



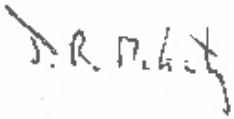
## Licensing and Enforcement Committee

**Meeting: Monday, 20th November 2023 at 6.30 pm hours in Civic Suite,  
North Warehouse, The Docks, Gloucester, GL1 2EP**

|                    |   |
|--------------------|---|
| <b>Membership:</b> | Cllrs. Brooker (Chair), Kubaszczyk (Vice-Chair), Ackroyd, Bowkett, Chambers-Dubus, Finnegan, Hyman, Patel, Radley, Tracey, Trimmell and Williams      |
| <b>Contact:</b>    | Democratic and Electoral Services<br>01452 396126<br><a href="mailto:democratic.services@gloucester.gov.uk">democratic.services@gloucester.gov.uk</a> |

### AGENDA

|           |  |
|-----------|--|
| <b>1.</b> | <b>APOLOGIES</b><br><br>To receive any apologies for absence.  |
| <b>2.</b> | <b>DECLARATIONS OF INTEREST</b><br><br>To receive from Members, declarations of the existence of any disclosable pecuniary, or nonpecuniary, interests and the nature of those interests in relation to any agenda item. Please see Agenda notes.  |
| <b>3.</b> | <b>MINUTES</b> (Pages 5 - 8)<br><br>To approve as a correct record the minutes of the meeting held on Tuesday, September 12, 2023.   |
| <b>4.</b> | <b>APPLICATION FOR AN ENVIRONMENTAL PERMIT - PERMALI GLOUCESTER UK LTD.</b> (Pages 9 - 340)<br><br>To receive the report of the Head of Communities. The purpose of the report was for the Licensing and Enforcement Committee to consider the granting of an Environmental Permit, to operate a solvent impregnation activity, at Permal Gloucester UK Ltd. 170 Bristol Road, Gloucester GL1 5TT.<br><br>To speak at the committee hearing please contact <a href="mailto:community.wellbeing@gloucester.gov.uk">community.wellbeing@gloucester.gov.uk</a> or call 01452 396396 for support by noon on Wednesday 15 November 2023. Please note that only those that have made representations/interested parties will be permitted to address the Committee at the meeting. |
| <b>5.</b> | <b>DATE OF NEXT MEETING</b><br><br>Tuesday, 12 December at 6.30 p.m.   |

A handwritten signature in black ink, appearing to read 'J. R. McGinty', written in a cursive style.

**Jon McGinty**  
**Managing Director**

**Date of Publication: Friday, 10 November 2023**

## NOTES

### Disclosable Pecuniary Interests

The duties to register, disclose and not to participate in respect of any matter in which a member has a Disclosable Pecuniary Interest are set out in Chapter 7 of the Localism Act 2011.

Disclosable pecuniary interests are defined in the Relevant Authorities (Disclosable Pecuniary Interests) Regulations 2012 as follows –

| <u>Interest</u>                                   | <u>Prescribed description</u>   |
|---|---|
| Employment, office, trade, profession or vocation | Any employment, office, trade, profession or vocation carried on for profit or gain.  |
| Sponsorship                                       | Any payment or provision of any other financial benefit (other than from the Council) made or provided within the previous 12 months (up to and including the date of notification of the interest) in respect of any expenses incurred by you carrying out duties as a member, or towards your election expenses. This includes any payment or financial benefit from a trade union within the meaning of the Trade Union and Labour Relations (Consolidation) Act 1992.                       |
| Contracts   | Any contract which is made between you, your spouse or civil partner or person with whom you are living as a spouse or civil partner (or a body in which you or they have a beneficial interest) and the Council<br>(a) under which goods or services are to be provided or works are to be executed; and<br>(b) which has not been fully discharged  |
| Land  | Any beneficial interest in land which is within the Council's area.<br><br>For this purpose "land" includes an easement, servitude, interest or right in or over land which does not carry with it a right for you, your spouse, civil partner or person with whom you are living as a spouse or civil partner (alone or jointly with another) to occupy the land or to receive income.   |
| Licences  | Any licence (alone or jointly with others) to occupy land in the Council's area for a month or longer.  |
| Corporate tenancies                               | Any tenancy where (to your knowledge) –<br>(a) the landlord is the Council; and<br>(b) the tenant is a body in which you, your spouse or civil partner or a person you are living with as a spouse or civil partner has a beneficial interest   |
| Securities  | Any beneficial interest in securities of a body where –<br>(a) that body (to your knowledge) has a place of business or land in the Council's area and<br>(b) either –<br>i. The total nominal value of the securities exceeds £25,000 or one hundredth of the total issued share capital of that body; or<br>ii. If the share capital of that body is of more than one class, the total nominal value of the shares of any one class in which you, your spouse or civil partner or person with |

whom you are living as a spouse or civil partner has a beneficial interest exceeds one hundredth of the total issued share capital of that class.

For this purpose, "securities" means shares, debentures, debenture stock, loan stock, bonds, units of a collective investment scheme within the meaning of the Financial Services and Markets Act 2000 and other securities of any description, other than money deposited with a building society.

NOTE: the requirements in respect of the registration and disclosure of Disclosable Pecuniary Interests and withdrawing from participating in respect of any matter where you have a Disclosable Pecuniary Interest apply to your interests and those of your spouse or civil partner or person with whom you are living as a spouse or civil partner where you are aware of their interest.

### **Access to Information**

Agendas and reports can be viewed on the Gloucester City Council website: [www.gloucester.gov.uk](http://www.gloucester.gov.uk) and are available to view five working days prior to the meeting date.

For enquiries about Gloucester City Council's meetings please contact Democratic Services, 01452 396126, [democratic.services@gloucester.gov.uk](mailto:democratic.services@gloucester.gov.uk).

If you, or someone you know cannot understand English and need help with this information, or if you would like a large print, Braille, or audio version of this information please call 01452 396396.

### **Recording of meetings**

Please be aware that meetings may be recorded. There is no requirement for those wishing to record proceedings to notify the Council in advance; however, as a courtesy, anyone wishing to do so is advised to make the Chair aware before the meeting starts.

Any recording must take place in such a way as to ensure that the view of Councillors, Officers, the Public and Press is not obstructed. The use of flash photography and/or additional lighting will not be allowed unless this has been discussed and agreed in advance of the meeting.

### **FIRE / EMERGENCY EVACUATION PROCEDURE**

If the fire alarm sounds continuously, or if you are instructed to do so, you must leave the building by the nearest available exit. You will be directed to the nearest exit by council staff. It is vital that you follow their instructions:

- You should proceed calmly; do not run and do not use the lifts;
- Do not stop to collect personal belongings;
- Once you are outside, please do not wait immediately next to the building; gather at the assembly point in the car park and await further instructions;
- Do not re-enter the building until told by a member of staff or the fire brigade that it is safe to do so.



## LICENSING AND ENFORCEMENT COMMITTEE

**MEETING** : Tuesday, 12th September 2023

**PRESENT** : Cllrs. Brooker (Chair), Kubaszczyk (Vice-Chair), Ackroyd, Bowkett, Chambers-Dubus, Hyman, Radley, Tracey and Trimnell

**Officers in Attendance**

Licensing Team Leader

Senior Lawyer, One Legal

Democratic and Electoral Services Officer

**APOLOGIES** : Cllrs. Finnegan, Patel and Williams

### 11. APPOINTMENT OF CHAIR AND VICE-CHAIR

Councillor Brooker and Kubaszczyk were confirmed as Chair and Vice-Chair of the Committee respectively.

### 12. DECLARATIONS OF INTEREST

There were no declarations of interest.

### 13. MINUTES

**RESOLVED** – that the minutes of the meeting held on the 13<sup>th</sup> of June, 2023 were confirmed and signed as a correct record by the Chair.

### 14. MINUTES OF LICENSING SUB-COMMITTEES

**RESOLVED** – that the minutes of the Licensing Sub-Committee held on Wednesday 2<sup>nd</sup> August 2023 were noted.

### 15. PUBLIC QUESTION TIME (15 MINUTES)

15.1 A question was submitted by the CEO of Stamp Out Spiking, to the Licensing Team Leader. The question was read aloud by the Democratic and Electoral Services Officer. The question read:

**LICENSING AND ENFORCEMENT COMMITTEE**  
**12.09.23**

*“What measures are currently in place to safeguard against spiking within your current licensed venues?”*

15.2 In response, the Licensing Team Leader noted that he would liaise with Gloucestershire Constabulary to provide a formal written answer. The Licensing and Enforcement Committee would receive a copy of the answer.

**16. PETITIONS AND DEPUTATIONS (15 MINUTES, MAXIMUM 3 MINUTES PER PERSON)**

There were no petitions nor deputations.

**17. PROPOSED REVISED DRAFT CONDITIONS FOR HACKNEY CARRIAGE AND PRIVATE HIRE LICENSING**

17.1 The Licensing Team Leader presented the report of the Director of Communities. The purpose of the report was to present the results of the consultation feedback on the revised draft Policy Conditions for Hackney Carriage and Private Hire Licensing. Additionally, it aimed to consider the consultation feedback and reach an agreement on the final version of the Hackney Carriage and Private Hire Policy for adoption by the Licensing and Enforcement Committee.

17.2 The Chair noted her support for the recommendations outlined in the report and moved to accept them. With no dissent, the recommendations were accepted.

**RESOLVED** – that the revised Policy and conditions for Hackney Carriage and Private Hire Licensing and consultation feedback be noted by Members and adopted by the Licensing and Enforcement Committee to take immediate effect.

**18. QUARTERLY UPDATE**

The Licensing Team Leader asked members if they had read and understood the content of the quarterly report. Members indicated that they had read the report and understood its content.

**RESOLVED** – that Licensing and Enforcement Committee noted the content of the report.

**19. EXCLUSION OF PRESS AND PUBLIC**

There was no requirement to exclude the press and public as no member indicated that they wished to discuss agenda item 11.

**20. LICENSING AND ENFORCEMENT SUB-COMMITTEE MINUTES**

**LICENSING AND ENFORCEMENT COMMITTEE  
12.09.23**

**RESOLVED** – that the minutes of the meeting of the Licensing and Enforcement Sub-Committee held on Wednesday, 28th June 2023 were noted.

**21. DATE OF NEXT MEETING**

Tuesday, 12 December 2023 at 6.30 p.m.

**Time of commencement: 6.30 pm hours**

**Time of conclusion: 6.35 pm hours**

**Chair**

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# Gloucester City Council

|                               |   |                                 |                    |
|-------------------------------|---|---------------------------------|--------------------|
| <b>Meeting:</b>               | <b>Licensing &amp; Enforcement Committee</b>  | <b>Date:</b>                    | <b>20.11.23</b>    |
| <b>Subject:</b>               | <b>Pollution Prevention &amp; Control Act 1999 / Environmental Permitting (England &amp; Wales) Regulations 2016 / Application for an Environmental Permit.</b> |                                 |                    |
| <b>Report Of:</b>             | <b>Community Wellbeing Manager</b>  |                                 |                    |
| <b>Wards Affected:</b>        | <b>Westgate</b>   |                                 |                    |
| <b>Key Decision:</b>          | <b>No</b>   | <b>Budget/Policy Framework:</b> | <b>No</b>          |
| <b>Contact Officer:</b>       | <b>Gupti Gosine</b>   |                                 |                    |
|                               | <b>Email: Gupti.Gosine@gloucester.gov.uk</b>  | <b>Tel:</b>                     | <b>01452396288</b> |
| <b>Documentation / Plans:</b> | <b>Application Documents, Request for Further Information Notice, Draft Environmental Permit.</b>   |                                 |                    |

## 1. Purpose of Report

- 1.1. To ask the Committee to consider the granting of an Environmental Permit, to operate a solvent impregnation activity, at Permali Gloucester UK Ltd. 170 Bristol Road, Gloucester GL1 5TT.

