecosystems. In relation to combustion emissions CLo for acidification are relevant which can occur via both wet and dry deposition; however, on a local scale only dry (direct deposition) is considered significant. Deposition of nitrogen can cause eutrophication and acidification.

Nutrient nitrogen and acidification Critical Loads are site specific. Critical Loads for the habitats and species of relevance to this assessment have been obtained from the Air Pollution Information System (APIS) website[5]. The most sensitive habitat listed (that is present in the study area) has been used / provided to facilitate a worst-case assessment. The relevant CLo are presented in Section 4.3.

2.4 Assessment Guidance Documents

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

2.4.1 EA and NRW Guidance for Air Emissions Risk Assessments

Guidance Notes produced by Defra provide a framework for the regulation of installations and additional technical guidance produced by the EA is used to provide the basis for permit conditions. Of particular relevance to the assessment of air quality impacts is the EA's '*air emission risk assessment for your environmental permit*' guidance[6] (referred to as the 'AERA guidance' throughout this report). The purpose of this guidance is to assist operators to assess risks to the air environment and human health when applying for a permit under the EP Regulations.

The EA also provides specific guidance for assessing impacts on ecological sites known as AQTAG.06[7].

[5] Air Pollution Information System http://www.apis.ac.uk/

[6] https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit.

[7] AQTAG06 – Technical Guidance on detailed modelling approach for an appropriate assessment for emissions to air. Environment Agency, March 2014 version.

2.4.2 Defra Local Air Quality Management Technical Guidance

Defra LAQM.TG(22) 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.

3.0 Assessment Methodology

The dispersion modelling has been undertaken with due consideration to the EA's AERA guidance, which is referred to by NRW. 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 (GLC) 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. The emission parameters have been input on the basis of manufacturer's design specifications and stack emission monitoring reports. The emission concentrations are compliant with the relevant EP ELVs.

Table 3-1: Emission Parameters

Parameter	Stack A5
Stack Location (NGR x,y)	321477, 176265
Stack Height (m)	22
Stack Diameter (m)	1.4
Actual Volumetric Flow Rate (Am^3/s)	18.01
Velocity (m/s)	11.7
Emission Temperature (°C)	55.8
Normalised Volumetric Flow Rate (Nm^3/s)	15.06
NO_x Emission Concentration (mg/Nm^3) (A)	12
PM_{10} Emission Concentration (mg/Nm^3) (A)	20
NO_x Emission Rate (g/s)	0.181
PM_{10} Emission rate (g/s)	0.301

Table notes:

(A) The reference conditions for the limits are: 273.1K, 101.3kPa, without correction for water vapour content.

3.2 Dispersion Model Setup

For this assessment the ADMS 6 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.

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 GLC. Building downwash has been considered for buildings that have a maximum height equivalent to at least 40% of the emission height and which are within a distance defined as five times the lesser of the height or maximum projected width of the building.

Structures input to the model are represented in Figure 3-1.

3.2.3 Meteorological Data and Preparation

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 3-year dataset (2021, 2022 and 2023) to allow for the maximum predicted impacts to be presented. The 2023 windrose is presented in Figure 4-1.

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.

The minimum Monin-Obukhov (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 into 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.

