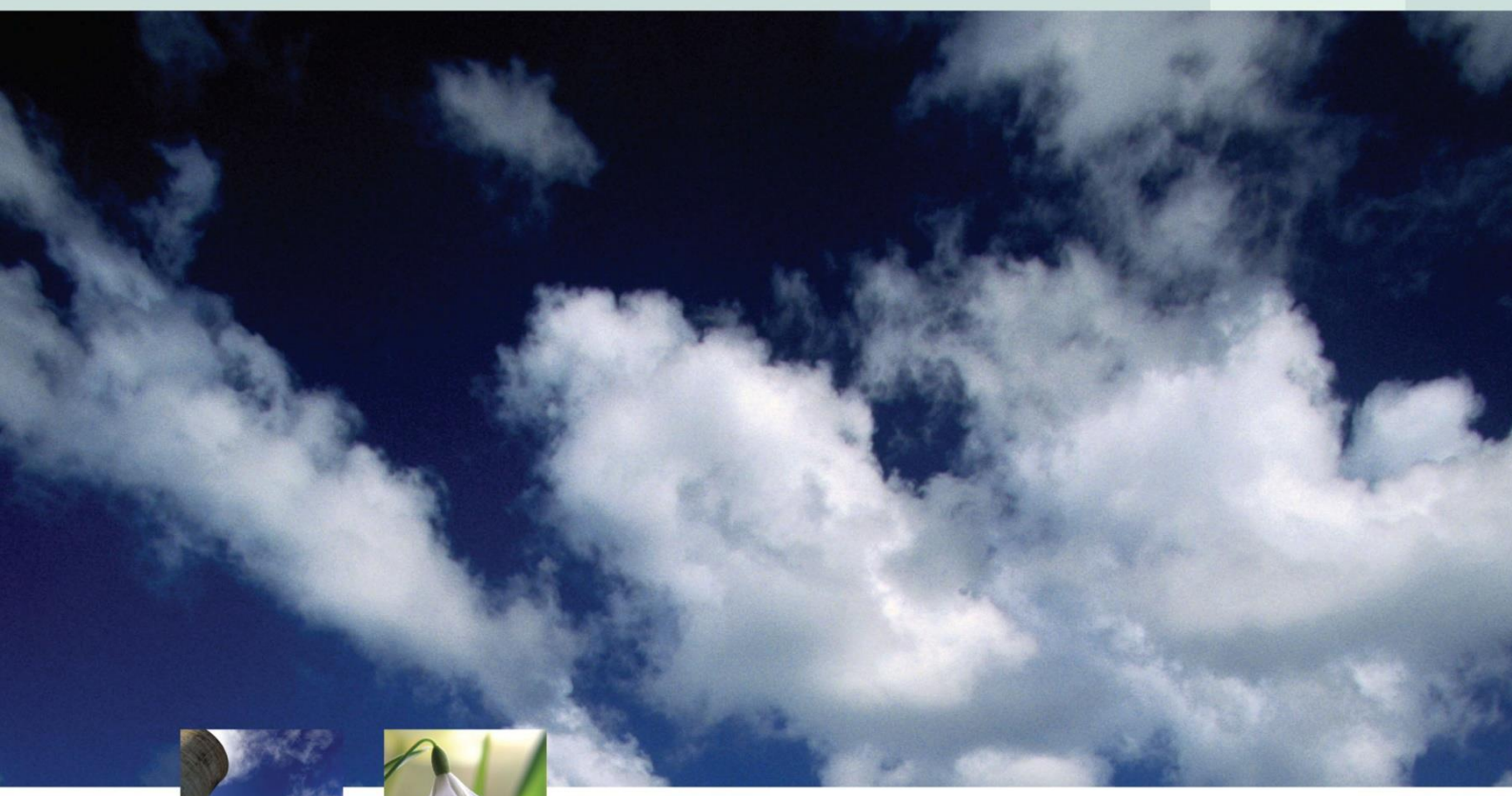

AIR QUALITY ASSESSMENT

The Royal Mint, Llantrisant

Prepared for:
The Royal Mint

Date:
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Project Issue Number:
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Contents

EXECUTIVE SUMMARY

Sol Environment Ltd has been commissioned by The Royal Mint to undertake an assessment of the local air quality impacts arising from the installation of a new activity at the Llantrisant facility, Pontyclun, South Wales. The new activity is for a Direct Brass Plating Line and associated activities. With the installation of the new plating line, decommissioning of four listed activities (Zinc Plating line 1, Copper Plating line 2, Copper Plating line 3 and Cyanide Treatment room 2) will eventually take place.

Detailed dispersion modelling of the existing emission sources and new emission sources has been undertaken to determine the impact of the facility at nearby sensitive human and ecological receptors. It is possible that the new facilities may operate for a short period alongside the activities to be decommissioned. Therefore, the combined short-term impact of new and future decommissioned activities is provided.

The maximum impact of the new pollutant emissions from the site is considered not significant on the basis of the Environment Agency / Natural Resources Wales assessment criteria and professional judgement.

The impact of the new pollutant emissions on local habitat sites was also assessed and found to be negligible compared with relevant critical loads.

Based on the above information, it is considered that current and future operations at the Site do not have an adverse impact on local air quality.

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1. INTRODUCTION

1.1. Purpose of the Assessment

Sol Environment Ltd has been commissioned by The Royal Mint to undertake an assessment of the local air quality impacts arising from the installation of a new activity at the Llantrisant facility, Pontyclun, South Wales. The new activity is for a Direct Brass Plating Line and associated activities. With the installation of the new plating line, decommissioning of four listed activities (Zinc Plating line 1, Copper Plating line 2, Copper Plating line 3 and Cyanide Treatment room 2) will eventually take place.

Detailed dispersion modelling of the existing emission sources and new emission sources has been undertaken to determine the impact of the facility at nearby sensitive human and ecological receptors. It is possible that the new facilities may operate for a short period alongside the activities to be decommissioned. Therefore, the combined short-term impact of new and future decommissioned activities is provided.

1.2. Scope of the Assessment

The location of The Royal Mint facility is presented in Figure 1.1. The facility is located in a semi-rural area. To the north of the Site is agricultural land with outlying residential properties and farms. The Llantrisant Business Park lies immediately to the east, south and west and The Royal Glamorgan Hospital is approximately 450 m south-southwest of the Site.

The primary emissions sources at the site are those associated with coin production, primarily annealing furnaces and metal plating gas scrubbers. Emissions from the new activities will be emitted to air from two 15 m high stacks. These include emission point A9 (formerly Nickel Plating Plant 2, nickel scrubber) and A10 (formerly Nickel Plating Plant 2, acid/alkali scrubber). Future emissions would be as follows:

- Emission point A9 from the cyanide scrubber comprising residual hydrogen cyanide (HCN);
- Emission point A10 from the pre-treatment plant comprising sulphuric acid (H_2SO_4).