## 2. Recommendations

- 2.1. The Licensing and Enforcement Committee is asked to **RESOLVE** that the granting of an Environmental Permit to Permali Gloucester UK Ltd. be approved for the purposes of enabling the Council to regulate the site in terms of emissions to air, including noise and odour.

## 3. Background and Key Issues

- 3.1. The Environmental Permitting (England & Wales) Regulations 2016 (EPR) provide a legislative framework for the application and granting of permits for those operators undertaking a wide range of activities that release emissions to land, air and water, or that involve waste.
- 3.2. The Local Authority is the Regulator under the EPR in relation to Part A(2) installations, Part B installations and Part B mobile plant, small waste incineration plants and Solvent Emission Activities.
- 3.3. On 3<sup>rd</sup> March 2023 the Council received an application from Permali Gloucester UK Ltd to operate a solvent impregnation activity at 170 Bristol Road, Gloucester GL1 5TT.

- 3.4. The application was deemed Duly Made (sufficient information was submitted for the application to be considered) by the Council on 3<sup>rd</sup> May 2023 and the application documents were made available on the Council web site for the public / statutory consultees consultation.
- 3.5. The Council is required, under regulation 13 (EPR), to consider the granting of an Environmental Permit following the Application by Permali Gloucester Ltd. to operate an activity listed in Schedule 1, Part 2, Chapter 6, Section 6.4 Part A(2) and Schedule 14 of those regulations.
- 3.6. The activity will involve the consumption of over 200 Tonnes of organic solvents per annum in the manufacture of bespoke laminated products for a range of end uses. Directly associated activities include the machining and coating, using organic solvents, of the laminated products. At the time of the application, organic solvent consumption exceeded the threshold for a Part B solvent activity but well below the 200 Tonne per annum threshold for a Part A2 solvent activity. Permali Gloucester Ltd. should have therefore made an application for their existing solvent activity when solvent consumption was expected to exceed the 5 Tonne per annum threshold. The current application for consideration seeks to remedy the historic issue and allow the process to be permitted under regulation 12(1) EPR.
- 3.7. Organic solvent emissions from the activity are abated via a Regenerative Thermal Oxidiser (RTO) and a Carbon Filter and particulate matter emissions via two dust arrestment plants. Noise from the site will be mitigated at source and by a noise barrier along the boundary of the adjacent Gloucester to Sharpness canal. In general terms, the regulated site will operate under an approved Environmental Management System (EMS) and utilise the Best Available Techniques (BAT) to prevent, and where this is not possible, minimise emissions to the surrounding environment.
- 3.8. Worcestershire Regulatory Services (WRS) undertake the regulation of permitted activities in the Gloucester City area on behalf of the Council and have considered the application submissions from Permali in relation to emissions to air, noise, their EMS and the application of BAT.
- 3.9. The EPR require the Council to consult anyone who they consider is affected by, is likely to be affected by, or has an interest in, an application for an Environment Permit. The Council therefore published the application documents on their web site and informed local residents, by letter drop, of the application with a link to the web site. Additionally, The Canal and River Trust, Natural England and the local NHS Foundation Trust were also consulted.
- 3.10. Following notifications to nearby residents and publication of the permit application documents the Council received approximately 170 representations from local residents and Councillors objecting to the granting of an Environmental Permit for the site on the grounds that noise and odour from the site was adversely impacting local residents and that an intensification of site activities would exacerbate this situation. No responses were received from Natural England nor the local NHS Foundation Trust. The response from The Canal & River Trust related to their concerns that polluting emissions from the site could enter the adjacent canal. There are no polluting emissions to the canal from the site and a permit condition is included prohibiting any polluting emissions to land or water.

- 3.11. Copies of the representations are attached to this report. The Council has a duty under the EPR to consider the representations that have been made during the determination period.
- 3.12. Subsequently, the Council served a 'Request for Further Information' notice on Permali requiring additional information to be submitted in relation to noise, odour and polluting emissions from the site.
- 3.13. In terms of odour emissions from the site, it is considered that the existing RTO was not capable of managing odour emissions. The RTO has been replaced along with a new Carbon Filter, this have been shown to comply with the required organic solvent emission limit for new activities of 20mg/m<sup>3</sup> and has reduced the complaints of odour nuisance linked to the site since they were brought into service in September 2023. Emission testing was undertaken for unabated emissions relating to finishing activities (layup and pressing) and the Council consider that the polluting / odorous emissions from these activities are not significant and do not require further abatement. Additionally, Permali will operate under an approved Odour Management Plan which will ensure that any complaints of odour nuisance are dealt with appropriately and odour further mitigated if deemed necessary by the Council .
- 3.14. In terms of noise emissions from the site, Permali are / have implementing the submitted Noise Action Plan with the overall aim of reducing the cumulative noise impact from the factory to levels similar to the existing background (LA90) noise levels in the locality when assessed in terms of BS4142:2014+A1:2019 (Methods for Rating and Assessing Industrial and Commercial Sound). Noise mitigation measures implemented to date include 'at source' noise mitigation to plant / equipment and the installation of a temporary noise barrier(s) along the factory boundary with the Gloucester & Sharpness canal. A permanent absorptive barrier is scheduled for installation in January 2024. Additionally, Permali will operate under an approved Noise Management Plan which will ensure that any complaints of noise nuisance are dealt with appropriately and noise further mitigated if deemed necessary by the regulator.
- 3.15. The Council therefore consider that Permali have demonstrated that the site can operate without adversely impacting local residential premises. In terms of BAT, the Council consider that the company's current Management System is fit for purpose with respect to emissions to air and noise. Improvements / additions to a dedicated EMS, in relation to the overall environmental impact of site activities, are detailed within the 'Improvement Plan Requirements' detailed in Table 1.3 of the draft permit with a target date for compliance 6 months from the date any permit is granted. Permali are currently in the process of preparing an application for ISO14001 (Environmental Management Systems Standard) accreditation for their dedicated EMS.
- 3.16. Regulation 13 EPR requires the Council to consider the duly made application and either grant or refuse an environmental permit. Any environmental permit subsequently granted will contain conditions that must be complied with. It is an offence for a person / company to fail to comply with or to contravene an environmental permit condition under regulation 38(2) EPR.

- 3.17. In respect of the applications under the EPR, the Council must ensure that its determination delivers all relevant statutory requirements and provides the required level of protection to the environment.
- 3.18. The EPR and the Guidance to the EPRs state that when determining an application, a Regulator i.e. the Council should satisfy itself that the Operator's assessment of the risk is sufficiently robust. In particular, any assumptions that the operator has made about its proposals must be clearly justified. The Council should assess the application and the adequacy of the impact assessment including whether the control measures proposed by the operator are appropriate for mitigating the risks and their potential impact.
- 3.19. The Council is required to refuse an application for a permit in certain circumstances. The Council must not grant the permit (a) if it considers that the applicant will not be the Operator of the Regulated Facility or (b) if it considers that the operator will not comply with its conditions.
- 3.20. The Council is satisfied that in respect of this application the Applicant is the Operator of the regulated facility.
- 3.21. In terms of operator competence, the Council consider that Permali have robust site management structures, policies and procedures in place in order to minimise the impact of their activities on the environment and to comply with the proposed permit conditions.
- 3.22. Regulated facilities will often need to comply with other relevant environmental legislation, as well as the EPR. When determining applications for Permits and, if necessary, applying conditions duplication with other legislation should be avoided.

#### **4. Reasons for Recommendations**

- 4.1. Gloucester City Council is required, under regulation 13 'Grant of an Environmental Permit' of the Environmental Permitting (England & Wales) Regulations 2016 (EPR), to consider the granting of an Environmental Permit following an Application by Permali Gloucester Ltd. to operate an activity listed in Schedule 1, Part 2, Chapter 6, Section 6.4 Part A(2) and Schedule 14 of those regulations. Granting an Environmental Permit would allow the site to be regulated under EPR which would enable the City Council to deal with any nuisance complaints more effectively than the Statutory Nuisance provisions of the Environmental Protection Act 1990.

#### **5. Future Work and Conclusions**

- 5.1. If a permit is granted, the Council through WRS would undertake the regulation of the site. This will include:
- 5.2. Regular site visits to assess compliance with the permit conditions.

- 5.3. Review of extractive emission testing results from the RTO, Carbon Filter and Dust Arrestment Plants in relation to the conditioned emission limits.
- 5.4. Review of annual submissions relating to calculated fugitive solvent emissions in relation to the conditioned limit.
- 5.5. Review of annual submissions relating to energy efficiency and waste.
- 5.6. Review of annual submissions relating to the company management systems and application of BAT.
- 5.7. Being the first point of contact for nuisance complaints relating to the site.
- 5.8. Enforcement of permit conditions.
- 5.9. Should Permali be found in breach / contravention of any permit condition(s) then Enforcement Notice(s) may be served requiring compliance with the relevant condition(s). Failure to comply with an Enforcement Notice is an offence under regulation 38(3) EPR.

## **6. Financial Implications**

- 6.1. Any company / individual operating an installation under an Environmental Permit are required to pay an annual subsistence fee based on the annual risk rating (Low, Medium, High) of the permitted installation. The current permitted activity fees and charges are detailed within THE LOCAL AUTHORITY PERMITS FOR PART A (2) INSTALLATIONS AND SMALL WASTE INCINERATION PLANT (FEES AND CHARGES) (ENGLAND) SCHEME 2017 to cover the costs of regulating the site.

## **7. Legal Implications**

- 7.1. The legal background is contained within the body of the Report. The application must be determined in accordance with the EPR and the statutory guidance.
- 7.2. An applicant has a right to appeal if the application is refused or the applicant disagrees with any conditions imposed in the permit. An appeal is to the Secretary of State and can be determined either by written representations to the Secretary of State or by way of a hearing or inquiry. Normally each party will bear its own costs in respect of an appeal. An application for costs can be made at the end of an appeal and can be awarded if the party claiming them can show that the other side behaved unreasonably and put them to unnecessary expense.

(One Legal have been consulted in the preparation this report.)

## **Background Documents:**

Application for an Environmental Permit: Supporting Information and BAT Assessments  
Appendix A: A2 Application Form  
Appendix B: Site Plans 4off  
Appendix C: Raw Materials Inventory  
Appendix D: Site Condition Report

Appendix E: Air Quality Assessment  
Appendix F: Noise Assessment  
Appendix G: Environmental Risk Assessment  
Appendix H: Waste Inventory

Appendix I: Request for Further Information Notice under Schedule 5 EPR

Appendix J: Response to Further Information Notice Documentation:

Appendix J1: Noise Action Plan  
Appendix J2: Noise Management Plan  
Appendix J3: Odour Management Plan  
Appendix J4: Emission test results for;  
    J4a RTO,  
    J4b Carbon Filter  
    J4c Unabated emission points

Appendix J5: Updated Site Plan and Details of all Emission Points

Appendix K: Draft Permit

# Application for a Part A(2) permit

## Environmental Permitting (England and Wales) Regulations 2016

### Introduction

#### **When to use this form**

If you are sending an application to a Local Authority under the Environmental Permitting (England and Wales) Regulations 2016 and the installation requires an integrated pollution control permit (known as "Part A(2)" installations).

