



Environmental Visage

**DETAILED AIR QUALITY ASSESSMENT OF  
LEAD EMISSIONS FROM**

**GS YUASA BATTERY MANUFACTURING UK  
RASSAU INDUSTRIAL ESTATE, EBBW VALE**

**Report Issue No: 1  
Report Date: February 2021  
Report Author: Amanda Owen**

## Executive Summary

Environmental Visage Limited was commissioned to undertake a detailed air quality assessment of Lead emissions from the permitted and proposed discharge points at the GS Yuasa Battery Manufacturing UK Limited installation, on the Rassau Industrial Estate, Rassau, Ebbw Vale. The site has recently applied for a variation to their Environmental Permit, in order to incorporate two new discharge points, and the detailed modelling was required in order to demonstrate that the potential changes to the emissions to atmosphere would have an insignificant effect on local air quality.

The results from the detailed dispersion modelling confirm that the impact of the emissions from the site operations remain within the UK Air Quality Strategy (AQS) objective value of  $0.25 \mu\text{g m}^{-3}$  across the entire modelled area and in most cases can be screened as insignificant. Some areas within the operational site boundary are not screened as insignificant. However, the installation area is not classed as a sensitive receptor, the Predicted Environmental Concentration does not exceed the AQS at any point, and Lead processes across the site apply the Best Available Techniques.

At the modelled discrete sensitive receptors, the impact of Lead emissions from the Rassau Battery Manufacturing Site operations screen as insignificant either at the initial or secondary assessment stage.

The results from detailed modelling therefore confirm that emissions of Lead to air from the existing and proposed operations at the site are acceptable, will not result in any exceedance of the UK Air Quality Strategy objective value, and are screened as insignificant at local sensitive receptors.

## Contents

Executive Summary .....	i
Contents .....	iii
Issue and Revision Record.....	ii
1. Introduction.....	1
1.1 ADMS Model .....	1
1.2 Modelling Uncertainty.....	1
2. Modelling Input Data .....	2
2.1 Introduction .....	2
2.2 Site Location and Local Setting .....	2
Figure 1 The Location and Local Setting of the Rassau Battery Manufacturing Site .....	3
2.3 Plant Details and Emissions .....	3
Table 1 Stack Dimensions, Discharge Conditions and Modelled Emissions .....	4
2.4 Local Environmental Conditions .....	5
Nearby Buildings and Structures .....	5
Table 2 Associated Building Dimensions.....	5
Figure 2 Site Layout as Modelled .....	5
Surface Roughness .....	6
Local Terrain .....	6
Output Grid .....	6
Table 3 Specific Receptors Included in Detailed Modelling.....	6
Figure 3 Location of Specific Receptors in Relation to the Rassau Battery Manufacturing Site .....	7
2.5 Meteorological Data .....	7
Figure 4 2020 Wind Rose for the Sennybridge Meteorological Measurement Station.....	8
2.6 Background Air Quality .....	8
Table 4 Background Levels of Lead in Ambient Air.....	8
2.7 Determining Significance .....	8
3. Detailed Assessment of Lead Emissions from the Rassau Battery Manufacturing Site.....	9
3.1 Introduction .....	9
3.2 Process Contributions of Lead .....	9
Table 5 Results from Detailed Assessment of Lead at the Point of Maximum Process Contribution.....	9
Figure 5 Maximum Annual Average Lead Process Contribution ( $\mu\text{g m}^{-3}$ ) .....	10
Figure 6 Maximum Annual Average Lead Predicted Environmental Concentration ( $\mu\text{g m}^{-3}$ ) .....	11
Table 6 Results from Detailed Assessment of Lead at the Point of Maximum Process Contribution – Modelling Discharges from A1 and A3 Only .....	12
3.3 Deposition of Lead to Ground .....	12
4. Air Quality Impact at Specific Receptors.....	12
Table 7 Detailed Assessment of Process Contributions ( $\mu\text{g m}^{-3}$ ) at Specific Receptors Due to Discharges of Lead from the Rassau Battery Manufacturing Site Operations .....	13
5. Conclusions.....	13
6. References .....	14

## Issue and Revision Record

Issue	Date	Author	Review / Authorise	Description
DRAFT	21/02/2021	A. Owen	ENVISAGE	DRAFT
1	24/02/2021	A. Owen	ENVISAGE	1 – For Submission

# 1. Introduction

Environmental Visage Limited was commissioned to undertake a detailed air quality assessment of Lead emissions from the permitted and proposed discharge points at the GS Yuasa Battery Manufacturing UK Limited (GSY) installation, on the Rassau Industrial Estate, Rassau, Ebbw Vale. The site, known as the Rassau Battery Manufacturing Site, has recently applied for a variation to their Environmental Permit, in order to incorporate two new discharge points, and the detailed modelling was required in order to demonstrate that the potential changes to the emissions to atmosphere would have an insignificant effect on local air quality.

GSY has requested a variation to their Environmental Permit in order to incorporate the introduction of a new Lead Oxide mill. The site currently has four mills (numbers 4 – 7). Mill 4 is a small (8-tonne capacity) mill which can only produce approximately 2 tonnes of Lead Oxide per day. Mills 5 and 6 are each 14-tonne capacity mills with a combined output of 14 tonnes of Lead Oxide per day. Mill 7 is a 24-tonne capacity mill, producing approximately 18 tonnes of Lead Oxide per day.

The new mill is a state of the art 24 tonne capacity mill, and will be run 24 hours, 5 days per week to meet current demand and to future-proof the site's Lead Oxide production capacity.

It is proposed that, once the new mill (mill number 8) is on-line, mills 5 and 6 will become back-up plant and mill 4 will be decommissioned. Mill 7 will continue to run as currently, and the proposed operations will increase the site's overall capacity to approximately 40 tonnes Lead Oxide per day. The discharge from mill 8 will effectively replace that of mill 4. An additional local exhaust ventilation emission point will be required from a new cutting and brushing machine. All Lead emission points are suitably filtered, and usually operate well within their Permitted emission limit values.

In support of the Permit variation application, an H1 environmental risk assessment for emissions to air was prepared. As the output from this conservative assessment could not readily be screened as insignificant when applying worst-case scenarios, Natural Resources Wales (NRW) requested the submission of a detailed air quality assessment to further investigate the likely impact of the Lead emission discharges from the site operations. As most of the emissions have been in place and operational for many years and undergo regular testing, the 2020 average reported Lead emission from each existing source was included in the model. The modelling of A1 (Lead Oxide mill number 8) and A3 (the cutting and brushing machine extract) were modelled at the maximum emission levels expected to be included within the revised Permit for these new discharge points.