Therefore, the assessment has considered the impact of the new treatment activities on the emissions of HCN and H_2SO_4 along with other sources that emit these pollutants.

This report presents the findings of a dispersion modelling assessment to determine the impact of the new activity on air quality at sensitive human and habitat receptors in the surrounding area. The emissions parameters used in the assessment for the new activities are based on estimated emissions and are considered to be worst-case. For the existing sources, historical monitoring data have been used.

A glossary of common air quality terminology is provided in **Appendix A**.

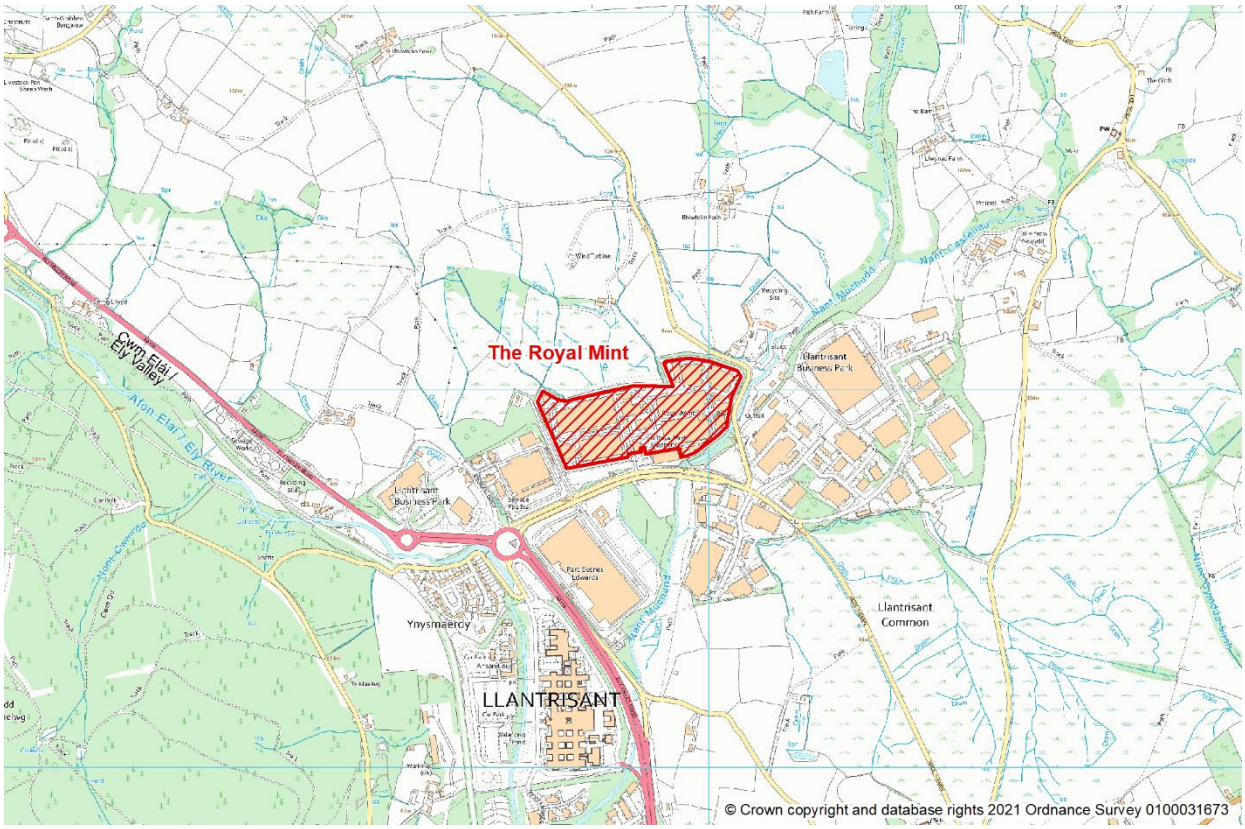

Figure 1.1: Site Location Plan

2. LEGISLATION AND POLICY

2.1 The European Directive on Ambient Air and Cleaner Air for Europe

European Directive 2008/50/EC of the European Parliament and of the Council of 21st May 2008, sets legally-binding Europe-wide limit values for the protection of public health and sensitive habitats. The Directive streamlines the European Union's air quality legislation by replacing four of the five existing Air Quality Directives within a single, integrated instrument.

The pollutants included are sulphur dioxide (SO_2), nitrogen dioxide (NO_2), particulate matter of less than 10 micrometres (μm) in aerodynamic diameter (PM_{10}), particulate matter of less than 2.5 μm in aerodynamic diameter lead ($PM_{2.5}$), lead (Pb), carbon monoxide (CO), benzene, ozone (O_3), polycyclic aromatic hydrocarbons (PAHs), cadmium (Cd), arsenic (As), nickel (Ni) and mercury (Hg).

2.2 Air Quality Strategy for England, Scotland, Wales and Northern Ireland

The Government's policy on air quality within the UK is set out in the Air Quality Strategy (AQS) for England, Scotland, Wales and Northern Ireland (AQS) published in July 2007[1], pursuant to the requirements of Part IV of the Environment Act 1995. The AQS sets out a framework for reducing hazards to health from air pollution and ensuring that international commitments are met in the UK. The AQS is designed to be an evolving process that is monitored and regularly reviewed.

The AQS sets standards and objectives for ten main air pollutants to protect health, vegetation and ecosystems. These are benzene, 1,3-butadiene, carbon monoxide, lead, nitrogen dioxide, particulate matter (PM_{10} and $PM_{2.5}$), sulphur dioxide, ozone and polycyclic aromatic hydrocarbons.

The air quality standards are long-term benchmarks for ambient pollutant concentrations which represent negligible or zero risk to health, based on medical and scientific evidence reviewed by the Expert Panel on Air Quality Standards (EPAQS) and the World Health Organization (WHO). These are general concentration limits, above which sensitive members of the public (e.g. children, the elderly and the unwell) might experience adverse health effects.

The air quality objectives are medium-term policy based targets set by the Government which take into account economic efficiency, practicability, technical feasibility and timescale. Some objectives are equal to the EPAQS recommended standards or WHO guideline limits, whereas others involve a margin of tolerance, i.e. a limited number of permitted exceedances of the standard over a given period.

For some pollutants there is both a long-term (annual mean) standard and a short-term standard. In the case of nitrogen dioxide, the short-term standard is for a 1-hour averaging period, whereas for fine

1 The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (July 2007)

particulates (PM_{10}) it is for a 24-hour averaging period. These periods reflect the varying impacts on health of differing exposures to pollutants (e.g. temporary exposure on the pavement adjacent to a busy road, compared with the exposure of residential properties adjacent to a road).