#### **Before you fill in this form**

Do please read relevant parts of the Defra general guidance manual. Chapter 4 is about making an application, Chapter 6 is about how permits are decided, and Chapter 12 gives the meaning of Best Available Techniques (BAT). Other chapters introduce the Regulations and give information about various issues.

You also need to read the relevant sector guidance note to see what standards and requirements are likely to be expected of your installation.

#### **Pre-application discussions**

It is usually sensible to talk to one of our pollution control officers before you complete and submit the application. Contact 01905 822799

#### **Which parts of the form to fill in**

Please fill in as much of it as possible and enclose the appropriate fee. Then send it to:

*Worcestershire Regulatory Services  
Strategic Services  
Wyre Forest House  
Finpoint Way  
Kidderminster  
DY11 7WF*

*Email: [wrsenquiries@worcsregservices.gov.uk](mailto:wrsenquiries@worcsregservices.gov.uk)*

#### **Other documents you may need to submit**

You will need to send us various other documents. The application form tells you which ones. It will be simplest for all concerned if you give a reference number for each document and record it on both this form and on the document itself. Please use any existing documents where you can and they are suitable.

#### **Using continuation sheets**

Feel free to use a continuation sheet, but you need to clearly identify where you have done so.

#### **Copies - not relevant for e-applications**

If you are submitting a paper application, please send the original and 2 copies of the form and all other supporting material, for consultation purposes.

Company registration number **03546214**

**A4 Any holding company?**

Is the operator a subsidiary of a holding company within the meaning of section 1159 of the Companies Act 2006? If "yes" please fill in details of the ultimate holding company.

No  Yes

|   |
|---|
| Name<br>Trading name, if different                                      |
| Registered office address<br><br>Principal office address, if different |
| Company registration number   |

**A5 Who can we contact about your application?**

Name + position **David Compton - Integration & NPI Manager**  
Tel **07814 757911**  
Email **david.compton@permali.co.uk**



Doc reference

**Supporting Information Appendix B**

- A site plan or plans showing where all the relevant activities are on site, including storage areas, emission/discharge points, and site drainage

Doc reference

**Supporting Information Appendix B**

use, and proposed measures to improve energy efficiency? Please list any climate change or carbon emission measure signed up to.

See section 2.6: Energy Efficiency of Doc Reference: **JER9222\_RN\_Permali Gloucester\_Application for an Environmental Permit**

**C7 Noise and vibration?**

What are the main sources of environmental noise and vibration, where are the nearest noise-sensitive receptors, and what techniques will be used to minimise noise and vibration in line with BAT? Please provide data from any noise surveys.

See the Noise Impact Assessment in Appendix F of Doc Reference: **JER9222\_RN\_Permali Gloucester\_Application for an Environmental Permit**

**C8 Site report?**

Please provide a site report in line with Chapter 18 of the general guidance manual.

See Doc Reference: **Application for an Environmental Permit Appendix D – Site Condition Report**

**C9 How will the installation be returned to a satisfactory state?**

What measures are proposed to be taken to avoid any pollution risk to land and return the site of the installation to a satisfactory state upon definitive cessation of activities?

Doc Reference: **Application for an Environmental Permit Appendix D – Site Condition Report**

**C10 Environmental management?**

What environmental management procedures and policy will you deploy?

Doc Reference: **JER9222\_TC\_Permali Gloucester\_Application for an Environmental Permit**

**C11 Impact on the environment?**

- a) what are the potential significant local environmental effects (including nuisance) of the foreseeable releases?
- b) is the installation likely to have a significant effect on sites of special scientific interest (SSSIs) or European protected sites and, if it is, what are the implications for the purposes of the Conservation (Natural Habitats etc) Regulations 1994 (see appendix 2 of Annex XVII of the general guidance manual )
- c) has an environmental impact assessment been carried out for the installation under planning legislation or for any other purpose. If so, please provide a copy

Doc Reference: **Application for an Environmental Permit Appendix C –**

**D Non-technical summary**

Please provide a non-technical summary of the information required above.

Doc Reference: **JER9222\_TC\_Permali Gloucester\_Application for an Environmental Permit**

**E Anything else?**

Please tell us anything else you would like us to take account of.

Doc Reference **JER9222\_TC\_Permali Gloucester\_Application for an Environmental Permit**

**F Application fee**

You must enclose the relevant fee with your application. If your application is successful you will also have to pay an annual subsistence charge, so please say who you want invoices to be sent to.

*Permali. A@ Diamorph.com*

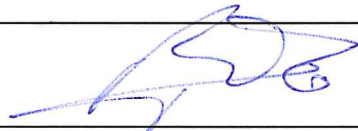
**H Declarations A and B for signing, please**

*These declarations should be signed by the person listed in answer to question A3. Where more than one person is identified as the operator, all should sign. Where a company or other body corporate is the operator, an authorised person should sign and provide evidence of authority from the board.*

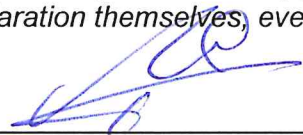
**Declaration A:** I/We certify

EITHER- No offences have been committed in the previous five years which are relevant to my/our competence to operate this installation in accordance with the EP Regulations.

OR- The following offences have been committed in the previous five years which may be relevant to my/our competence to operating this installation in accordance with the regulations:

\_\_\_\_\_  
Signature  Name Tony Baswick  
Position MD Date 1/3/23

**Declaration B:** I/We certify that the information in this application is correct. I/We apply for a permit in respect of the particulars described in this application (including the listed supporting documentation) I/we have supplied. *(Please note that each individual operator must sign the declaration themselves, even if an agent is acting on their behalf.)*

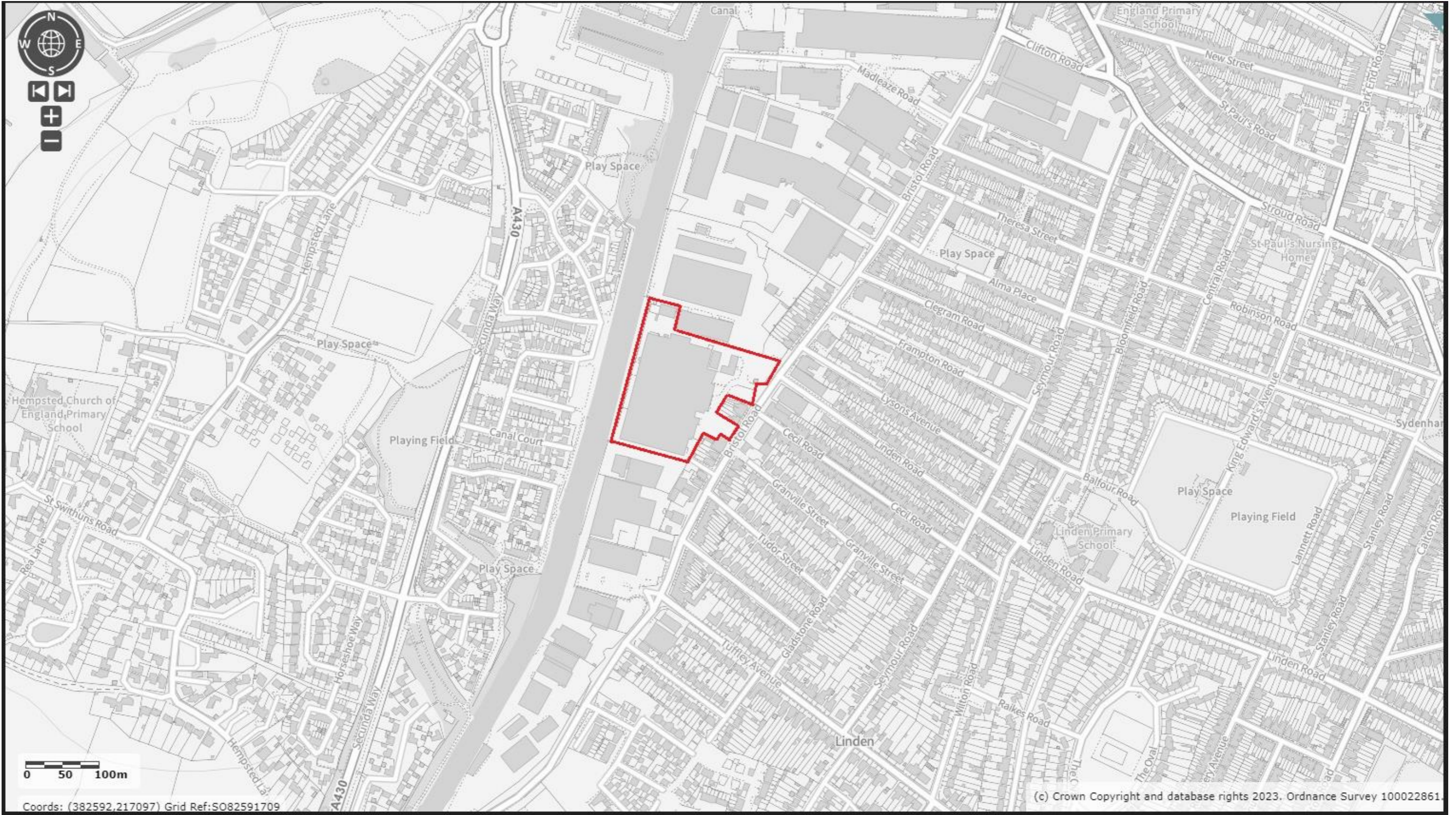
\_\_\_\_\_  
Signature  Name Tony Baswick  
Position MD Date 1/3/23