This report details the assessment methodology applied, the detailed inputs incorporated within the modelling assessment, the results obtained and the overall environmental impact of the proposed releases.

## 1.1 ADMS Model

The ADMS Version 5.2 modelling software was applied and is one of a range of models available for assessing the impact of pollutant emissions to atmosphere on local air quality. Those used routinely in the UK for this sort of application include United States Environmental Protection Agency (US-EPA) models such as AERMOD, and the ADMS models developed in the UK by Cambridge Environmental Research Consultants (CERC)<sup>1</sup>.

The ADMS model can be used to assess ambient pollutant concentrations arising from a wide variety of emissions sources associated with an industrial process. It can be used for initial screening or more refined determination of ground level pollutant concentrations on either a short-term basis (up to 24-hour averages) or longer term (monthly, quarterly, or annual averages).

## 1.2 Modelling Uncertainty

Atmospheric dispersion modelling is not a precise science and results can be impacted by a variety of factors such as:

- Model uncertainty - due to limitations in the dispersion algorithms incorporated into the model and their ability to replicate "real life" situations;

- Data uncertainty - due to potential errors associated with emission estimates, discharge characteristics, land use characteristics and the relevance of the meteorological data to a particular location; and,
- Variability - randomness of the measurements used.

CERC models are continually validated against available measured data obtained from real world situations, field campaigns and wind tunnel experiments. Validation of the ADMS dispersion models has been performed using many experimental datasets that test different aspects of the models, for instance: ground / high level sources, passive and buoyant releases, buildings, complex terrain, chemistry, deposition, and plume visibility. These studies are both short-term as well as annual, and involve tracer gases or specific pollutants of interest.

Potential uncertainties in model results derived from the current study have been minimised as far as practicable, and a series of worst-case assumptions have been applied to the input data in order to provide a robust assessment. These included the following:

- Selection of the dispersion model - ADMS 5.2 is a commonly used atmospheric dispersion model and results have been verified through a number of inter-comparison studies to ensure that model predictions are as accurate as possible;
- Meteorological data - Modelling was undertaken using hourly average meteorological data from the Sennybridge measurement station which is considered to be the most representative of local conditions;
- Operating conditions – Operating conditions are assumed to be continual and are therefore considered to be representative of worst-case, long-term process operations;
- Receptor locations - A 4 km x 4 km Cartesian Grid (with 20-metre grid spacing) was utilised in the model in order to calculate maximum predicted concentrations in the vicinity of the site. Specific receptor locations were also included in the model to provide detailed assessment at local sensitive locations; and,
- Variability - All model inputs are as accurate as possible and worst-case conditions were considered as necessary in order to ensure a robust assessment of potential ground level pollutant concentrations.

The application of the above measures to reduce uncertainty, and the use of a series of worst-case assumptions relating to the operational performance of the process should result in model accuracy of an acceptable level. Results were considered in the context of Air Quality Strategy (AQS) annual average objective value for Lead.

## **2. Modelling Input Data**

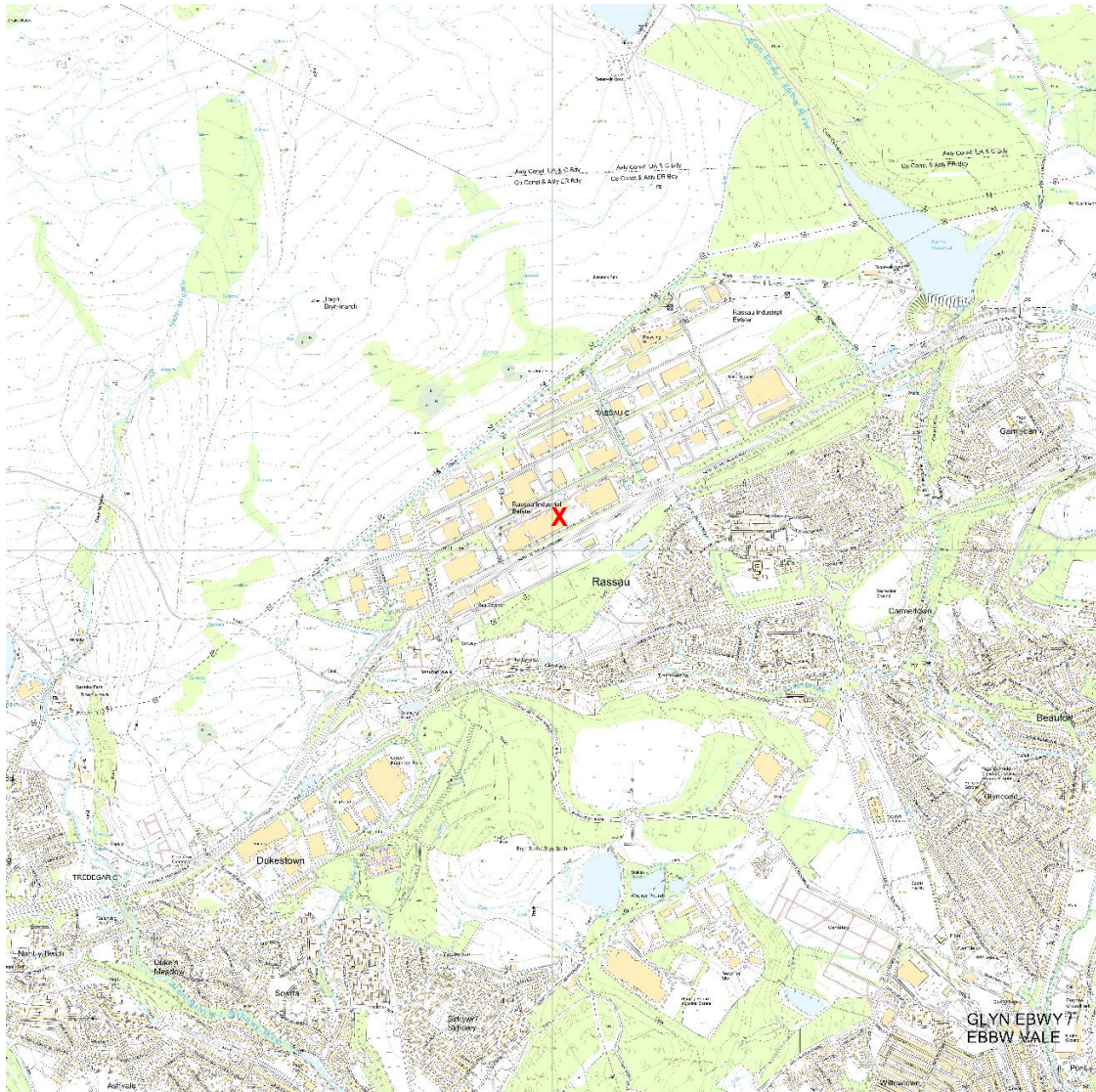
### **2.1 Introduction**

This section summarises the input data applied to the dispersion model in order to assess the impact of the Rassau Battery Manufacturing Site.