2.3 Air Quality Standards Regulations

The Air Quality Standards Regulations 2010 have adopted into UK law the limit values required by EU Directive 2008/50/EC and came into force on the 10th June 2010. These regulations prescribe the 'relevant period' (referred to in Part I2V of the Environment Act 1995) that local authorities must consider in their review of the future quality of air within their area. The regulations also set out the air quality objectives to be achieved by the end of the 'relevant period'.

Ozone is not included in the Regulations as, due to its trans-boundary nature, mitigation measures must be implemented at a national level rather than at a local authority level.

The Environmental Assessment Levels (EALs), air quality standards and objectives for the pollutants considered in the assessment are presented in **Appendix B.**

2.4 Local Air Quality Management (LAQM)

Part IV of the Environment Act 1995 also requires local authorities 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 any air quality objectives prescribed in the Regulations are being achieved or are likely to be achieved in the future.

Where any of the prescribed air quality objectives are not likely to be achieved the authority concerned must designate that part 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 air quality objectives. Local authorities are not statutorily obliged to meet the objectives, but they must show that they are working towards them.

The Department of Environment, Food and Rural Affairs (Defra) has published technical guidance for use by local authorities in their Review and Assessment work[2]. This guidance, referred to in this chapter as LAQM.TG(16) is applicable to the Devolved Administrations and has been used where appropriate in the assessment.

2 Department for Environment, Food and Rural Affairs (Defra), (2016): Part IV The Environment Act 1995 Local Air Quality Management Review and assessment Technical Guidance LAQM.TG(16) (February 2018)

2.5 Rhondda-Cynon-Taff County Borough Council Review and Assessment of Air Quality

Rhondda-Cynon-Taff County Borough Council (RCTCBC) carries out frequent review and assessments of air quality within the area and produce Progress Reports in accordance with the requirements of the Regulations. The most recent LAQM report is the 2020 Progress Report[3].

On average, the county enjoys relatively good air quality, with background pollutant concentrations in rural areas well within the air quality standards. However, in a number of urban areas there are measured exceedances of the annual mean air quality objective for NO_2 due to road traffic congestion, which are accentuated by topographical and urban features (e.g. street canyons) which impede dispersion.

To date, the council have declared sixteen AQMAs for NO_2. The facility is not within a designated AQMA. The nearest AQMA is approximately 4 km southwest of the Site adjacent to the A473 in Llanharan. At this distance it is considered unlikely to be adversely impacted by emissions from the Site.

3 Rhondda Cynon Taff County Borough Council 2020 Air Quality Progress Report (October 2020)

3. METHODOLOGY

3.1 Scope of the Assessment

The scope of the assessment has been determined in the following way:

- Review of air quality data for the area surrounding the site, including data from the Defra Air Quality Information Resource (UK-AIR);
- Desk study to confirm the location of nearby areas that may be sensitive to changes in local air quality; and
- Review and modelling of emissions data which has been used as an input to the Breeze AERMOD dispersion modelling assessment.

Predicted ground level concentrations are compared with relevant air quality standards for the protection of health and critical levels / loads for the protection of sensitive ecosystems and vegetation.

3.2 Dispersion Model Parameters

Introduction

The predicted impact of the proposed installation on local air quality has been undertaken using the Breeze AERMOD 7 dispersion model (US EPA Version 21112).

The emission points that have been included in the assessment are presented in Table 3.1. Only those emission sources that emit HCN or H_2SO_4 are included in the assessment.

Table 3.1: Emissions to Air Considered for the Assessment			
Ref.	Source	Status	Pollutant Emission
A3	Copper Plating CP2	To be decommissioned	H_2SO_4
A4	Copper Plating Scrubber CP2	To be decommissioned	HCN
A7	Copper Plating CP3	To be decommissioned	H_2SO_4
A8	Copper Plating Scrubber CP3	To be decommissioned	HCN
A9	Direct Brass Plating – Cyanide Scrubber	New	HCN
A10	Direct Brass Plating – Pre-treatment	New	H_2SO_4
A15	Nickel Plating - Armour 1	Existing	H_2SO_4
A16	Nickel Plating - Armour 2	Existing	H_2SO_4
A17	SAFED Annealing Oven Furnace Stack 1	Existing	H_2SO_4
A18	SAFED Annealing Oven Furnace Stack 2	Existing	H_2SO_4
A19	SAFED Annealing Oven Furnace Stack 3	Existing	H_2SO_4
A20	SAFED Annealing Oven	Existing	H_2SO_4
A21	SAFED Annealing Oven	Existing	H_2SO_4
A22	SECO Warwick Furnace	Existing	H_2SO_4
A23	Wellman 3	Existing	H_2SO_4
A24	Wellman 2	Existing	H_2SO_4
A25	Rogers Annealing Oven	Existing	H_2SO_4
A26	SAFED Annealing Oven	Existing	H_2SO_4
A27	SAFED Annealing Oven	Existing	H_2SO_4
A30	Trial Plating Line 1	Existing	H_2SO_4
A31	Trial Plating Line 2	Existing	HCN

For the purposes of the modelling assessment all units are assumed to be operating at full load, continually throughout the year.

Stack monitoring was originally undertaken in 2013 for emission points A2, A9, A10, A16, A22, A23, A25, A30 and A31 to assess the representative pollutant concentrations being released by these process stacks. Due to accessibility issues, monitoring of emissions from the SAFED units was not undertaken. Therefore, emissions from these stacks are assumed to be the same as those measured for the Rogers Annealing Oven (A25). Similarly, the A24 (Wellman) emissions are assumed to be representative of A23. Monitoring of A3, A4, A7 and A8 was not carried out in 2013 and monitoring data from 2006 has been used for these sources. All of these processes are consistent and continuous and have not been subject to any material change since the original testing in 2013 and are therefore considered relevant for this assessment.

A summary of the input parameters used in the assessment are provided in Appendix C.

Meteorological Data

Dispersion modelling has been undertaken using five years (2015-2019) of hourly sequential meteorological data in order to take account of inter-annual variability and reduce the effect of any atypical conditions. Data from a meteorological station at Rhoose - Cardiff Airport (approximately 18 km south of the Site) has been used for the assessment, which is the most representative data currently available for the area.

Wind roses for each year of meteorological data are presented in Appendix D.

Building Downwash / Entrainment

The presence of buildings close to emission sources can significantly affect the dispersion of pollutants by leading to a phenomenon called downwash. This occurs when a building distorts the wind flow, creating zones of increased turbulence. Increased turbulence causes the plume to come to ground earlier than otherwise would be the case and result in higher ground level concentrations closer to the stack.

Downwash effects are only significant where building heights are greater than 30 to 40% of the emission release height. The downwash structures also need to be sufficiently close for their influence to be significant. All potential downwash structures have been included in the model.