Signature \_\_\_\_\_ Name \_\_\_\_\_  
Position \_\_\_\_\_ Date \_\_\_\_\_

PERMALI LTD PROCESS LOCATIONS  
AND EMISSION POINTS



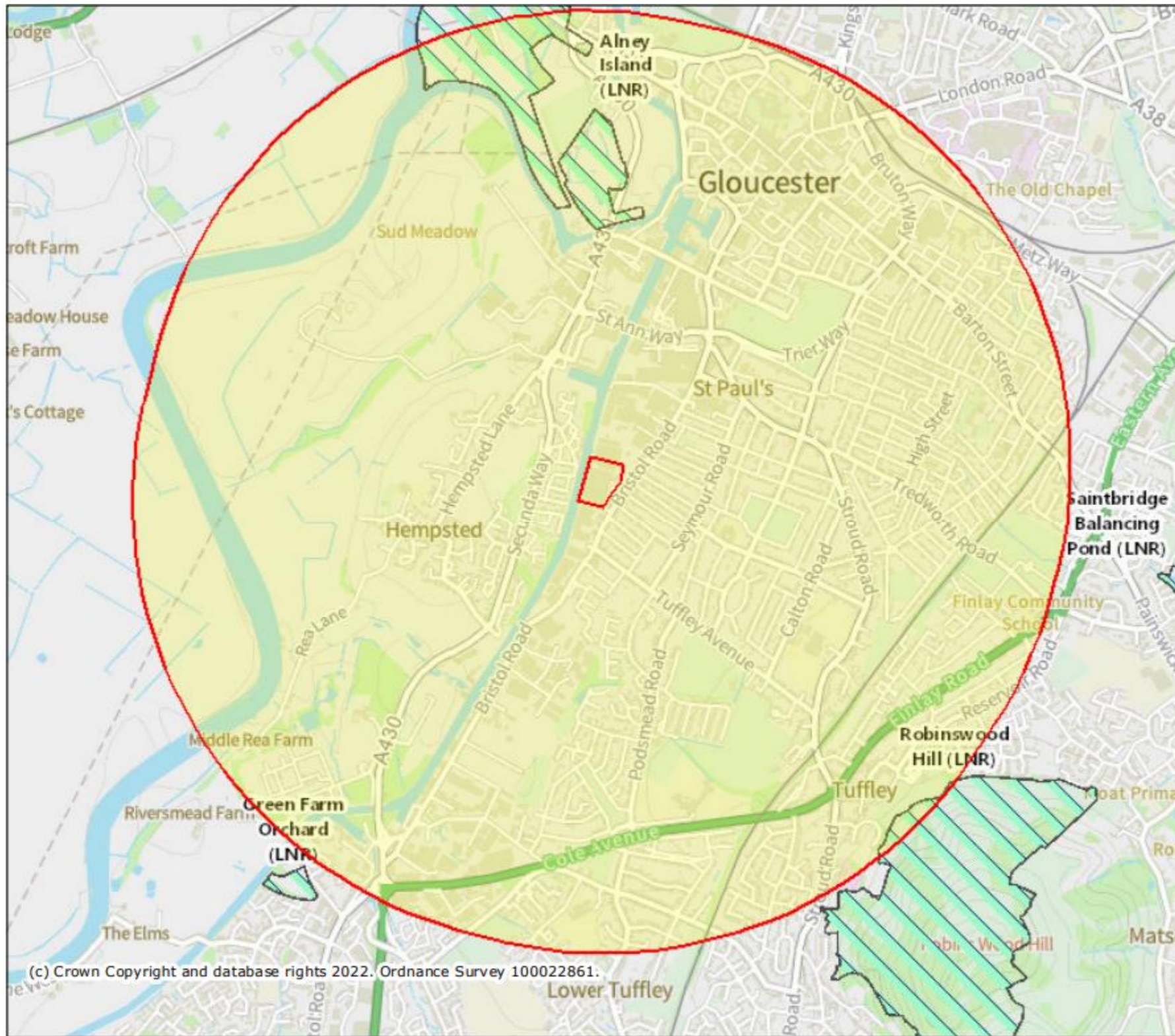




0 50 100m

Coords: (382592,217097) Grid Ref:SO82591709

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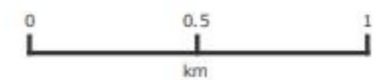


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### Legend

-  Local Nature Reserves (England)
-  National Nature Reserves (England)
-  Ramsar Sites (England)
-  Special Areas of Conservation (England)
-  Special Protection Areas (England)

Projection = OSGB36  
xmin = 375600  
ymin = 213700  
xmax = 389000  
ymax = 220200



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| Raw Material  | Amount stored    | How is it stored? | Storage Location | Purpose          | Annual Usage (kg) |
|---|------------------|-------------------|------------------|------------------|-------------------|
| CRESYLIC RESIN WAC 2 RMS 232  | 2403.20 l        | IBC               | Chiller          | Filament Winding | 18000             |
| Cellobond SC1008P   | 1,500 kg         | 215kgs drum       | Chiller          | Wide Width       | 60000             |
| Methylated Spirits  | 1000             | DRUM FULL SIZE    | Flammable store  | Wide Width       | 4000              |
| Phenolic Resin  | 5000 l           | IBC               | Flammable store  | Wide Width       | 97853             |
| Phenolic Resin  | 5000 l           | IBC               | Flammable store  | Wide Width       | 86635             |
| Polyester Resin   | 6600 l           | IBC               | Flammable store  | Wide Width       | 130205            |
| EPOXY RESIN RMS 307   | 2296.32          | Drum              | Resin Compound   | Filament Winding | 4180              |
| EPOXY ANHYDRIDE CURING AGENT RMS 308  | 1776.84          | Drum              | Resin Compound   | Filament Winding | 3740              |
| Phenolic resin for Paper impregnation Bitrez grade Curaphen 46-358 M58 to raw material specification TRMS3014 Issue 2                   | 10 x 1,000kg IBC | IBC               | Resin Compound   | Wide Width       | 29000             |
| Phenolic Resin for Fabric I to our Raw material specification TRMS3015 Issue 1 impregnation (Methanol) Bitrez grade Curaphen 46-362 M60 | 10 x 1,000kg IBC | IBC               | Resin Compound   | Wide Width       | 48680             |
| Araldite® Z 7062 N75 Resin to our raw Material Specification 4001   | 4 x 200kg Drums  | Drum              | Resin Compound   | Wide Width       | 4800              |
| Melamine Resin EML 110 to our Raw Material  | 1,200kg          | 1 x IBC           | Resin Compound   | Wide Width       | 2400              |

| Raw Material  | Amount stored   | How is it stored? | Storage Location | Purpose    | Annual Usage (kg) |
|---|-----------------|-------------------|------------------|------------|-------------------|
| Specification TRMS 4506 Issue 011   |                 |                   |                  |            |                   |
| SEE RM4511 Epoxy Resin MY750 to be supplied in accordance with our raw material specification TRMS 4510 alternatively Epoxy Resin NPEL128n to be supplied in accordance with our raw material specification TRMS 4511 | 4 x 240kg Drums | Drum              | Resin Compound   | Wide Width | 6720              |
| Industrial Methylated Spirits 94 to our Raw Material Specification TRMS 5600 issue 009  | 8 x 170kg Drums | Drum              | Resin Compound   | Wide Width | 1360              |
| Acetone to our Raw Material Specification TRMS 5601 Issue 010   | 8 x 165kg Drum  | Drum              | Resin Compound   | Wide Width | 5980              |
| DiMethyl Formamide to our Raw Material Specification TRMS 5605 Issue 9  | 4 x 200kg Drums | Drum              | Resin Compound   | Wide Width | 2400              |
| Acetone   | 1810            | Drum              | Resin Compound   | Wide Width | 12880             |
| IDA (INDUSTRIAL DENATURED ALCOHOL)  | 9110 kg         | 165kgs drum       | Resin Compound   | Wide Width | 40000             |
| Araldite® LZ7062  | 3860            | Drum              | Resin Compound   | Wide Width | 6000              |
| Araldite® Z8001 or XTW 9820 A80   | 1,000           | Drum              | Resin Compound   | Wide Width | 1000              |
| Methyl Cellusolve/ Methyl Glycol  | 8895            | Drum              | Resin Compound   | Wide Width | 10140             |

| Raw Material                 | Amount stored | How is it stored?                        | Storage Location | Purpose                   | Annual Usage (kg) |
|------------------------------|---------------|--|------------------|---------------------------|-------------------|
| MY750                        | 560           | Drum                                     | Resin Compound   | Wide Width                | 40000             |
| HYPERLAST EMH 85A Prepolymer | 400           | Drum                                     | Resin Compound   | Paint/Spray               | 1320              |
| White Diesel                 | 280 litres    | 280 litre drum                           | Resin Compound   | Fuel for sprinkler system |                   |
| Hydraulic oil                | 8000 litres   | IBC's, 280 litre drums or 20 litre pails | Resin Compound   |                           |                   |

# APPLICATION FOR AN ENVIRONMENTAL PERMIT

Site Condition Report

Permal Gloucester Limited



JER9222

3

1

24 February 2023

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## Document status

| Version | Revision | Authored by  | Reviewed by       | Approved by       | Review date      |
|---------|----------|--------------|-------------------|-------------------|------------------|
| 1       | 0        | Tom Hatch    | Roger Newman      | -                 | 7 December 2022  |
| 2       | 0        | Roger Newman | Jennifer Stringer | -                 | -                |
| 3       | 0        | Roger Newman | Jennifer Stringer | -                 | -                |
| 3       | 1        | Roger Newman | Jennifer Stringer | Jennifer Stringer | 24 February 2023 |

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## Approval for issue

Jennifer Stringer

Technical Director

24 February 2023

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## File Name

230224 R JER9222 RN Permal Gloucester Ltd Site Condition Report v3 r1

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- Appendix A Site Plans
- Appendix B Ground Investigations
- Appendix C raw materials inventory
- Appendix D Groundsure report
- Appendix E Discharge consent surrender

# 1 INTRODUCTION

## 1.1 Site Details

1.1.1 Site details are shown in Table 1.1 below:

|   |  |
|---|--|
| <b>Name of the applicant</b>  | Permali Gloucester Ltd   |
| <b>Activity address</b>   | Bristol Road<br>Gloucester<br>Gloucestershire<br>GL1 5TT         |
| <b>National grid reference</b>  | SO 82318 17113   |
| <b>Site area (ha)</b>   | 2.78ha   |
| <b>Document reference and dates</b> for Site Condition Report at permit application and surrender | 230214 R JER9222 RN Permali Gloucester Ltd Site Condition Report |
| <b>Document references for site plans</b> (including location and boundaries):                    | See site plans included in Appendix A to this SCR                |

## 1.2 Background

- 1.2.1 Permali Ltd has, for a number of years, undertaken coating activities in relation to the production of ballistic materials for the Defence and Aerospace industries. The consolidation of business activities onto the Gloucester site means that the consumption of organic solvents and the polymerisation/co-polymerisation of unsaturated hydrocarbons in the production of both coating materials and coating activities will exceed the thresholds above which a Part A2 Environmental Permit is required, as prescribed under the Environmental Permitting (England and Wales) Regulations 2016.
- 1.2.2 The activities involve the use of organic solvents with potential emissions to air and associated potential for odour impacts.
- 1.2.3 The site, covering an area of approximately 11 hectares on the Western edge of Gloucester, comprises a large factory building with associated parking, security gatehouse and access onto Bristol Road in the north-eastern area of the site.
- 1.2.4 This Site Condition Report has been prepared to support the proposed application for an Environmental Permit in accordance with Environmental Permitting General Guidance Manual on Policy and Procedures for A2 and B Installations, Revised April 2012.
- 1.2.5 This report based on information and data available at the time of preparation of the report.

## 1.3 Key Objectives

- 1.3.1 The key objectives of this report are to:
- To identify the Site Conditions at the site at the point application for the permit for the facility (baseline condition) such that they may be used as a point of reference to determine whether the site has been contaminated during the site's permitted operation in line with Environmental Permitting Regulations requirements; and
  - To provide conclusions on whether land quality has been impacted from historical activities.

---

## 2 APPLICATION SITE CONDITION REPORT

### 2.1 Application Phase

2.1.1 This section of the Site Report has been prepared in accordance with the Environment Agency Horizontal Guidance Note H5 and the General Guidance Manual: policy and procedures for A(2) and B installations. Where available, information on the known current condition of the operational area is provided.

### 2.2 Site Condition Report Summary

|   |  |
|---|--|
| Environmental setting including:<br>Topography<br>Geology<br>Hydrology<br>Hydrogeology<br>Surrounding land use<br>Environmental Consents, Licences, Authorisations, Permits and Designations  | Details of the environmental setting are provided in sections 2.3 to 2.7 of this Site Condition Report                             |
| Pollution history including:<br>Location, nature of incidents or direct discharges that may have affected soil or groundwater<br>Historical land uses and associated contaminants<br>Evidence of historic contamination, including, historical site investigations, | Any details regarding historical contamination at the site are provided in Section 3 of this Site Condition Report                 |
| Baseline soil and groundwater reference data  | Details regarding baseline soil and groundwater reference data at the site are provided in Section 4 of this Site Condition Report |
| <b>Supporting information</b>   | Permit Application Supporting Information  |



---

## 2.3 Environmental Setting

2.3.1 The following sections detail the environmental setting of the site. The sources of desk study information utilised are listed below:

- Publicly available datasets from the EA<sup>1</sup>
- Information held by the British Geological Survey relating to geology and hydrogeology<sup>2</sup>.