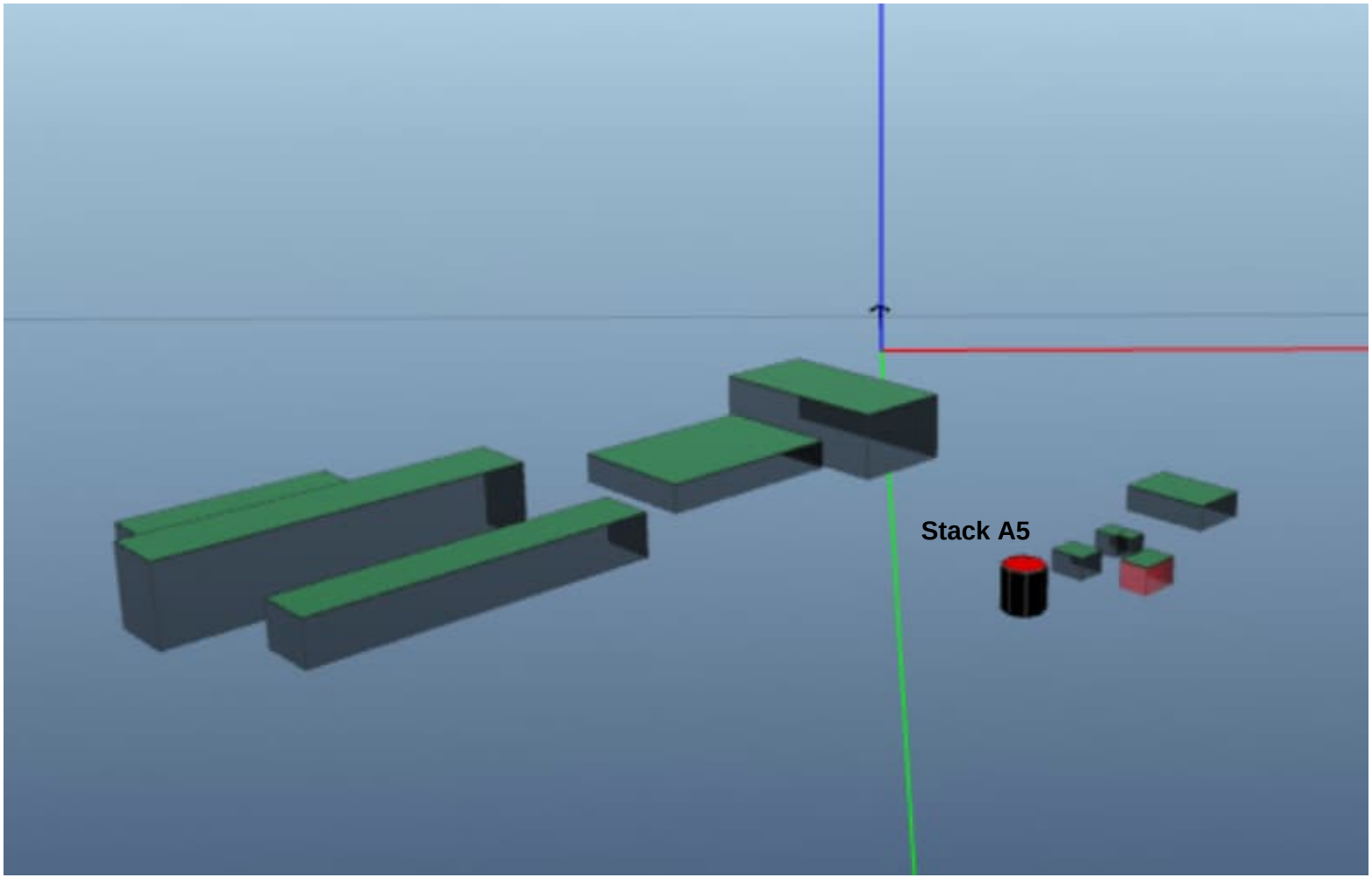

Figure 3-1: Modelled Buildings and Structures

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 100% of the year.

3.3.2 Treatment of Model Output

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

With respect to NO_x emissions as per the EA Air Quality Modelling and Assessment Unit (AQMAU) guidance[8] 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 (NO_2) from 3 met. years	PC + 2 x annual mean background
24-hour mean (not to be exceeded on more than 35 occasions per year)	90.41%ile of 24-hour means (PM_{10}) from 3 met. years	PC + annual mean background
Calendar year	Annual mean (NOx, NO_2 and PM_{10}) from 3 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 AQALs, 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 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.

[8] Environment Agency, Air Quality Modelling and Assessment Unit, 'Conversion Ratios for NO_x and NO_2' (no date)

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[9]. Dry deposition flux was calculated using the following equation:

> Dry deposition flux (µg/m^2/s) = ground level concentration (µg/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 (AQTAG06) 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.

Table 3-3: Applied Deposition Velocities

Chemical Species	Recommended Deposition Velocity (m/s)	
NO_2	Grassland	0.0015
	Woodland	0.0030

3.4.1.1 Critical Loads – Eutrophication

The CLo 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.