3.3 Significance Criteria

The Environment Agency has developed risk assessment guidance to assess the impact of emissions to air and which Natural Resources Wales currently apply. The guidance provides criteria for assessing the significance of an impact compared with relevant air quality standards and background air quality[4]. A process contribution (PC) is considered not significant if:

- The long-term PC < 1% of the long-term air quality standard; and
- The short-term PC < 10% of the short-term air quality standard.

At 1% of the long-term air quality standard, the impact of a development is unlikely to be significant compared with background air quality. Both the short-and long term criteria are also designed to ensure that there is a substantial safety margin to protect public health and the environment.

If the screening criteria are not met, the process contribution should be considered in combination with relevant ambient background pollutant concentrations. The air quality standards are likely to be met if:

4 https://www.gov.uk/government/collections/risk-assessments-for-specific-activities-environmental-permits

- The long-term PC + background concentration is < 70% of the air quality standard; and
- The short-term PC < 20% (air quality standard – short-term background concentration), where the short-term background concentration is assumed to be twice the long-term background concentration.

3.4 Sensitive Receptors

Specific receptors have been identified where people are likely to be regularly exposed for prolonged periods of time (e.g. residential areas). The location of each of the discrete sensitive receptors is presented in Table 3.2 and Figure 3.1.

Table 3.2: Human Health Receptors

Ref.	Receptor	Type	Easting	Northing
D1	Rhiwfelin Fawr	Residential	303163	185915
D2	Rhiwfelin Nursing Home	Nursing Home	303276	186124
D3	Rhiwfelin Fach	Residential	304036	185512
D4	Glanmychydd-Fach	Residential	304071	185111
D5	Llantrisant Dialysis Centre	Medical Facility	304500	185110
D6	Tal-y-fedw	Residential	304693	185336
D7	Tyclwydau	Residential	304847	184161
D8	Llwyncrwn Isaf	Residential	305459	184617
D9	Ty'n-y-coed	Residential	305649	184240
D10	Coed-yr-Escob Primary School	School	304482	183941
D11	Graig-y-Ilan	Residential	303946	184107
D12	Royal Glamorgan Hospital	Hospital	303610	184366
D13	Glan-yr-ely	Residential	303378	184553
D14	Signalmans Cottage	Residential	303047	184627
D15	Dyffryn-isaf	Residential	303012	184754
D16	Dyffryn-uchaf	Residential	303063	184907
D17	Bedw	Residential	302567	185478
D18	Royal Mint Experience	Leisure	303887	184825

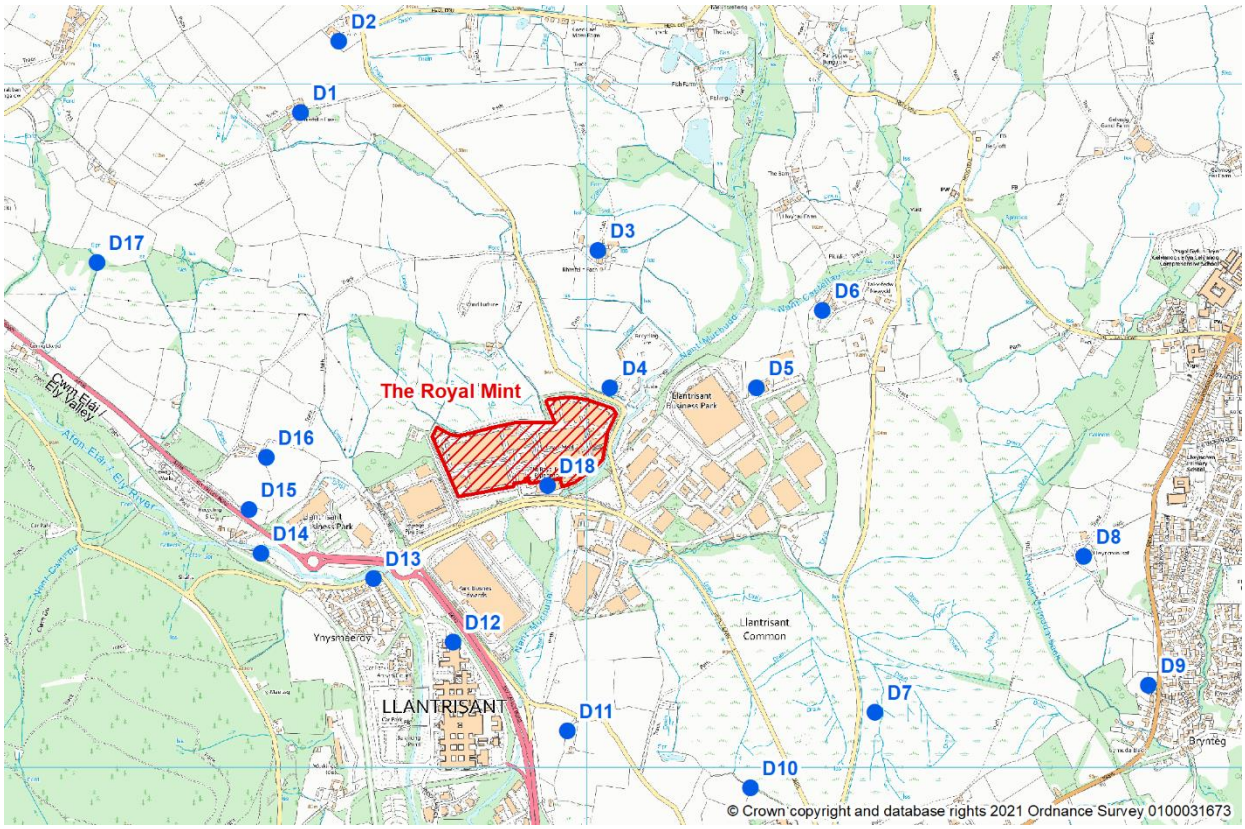

Figure 2: Sensitive Human Health Receptor Locations

Pollutant concentrations have been predicted at both discrete receptor locations and over a 4 km by 3 km Cartesian grid of 25m resolution.

3.5 Habitat Assessment

The Environment Agency's risk assessment guidance states that the impact of emissions to air on vegetation and ecosystems should be assessed for the following habitat sites within 10 km of the source:

- Special Areas of Conservation (SACs) and candidate SACs (cSACs) designated under the EC Habitats Directive[5];
- Special Protection Areas (SPAs) and potential SPAs designated under the EC Birds Directive[6;] and
- Ramsar Sites designated under the Convention on Wetlands of International Importance[7.]

Within 2km of the source:

5 Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora.
6 Council Directive 79/409/EEC on the conservation of wild birds
7 Ramsar (1971), The Convention of Wetlands of International Importance especially as Waterfowl Habitat.

- Sites of Special Scientific Interest (SSSI) established by the 1981 Wildlife and Countryside Act;
- National Nature Reserves (NNR);
- Local Nature Reserves (LNR);
- local wildlife sites (Sites of Interest for Nature Conservation, SINC and Sites of Local Interest for Nature Conservation, SLINC); and
- Ancient woodland.