### Sensitive Receptors

## 2.4 Topography

2.4.1 The site is formed mainly of a large factory building with external areas for parking and therefore the topography of the site is uniform.

2.4.2 The site is situated at an altitude of 13 metres.

## 2.5 Geology

2.5.1 The British Geological Survey Geology of Britain Viewer<sup>3</sup> has been reviewed and it shows that the site is located on the following geology:

- Bedrock geology: Blue Lias Formation and Charmouth Mudstone Formation - Mudstone. Sedimentary bedrock formed between 209.5 and 182.7 million years ago during the Triassic and Jurassic periods.
- Superficial deposits: Tidal Flat Deposits - Clay, silt and sand. Sedimentary superficial deposit formed between 11.8 thousand years ago and the present during the Quaternary period.

## 2.6 Hydrology and Hydrogeology

2.6.1 The superficial and bedrock geology are designated as Secondary (undifferentiated) aquifer units and therefore represent a controlled water body. Approximately 10 m to the west of the Site is the Gloucester and Sharpness Canal which represents a potential off-site controlled water receptor.

2.6.2 There are four water network (OS MasterMap) records within 250m of the site. Two of these records are associated with the Gloucester and Sharpness Canal. 98m north of the site boundary is an inland river. A second inland river lies 224m west of the site. Both of these inland rivers contain water year-round (in normal circumstances).

2.6.3 The nearest Nitrate Vulnerable Zone (NVZ) is the North and South Streams in the Lydden Valley which is located approximately 100 metres to the south.

2.6.4 The site is not situated in a source protection zone.

---

<sup>1</sup> <https://environment.data.gov.uk/public-register/view/index>

<sup>2</sup> <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>

<sup>3</sup> <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>

---

## 2.7 Surrounding Land Use

- 2.7.1 Land to the immediate North and South of the site is given over to industrial and commercial uses. Immediately to the south of the site is Lilleshall Steel Services and to the North are units dedicated to a chauffeur service, a book shop and a vehicle repair shop. To the west of the site is the canal and, beyond that, is residential development. To the East lies Bristol Road with dense residential housing on the opposite side of Bristol Road from the Permali site.
- 2.7.2 The closest residential properties are located on the eastern boundary of the site with the Bristol Road. There are further residential properties approximately 0.07km to the west of the site located at Mainsail Lane on the opposite side of the Gloucester and Sharpness Canal.

## 2.8 Environmental Consents, Licences, Authorisations, Permits and Designations for the Site and Surrounding Areas

### Water Discharges and Abstraction Licences

- 2.8.1 There was a single licensed discharge to controlled water from the site under the Water Resources Act 1991. The licensed discharge (permit number S/20/22129/T) related to the release of cooling waters to the Gloucester and Sharpness Canal. The Permit was revoked on 19/02/2008.
- 2.8.2 A Trade Effluent Discharge Consent was issued by Severn Trent Water under the Water Industry Act 1991 for the discharge of trade effluent to the public sewer. This consent was formally surrendered on 14/09/2021. A copy of the surrender declaration is enclosed as Appendix E.
- 2.8.3 Trade effluent is currently collected in IBC's and stored securely prior to removal from site by a licenced waste carrier.
- 2.8.4 There is a single historic potable water abstraction within 2,000m of the site.

### Landfill Sites

- 2.8.5 There are no active or recent landfills within 500m of the site.
- 2.8.6 There is a single known historical (closed) landfill site within 500m of the site.

### Waste / Permitted Sites

- 2.8.7 There are three historical waste sites within 500m of the site.
- 2.8.8 There are eight licensed waste sites which are either active or recently closed within 500m of the site. This consists of three metal recycling sites, three special waste transfer stations and two household, commercial & industrial waste transfer stations.

### Statutory Designated / Sensitive Sites within 2km

- 2.8.9 The site is not within 2km of the following designations:
- Site of Special Scientific Interest (SSSI)
  - Conserved wetland sites (Ramsar sites)
  - Special Areas of Conservation (SAC)
  - Special Protection Areas (SPA)

- 
- National Nature Reserves (NNR)
  - Designated Ancient Woodland
  - Biosphere Reserves
  - Forest Parks
  - Marine Conservation Zones
  - Green Belt
  - Proposed Ramsar sites
  - Possible Special Areas of Conservation (pSAC)
  - Potential Special Protection Areas (pSPA)
  - Nitrate Sensitive Areas
  - Nitrate Vulnerable Zones

2.8.10 A 2km radius screening of designated ecological receptors has identified three local nature reserves (LNR) as follows:

- Two Alney Island LNRs (1018m and 1124m to the north)
- Robinswood Hill LNR (1908m to the southeast)

2.8.11 A 10km radius screening of designated ecological receptors has identified the following additional sites:

**Local Nature Reserves**

- Barnwood Arboretum
- Coopers Hill, Gloucester
- Hucclecote Meadows
- Green Farm Orchard
- Quedgeley Arboretum
- Saintbridge Balancing Pond

**National Nature Reserve**

- Cotswold Commons and Beechwoods

**Ramsar Sites**

- Walmore Common

**Sites of Special Scientific Interest**

- Badgeworth SSSI
- Coombe Hill Canal SSSI
- Robin's Wood Hill Quarry SSSI
- Cotswold Commons and Beechwoods SSSI
- Edge Common SSSI
- Range Farm Fields SSSI
- Crickley Hill and Barrow Wake SSSI
- Haresfield Beacon SSSI

- 
- Hucclecote Meadows SSSI
  - Wainlode Cliff SSSI
  - Innsworth Meadow SSSI
  - Walmore Common SSSI
  - Ashleworth Ham SSSI

#### **Special Areas of Conservation**

- Cotswold Beechwoods

#### **Special Protection Areas**

- Walmore Common

### **Mining**

- 2.8.12 British Pits database show that there are two records of surface mineral working. These are both at High Orchard Slate and Marble Works, Gloucester, Gloucestershire. This operation is now ceased.
- 2.8.13 There are no records on coal mining, non-coal mining, mining cavities, underground workings, JPB mining areas, brine areas, gypsum area, tin mining, or clay mining within 1000m of the site

### **COMAH**

- 2.8.14 There are two COMAH sites recorded within 500m of the site. These are both at the Contract Chemical (Gloucester) Ltd site at Contract Chemical (Gloucester) Ltd, 249 Bristol Road, Gloucester, GL2 5BX.

### **Radon**

- 2.8.15 The estimated percentage of dwellings exceeding the Radon Action Level is less than 1%. Therefore, no radon protection measures are required.

---

## 3 SITE HISTORY

### 3.1 General Site History

- 3.1.1 A Groundsure report, included as Appendix D to this report, identified that there are 25 historical industrial land use records for the site, including sawmills and joinery works, timber yards, wharfs, and railway sidings.
- 3.1.2 Operations at the site include use as a Baltic Wharf (1884-1936), timber yard (1884-1956), sawmill and joinery works (1902), an electrical insulation works (1965 – 1992).
- 3.1.3 There are also historical tanks identified at the site between 1965 and 1991.
- 3.1.4 An on-site electricity substation was identified between 1984-1991.
- 3.1.5 No historical petrol station or garages were identified.
- 3.1.6 There was a single historical military land use identified on site circa World War 1 which is associated with National Sawmill, sawing timber.

### 3.2 Evidence of Historic Contamination

#### Structural Soils 1998

- 3.2.1 A ground investigation was undertaken by Structural Soils Limited in 1998. This comprised drilling of 22 exploratory sampling locations to a maximum depth of 4 metres below ground level (mbGL) and installation of 7 ground gas and groundwater monitoring wells across the whole site.
- 3.2.2 The Structural Soils Limited report in 1998 indicated Made Ground to depths of up to 3 mbGL (comprising gravel over sand or clay with brick and ash) underlain by Superficial Deposits indicated to be Alluvium in majority of locations at depths of 1 mbGL to 4 mbGL with a base layer of Lower Lias Clay at all locations. Shallow groundwater of 0.75 m to 1.5 m depth was only encountered in the locations in the northwest of the site (area of tanks).
- 3.2.3 In the northwest corner of the site, where the boiler house and “scrap oil” tank are located, elevated diesel oil and Polycyclic Aromatic Hydrocarbon (PAH) was identified in groundwater at locations WS8 and WS9 and elevated PAH at locations WS1, WS10 and WS11. Light non-aqueous phase liquid (LNAPL) was also identified at WS8, and elevated boron and slightly elevated selenium in the area. Away from the tanks, concentrations were generally low.
- 3.2.4 The elevated diesel oil corresponds with a known fuel leakage adjacent to the boiler house’s southern edge.

#### Structural Soils 1999

- 3.2.5 Structural Soils carried out a second investigation in 1999 to further delineate the extent of contamination in the northwest of the site.
- 3.2.6 This investigation involved drilling a further 13 window sampling exploratory locations to a maximum depth of 3 mbGL, revealing Made Ground comprising up to 2.4 mbGL of sandy clay with gravel of brick, concrete and limestone underlain by locally peaty or sandy clay of Alluvium of 2 m to 3 m thickness to the base depth of each hole. Groundwater was present at shallow depths of between 0.75 m and 1.10 m depth with LNAPL above groundwater at WS11a.
- 3.2.7 Elevated concentrations of mineral oil, diesel and PAH were again recorded.
- 3.2.8 A remediation plan was proposed which recommended the removal of approximately 1,800 m<sup>3</sup> of soil.

---

## RPS Report 2000

- 3.2.9 Following on from these investigations a ground investigation and assessment was undertaken by RPS in Autumn 1999 to determine the potential risk this contamination posed to both human health and the offsite surface water receptor (Gloucester and Sharpness Canal) beyond the western site boundary. The conclusions of this investigation are as follows:
- Air monitoring did not identify any contaminants of concern above detection limit indicating that there is no significant risk of organic vapour migration into buildings creating a human health, fire risk or explosive hazard.
  - Shallow Made Ground contained visual evidence of hydrocarbon contamination which appeared to be restricted in vertical migration by lower permeability silty clay.
  - Shallow ground comprised fine sand with some organic matter including peaty horizons;
  - Groundwater monitoring identified diesel range organics (DRO) concentrations of 1.241 mg/l in monitoring well MW1 and 0.873 mg/l in monitoring well MW3 in the area of the reported diesel fuel leak. Outside the main source area and in canal on western edge of the site, concentrations were significantly lower. There was no LNAPL, PAH or VOC detected above laboratory limit of detection (LOD) at the locations.
  - There was some evidence from field data and inorganic analysis for the presence of biological degradation processes at the site and anaerobic groundwater conditions.
  - Contaminant calculations undertaken using site specific data (including hydraulic conductivity) and contaminant specific parameters (including half-life, retardation factor, contaminant velocity) have suggested that the potential movement of dissolved phase diesel contamination is limited. A tentative estimate of travel time of 32 years was suggested from the point source to the canal of which are approximately 35 m apart.