3.4.1.2 Critical Loads – Acidification

The predicted deposition rates are converted to units of equivalents (keq/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 the standard conversion factor of 6.84.

3.4.1.3 Calculation of PC as a percentage of Acid Critical Load Function

The calculation of the process contribution of N to the acid CLo function has been carried out according to the guidance on the Air Pollution Information System (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.*

[9] Environment Agency, AQTAG06 – Technical Guidance on detailed modelling approach for an appropriate assessment for emissions to air, March 2014 version.

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[10] 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 international sites, 'no likely damage' for Sites of Special Scientific Interest (SSSI) and 'no significant pollution' for other sites, as follows:

- PC does not exceed 1% long-term CLe and/or CLo or that the PEC does not exceed 70% long-term CLe and/or CLo for International sites and SSSIs;
- PC does not exceed 10% short-term CLe for NOx for International sites and SSSIs;
- PC does not exceed 100% long-term CLe and/or CLo other conservation sites; and
- PC does not exceed 100% short-term CLe for NO_x for other conservation sites.

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]. This can require the consideration of 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 exceedance – 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 exceedance – 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.

[10] 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.

[11] EA Working Instruction 67_12 – Detailed assessment of the impact of aerial emissions from new or expanding IPPC regulated industry for impacts on nature conservation.

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 Wastewater Treatment Works is located approximately 250m west from the operational area of the Site. The Site setting and assessed receptor locations are described in the following sections.

4.1.1 Human Receptors

According to LAQM.TG(22), the AQALs 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 AQAL. As such, several locations surrounding the Site have been selected to inform the risk assessment in terms of relevant annual mean exposure (presented in Table 4-1). The selected receptor locations have been modelled at a height of 1.0 (HR3) - 1.5m (HR1 and HR2).

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 Human Receptor Locations

ID	Description	NGR-X	NGR-Y
HR1	Caravan Site	321899	176750
HR2	Residential – Willows Avenue	321069	176556
HR3	School – Willows High School	321237	176648

4.1.2 Ecological Receptors

The details of the designated ecological sites present within the relevant screening distances from the Site are presented in Table 4-2 and displayed in Figure 4-2.

Table 4-2: Assessed Designated Ecological Sites

ID	Site and Designation	Approx. Distance to A5 Source (km)
ER1	Severn Estuary Ramsar/SAC/SPA/SSSI	0.3
ER2	Cardiff Beech Woods SAC	9.8
ER3	Gwent Levels – Rumney and Peterstone SSSI	1.8
ER4	Tidal Sidings SINC	0.9
ER5	Ocean Park South SINC	1.2
ER6	Cardiff Heliport Fields SINC	1.2
ER7	Beach Sidings SINC	1.9
ER8	Pengam Moors SINC	0.3
ER9	River Rhymney SINC	1.1
ER10	Lamby Salt Marsh SINC	1.2
ER11	Lamby North SINC	1.9

ID	Site and Designation	Approx. Distance to A5 Source (km)
ER12	Roath Brook SINC	2.0

4.2 Baseline Conditions at Human Receptors

4.2.1 Local Air Quality Management

The Site is located 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 closest AQMAs to the Site are Stephenson Court AQMA and Cardiff City Centre AQMA, located approximately 2km and 2.8km north-east of the Site respectively. These AQMAs are designated due to exceedances of the annual mean AQS objective for NO_2. However, given the separation distance between the Site and the AQMAs they have not been considered further within the AERA.

4.2.2 Local Monitoring Data

A review of LAQM monitoring data (collected outside of the COVID-19 pandemic), undertaken by CC, has been undertaken. Moreover, a review has been undertaken of Defra's automatic monitoring network: the Automatic Urban and Rural Network[12] (AURN). As all LAQM and AURN monitoring locations are situated at a distance of over 1.5km from the Site, they are not considered representative of the AERA study area and therefore have not been considered further.

4.2.3 Defra Mapped Background Concentrations

Defra maintains a nationwide model of existing and future background air quality concentrations at a 1km grid square resolution which is routinely used to support LAQM requirements and air quality assessments. The data sets include annual average concentration estimates for NO_2 using a reference year of 2018 (the year in which comparisons between modelled and monitored concentrations are made).