Habitat receptor designations and locations relevant to the assessment are presented in Table 3.3.

Table 3.3: Sensitive Habitat Receptors

Receptor	Primary Habitat	Approx. Location (Relative to Site)
Llantrisant Common and Pastures SSSI	Acidic grassland and fen	300 m south and southwest
Rhos Tonyrefail SSSI	Acidic grassland and fen	100 m northwest
Cardiff Beech Woods SAC	Beech Woodland	7.5 km east-southeast

Due to the close proximity of the SSSIs to the Site, the designated areas have been modelled using a Cartesian grid of 50 m resolution to enable the maximum impact to be determined. Cardiff Beech Woods SAC, which is 7.5 km from the facility, has been represented in the model by a discrete receptor at the nearest boundary of the designated area.

It is considered that the deposition of sulphate will contribute to acidification. Other emissions (e.g. the oxides of nitrogen and ammonia) will also contribute to acidification. The modelled ground level pollutant concentrations are used to predict deposition rates, using typical deposition velocities. A summary of NO_x, NH_3 and sulphate (SO_4^{-2}) dry deposition velocities is presented in Table 3.4.

Table 3.4: Dry Deposition Velocities (m/s)

Pollutant	Grassland	Woodland
Sulphate	0.010	0.010
Ammonia	0.02	0.03
Oxides of nitrogen	0.0015	0.003

Emissions of NO_x and NH_3 are not considered in this assessment. An assessment of the impact of emissions from The Royal Mint installation on habitat sites was included in an air quality assessment provided in January 2014[8]. However, this only considered the impact of airborne concentrations of the oxides of nitrogen (NO_x) and ammonia (NH_3) and nutrient nitrogen deposition. Therefore, the results of

8 Air Quality Assessment, The Royal Mint, Llantrisant, Sol Environment SOL0114RM01 AQMS (January 2014)

the 2014 assessment have been used to assess the combined impact of the installation emissions (NO_x, NH_3 and sulphate) on the rate of acidification.

Predicted acidification rates are compared with relevant critical loads for the protection of sensitive ecosystems and vegetation (see Appendix E).

3.6 BASELINE CONDITIONS

Monitoring of hydrogen cyanide and airborne sulphuric acid concentrations is not currently carried out in the UK. However, background sources are likely to be low. Therefore, the assessment has focussed on the process contribution only in comparison with the EAL.

4. ASSESSMENT OF IMPACTS

4.1. Human Health Impact

Introduction

Predicted pollutant concentrations (PC) for the five years of meteorological data are presented as the maximum concentration for each of the discrete receptors identified in Section 3.4. The significance of the impacts has been assessed in accordance with the Environment Agency's risk assessment guidance.

Hydrogen Cyanide (HCN)

Emissions of hydrogen cyanide are likely to be emitted from the new cyanide scrubber (A9) and source A31. The combined impact of these emissions on local air quality is compared to the long-term and short-term EALs in Table 4.1.

Table 4.1: Predicted HCN Concentrations

Receptor	Annual Mean		Maximum 1-Hour Mean	
	PC (µg/m³)	PC (% of EAL)	PC (µg/m³)	PC (% of EAL)
Maximum predicted	0.080	0.80%	3.3	1.5%
Rhiwfelin Fawr	0.00079	0.01%	0.078	0.0%
Rhiwfelin Nursing Home	0.00065	0.01%	0.085	0.0%
Rhiwfelin Fach	0.0066	0.07%	0.99	0.4%
Glanmychydd-Fach	0.039	0.39%	3.1	1.4%
Llantrisant Dialysis Centre	0.023	0.23%	1.1	0.5%
Tal-y-fedw	0.0085	0.08%	0.94	0.4%
Tyclwydau	0.0052	0.05%	0.70	0.3%
Llwyncrwn Isaf	0.0041	0.04%	0.40	0.2%
Ty'n-y-coed	0.0035	0.03%	0.44	0.2%
Coed-yr-Escob Primary School	0.0021	0.02%	0.65	0.3%
Graig-y-llan	0.0047	0.05%	0.84	0.4%
Royal Glamorgan Hospital	0.0054	0.05%	0.83	0.4%
Glan-yr-ely	0.0077	0.08%	0.80	0.4%
Signalmans Cottage	0.0049	0.05%	0.58	0.3%
Dyffryn-isaf	0.0046	0.05%	0.61	0.3%
Dyffryn-uchaf	0.0043	0.04%	0.73	0.3%
Bedw	0.0012	0.01%	0.22	0.1%
Royal Mint Experience	0.035	0.35%	1.2	0.6%
EAL (µg/m³)	10		220	

Maximum predicted HCN concentrations are less than 1% of the long-term EAL and less than 10% of the short-term EAL. Therefore, the impact of the emissions would be assessed as not significant, compared with the EALs at all of the identified receptors including the maximum predicted off-site concentration.

The new cyanide scrubber may operate for a short period alongside the existing copper plating scrubbers (A4 and A8) that will eventually be decommissioned. Predicted short-term concentrations for all cyanide sources operating (A9, A31, A4 and A8) indicate that maximum predicted concentrations (anywhere off-site) are 3.3 µg/m^3 (1.5% of the EAL) and would be assessed as not significant. The existing sources, due to the very low measured HCN emissions, have very little impact on off-site concentrations.

Sulphuric Acid (H_2SO_4)

The maximum predicted annual and 1-hour mean ground level H_2SO_4 concentrations are presented in Table 4.2. These are for all existing and future sources of H_2SO_4 but exclude A3 and A7 which will eventually be decommissioned.

Table 4.2: Predicted H_2SO_4 Concentrations

Receptor	Annual Mean		Maximum 1-Hour Mean	
	PC (µg/m^3)	PC (% of EAL)	PC (µg/m^3)	PC (% of EAL)
Maximum predicted	0.32	3.2%	4.1	1.4%
Rhiwfelin Fawr	0.0015	0.01%	0.14	0.0%
Rhiwfelin Nursing Home	0.0013	0.01%	0.13	0.0%
Rhiwfelin Fach	0.012	0.12%	1.6	0.5%
Glanmychydd-Fach	0.081	0.81%	3.4	1.1%
Llantrisant Dialysis Centre	0.035	0.35%	1.6	0.5%
Tal-y-fedw	0.014	0.14%	1.4	0.5%
Tyclwydau	0.0094	0.09%	0.85	0.3%
Llwyncrwn Isaf	0.0069	0.07%	0.61	0.2%
Ty'n-y-coed	0.0060	0.06%	0.56	0.2%
Coed-yr-Escob Primary School	0.0046	0.05%	1.1	0.4%
Graig-y-Ilan	0.0098	0.10%	1.0	0.3%
Royal Glamorgan Hospital	0.012	0.12%	1.1	0.4%
Glan-yr-ely	0.017	0.17%	1.2	0.4%
Signalmans Cottage	0.011	0.11%	0.79	0.3%
Dyffryn-isaf	0.010	0.10%	0.67	0.2%
Dyffryn-uchaf	0.0097	0.10%	0.87	0.3%
Bedw	0.0025	0.03%	0.67	0.2%
Royal Mint Experience	0.062	0.62%	2.2	0.7%
EAL (µg/m^3)	10		300	

Maximum predicted annual mean H_2SO_4 impacts are not significant (<1% of the EAL) at all of the identified receptors but the maximum predicted is in excess of 1% of the EAL. However, there are no other significant sources of H_2SO_4 in the area and it is considered very unlikely that an exceedance of the

EAL would occur at this location. At all discrete sensitive receptors, predicted concentrations are less than 1% of the EAL and would be assessed as not significant.