## 3.3 Baseline Soil and Groundwater Investigations

- 3.3.1 It is known that a historic leak from a “scrap oil” tank has resulted in contamination of the ground with a range of hydrocarbons in the northwest corner of the Permali site. It is believed that the leak occurred over a period of time in excess of 25 years ago from a bund housing the tank that was compromised.
- 3.3.2 No records of the incident have been located by Permali so the nature and volumes of the materials that escaped containment are unknown. Likewise, no records exist relating to any incident prior to the first ground investigation in 1998.
- 3.3.3 The scrap oil tank has been decommissioned, drained and infilled.
- 3.3.4 RPS was commissioned by Permali to undertake a review of available information and undertake groundwater monitoring and assessment of existing boreholes at the site. This was undertaken in 2020. The monitoring undertaken identified that there was no reduction in hydrocarbon contamination in the boreholes in the north-western site area with high PAH also encountered, and lubrication oil in the borehole at the north-western corner of the main factory building adjacent to a “scrap oil” tank.
- 3.3.5 The key findings were:
- Liaison with site staff indicated that there was no record of any reportable pollution incidents since the previous investigations undertaken in 2000.
  - Elevated petroleum hydrocarbon contamination has been identified in the recent and historical monitoring. The breakdown is largely aromatic carbon banding further north, becoming largely aliphatic carbon ranges further to the south.

- 
- Concentrations of PAH are highly elevated on the north-western boundary (RPS-BH2) with concentrations elevated but at a lower level to the south.
  - LNAPL was identified at location adjacent to the main factory (RPS-BH3) next to a 'scrap oil' tank comprising lubrication oil which was also present in the dissolved phase of groundwater. This suggests a separate source to the diesel leak in the boiler house area.
  - The canal showed very low hydrocarbon concentrations with PAH and speciated petroleum hydrocarbon concentrations not exceeding the laboratory limit of detection.

3.3.6 An outline conceptual site model (CSM) was produced which suggests a very low potential risk to the canal from contamination on site, and a low risk to site users from on-site soil and groundwater contamination.

3.3.7 Further ground investigation involving the drilling of a number of boreholes and installation of monitoring wells was recommended to allow a more thorough assessment of the ground and groundwater contamination status, and to allow a better understanding of the potential risk to the canal from on-site contamination.

3.3.8 Continued periodic sampling is being carried out by RPS on a quarterly basis to identify trends in levels of contamination and to detect any migration of pollution into the Gloucester and Sharpness Canal.

3.3.9 A copy of the most recent RPS groundwater and surface water monitoring report from Q4 2022 is appended to this site condition report, along with the historic ground investigation reports, as Appendix B.

## 4 PERMITTED ACTIVITIES

**Table 2.2 Permitted activities**

|   |  |
|---|--|
| Permitted activities  | Details regarding permitted activities on the proposed site are provided below.                              |
| Non-permitted activities undertaken   | N/A  |
| Document references for: <ul style="list-style-type: none"><li>• plan showing activity layout; and</li><li>• environmental risk assessment.</li></ul> | Appendix A - Site Plans to this SCR.<br>Appendix C - Environmental Risk Assessment to the permit application |

### 4.1 Description of Permitted Activities

- 4.1.1 The activities to be carried out at the site are prescribed for control as a Part A(2) and a Part B activity, according to the descriptions below, and will, therefore, be permitted as a Part A (2) installation under the Environmental Permitting (England and Wales) Regulations 2016<sup>4</sup>:
- Section 4.1 Organic chemicals – Part B  
(c) Any activity for the polymerisation or co-polymerisation of any pre-formulated resin or pre-formulated gel coat which contains any unsaturated hydrocarbon, where the activity is likely to involve, in any 12-month period, the polymerisation or co-polymerisation of 100 or more tonnes of unsaturated hydrocarbon.
  - Section 6.4 Coating activities, printing and textile treatments – Part A2  
(a) *Unless falling within Part A (1) of this Section, surface treating substances, objects or products using organic solvents, in particular for dressing, printing, coating, degreasing, waterproofing, sizing, painting, cleaning or impregnating, in plant with a consumption capacity of more than 150kg or more per hour than 200 tonnes per year.*
- 4.1.2 In addition to the main activity, the following directly associated activities (DAAs) will be carried out at the site:
- Pressing, machining and spray painting of products.
  - Surface water - discharge of clean uncontaminated site surface water from roofs, paths and roads.
  - Raw materials storage.
  - Waste storage.
- 4.1.3 The permitted activities at the site involve the polymerisation/co-polymerisation of unsaturated hydrocarbons in the production of coating materials (resins) and the impregnation of woven glass fibre cloths and tissue using pre-formulated resins and subsequent conversion to a composite laminate material
- 4.1.4 The key process stages comprise:
- Mixing and formulation of the resin.
  - Coating/impregnation of the fibre textile.
  - Drying and “B-staging” of coated textiles.
  - Hydraulic pressing of coated (B-staged) materials to form a densified laminate structure.
  - Machining, and
  - Painting of machined parts.

<sup>4</sup> <https://www.legislation.gov.uk/uksi/2016/1154/contents/made>



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## 5 SUBSTANCES USED, PRODUCED OR RELEASED

5.1.1 A full list of raw materials used in the on-site activities, including the quantities held in stock, is presented in Appendix C to this SCR.

5.1.2 The raw materials can be divided into the following general categories:

- Resins, curing agents, hardeners used in the manufacturing process, for example epoxy resin, cresylic resin, phenolic resin
- Coating products used in the spray booths, for example primer, epoxy topcoat. These may also be resins
- Organic solvent used as cleaning, thinning and release agents, for example acetone, Industrial denatured alcohol (IDA), methylated spirits
- Fillers and additives required for specific resin applications, for example glass spheres, graphite, nitrile rubber, PTFE powder
- White diesel
- Hydraulic oil

5.1.3 The risk of ground contamination from on-site activities during the operational phase of the Environmental Permit will be minimised by:

- Appropriate storage and handling of raw and waste materials.
- Storage of hazardous chemicals in dedicated, bunded storage areas with impermeable flooring.
- Storage of flammable materials in flammables stores
- Appropriate spill procedures and spill containment kits.
- Training of operatives.

## 6 SITE SPECIFIC POLLUTION POSSIBILITY

- 6.1.1 The full list of raw materials was filtered to remove materials delivered, stored and used as solids, non-hazardous material and raw materials used infrequently or in small annual quantities (under one tonne per annum)
- 6.1.2 Each of the hazardous substances identified as significant are reviewed in this section to determine the site-specific pollution possibility based on factors such as storage arrangements.
- 6.1.3 ~~Table 6-1~~ ~~Table 6-4~~ shows the site-specific pollution possibility for each of the previously identified hazardous substances.

### 6.2 Site Specific Pollution Possibility

**Table 6-1 Substance Inventory and Assessment of Actual Pollution Risk**

| Substance          | Nature | Amount stored on site | management/control measures  | Purpose      | Actual Pollution Risk                               |
|--------------------|--------|-----------------------|--|--------------|---|
| Epoxy Resin        | Liquid | 3300                  | 240 kg drums are stored within the resin compound or an internal bunded mixing room while in use                 | Impregnation | Very Low – due to storage and handling arrangements |
| Phenolic Resin     | Liquid | 31500 kg              | 1,000kg IBC and 215 kg drums are stored within the resin compound or an internal bunded mixing room while in use | Impregnation | Very Low – due to storage and handling arrangements |
| Cresylic resin     | Liquid | 2400 kg               | 1,000kg IBCs are stored within the resin compound or an internal bunded mixing room while in use                 | Impregnation | Very Low – due to storage and handling arrangements |
| Araldite           | Liquid | 6200 kg               | 200 kg drums are stored within the resin compound or an internal bunded mixing room while in use                 | Impregnation | Very Low – due to storage and handling arrangements |
| Melamine resin     | Liquid | 1200 kg               | 1,000kg IBCs are stored within the resin compound or an internal bunded mixing room while in use                 | Impregnation | Very Low – due to storage and handling arrangements |
| Polyester resin    | Liquid | 6600 kg               | IBCs stored within flammables stores   | Impregnation | Very Low – due to storage and handling arrangements |
| Epoxy curing agent | Liquid | 1800 kg               | Drums are stored within the resin compound or an internal bunded mixing room while in use                        | Impregnation | Very Low – due to storage and handling arrangements |

| Substance                          | Nature | Amount stored on site | management/control measures  | Purpose                                 | Actual Pollution Risk                  |
|------------------------------------|--------|-----------------------|--|---|--|
| Industrial Denatured Alcohol (IDA) | Liquid | 9000 kg               | 165 kg drums held in the resin compound                                  | Resin formulation<br>Equipment Cleaning | Very Low – due to storage arrangements |
| 2-Methoxyethanol (Cellosolve)      | Liquid | 8900 kg               | Drums held in the resin compound   | Resin formulation                       |  |
| Acetone                            | Liquid | 3130 kg               | 165 kg drums held in the resin compound                                  | Resin formulation<br>Equipment Cleaning |  |
| Industrial Methylated Spirits      | Liquid | 2,500kg               | 170kg drums stored within the resin compound                             | Cleaning equipment                      | Very Low – due to storage arrangements |
| DiMethyl Formamide (DMF)           | Liquid | 800 kg                | 200 kg drums stored within the resin compound                            | Resin formulation                       | Very Low – due to storage arrangements |
| Hyperlast EMH 85A Prepolymer       | Liquid | 400 kg                | Drums stored within the resin compound                                   | Painting / coating                      | Very Low – due to storage arrangements |
| White diesel                       | Liquid | 280 litres            | 280 litre drum stored within the resin compound                          | Fuelling the sprinkler system           | Very Low – due to storage arrangements |
| Hydraulic oil                      | Liquid | 8000 litres           | IBCs, 280 litre drums or 20 litre pails stored within the resin compound |   | Very Low – due to storage arrangements |

---

## 7 CONCLUSIONS

- 7.1.1 A review of ground investigation reports has been carried out to identify the Site Conditions at the point of application for the permit for the facility (baseline condition).
- 7.1.2 Ground investigations have concluded that there are elevated levels of the following contaminants resulting from historic releases to ground of fuel and lubricating oil in the Northwest of the site in the vicinity of the boiler house and former “scrap oil” tank:
- hydrocarbon contamination
  - diesel oil
  - polycyclic aromatic hydrocarbon (PAH)
  - light non-aqueous phase liquid (LNAPL)
  - boron
  - selenium
  - mineral oil
  - lubrication oil
- 7.1.3 The risk from these contaminants to human health is deemed to be low. Likewise, the risk to the Gloucester and Sharpness Canal is currently deemed to be low. However, a programme of further sampling is being carried out to monitor the movement of the plume and to detect any contamination of the Gloucester and Sharpness Canal.
- 7.1.4 Hazardous substances have been identified in the following materials used on site:
- Resins, curing agents, hardeners used in the manufacturing process
  - Coating products used in the spray booths
  - Organic solvent used as cleaning, thinning and release agents
  - White diesel
  - Hydraulic oil
- 7.1.5 The risk to soil, groundwater and surface water will be minimised through a variety of measures and controls delivered through design and operational protocols for the facility. These include:
- Impermeable surfaces and sealed drainage for internal storage areas
  - Externally stored materials are kept within bunded areas and/or sealed containers to prevent fugitive emissions to ground
  - Management systems and procedures will ensure risks to the environment are minimised and appropriately controlled. This will include a spillage procedure to ensure that any risk from spillages is minimised and are cleaned up as soon as a spill is detected. Emergency spill kits will be available across the site
- 7.1.6 The assessment of site-specific pollution potential concluded that hazardous substances used, produced, or emitted on the facility represent a low risk to soil, groundwater and surface water receptors on the site.
- 7.1.7 The “scrap oil” tank has been decommissioned, drained and in-filled.
- 7.1.8 No specific solvents were included in the ground investigation analysis suite and therefore a baseline concentration cannot be provided.
- 7.1.9 There are no records of incidents that may have released solvents to the ground over the last 25 years, i.e., since the first ground investigation by Structural Soils Ltd in 1998.