### **2.2 Site Location and Local Setting**

The Rassau Battery Manufacturing Site is located on the Rassau Industrial Estate in Ebbw Vale, South Wales. The approximate central grid reference of the site is 315027 212133, and the site has been operational since 1982. Figure 1 over page shows the local setting of the Rassau Battery Manufacturing Site, with the approximate centre of the site highlighted by the red 'X'.

**Figure 1 The Location and Local Setting of the Rassau Battery Manufacturing Site**



Ordnance Survey on behalf of the Controller of Her Majesty's Stationary Office, © Crown Copyright 100055158 Environmental Visage Limited (2021)

## 2.3 Plant Details and Emissions

The detailed air quality assessment was based on data generated by the ADMS Version 5.2 atmospheric dispersion model, which requires emission sources to be defined in terms of dimensions, location and physical characteristics of temperature, velocity, and pollutant discharge rate. This modelling study has been undertaken to assess the potential impact on local air quality due to releases of Lead from the processes at GSY. The majority of the discharge points are already in-situ and have been operational for many years. Quarterly monitoring data of the emissions is therefore readily available for each of the Lead emission points, and this data has been applied within the model when considering existing discharge points. The two new emission points have been modelled at the discharge conditions and emission levels which are expected to be included within the revised Environmental Permit as emission limit values.

The following parameters were used in the detailed modelling and include information on all Lead discharges from the site. Although other discharge points exist at the site these do not emit Lead and have not been considered within this assessment.

**Table 1 Stack Dimensions, Discharge Conditions and Modelled Emissions**

No.	Process	Stack Height (m)	Stack Diameter (m)	Stack Temperature (°C)	Velocity (m s <sup>-1</sup> )	Volumetric Flow-Rate (Am <sup>3</sup> hr <sup>-1</sup> )	Volumetric Flow-Rate (Nm <sup>3</sup> hr <sup>-1</sup> )	Emission Concentration (mg Nm <sup>-3</sup> )	Mass Release (g s <sup>-1</sup> )
A1	Mill 8 (New Mill)	13	0.355	100	28.06	10,000.00	7,319	0.5	1.02E-03
A2	Oxide Mill No. 5	13.6	0.2	62	9.41	1,063.71	814	0.02	4.52E-06
A3	New Cutting/Brushing Extraction	12	0.56	20	11.20	10,000.00	8,869	0.1	2.46E-04
A4	Casting Ladles 1 - 16	6	0.65	33	10.37	12,386.76	10,426	0.040	1.16E-04
A5	Pellet Casting Processes	13	0.5	31	12.26	8,663.90	7,403	0.030	6.17E-05
A6	Pasting Machine Mixers 2 & 3	11	0.9	28	4.41	10,100.31	9,255	0.070	1.80E-04
A7	Expanded Grid Line	9	0.7	27	5.21	7,217.31	6,646	0.147	2.71E-04
A9	Lead Dross and Recycling	12	0.48	24	14.80	9,643.68	8,432	0.047	1.09E-04
A11	Assembly Line 9A Extraction	9	1.15	22	8.47	31,672.04	27,824	0.010	7.73E-05
A18	Cutting Machines 1 - 7 Vacuum	11	0.15	35	12.86	819.44	733	0.017	3.39E-06
A19	Dross Bins 1 - 8	9	0.4	25	13.52	6,118.07	5,251	0.020	2.92E-05
A20	Oxide Mill No. 6	13.4	0.2	82	14.44	1,632.30	1,182	0.017	5.47E-06
A23	Oxide Mill No. 7	13	0.35	100	14.33	4,962.77	3,402	0.170	1.61E-04
A24	Assembly Line 9 Extraction	11	0.55	25	18.86	16,132.09	14,053	0.030	1.17E-04
A26	Casting Pots 1 - 8	6.5	0.64	39	10.32	12,327.03	10,872	0.230	6.95E-04
A27	Small Parts Casting Machine	13	0.45	53	3.53	2,020.57	1,589	0.020	8.83E-06

The velocity, volumetric flow-rate, emission concentrations and therefore the mass release modelled for A1 and A3 are the maximum operational values and guaranteed emission levels of the plant as specified by the technology providers for the SOVEMA SPA 24 T Oxide Mill CL and the Luksal Vario 3 exhaust filter respectively.

The discharge conditions (temperature, velocity and volumetric flow-rate) for all other emission points are as reported by Anchem Laboratories Limited in their Quarter 4 2020 monitoring report. The emission concentration for these points is the average of three quarter's monitoring data in 2020. No monitoring was undertaken in Quarter 2 2020 due to the global COVID-19 pandemic.

Reference conditions (N) in all cases are as per the Permit requirements and are therefore corrected to Standard Temperature and Pressure (273 K, 101.3 kPa without correction for moisture content or Oxygen).

## 2.4 Local Environmental Conditions

Local environmental conditions describe the factors that might influence the dispersion process (such as nearby structures, sharply rising terrain, etc.) and also describe the locations at which pollutant concentrations are to be predicted. These include:

### Nearby Buildings and Structures

The proximity of solid structures, such as buildings, to an emission source can affect the dispersion of a plume emitted from an adjacent chimney, particularly in the vicinity of that structure. The potential impact of this occurring was assessed based on the building dimensions data presented in Table 2 and the layout depicted in Figure 2.

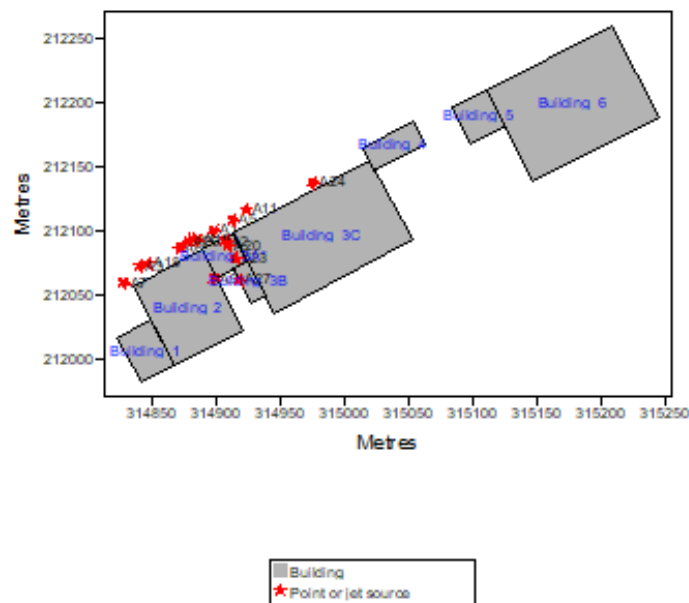
The inclusion of building layouts into the ADMS modelling system requires an element of simplification as only rectangular or circular structures are accepted by the model. As a result, a number of different blocks may be used to build the most accurate layout of the factory buildings ensuring, in this case, that the potential for downwash to be caused by semi-enclosed areas is fully considered.