The hourly-mean predictions are less than 10% of the EAL at all locations and therefore the short-term impacts are not significant in accordance with the screening criteria.

The new emission sources may operate for a short period alongside the existing copper plating sources which emit H_2SO_4 (A3 and A7) that will eventually be decommissioned. Predicted short-term concentrations for all H_2SO_4 sources operating indicate that maximum predicted concentrations (anywhere off-site) are 5.4 µg/m^3 (1.8% of the EAL) and would be assessed as not significant. Therefore, the combined impact with sources to be decommissioned would also be assessed as not significant.

4.2. Habitat Impact - Acidification

Emissions of NO_x and NH_3 will contribute to acidification impacts but have not been assessed as these emissions will not change as a result of the new Direct Brass Plating Line. The impact of the installation on airborne NO_x and NH_3 at the sensitive habitats has been provided in a previous study [8] and are presented in Table 4.3.

Table 4.3: Predicted Maximum NOx and NH_3 Concentrations

Habitat Site	NO_x Annual Mean	NH_3 Annual Mean
	PC (µg/m^3)	PC (µg/m^3)
Llantrisant Common and Pastures SSSI	0.21	0.017
Rhos Tonyrefail SSSI	0.060	0.0048
Cardiff Beech Woods SAC	0.0036	0.00026

The maximum predicted NOx and NH_3 concentrations at the identified habitat sites have been used to determine the nitrogen contribution to acidification. Only the sulphur acidification will be affected as a result of the proposed changes at the site. A summary of the acidification impacts from nitrogen and sulphur is provided in Table 4.4. The predicted contribution is from the total installation emissions rather than the new sources alone and represents a worst-case.

Table 4.4: Predicted Acidification at Habitat Sites				
Habitat Site	Nitrogen Acidification	Sulphur Acidification	Sulphur	Total
	(keq/ha/a)	(keq/ha/a)	(%age CL)	(%age CL)
Llantrisant Common and Pastures SSSI	0.0085	0.0030	0.5%	2.0%
Rhos Tonyrefail SSSI	0.0024	0.0015	0.3%	0.7%
Cardiff Beech Woods SAC	0.00022	0.000043	<0.01%	0.02%

Highest acidification impacts relative to the respective critical loads occur at the Llantrisant Common and Pastures SSSI due to the proximity to the Site. Total sulphur emissions (existing plus proposed) contribute 0.5% of the critical load and would be assessed as not significant. Total acidification (nitrogen plus sulphur) impacts from the installation represents 2.0% of the critical load.

5. CONCLUSIONS

Detailed air quality modelling using the AERMOD 7 dispersion model has been carried out to determine the local air quality impacts associated with a new Direct Brass Plating Line emissions from the Royal Mint works at LLantrisant, South Wales. The assessment has considered emissions of hydrogen cyanide and sulphuric acid from the new emissions sources alongside existing sources which emit these pollutants.

The stack emissions used in the assessment have been determined from historic sampling at the facility. Predicted pollutant concentrations at sensitive receptor locations are not significant compared with the air quality standards and objectives set for the protection of human health.

At the identified habitat sites, the predicted process contributions are not significant compared with the relevant critical loads for acidification.

Based on the above information, it is considered that the proposed operations at the Site do not have an adverse impact on local air quality.

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Appendix A – Air Quality Terminology

Term	Definition
Accuracy	A measure of how well a set of data fits the true value.
Air quality objective	Policy target generally expressed as a maximum ambient concentration to be achieved, either without exception or with a permitted number of exceedences within a specific timescale (see also air quality standard).
Air quality standard	The concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. The standards are based on the assessment of the effects of each pollutant on human health including the effects on sensitive sub groups (see also air quality objective).
Ambient air	Outdoor air in the troposphere, excluding workplace air.
Annual mean	The average (mean) of the concentrations measured for each pollutant for one year. Usually this is for a calendar year, but some species are reported for the period April to March, known as a pollution year. This period avoids splitting winter season between 2 years, which is useful for pollutants that have higher concentrations during the winter months.
AQMA	Air Quality Management Area.
Defra	Department for Environment, Food and Rural Affairs.
Exceedance	A period of time where the concentration of a pollutant is greater than, or equal to, the appropriate air quality standard.
Fugitive emissions	Emissions arising from the passage of vehicles that do not arise from the exhaust system.
LAQM	Local Air Quality Management.
NO	Nitrogen monoxide, a.k.a. nitric oxide.
NO_2	Nitrogen dioxide.
NO_x	Nitrogen oxides.
O_3	Ozone.
Percentile	The percentage of results below a given value.
PM_{10}	Particulate matter with an aerodynamic diameter of less than 10 micrometres.
ppb parts per billion	The concentration of a pollutant in the air in terms of volume ratio. A concentration of 1 ppb means that for every billion (10^9) units of air, there is one unit of pollutant present.
ppm parts per million	The concentration of a pollutant in the air in terms of volume ratio. A concentration of 1 ppm means that for every billion (10^6) units of air, there is one unit of pollutant present.
Ratification (Monitoring)	Involves a critical review of all information relating to a data set, in order to amend or reject the data. When the data have been ratified they represent the final data to be used (see also validation).
µg/m^3 micrograms per cubic metre	A measure of concentration in terms of mass per unit volume. A concentration of 1ug/m3 means that one cubic metre of air contains one microgram (millionth of a gram) of pollutant.
UKAS	United Kingdom Accreditation Service.
Uncertainty	A measure, associated with the result of a measurement, which characterizes the range of values within which the true value is expected to lie. Uncertainty is usually expressed as the range within which the true value is expected to lie with a 95% probability, where standard statistical and other procedures have been used to evaluate this figure. Uncertainty is more clearly defined than the closely related parameter 'accuracy', and has replaced it on recent European legislation.
USA	Updating and Screening Assessment.
Validation (modelling)	Refers to the general comparison of modelled results against monitoring data carried out by model developers.
Validation	Screening monitoring data by visual examination to check for spurious and unusual

Term	Definition
(monitoring)	measurements (see also ratification).
Verification (modelling)	Comparison of modelled results versus any local monitoring data at relevant locations.