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## REFERENCES

1. H5 Site Condition Report guidance - <https://www.gov.uk/government/publications/environmental-permitting-h5-site-condition-report>
2. European Commission Guidance concerning baseline reports - [https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52014XC0506\(01\)&from=EN](https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52014XC0506(01)&from=EN)
3. Magic Map - <https://magic.defra.gov.uk/MagicMap.aspx>
4. British Geological Survey, Geology of Britain Viewer - <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>

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# Appendix A SITE PLANS



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**Appendix B**  
**GROUND INVESTIGATIONS**

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# Appendix C

## RAW MATERIALS INVENTORY





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**Appendix D**  
**GROUNDSURE REPORT**

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**Appendix E**  
**DISCHARGE CONSENT SURRENDER**



# PERMALI GLOUCESTER LTD - SITE CONDITION REPORT

2023-02-24

JER9222

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## Permit Variation

Permal, Gloucester

For Permal

PERMALI, GLOUCESTER

| Quality Management               |  |                                     |                        |
|----------------------------------|--|-------------------------------------|------------------------|
| <b>Prepared by</b>               | Kathryn Barker<br>MSc, BSc (Hons), MIAQM,<br>MIEnvSc       | Principal Air Quality<br>Consultant | 02/05/2023             |
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| <b>Date of Issue</b>             | 02/05/2023   |                                     | <b>Revision Number</b> |
| <b>Job Number</b>                | JAR02788   |                                     |                        |

| Revision History |            |        |   |          |
|------------------|------------|--------|---|----------|
| Rev              | Date       | Status | Reason for revision   | Comments |
| 0                | 18/01/2023 | Draft  | -   | -        |
| 1                | 02/05/2023 | Draft  | Remodel new RTO location, additional proposed boiler and second existing boiler | -        |

| Calculations or models file name, link and location |   |                                     |            |
|---|---|-------------------------------------|------------|
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**Figure 6: 30 Minute Mean VOCs (Formaldehyde) PCs (ug/m<sup>3</sup>)**

## Appendices

**Appendix A: Stack Height Determination**

# 1 Introduction

- 1.1 This report details the air quality assessment undertaken to accompany the application to vary the Environmental Permit for the Permal, Gloucester site.
- 1.2 The assessment covers an evaluation of the impacts on the local area of emissions from the proposed sources and existing stacks operated on the site. The proposed sources comprise:
- 1 No. Regenerative Thermal Oxidiser which emits Volatile Organic Compounds (VOCs)
  - 1 No. Scrubber which emits VOCs, phenol and formaldehyde
  - 3 No. Dust Arrestment which emits particulate matter (PM)
  - 2 No. Gas-fired Boiler which emits nitrogen dioxide (NO<sub>2</sub>)
- 1.3 The assessment also considers the effects of the proposed sources on the surrounding area in the context of odour. The odour assessment has been undertaken in accordance with the Institute of Air Quality Management (IAQM) *Guidance on the Assessment of Odour for Planning* (2018) methodology [1], drawing on the evidence of multiple best-practice investigative tools. The IAQM odour guidance states that using different assessment tools in combination can “*minimise individual limitations and increase confidence in the overall conclusion. Best practice is to use a multi-tool approach where practicable.*” The proposed sources are not yet in operation; therefore, a combination of predictive assessment tools (qualitative risk-based assessment and odour modelling) has been used to evaluate the operational effects of the proposed sources.
- 1.4 This report begins by setting out the policy and legislative context for the assessment. The methods and criteria used to assess potential air quality effects have then been described. The baseline air quality conditions have been established taking into account Defra estimates. The results of the assessment of air quality impacts have been presented. A conclusion has been drawn on the significance of the residual effects.

## 2 Policy and Legislative Context

### Environmental Permitting Regulations

- 2.1 EU Directive 96/61/EC concerning Integrated Pollution Prevention and Control (“the IPPC Directive”) [2] applies an integrated environmental approach to the regulation of certain industrial activities. The Environmental Permitting Regulations (EPR) 2016 [3] implement the IPPC Directive relating to installations in England and Wales. The Regulations define activities that require an Environmental Permit from the Environment Agency (EA).
- 2.2 EPR is a regulatory system that employs an integrated approach to control the environmental impacts of certain listed industrial activities. The intention of the regulatory system is to ensure that Best Available Techniques (BAT), required by the IPPC Directive, are used to prevent or minimise the effects of an activity on the environment, having regard to the effects of emissions to air, land and water via a single permitting process.
- 2.3 To gain a permit, Operators have to demonstrate in their applications, in a systematic way, that the techniques they are using or are proposing to use are the BAT for their installation and meet certain other requirements taking account of relevant local factors. The permitting process also places a duty on the regulating body to ensure that the requirements of the Industrial Emissions Directive (IED) are included for permitted sites to which these apply.
- 2.4 The essence of BAT is that the techniques selected to protect the environment should achieve a high degree of protection of people and the environment taken as a whole. Indicative BAT standards are laid out in national guidance and where relevant, should be applied unless a different standard can be justified for a particular installation. The EA is legally obliged to go beyond BAT requirements where EU Air Quality Limit Values may be exceeded by an existing operator.
- 2.5 The EA’s on-line guidance entitled ‘*Environmental management – guidance, Air emissions risk assessment for your environmental permit*’ [4] provides guidelines for air dispersion modelling. The assessment of air quality effects for the proposed development is consistent with this guidance.

### Nuisance Provisions

- 2.6 Part III of the Environmental Protection Act 1990 defines a number of statutory nuisances and includes: “*any dust, steam, smell or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance*”. The Act places a duty on local authorities to investigate the likely occurrence of statutory nuisance and to take reasonable steps to investigate local complaints. Where a local authority is satisfied of the existence or recurrence of statutory

nuisance it must generally serve an abatement notice requiring the execution of such works and other steps necessary to rectify the nuisance. If ignored, this can result in proceedings in the Magistrates Court and imposition of an order to prevent the nuisance and a fine. The Act provides a defence for the operator to demonstrate that the Best Practicable Means (BPM) have been used to control potential nuisance. For a nuisance action to succeed the offence also has to be a cause of material harm or to be persistent or likely to recur.

- 2.7 The above statutory nuisance controls apply mainly to odour from premises not regulated under other specific environmental regulations, such as the EPR. Indeed, a local authority requires the consent of the Secretary of State to institute statutory nuisance proceedings arising from operation of a “regulated facility” (including a waste operation, a Part A(1), Part A(2) or Part B EPR installation, mobile plant or mining operation); or an “exempt waste operation”. This is designed to avoid the operators of such regulated facilities or exempt waste operations being exposed to action by both the Environment Agency and the local authority for the same incident (i.e. to avoid “double jeopardy”) [5].
- 2.8 It is important to note that there is no numerical odour concentration limit that can indicate unequivocally whether a statutory (or other) nuisance is being caused and it is ultimately only the Court that can decide at what point it becomes “prejudicial to health or a nuisance” and whether a statutory nuisance is occurring.

## The Ambient Air Quality Directive and Air Quality Standards Regulations

- 2.9 The Air Quality Standards Regulations 2010 [6], amended by The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020 [7], sets limit values for ambient air concentrations for the main air pollutants: particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>), nitrogen dioxide (NO<sub>2</sub>), sulphur dioxide (SO<sub>2</sub>), ozone (O<sub>3</sub>), carbon monoxide (CO), lead (Pb) and benzene, certain toxic heavy metals (arsenic, cadmium and nickel) and polycyclic aromatic hydrocarbons (PAHs).
- 2.10 These limit values are legally binding on the Secretary of State. The Government and devolved administrations operate various national ambient air quality monitoring networks to measure compliance and develop plans to meet the limit values.
- 2.11 The statutory air quality limit value relevant to this assessment is summarised in Table 2.1.

**Table 2.1 Statutory Air Quality Limit Values**

| Pollutant | Averaging Period | Limit Values           | Not to be Exceeded More Than |
|-----------|------------------|------------------------|------------------------------|
| Nitrogen  | 1 hour           | 200 µg.m <sup>-3</sup> | 18 times pcy                 |

| Pollutant                              | Averaging Period | Limit Values          | Not to be Exceeded More Than |
|--|------------------|-----------------------|------------------------------|
| Dioxide (NO <sub>2</sub> )             | Annual           | 40 µg.m <sup>-3</sup> | -                            |
| Particulate Matter (PM <sub>10</sub> ) | 24 hour          | 50 µg.m <sup>-3</sup> | 35 times pcy                 |
|  | Annual           | 40 µg.m <sup>-3</sup> | -                            |
| Particulate Matter (PM <sub>10</sub> ) | Annual           | 20 µg.m <sup>-3</sup> | -                            |
| Benzene                                | Annual           | 5 µg.m <sup>-3</sup>  | -                            |

## Non-Statutory Air Quality Objectives and Guidelines

- 2.12 The Environment Act 1995 established the requirement for the Government and the devolved administrations to produce a National Air Quality Strategy (AQS) for improving ambient air quality, the first being published in 1997 and having been revised several times since, with the latest published in 2007 [8]. The Strategy sets UK air quality standards\* and objectives# for the pollutants in the Air Quality Standards Regulations plus 1,3-butadiene and recognises that action at national, regional and local level may be needed, depending on the scale and nature of the air quality problem. There is no legal requirement to meet objectives set within the UK AQS except where equivalent limit values are set within the EU Directives.
- 2.13 Non-statutory air quality objectives and guidelines also exist within the World Health Organisation Guidelines [9] and the Expert Panel on Air Quality Standards Guidelines (EPAQS) [10]. There are no non-statutory objectives and guidelines relevant to this assessment.

## Environmental Assessment Levels

- 2.14 The Environment Agency’s on-line guidance entitled ‘Environmental management – guidance, Air emissions risk assessment for your environmental permit’ [4] provides further assessment criteria in the form of EALs. The on-line guidance states “*If you release volatile organic compounds into the air and do not know what all the substances in them are, treat them all as 100% benzene in your risk assessment. If you want to treat them as something else, you’ll need to explain why*”.
- 2.15 Table 2.2 presents all available EALs for the pollutants relevant to this assessment.

**Table 2.2 Environmental Assessment Levels (EALs)**

| Pollutant                           | Long-term EAL, µg.m <sup>-3</sup> | Short-term EAL, µg.m <sup>-3</sup> |
|-------------------------------------|-----------------------------------|------------------------------------|
| Nitrogen dioxide (NO <sub>2</sub> ) | 40                                | 200                                |
| Particulates (PM <sub>10</sub> )    | 40                                | 50                                 |
| Particulates (PM <sub>2.5</sub> )   | 20                                | -                                  |

| <b>Pollutant</b>             | <b>Long-term EAL, <math>\mu\text{g.m}^{-3}</math></b> | <b>Short-term EAL, <math>\mu\text{g.m}^{-3}</math></b> |
|------------------------------|---|--|
| VOCs (assuming 100% Benzene) | 5   | 30   |
| Formaldehyde                 | 5   | 100  |
| Phenol                       | 200   | 3900   |

2.16 Within the assessment, the statutory air quality limit and target values (as presented in Table 2.1) are assumed to take precedent over objectives, guidelines and the EALs. In addition, for those pollutants which do not have any statutory air quality standards, the assessment assumes the lower of either the EAL or the non-statutory air quality objective or guideline where they exist.