Building dimensions were measured from Google Earth and building heights were confirmed by GSY.

**Table 2 Associated Building Dimensions**

Building / Factory	Height (m)	Length (m)	Width (m)
1 / Factory 1 Warehouse	9	30	40
2 / Factory 1	9	60	70
3A / Factory 1-2 Link	11	27	25
3B / Factory 2	11	12	30
3C / Factory 2	11	121	70
4 / Factory 2 Dispatch	9	44	20
5 / Factories 3 – 5 Dispatch	10.5	30	32
6 / Factories 3 - 5	9	110	80

**Figure 2 Site Layout as Modelled**



## Surface Roughness

Surface roughness defines the amount of near-ground turbulence that occurs as a consequence of surface features, such as land use (i.e. agriculture, water bodies, urbanisation, open parkland, woodland, etc.). Agricultural areas may have a surface roughness of approximately 0.2 m to 0.3 m whereas large cities and woodlands may have a roughness of 1 to 1.5 m. The surface roughness of an area can be included into the model as a single figure where appropriate, or as a spatially variable surface roughness file where land-use differs across the modelled area.

The area close to the GSY site is varied with the installation itself located on an industrial estate, residential villages and towns located to the south west and south east, and open heathland to the north of the estate. Due to this mixed land-use, a variable surface roughness file was created to accurately describe the surface features across the modelled grid. The file was created from Co-ORdination of INformation on the Environment (CORINE) Land Cover data, and included roughness figures for all areas.

## Local Terrain

Local terrain can affect wind flow patterns and, consequently, can affect the dispersion of atmospheric pollutants. The effects of terrain are not normally noticeable where the gradient is less than 10 %.

Due to the steadily rising terrain to the north of the site and the valley features to the south, a spatially variable terrain file was created using digitally mapped Ordnance Survey data of the local area, in order to ensure that the effects of variation in terrain were accurately calculated within the modelling exercise.

## Output Grid

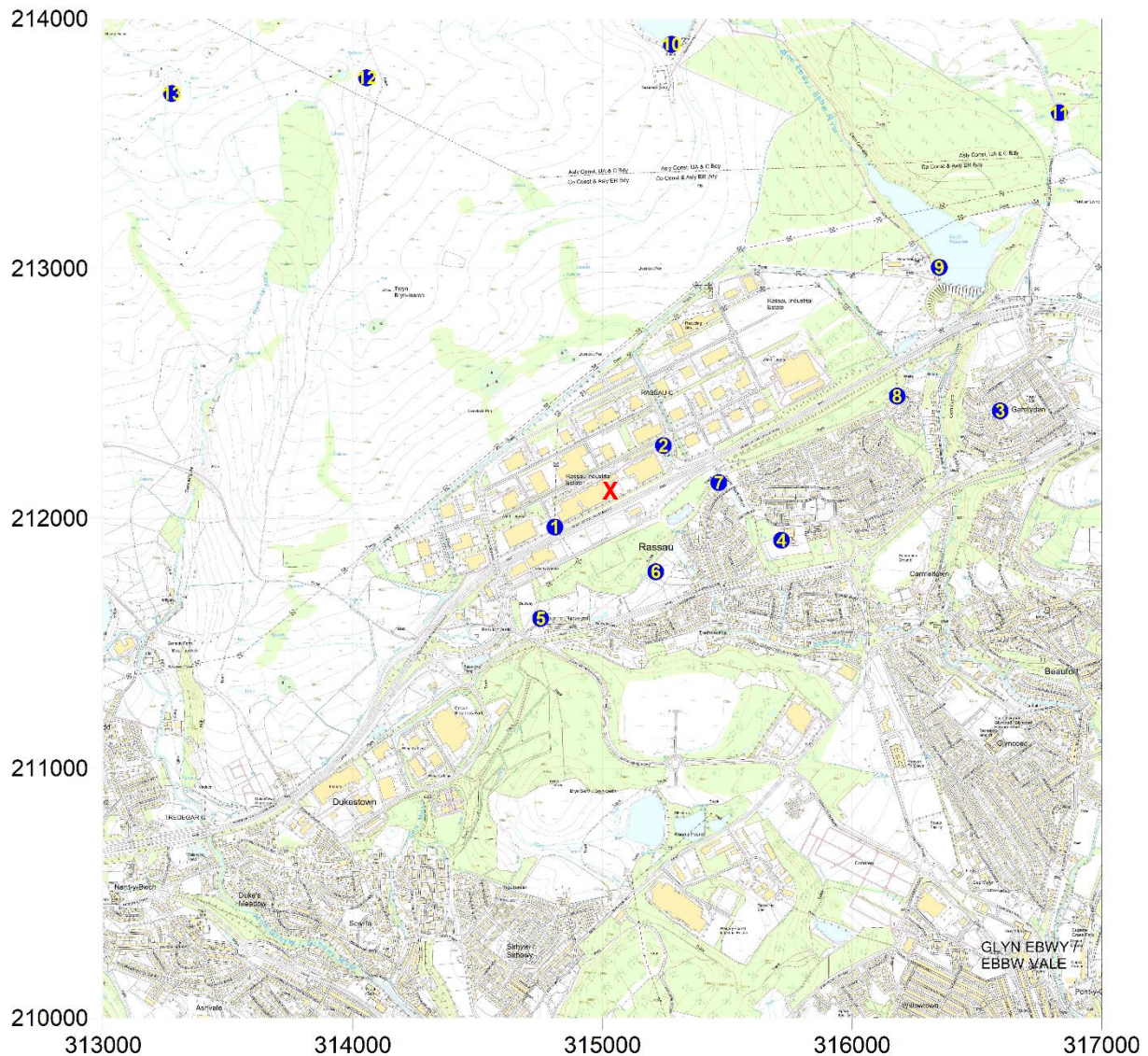
When setting up a receptor grid it is important to ensure that there are sufficient receptor points to be able to accurately predict the magnitude and location of the maximum Process Contribution. If the grid of receptor points is too widely spaced, the maximum concentration may be missed. Modelling was undertaken using a 4 km x 4 km grid (from 313000 – 317000 and 210000 - 214000) with 20-metre grid spacing across the modelled area. The site is located approximately centrally within the grid.