The Defra mapped annual mean background concentrations for a base year of 2024 for the grid square(s) containing the modelled receptors are presented in Table 4-3.

All of the mapped background concentrations presented are well below the respective annual mean AQALs.

Table 4-3: Defra Mapped Background Pollutant Concentrations

Grid Square (X, Y)	Year	Annual Mean Background Concentration (µg/m^3)		
		NO_2	PM_{10}	$PM_{2.5}$
321500, 176500	2024	12.3	12.6	7.9

4.2.4 Application of Baseline Data in the Assessment

For all human receptors, the corresponding mapped Defra background annual mean pollutant concentrations for the relevant grid squares have been applied.

[12] Automatic Urban and Rural Network (AURN) - Defra, UK.

4.3 Baseline Conditions at Ecological Receptors

The APIS website[13], 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 CLo for nutrient nitrogen (Table 4-4Table 4-4) and CLo functions for acidity (Table 4-5Table 4-5) at the ecological receptors. The most sensitive habitat to nitrogen deposition and acid deposition has been selected for use in the assessment.

Table 4-4: NO_x Backgrounds, Nitrogen Critical Loads and Current Loads

Site	APIS CLo Class	NO_x Annual Mean (µg/m^3)	CLo Range (kg N/ha/yr)	CLo Applied in Assessment (kg N/ha/yr)	Current Load (kg N/ha/yr)
Severn Estuary	Valley mires, poor fens and transition mires / Atlantic salt meadows	26.1	10-20	10	12.2
Cardiff Beech Woods	Fagus woodland	18.1	10-20	10	22.6
Gwent Levels – Rumney and Peterstone	Standing open water and canals [(a)]	18.6	N.A.	N.A.	12.5
SINCs	Calcareous grassland [(b)]	26.1	5-20	5	12.5

Table note:
[(a)] CLo values for the Gwent Levels – Rumney and Peterstone SSSI are not available on APIS (standing open water and canals).
[(b)] The SINCs were assessed collectively against the most sensitive CLo and highest background conditions.

Table 4-5: Acid Critical Load Functions and Current Loads

Site	APIS CLo Class	CLo Function (keq/ha/yr)		Current Load (keq/ha/yr)
		CLminN	CLmaxN	N
Severn Estuary	Valley mires, poor fens and transition mires / Atlantic salt meadows	0.856	4.856	1.1
Cardiff Beech Woods	Fagus woodland	0.142	1.428	1.8
Gwent Levels – Rumney	Standing open water and canals [(a)]	N.A.	N.A.	1.1

[13] http://www.apis.ac.uk/ accessed September 2023.

Site	APIS CLo Class	CLo Function (keq/ha/yr)		Current Load (keq/ha/yr)
		CLminN	CLmaxN	N
and Peterstone				
SINCs	Calcareous grassland [b]	1.071	5.071	1.1

Table note:
[a] CLo values for the Gwent Levels – Rumney and Peterstone SSSI are not available on APIS (standing open water and canals).
[b] The SINCs were assessed collectively against the most sensitive CLo and highest background conditions.

4.4 Meteorological Conditions

The 2023 windrose from the Cardiff Airport meteorological station, approximately 17.5km south-west of the Site, is presented in Figure 4-1 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 south-east to north-east sectors which have the highest potential for impacts from any emissions originating from the Site.