Appendix B – Air Quality Standards and Objectives

Pollutant	Averaging Period	EAL / AQS (µg/m^3)	Comments
Sulphuric acid (H_2SO_4)	Annual	10	EAL derived from long-term occupational exposure limits
	1-hour	300	EAL derived from long-term occupational exposure limits as no short-term limit exists
Hydrogen cyanide (HCN)	Annual	10	EAL derived from long-term occupational exposure limits
	1-hour	220	EAL derived from short-term occupational exposure limits

Appendix C – Dispersion Model Input Parameters

Table C1: Emission Parameters – Existing and Proposed							
Parameter / Sources	A9 (New)	A10 (New)	A15, A16	A17 to A21 & A25 to A27	A22	A23, A24	A30, A31
Stack height (m)	15	15	16	10/15.1	15.1	15.1	10
Stack exit diameter (m)	0.75	0.65	0.90	0.25	0.30	0.30	0.20
Temperature of release (K)	289	Ambient	293	335	311	352	294
Actual flow rate (Am3/s)	7.0	5.2	10.1	0.84	1.3	1.0	0.84
Normalised flow rate (Nm^3/s) (a)	6.7	4.8	9.3	0.68	1.1	0.80	0.68
Emission velocity at stack exit (m/s)	15.9	15.6	15.9	17.1	17.8	14.7	17.1
Emission Concentrations (mg/Nm^3)							
H_2SO_4	-	0.50	0.50	0.50	0.50	0.65	0.50 (A30)
HCN	1.2	-	-	-	-	-	1.2 (A31)

HCN emissions for A9 are based on the manufacturer's estimate of the likely worst-case emission. For A31, the emission concentration is assumed to be the same as for A9 and is also considered to be a worst-case estimate. Monitoring carried out in 2013 indicated that H_2SO_4 concentrations were below 0.5 mg/Nm^3 except for A23 which were measured at 0.65 mg/Nm^3.

Table C2: Emission Parameters – Decommissioned Sources				
Parameter / Sources	A3	A4	A7	A8
Stack height (m)	16	16	18	16
Stack exit diameter (m)	0.8	1.1	0.8	1.1
Temperature of release (K)	309	302	307	304
Actual flow rate (Am3/s)	3.6	9.9	5.2	12.5
Normalised flow rate (Nm^3/s) (a)	3.2	8.9	4.6	11.2
Emission velocity at stack exit (m/s)	7.2	10.4	10.3	13.1
Emission Concentrations (mg/Nm^3)				
H_2SO_4	2.4	-	1.5	-
HCN	-	0.031	-	0.08

Concentrations of H_2SO_4 and HCN for the sources to be decommissioned were obtained from a stack monitoring exercise carried out between June and July 2006. For all four sources, measured concentrations of HCN and H_2SO_4 were recorded at the detection limit of the analysis. As a worst-case, it is assumed that the emission concentrations are at these detection limits.