Specific receptors, representing locations where members of the general public may be present for significant periods of time, as well as nearby ecological habitat receptors, were entered into the model, as shown in the following table.

**Table 3 Specific Receptors Included in Detailed Modelling**

Receptor Number	X	Y	Receptor Name
1	314809	211965	Upwind Ambient Monitor
2	315244	212291	Downwind Ambient Monitor
3	316593	212430	Garnlydan School
4	315717	211912	Rhos Y Fedwen Primary School
5	314752	211599	Nant-Y-Croft
6	315213	211786	Dwelling off Primrose Lane
7	315466	212143	Stonebridge Road
8	316180	212489	Chestnut Close
9	316349	213004	Carno Reservoir
10	315276	213897	Llangynidr Reservoir
11	316830	213623	Mynydd Llangatwg SAC and SSSI
12	314055	213763	Mynydd Llangynidr SSSI (1)
13	313274	213700	Mynydd Llangynidr SSSI (2)

**Figure 3 Location of Specific Receptors in Relation to the Rassau Battery Manufacturing Site**



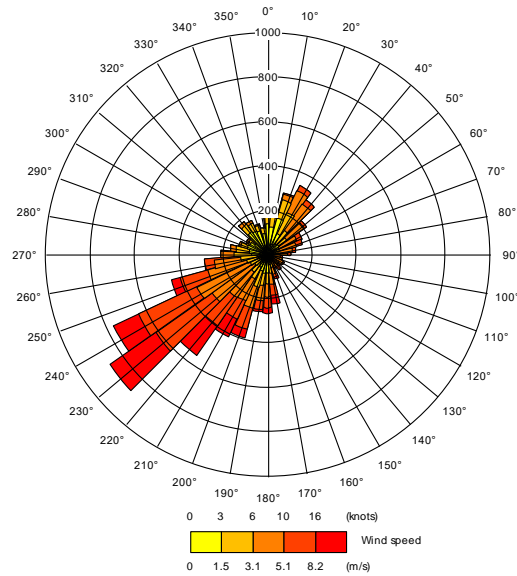
Ordnance Survey on behalf of the Controller of Her Majesty's Stationary Office, © Crown Copyright 10005158 Environmental Visage Limited (2021)

## 2.5 Meteorological Data

The detailed air quality assessment was undertaken using the ADMS Version 5.2 atmospheric dispersion model, applying five years' worth of hourly average meteorological data (2016 – 2020) from the Sennybridge measurement station, which is located approximately 40 kilometres to the north-west of the installation, at Triabad. Although some distance from the site, data from the Sennybridge meteorological measurement station is considered to be the most appropriate for the Rassau site. Data in 2020 included missing cloud cover data from Cardiff.

The surface roughness at the Sennybridge measurement station is considered to be best described as agricultural, including agricultural fields and buildings, the small village of Triabad and local areas of woodland. Hence a surface roughness of 0.3 metres was included for the meteorological measurement site, which is located outside of the extent of the spatially variable surface roughness file. The wind rose of the 2020 data is presented below and shows the prevailing wind coming principally from the south-west vector.

**Figure 4 2020 Wind Rose for the Sennybridge Meteorological Measurement Station**



## 2.6 Background Air Quality

GSY undertakes continuous monitoring of Lead levels in ambient air around their site, and manages two on-site monitoring stations. One unit is located to the south west of the site in the predominantly up-wind position and the second is located to the north east of the site, down-wind of the processing area. Additionally, a third background monitor is located at Garnlydan School and this is positioned in order to record the overall background concentration of Lead in the area, which might include contributions from the GSY site and the Envirowales battery recycling plant which is also situated on the Rassau Industrial Estate.

The annual average background levels of Lead recorded at each monitoring station in 2020, are detailed in Table 4.

**Table 4 Background Levels of Lead in Ambient Air**

Description	Monitor Reference	Annual Average Concentration ( $\mu\text{g m}^{-3}$ ) 2020
On-site up-wind monitor	TNT 1227	0.048
On-site down-wind monitor	TNT 1228	0.16
Garnlydan School approx. 1.6 km east of site	TNO 2899	0.048

Results from 2020 demonstrate that the measured concentrations at both background monitoring points recorded ambient concentrations of  $0.048 \mu\text{g m}^{-3}$  as an annual average. The on-site up-wind monitor reported comparable levels to those recorded at Garnlydan School and can both therefore be considered to be representative of the ambient Lead levels in the local area.

Monitor TNT 1228 is located in a generally down-wind direction from the site processing operations and Lead release points and hence could be expected to record higher concentrations of Lead in air. This is indeed seen to be the case, with annual average ambient concentrations equating to  $0.16 \mu\text{g m}^{-3}$  at this point, or 64 % of the Environmental Assessment Level for Lead in air.

## 2.7 Determining Significance

The UK Government, via the Environment Agency, provides guidance<sup>ii</sup> for screening the significance of air quality impacts associated with the operation of industrial processes and this methodology is also employed by NRW.

For long-term impacts, the guidance recommends a 1 % insignificance threshold relative to a long-term Air Quality Strategy (AQS) or Environmental Assessment Level (EAL) of the substance being studied, with a corresponding 10 % insignificance threshold for the assessment of short-term impacts (where relevant).

If both of these criteria are met, there is no requirement to do any further assessment of the substance and its impact is screened as insignificant.

If the initial criteria are not met, a second stage screening assessment is undertaken to determine the impact of the Predicted Environmental Concentration (PEC). The PEC is the sum of the Process Contribution (PC) plus the appropriate background concentration. The second stage screening assessment states that if:

- the short-term PC is less than 20 % of the short-term environmental standard minus twice the long-term background concentration; and
- the long-term PEC is less than 70 % of the long-term environmental standard,

there is no requirement to do any further assessment of the substance and its impact is screened as insignificant.

There are two assessment levels stipulated for Lead, that from the Ambient Air Directive (AAD) which is a strict limit of  $0.5 \mu\text{g m}^{-3}$  as an annual average, and the UK Air Quality Strategy (AQS) objective of  $0.25 \mu\text{g m}^{-3}$  which was to be achieved by 31<sup>st</sup> December 2008 and maintained thereafter<sup>iii</sup>. This latter, more stringent assessment level has been applied when considering the results from the modelling exercise.