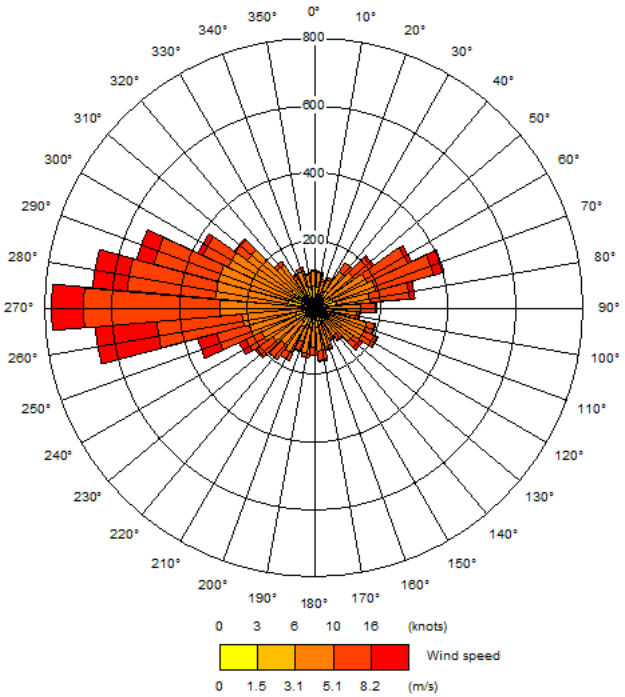

Figure 4-1: Windroses from Cardiff Airport (2023)