Appendix D – Rhoose Wind Roses

Figure D1: 2015

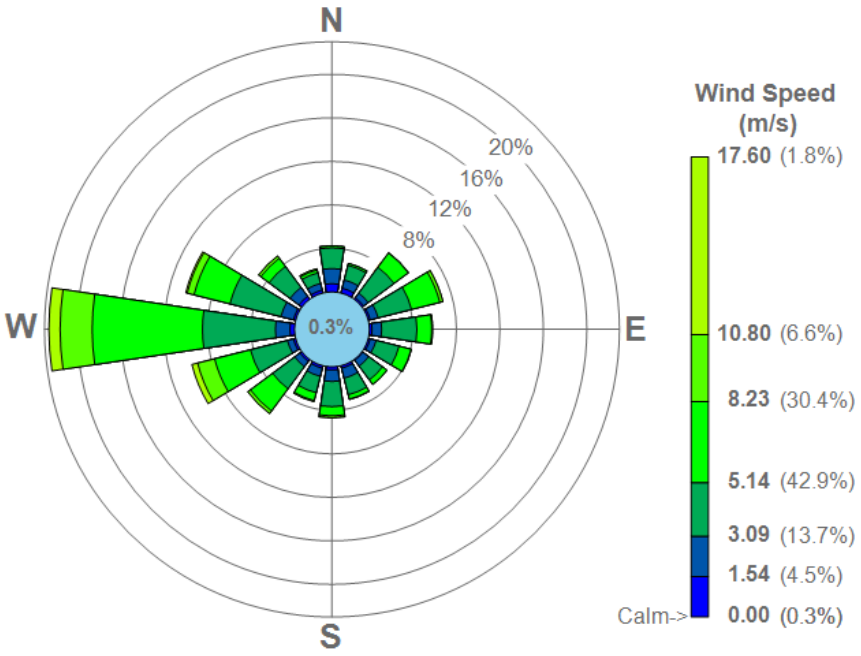


Figure D2: 2016

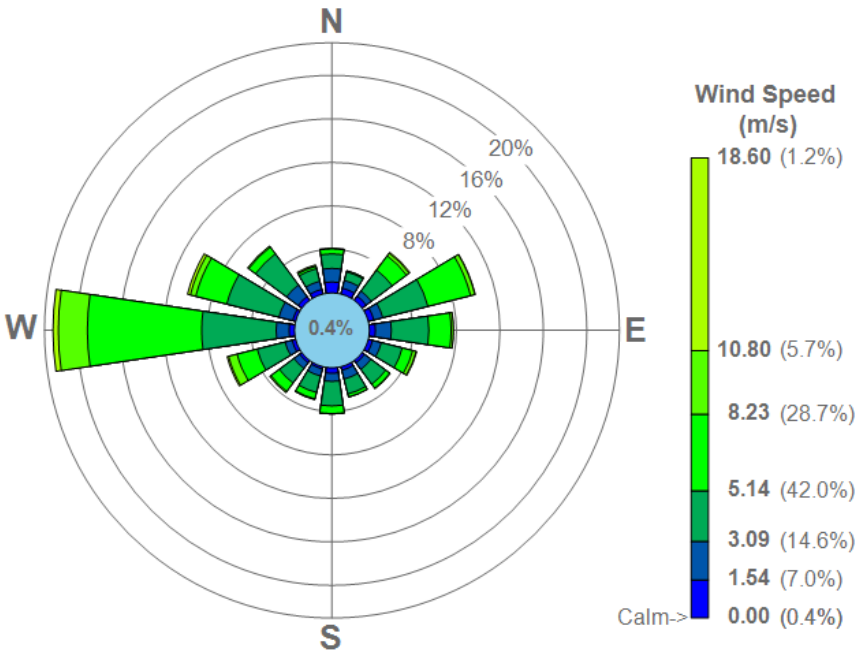


Figure D3: 2017

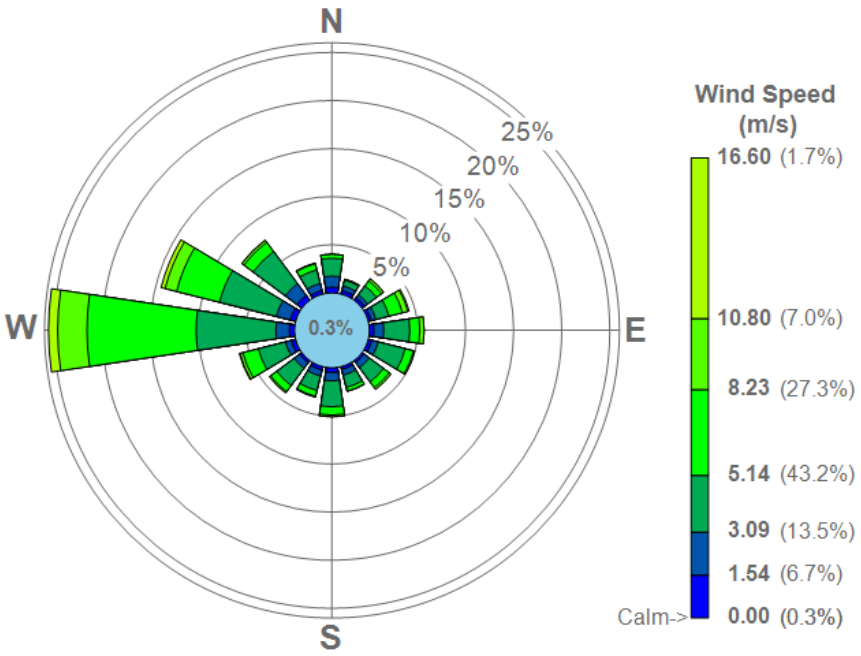


Figure D4: 2018

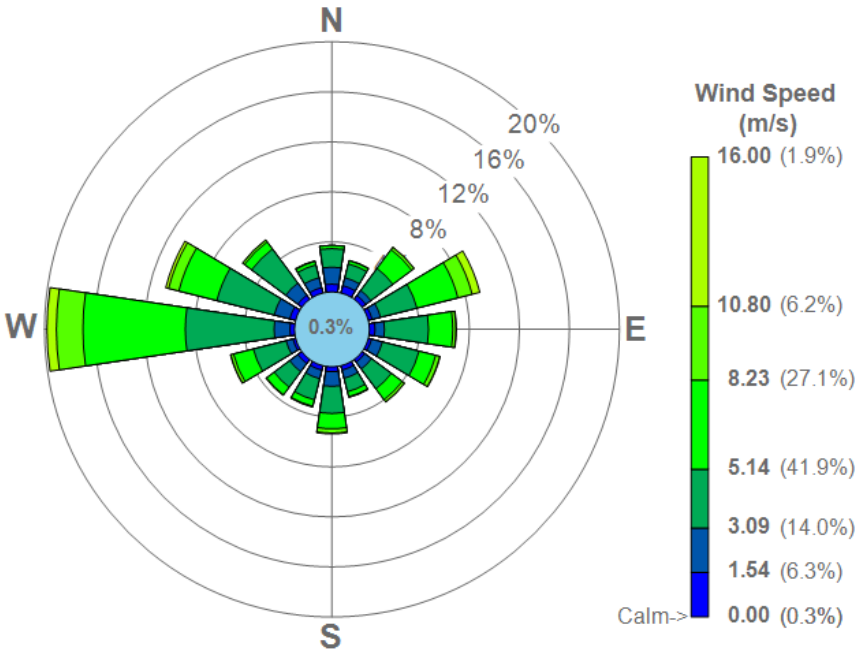
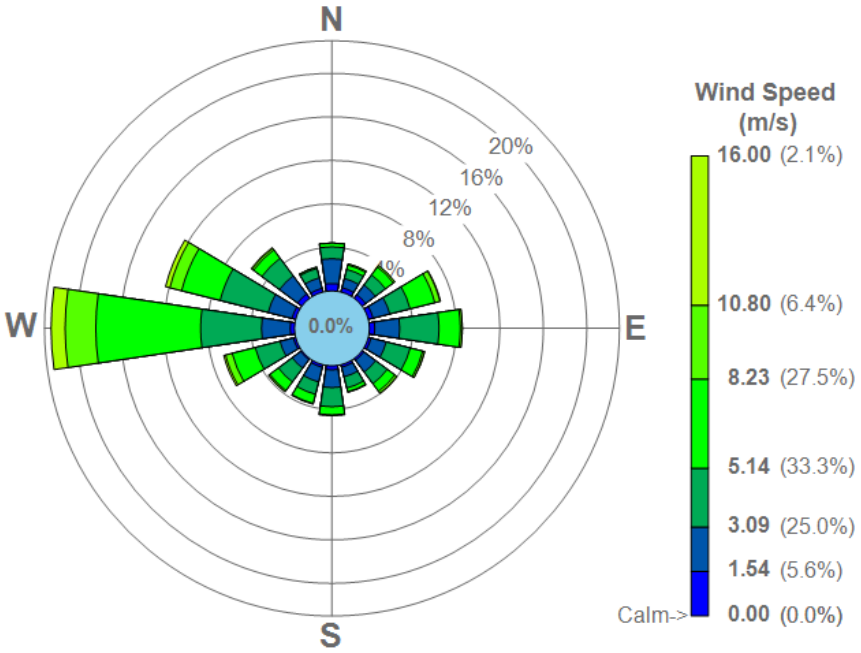


Figure D5: 2019



Appendix E – Environmental Assessment Levels for the Protection of Vegetation and Ecosystems

Critical Loads

Critical loads refer to the threshold beyond which deposition of pollutants to water or land results in measurable damage to vegetation and habitats. This takes the form of either gravitational settling of particulate matter (dry deposition) or wet deposition, where atmospheric pollutants dissolve in water vapour and then precipitate to the ground (e.g. as rain, snow, fog etc.).

Critical loads for acidification have been obtained from the Air Pollution Information System (APIS) and are summarised in Table E1 for the identified habitat sites.

Table E2: Critical Loads for Acidification

Habitat Site	Primary Sensitive Habitat	CLminN (keq/ha/a)	CLmaxN (keq/ha/a)	CLmaxS (keq/ha/a)
Llantrisant Common and Pastures SSSI	Acid grassland	0.366	0.586	0.22
Rhos Tonyrefail SSSI	Acid grassland	0.366	0.586	0.22
Cardiff Beech Woods SAC	Woodland	0.142	1.428	1.286