### 3. Detailed Assessment of Lead Emissions from the Rassau Battery Manufacturing Site

#### 3.1 Introduction

Detailed atmospheric dispersion modelling was undertaken to assess the impact of emissions from the Rassau Battery Manufacturing Site operated by GS Yuasa Battery Manufacturing UK Limited on Rassau Industrial Estate, South Wales. The following results relate specifically to the potential impact of emissions from the site Lead based processes.

#### 3.2 Process Contributions of Lead

The results from detailed modelling are presented in the following table. The results are based upon modelling the measured emissions from existing plant, and the proposed maximum discharge conditions and emission levels from A1 and A3; the new Lead Oxide mill and the new cutting and brushing line extraction point. The annual Process Contributions specified are the maximum results from modelling five years' worth of meteorological conditions and assume continuous operations and discharges for the entire year, which represent an over-estimate as processes are not operated continually.

The data presented in Table 5 below show both the maximum Process Contribution (PC) and the resultant Predicted Environmental Concentration (PEC) for Lead across the modelled grid. This is the highest predicted result and may not necessarily occur at a sensitive receptor. The PEC values take into account the up-wind annual average Lead concentration of  $0.048 \mu\text{g m}^{-3}$ .

**Table 5 Results from Detailed Assessment of Lead at the Point of Maximum Process Contribution**

Statistic	Exceedance Threshold	Concentration ( $\mu\text{g m}^{-3}$ )	Percentage of the AQS
Annual Average (PC)	0.25	0.15	59.9 %
Annual Average (PEC)		0.198	79.1 %

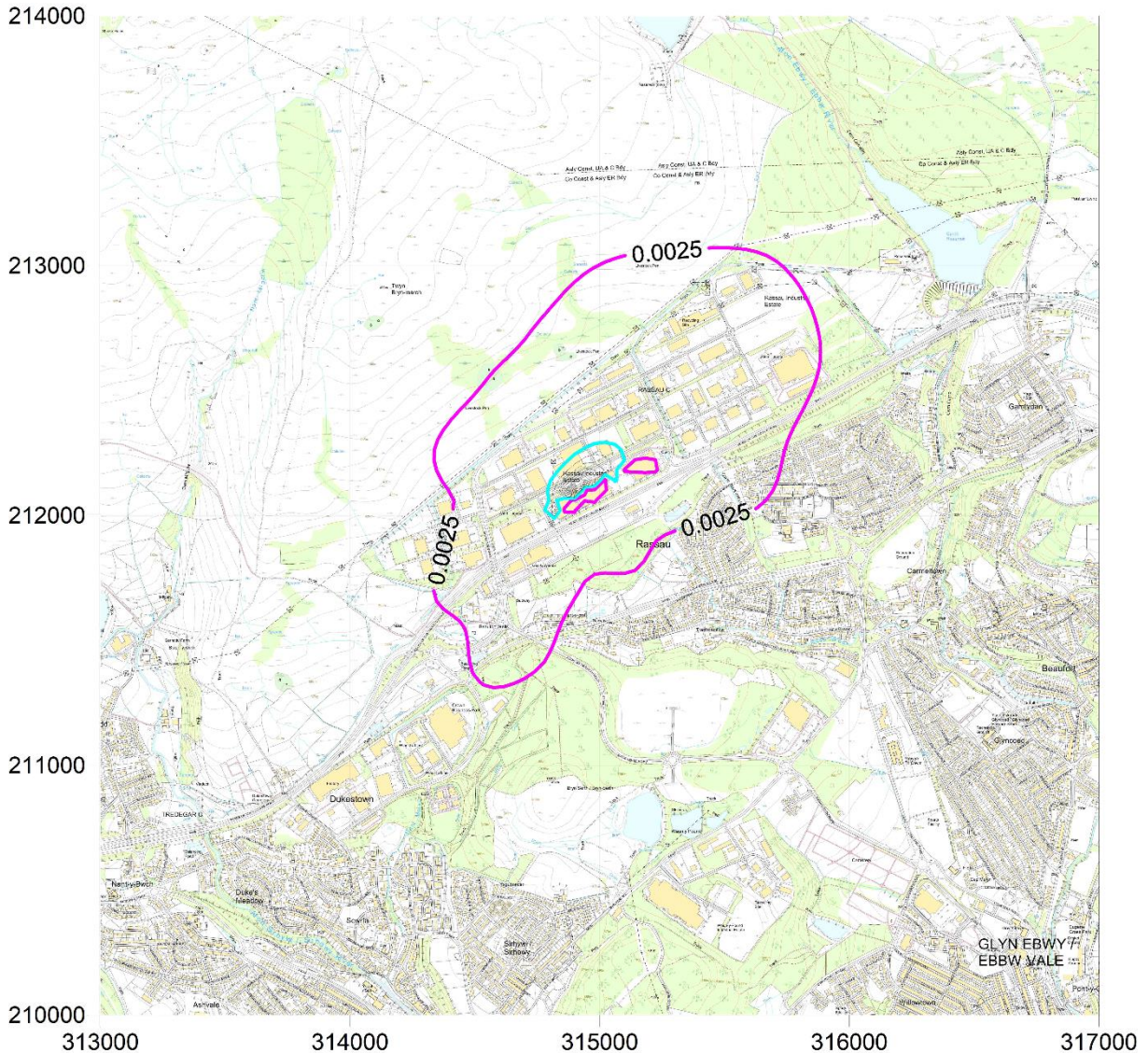
The results from detailed modelling predict that the site operations result in a maximum annual average Process Contribution of Lead which equates to approximately 60 % of the AQS objective value and hence does not immediately screen as insignificant. Taking account of the existing, up-wind background, the PEC equates to more than 70 % of the AQS and therefore also does not screen as insignificant at the secondary assessment stage.

It is noted however that this maximum PC occurs at a point which is located within the GSY site and is not the location of any sensitive receptor. Additionally, only one other point across the entire 40,401 modelled points within the grid would result in a PEC > 70 % of the AQS and this too is located within the site boundary.

Figure 5 below, shows the dispersion and reduction in the PC with distance from the point of maximum contribution. The magenta isopleth denotes the point at which the PC reduces to 1 % of the AQS ( $0.0025 \mu\text{g m}^{-3}$ ) and therefore in all areas outside of this contour line, contributions can immediately be screened as insignificant. The area within the magenta isopleth largely comprises the industrial estate.

The turquoise isopleth denotes a PC equating to 10 % of the annual average AQS ( $0.025 \mu\text{g m}^{-3}$ ), with higher contributions within that contour line.