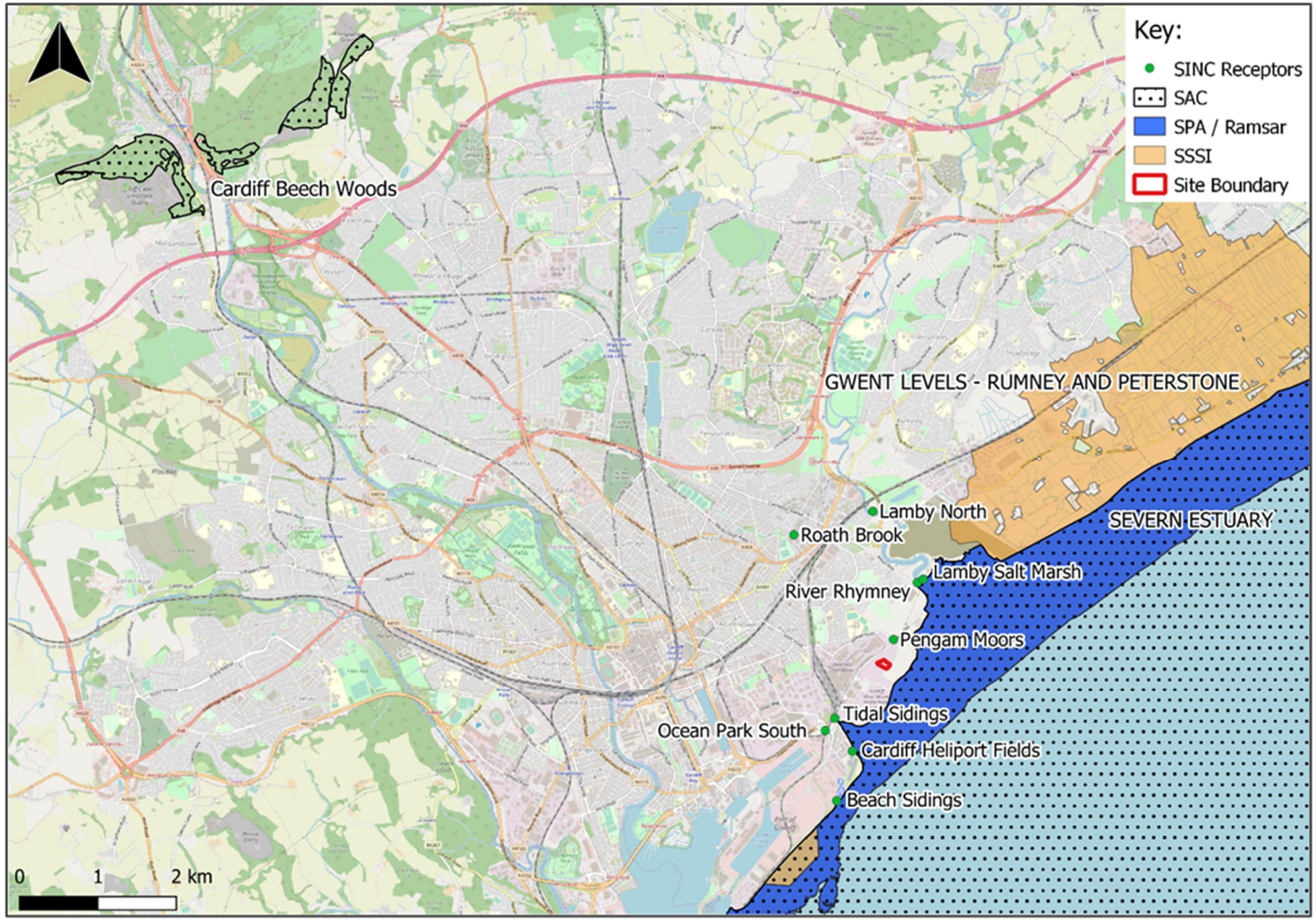

Figure 4-2: Modelled Designated Ecological Sites

5.0 Assessment Results

5.1 Impacts on Human Receptors

5.1.1 Annual Mean NO_2 Impacts

Predicted annual mean NO_2 impacts at the modelled receptor locations are summarised in Table 5-1 (an isopleth plot is presented in Appendix B) for an operational output of 100% per year. The maximum impact across the modelled receptor grid is also presented although not considered to be a location of relevant human exposure. Contour plots for NO_2 impacts are presented in Appendix B.

The PC impacts at all receptors are <1% of the AQAL and therefore impacts are deemed to be negligible at all receptors. It is noted that the maximum grid impact (not considered a location of relevant exposure) is over 1%, however the PEC is < 70% of the AQAL.

Table 5-1: Predicted Annual Mean NO_2 Impacts

ID	PC (µg/m^3)	PC as % of AQAL
Max. grid impact [(A)]	0.40	1.0%
R1	0.04	0.1%
R2	0.05	0.1%
R3	0.06	0.1%

Table note:
[(A)] The PEC is 12.7µg/m^3 and therefore <70% of the AQAL and not significant.

5.1.2 1-hour Mean (99.79%ile) NO_2 Impacts

The maximum predicted short-term NO_2 impacts at the modelled receptor locations are summarised in Table 5-2.

The PC impacts at all receptors are <10% of the AQAL and therefore impacts are classified as insignificant. The maximum impact across the modelled receptor grid is also presented and falls below <10% of the AQAL.

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

ID	PC (µg/m^3)	PC as % of AQAL
Max. grid impact	3.66	1.8%
R1	0.48	0.2%
R2	0.58	0.3%
R3	0.74	0.4%

5.1.3 Annual Mean PM_{10} Impacts

Predicted annual mean PM_{10} impacts at the modelled receptor locations are summarised in Table 5-3 for an operational output of 100% 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 AQAL and therefore impacts are deemed to be negligible at all receptors. It is noted that the maximum grid impact (not considered a location of relevant exposure) is over 1%, however the PEC is < 70% of the AQAL.

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

ID	PC (µg/m^3)	PC as % of AQAL
Max. grid impact [(A)]	0.95	2.4%
R1	0.10	0.3%
R2	0.12	0.3%
R3	0.14	0.3%

Table note:
[(A)] The PEC is 13.5µg/m^3 and therefore <70% of the AQAL and not significant.

Predicted short-term (24 hour) impacts are summarised in Table 5-4. The PC impacts at all receptors are <10% of the AQAL and therefore impacts are classified as insignificant. The maximum impact across the modelled receptor grid is also presented.

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

ID	PC (µg/m^3)	PC as % of AQAL
Max. grid impact	3.17	6.3%
R1	0.35	0.7%
R2	0.45	0.9%
R3	0.49	1.0%

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

5.1.4 Annual Mean $PM_{2.5}$ Impacts

Predicted annual mean $PM_{2.5}$ impacts (conservatively assuming all fine particulate matter comprises $PM_{2.5}$) at the modelled receptor locations are summarised in Table 5-5 for an operational output of 100% 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 AQAL and therefore impacts are deemed to be insignificant at all receptors. It is noted that the maximum grid impact (not considered a location of relevant exposure) is over 1%, however the PEC is < 70% of the AQAL.

Table 5-5: Predicted Annual Mean $PM_{2.5}$ Impacts

ID	PC (µg/m^3)	PC as % of AQAL
Max. grid impact [(A)]	0.95	4.7%
R1	0.10	0.5%
R2	0.12	0.6%
R3	0.14	0.7%

Table note:
[(A)] The PEC is 8.8µg/m^3 and therefore <70% of the AQAL and not significant.

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

5.2 Impacts on Ecological Receptors

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

5.2.1 Critical Levels

The results of the assessment of impacts on CLe are presented in Table 5-6. 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, 'no likely damage' to the SSSI and 'no significant pollution' to the SINC sites.

Table 5-6: Impacts on Critical Levels

Site	CLe	PC (µg/m^3)	PC as % of CLe
Severn Estuary	NO_x Annual	0.07	0.2%
	NO_x 24 hour	0.74	1.0%
Cardiff Beech Woods	NO_x Annual	<0.01	<0.1%
	NO_x 24 hour	0.02	<0.1%
Gwent Levels	NO_x Annual	0.01	<0.1%
	NO_x 24 hour	0.14	0.2%
Max. SINC impact	NO_x Annual	0.10	0.3%
	NO_x 24 hour	1.36	1.8%

5.2.2 Critical Loads

The results of the assessment are presented in Table 5-7 and Table 5-8. The findings are that the PC's do not exceed 1% of the C_{Lo} for the designated nature conservation sites.

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

Table 5-7: Impact on Nitrogen Critical Load

Site	Applied CLo (kg N/ha/yr)	PC (kg N/ha/yr)	PC as % of CLo
Severn Estuary	10	0.01	0.1%
Cardiff Beech Woods	10	<0.01	<0.1%
Gwent Levels	- [(A)]	<0.01	- [(A)]
Max. SINC impact	5	0.01	0.2%

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 kg N/ha/yr.

Table 5-8: Impact on Acid Critical Load

Site	Applied CLo (keq/ha/yr)	PC (keq/ha/yr)	PC as % of CLo
Severn Estuary	4.86	<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 kg N/ha/yr.

6.0 Summary and Conclusions

This AERA has quantified and assessed the potential air quality impacts associated with point source A5 emissions from the Site using NRW approved techniques against published AQALs for the protection of human health and designated ecological sites.

The conclusions of the AERA 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, ‘no likely damage’ to the SSSI and ‘no significant pollution’ to the SINC sites.

Appendix A Operating Scenarios Sensitivity Test

Celsa Steel, Rover Way

Air Emissions Risk Assessment

Harsco Metals Group Limited

SLR Project No.: 422.065025.00001

17 May 2024

Introduction

A sensitivity test has undertaken based around the plant operating at 100, 75 and 35% capacity. The results provided within the main assessment scenario correspond to normal operating conditions, which are assumed to comprise 50% capacity. The emission concentrations applied for PM_{10} and NO_X were 20mg/m^3 and 12mg/m^3, respectively, as per the main assessment scenario.

Table A-1: Emission Parameters

Plant Capacity	Exit Velocity (m/s)	Actual Volume Flow Rate (Am^3/s)	Normalised Volume Flow |ate (Nm^3/s) [(a)]	PM_{10} Emission Rate (g/s)	NO_2 Emission Rate (g/s)
100%	23.4	36.0	30.1	0.60	0.36
75%	17.6	27.0	22.6	0.45	0.27
35%	8.2	12.6	10.5	0.21	0.13
Table note: At reference conditions: 273.1K, 101.3kPa, without correction for water vapour content.					

Results

The most relevant pollutant and averaging period for the sensitivity test is the long-term NO_x and NO_2. Table A-2 presents annual NO_x impacts over the Severn Estuary SAC.

Table A-2: Annual NOx Impacts over the Severn Estuary SAC

Scenario	PC (µg/m^3)	PC as % of AQAL
100% load	0.10	0.3%
75% load	0.09	0.3%
35% load	0.05	0.2%

Table A-3 presents annual NO_2 impacts at residential receptor R3 (the receptor with the highest impact from the main assessment scenario).