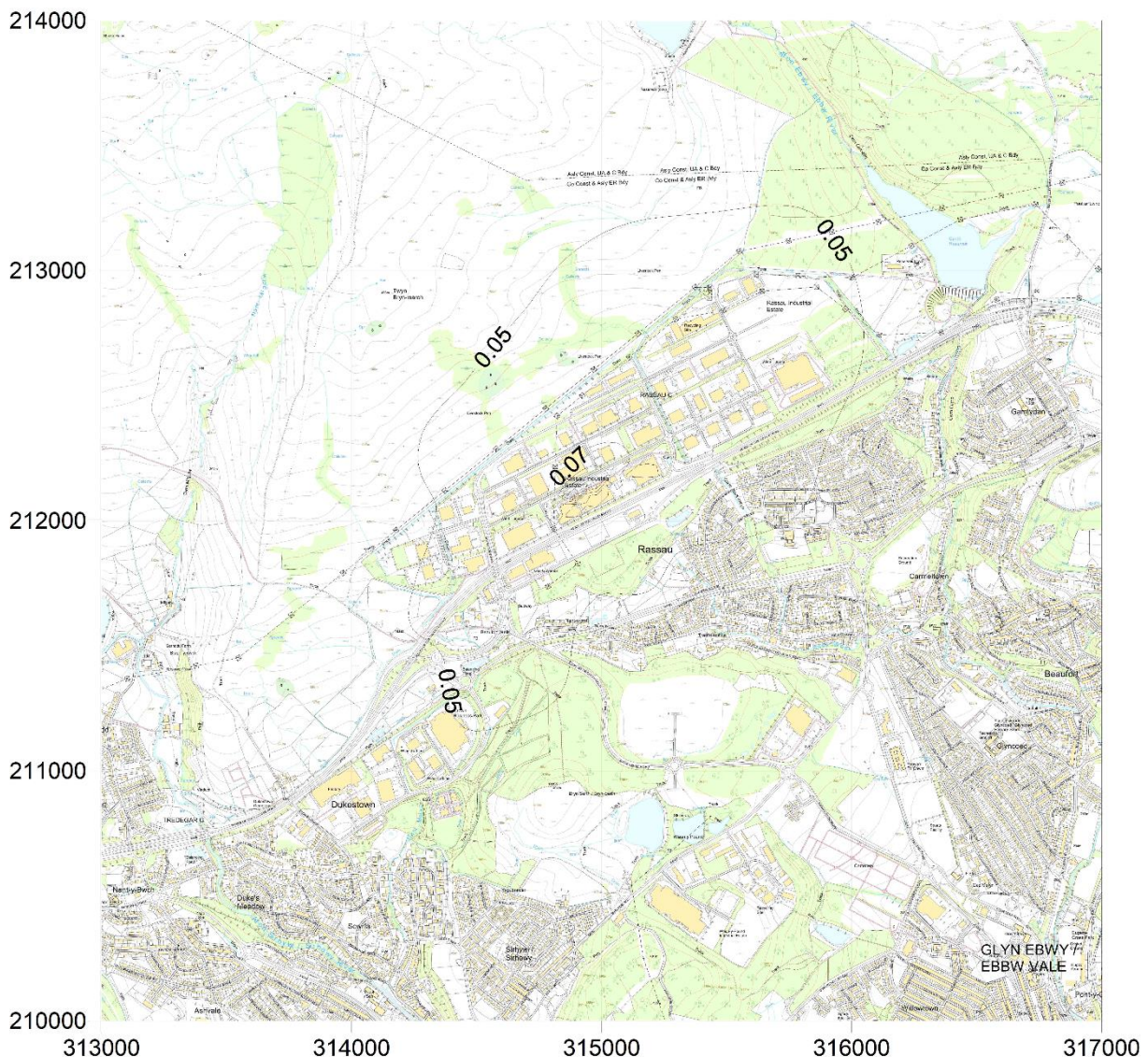
**Figure 5 Maximum Annual Average Lead Process Contribution ( $\mu\text{g m}^{-3}$ )**



Ordnance Survey on behalf of the Controller of Her Majesty's Stationary Office, © Crown Copyright 100055158 Environmental Visage Limited (2021)

A similar plot of the PEC is presented in Figure 6 below. The lack of a coloured isopleth to denote the point at which the PEC equates to less than 70 % of the AQS is due to the fact that only two points across the modelled grid actually do exceed 70 % of the AQS and thus, no isopleth can be drawn across such a restricted area. Both points which report a PEC of more than 70 % of the AQS are located within the GSY site boundary and remain within the AQS.

**Figure 6 Maximum Annual Average Lead Predicted Environmental Concentration ( $\mu\text{g m}^{-3}$ )**



Ordnance Survey on behalf of the Controller of Her Majesty's Stationary Office, © Crown Copyright  
100055158 Environmental Visage Limited (2021)

As the site also records a down-wind background concentration which would include consideration of the existing emissions to atmosphere, including those from mill number 4 which will ultimately be replaced, the results in Table 6 consider the Process Contributions from the proposed discharge points only (A1 and A3), and incorporate the down-wind background ( $0.16 \mu\text{g m}^{-3}$ ) to assess the resultant PEC with the existing operations.

The results show a reduction in the overall PEC, although this is still not screened as insignificant at the point of maximum impact, which again is located within the GSY site boundary.

**Table 6 Results from Detailed Assessment of Lead at the Point of Maximum Process Contribution – Modelling Discharges from A1 and A3 Only**

Statistic	Exceedance Threshold	Concentration ( $\mu\text{g m}^{-3}$ )	Percentage of the AQS
Annual Average (PC)	0.25	0.024	<b>9.6 %</b>
Annual Average (PEC)		0.184	<b>73.6 %</b>

NRW's guidance for undertaking risk assessments for air emissions applies the Environment Agency methodology. This states that, even where a Process Contribution cannot be screened as insignificant at either the initial or secondary assessment stages, you do not need to take further action where:

- the proposed emissions comply with the best available techniques associated emission levels (BAT-AELs) or the equivalent requirements where there is no BAT-AEL, and
- the resulting PECs will not exceed environmental standards.

The results above demonstrate that at some locations within the site boundary, neither the PC nor the PEC resulting from emissions of Lead associated with the Rassau Battery Manufacturing Site can be screened as insignificant. However, when applying the Environment Agency and NRW methodology specified above, no further assessment is required at this stage.

### 3.3 Deposition of Lead to Ground

The dry deposition of Lead emissions was also subsequently modelled to ascertain the Process Contributions of Lead to ground. Lead was assumed to be non-reactive that is, it is not expected to undergo any significant chemical reaction on contact with the ground's surface, and results are calculated by the model in  $\mu\text{g m}^{-2} \text{s}^{-1}$ .