Table A-3: Annual NO_2 Impacts at Residential Receptor R3

Scenario	PC (µg/m^3)	PC as % of AQAL
100% load	0.08	0.2%
75% load	0.07	0.2%
35% load	0.05	0.1%

Appendix B Contour Plots

Celsa Steel, Rover Way

Air Emissions Risk Assessment

Harsco Metals Group Limited

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Figure B-1: 1-hour Mean (99.79%ile) NO_2 Process Contribution (2021)

Figure B-2: Annual Mean NO_2 Process Contribution (2021)

Appendix C Model Files (electronic only)

Celsa Steel, Rover Way

Air Emissions Risk Assessment

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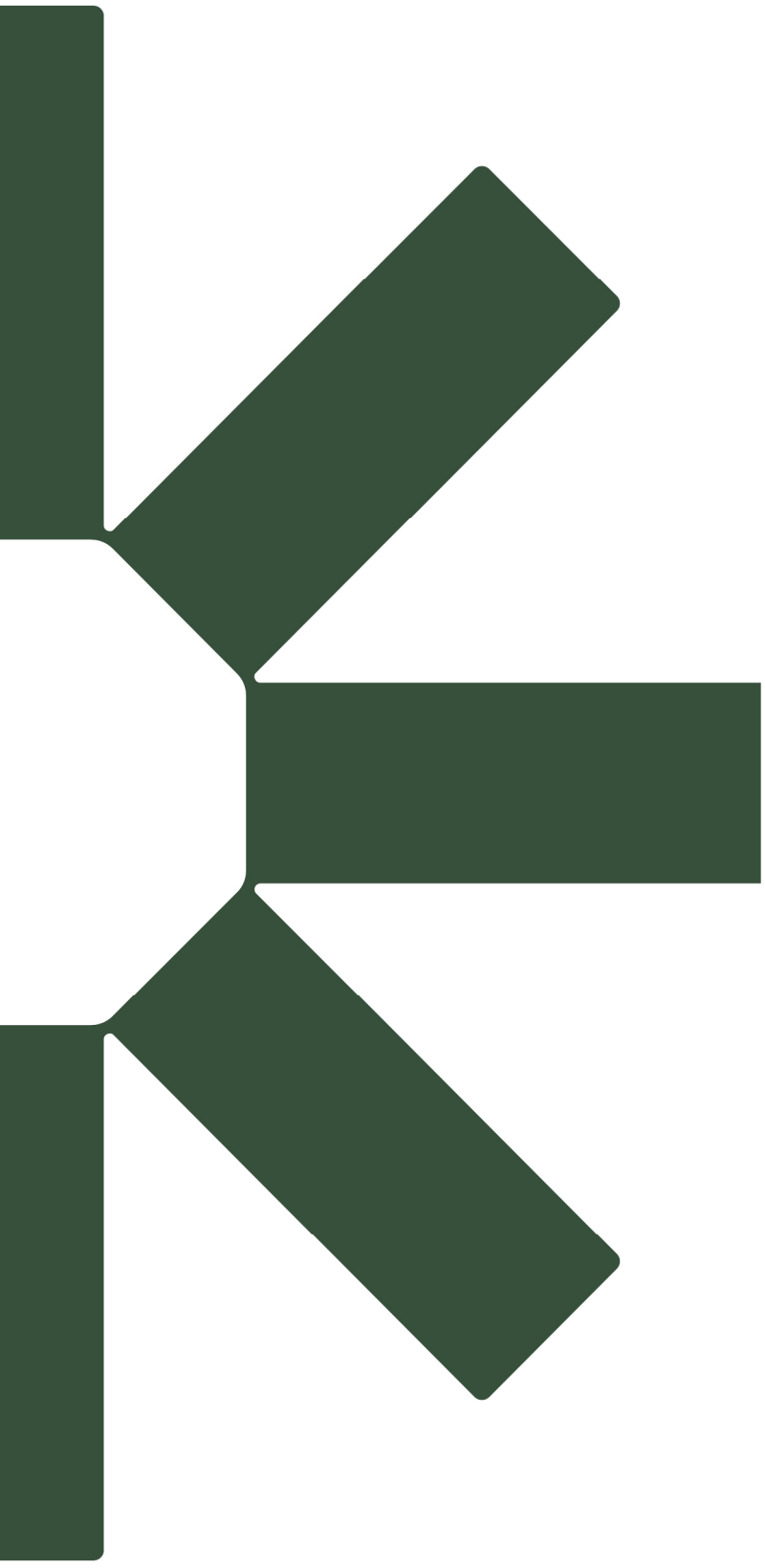

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