The maximum point of deposition occurred within the site boundary and was approximately  $0.00027 \mu\text{g m}^{-2} \text{s}^{-1}$ . This equates to  $0.023 \text{ mg m}^{-2} \text{ day}^{-1}$  and is approximately 2.1 % of the assessment level for Process Contributions of Lead to ground. Across the 4 km x 4 km modelled grid, only 16 points were predicted to equate to more than 1 % of the  $1.1 \text{ mg m}^{-2} \text{ day}^{-1}$  assessment level. Fifteen of these occur within the site boundary, with only five of those points being predicted to land in areas of landscaping. The remaining points, including the single location outside of the site where the levels of Lead deposition to ground are estimated to be over 1 % of the assessment level, occur over areas of hardstanding, for example roadways, and therefore will have no direct impact on the ground.

With very low levels of Lead deposition predicted across the modelled grid and with the rapid reduction of concentrations from the point of the maximum contribution, the potential impact of Lead deposition to open ground such as at sensitive ecological receptors, farmland, gardens or allotment plots in the local area, can be screened as insignificant.

## 4. Air Quality Impact at Specific Receptors

Noting that the most significant PCs reported in Section 3 above occur within the site boundary, the model was also set up to calculate the impact of emissions at a total of thirteen specific receptors as detailed in Table 3 and Figure 3. These locations include the up-wind and down-wind monitoring points and Garnlydan School (receptor numbers 1 – 3 respectively) where ambient concentrations of Lead are continually monitored.

The results are summarised in the following table, based on the impact of emissions from the site operations and are the maximum values reported at each location from modelling five years' worth of meteorological conditions. Long-term Process Contributions equating to more than 1 % of the AQS are presented in bold text.

**Table 7 Detailed Assessment of Process Contributions ( $\mu\text{g m}^{-3}$ ) at Specific Receptors Due to Discharges of Lead from the Rassau Battery Manufacturing Site Operations**

Receptor Number	Annual Average Lead PC ( $\mu\text{g m}^{-3}$ )	Percentage of the AQS	Annual Average Lead PEC ( $\mu\text{g m}^{-3}$ )	Percentage of the AQS
1	0.01861	<b>7.4 %</b>	0.067	27 %
2	0.01599	<b>6.4 %</b>	0.064	26 %
3	0.00145	0.6 %	0.049	20 %
4	0.00254	<b>1.0 %</b>	0.051	20 %
5	0.00388	<b>1.6 %</b>	0.052	21 %
6	0.00242	1.0 %	0.050	20 %
7	0.00628	<b>2.5 %</b>	0.054	22 %
8	0.00226	0.9 %	0.050	20 %
9	0.00211	0.8 %	0.050	20 %
10	0.00103	0.4 %	0.049	20 %
11	0.00113	0.5 %	0.049	20 %
12	0.00045	0.2 %	0.048	19 %
13	0.00029	0.1 %	0.048	19 %

Although Process Contributions cannot immediately be screened as insignificant at five of the thirteen receptors, the PC at eight of the discrete receptors remains within 1 % of the annual AQS for Lead and therefore require no further assessment. Locations where the PC is not immediately screened includes receptor numbers 1 and 2, which are the ambient Lead monitoring locations within the site boundary; 4 and 5, which relate to Rhos Y Fedwen Primary School and Nant-Y-Croft; and receptor number 7, representing the residential area on Stonebridge Road.

Although not immediately screened as insignificant, all PEC levels remain within 30 % of the AQS at the secondary assessment stage, and are therefore screened as insignificant. As a result of the impacts of Lead emissions screening at each of the modelled sensitive receptors, either at the initial or secondary assessment stage, the impact of the Rassau Battery Manufacturing Site operations on local sensitive receptors is confirmed as being insignificant.

## 5. Conclusions

Environmental Visage Limited was commissioned to undertake a detailed air quality assessment of pollutant emissions from proposed new and replacement plant at the Rassau Battery Manufacturing Site operated by GS Yuasa Battery Manufacturing UK Limited on the Rassau Industrial Estate, Rassau, Ebbw Vale, South Wales. The site has been operational for almost 40 years and is permitted to discharge controlled levels of Lead to atmosphere under the terms of the site Environmental Permit. However, the proposed introduction of a replacement Lead Oxide mill and the incorporation of an additional extraction point to provide local exhaust ventilation to a new cutting and brushing line, requires the assessment of the changes in Lead emissions and the resultant impact on levels of Lead in ambient air.

The ADMS Version 5.2 modelling software was employed to assess the dispersion of emissions from the site processes which might release Lead to atmosphere. As the majority of the site discharge points are currently operational and are regularly monitored, data from recent monitoring exercises was applied when incorporating the existing emissions. The two new discharge points were included into the model applying their maximum discharge characteristics and anticipated emission levels, which are levels guaranteed by the technology provider. The model assumed continuous operation of all Lead discharging processes, 24-hours per day, 7-days per week.

The results from the detailed dispersion modelling have confirmed that the impact of the emissions from the site operations remain within the UK Air Quality Strategy objective value of  $0.25 \mu\text{g m}^{-3}$  across the entire modelled area and in most cases can be screened as insignificant. Some areas within the operational site boundary cannot be screened as insignificant, with the overall Predicted Environmental Concentrations equating to between 70 and 80 % of the AQS.

However, the installation area is not classed as a sensitive receptor, the PEC does not exceed the AQS at any point, and Lead processes across the site apply the Best Available Techniques. As such, no further assessment of these maximum contributions is required.

At the modelled discrete sensitive receptors, which include sensitive human health receptors such as schools and residential areas, sensitive environmental features such as local reservoirs and sensitive ecological sites such as designated nature sites in the local area, the impact of Lead emissions from the Rassau Battery Manufacturing Site operations screen as insignificant either at the initial or secondary assessment stage.

The potential impact of Lead deposition to open ground outside of the site boundary such as at sensitive ecological receptors, farmland, gardens or allotment plots in the local area, also screened as insignificant.

The results from detailed modelling therefore confirm that emissions of Lead to air from the existing and proposed operations at the site are acceptable, will not result in any exceedance of the UK Air Quality Strategy objective value, and are screened as insignificant at local sensitive receptors.

## 6. References

---

<sup>i</sup> ADMS 5 Atmospheric Dispersion Modelling System. User Guide Version 5.2 November 2016

<sup>ii</sup> <https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit>

<sup>iii</sup> The Air Quality Strategy for England, Scotland, Wales and Northern Ireland. Volume 1. July 2007.  
[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/69336/pb12654-air-quality-strategy-vol1-070712.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69336/pb12654-air-quality-strategy-vol1-070712.pdf)