## 3 Assessment Methodology

### Approach

- 3.1 The approach for the air quality assessment includes the key elements listed below:
- Establishing the background Ambient Concentration (AC) from consideration of Air Quality Review & Assessment findings and assessment of existing local air quality through a review of Defra background map data in the vicinity of the proposed site.
  - Quantitative assessment of the operational effects on local air quality from stack emissions utilising a “new generation” Gaussian dispersion model, ADMS 5. Assessment of Process Contributions (PC) from the facility in isolation, and assessment of resultant Predicted Environmental Concentrations (PEC).
- 3.2 The odour assessment has used a multi-tool approach in accordance with the *IAQM Guidance on the Assessment of Odour for Planning (2018)* and incorporated multiple predictive assessment tools.

### Dispersion Model Selection

- 3.3 A number of commercially available dispersion models are able to predict ground level concentrations arising from emissions to atmosphere from elevated point sources. Modelling for this study has been undertaken using ADMS 5, a version of the ADMS (Atmospheric Dispersion Modelling System) developed by Cambridge Environmental Research Consultants (CERC) that models a wide range of buoyant and passive releases to atmosphere either individually or in combination. The model calculates the mean concentration over flat terrain and also allows for the effect of plume rise, complex terrain, buildings and deposition. Dispersion models predict atmospheric concentrations within a set level of confidence and there can be variations in results between models under certain conditions; the ADMS 5 model has been formally validated and is widely used in the UK and internationally for regulatory purposes.
- 3.4 ADMS comprises a number of individual modules each representing one of the processes contributing to dispersion or an aspect of data input and output. Amongst the features of ADMS are:
- An up-to-date dispersion model in which the boundary layer structure is characterised by the height of the boundary layer and the Monin-Obukhov length, a length scale dependent on the friction velocity and the heat flux at the surface. This approach allows the vertical structure of the boundary layer, and hence concentrations, to be calculated more accurately than does the use of Pasquill-Gifford stability categories, which were used in many previous

models (e.g. ISCST3). The restriction implied by the Pasquill-Gifford approach that the dispersion parameters are independent of height is avoided. In ADMS the concentration distribution is Gaussian in stable and neutral conditions, but the vertical distribution is non-Gaussian in convective conditions, to take account of the skewed structure of the vertical component of turbulence;

- A number of complex modules including the effects of plume rise, complex terrain, coastlines, concentration fluctuations and buildings; and
- A facility to calculate long-term averages of hourly mean concentration, dry and wet deposition fluxes and radioactivity, and percentiles of hourly mean concentrations, from either statistical meteorological data or hourly average data.

## Model Inputs

### Meteorological Data

3.5 The most important meteorological parameters governing the atmospheric dispersion of pollutants are wind direction, wind speed and atmospheric stability as described below:

- Wind direction determines the sector of the compass into which the plume is dispersed;
- Wind speed affects the distance that the plume travels over time and can affect plume dispersion by increasing the initial dilution of pollutants and inhibiting plume rise; and
- Atmospheric stability is a measure of the turbulence of the air, and particularly of its vertical motion. It therefore affects the spread of the plume as it travels away from the source. New generation dispersion models, including ADMS, use a parameter known as the Monin-Obukhov length that, together with the wind speed, describes the stability of the atmosphere.

3.6 For meteorological data to be suitable for dispersion modelling purposes, a number of meteorological parameters need to be measured on an hourly basis. These parameters include wind speed, wind direction, cloud cover and temperature. There are only a limited number of sites where the required meteorological measurements are made.

3.7 The year of meteorological data that is used for a modelling assessment can have a significant effect on source contribution concentrations. Dispersion model simulations have been performed using five years of numerical weather prediction (NWP) data centred on 382376, 217160 between 2017 and 2021.

3.8 Wind roses have been produced for each of the years of meteorological data used in this assessment and are presented in Figure 1.



## Stack Parameters and Emissions Rates used in the Model

3.9 The emissions characteristics for the proposed stacks are provided in Table 3.1. Stack height calculations have been performed for each type of plant proposed and are included in Appendix A.

**Table 3.1: Proposed Stack and Emissions Characteristics**

| Parameter  | P1                 | P2             | P3   | P4              | P5                 | P6               | P7               |
|--|--------------------|----------------|--|-----------------|--------------------|------------------|------------------|
| Type of Plant  | Thermal Oxidiser   | Scrubber       | Dust Arrestment                                  | Dust Arrestment | Dust Arrestment    | Gas fired boiler | Gas fired boiler |
| Grid coordinates   | 382295, 217222     | 382377, 217173 | 382262, 217088                                   | 382264, 217096  | 382266, 217103     | 382273, 217127   | 382272, 217216   |
| Stack height (m)   | 15                 | 14.3           | 14.9   | 7.72            | 7.78               | 5                | 5                |
| Efflux temperature (°C)                                    | 280                | 17             | 20   | 20              | 20                 | 101              | 101              |
| Internal diameter (m)                                      | 1.7                | 1.1            | 0.8  | 0.8             | 0.8                | 0.3              | 0.3              |
| Actual efflux velocity (m.s <sup>-1</sup> )                | 12.4               | 4.6            | 12.6   | 12.6            | 12.6               | 2.8              | 2.8              |
| Actual volumetric flow (Am <sup>3</sup> .s <sup>-1</sup> ) | 20                 | 4.4            | 6.3  | 6.3             | 6.3                | 0.2              | 0.2              |
| NO <sub>x</sub> mass emissions (g.s <sup>-1</sup> )        | -                  | -              | -  | -               | -                  | 0.023            | 0.023            |
| VOC mass emissions (g.s <sup>-1</sup> )                    | 0.274              | 0.010          | -  | -               | -                  | -                | -                |
| PM mass emissions (g.s <sup>-1</sup> )                     | -                  | -              | 0.003  | 0.003           | 0.003              | -                | -                |
| Phenol mass emissions (g.s <sup>-1</sup> )                 | -                  | 0.025          | -  | -               | -                  | -                | -                |
| Formaldehyde mass emissions (g.s <sup>-1</sup> )           | -                  | 0.0002         | -  | -               | -                  | -                | -                |
| Data source  | Provided by Permal |                | September 2020 stack emissions monitoring report |                 | Provided by Permal |                  |                  |

3.10 The stack parameters for the existing stacks are shown in

3.11 Table 3.2. Emissions from existing stacks have only been included in this assessment for those pollutants emitted from the proposed stacks, i.e. NO<sub>x</sub>, VOC and PM. No phenol or formaldehyde is emitted from the existing stacks.

**Table 3.2: Stack and Emissions Characteristics – Existing Stacks**

| Parameter        | E1  | E2             | E3   | E4             |
|------------------|---|----------------|--|----------------|
| Type of Plant    | 1 x Spray Booth routed through two stacks |                | 2 x Gas fired boiler routed through two stacks |                |
| Grid coordinates | 382376, 217160                            | 382378, 217168 | 382353, 217171                                 | 382353, 217172 |

| Parameter  | E1    | E2    | E3    | E4    |
|--|-------|-------|-------|-------|
| Stack height (m)   | 10.9  | 10.9  | 10.3  | 10.3  |
| Efflux temperature (°C)                                    | 19.2  | 19.2  | 87.9  | 87.9  |
| Internal diameter (m)                                      | 0.64  | 0.64  | 0.43  | 0.43  |
| Actual efflux velocity (m.s <sup>-1</sup> )                | 9.6   | 9.6   | 6.0   | 6.0   |
| Actual volumetric flow (Am <sup>3</sup> .s <sup>-1</sup> ) | 3.1   | 3.1   | 0.9   | 0.9   |
| NO <sub>x</sub> mass emissions (g.s <sup>-1</sup> )        | -     | -     | 0.01  | 0.01  |
| VOC mass emissions (g.s <sup>-1</sup> )                    | 0.197 | 0.197 | 0.028 | 0.028 |
| PM mass emissions (g.s <sup>-1</sup> )                     | 0.005 | 0.005 | -     | -     |

### Operating Hours

- 3.12 To ensure the assessment is conservative, the model has been run assuming that all proposed stacks will operate continuously throughout the year.
- 3.13 The existing E1 and E2 stacks are assumed to operate 5 days a week for 15 hours a day.
- 3.14 The actual operating conditions will be lower with most plant only running during the weekdays. Some processes are batch process so would be operational for a few hours or days at a time.

### Surface Roughness

- 3.15 The roughness of the terrain over which a plume passes can have a significant effect on dispersion by altering the velocity profile with height, and the degree of atmospheric turbulence. This is accounted for by a parameter called the surface roughness length.
- 3.16 A surface roughness length of 0.5 m has been used within the model to represent the average surface characteristics across the study area.

### Building Wake Effects

- 3.17 The movement of air over and around buildings generates areas of flow circulation, which can lead to increased ground level concentrations in the building wakes. Where building heights are greater than about 30 - 40% of the stack height, downwash effects can be significant. The building dimensions are listed in Table 3.3 and shown in Figure 2.

**Table 3.3: Dimensions of Buildings Included Within the Dispersion Model**

| Building number | Location X(m) | Location Y(m) | Height (m) | Length(m) | Width(m) | Angle from North |
|-----------------|---------------|---------------|------------|-----------|----------|------------------|
| 1               | 382317        | 217108        | 8.6        | 151       | 93       | 195              |
| 2               | 382321        | 217223        | 8.6        | 17        | 23       | 199              |
| 3               | 382372        | 217203        | 8.6        | 28        | 75       | 196              |

## Model Outputs

### Receptors

3.18 The air quality assessment predicts the impacts at locations that could be sensitive to any changes. Such sensitive receptors should be selected where the public is regularly present and likely to be exposed over the averaging period of the objective. LAQM.TG22 [11] provides examples of exposure locations and these are summarised in Table 3.4.

**Table 3.4: Example of Where Air Quality Objectives Apply**

| Averaging Period | Objectives should apply at:  | Objectives should generally not apply at:   |
|------------------|--|---|
| Annual-mean      | All locations where members of the public might be regularly exposed.<br>Building façades of residential properties, schools, hospitals, care homes.   | Building façades of offices or other places of work where members of the public do not have regular access.<br><br>Hotels, unless people live there as their permanent residence.<br><br>Gardens of residential properties.<br><br>Kerbside sites (as opposed to locations at the buildings façades), or any other location where public exposure is expected to be short-term. |
| Daily-mean       | All locations where the annual-mean objective would apply, together with hotels.<br><br>Gardens of residential properties.   | Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short-term.  |
| Hourly-mean      | All locations where the annual and 24 hour mean would apply. Kerbside sites (e.g. pavements of busy shopping streets).<br><br>Those parts of car parks, bus stations and railway stations etc which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more.<br><br>Any outdoor locations to which the public might reasonably be expected to spend 1-hour or longer. | Kerbside sites where the public would not be expected to have regular access.   |

3.19 The effects of the proposed development have been assessed at the façades of local receptors. All human receptors have been modelled at a height of 1.5 m, representative of typical head height. The locations of these discrete receptors are listed in Table 3.5 and illustrated in Figure 2.

**Table 3.5: Modelled Sensitive Receptors**

| Receptor       | National Grid Reference |        |
|----------------|-------------------------|--------|
|                | X (m)                   | Y (m)  |
| Residential 1  | 382150                  | 216948 |
| Residential 2  | 382185                  | 217055 |
| Residential 3  | 382190                  | 217147 |
| Residential 4  | 382217                  | 217213 |
| Residential 5  | 382245                  | 217239 |
| Residential 6  | 382254                  | 217266 |
| Residential 7  | 382531                  | 217246 |
| Residential 8  | 382482                  | 217179 |
| Residential 9  | 382414                  | 217097 |
| Residential 10 | 382390                  | 217050 |
| Residential 11 | 382362                  | 217001 |
| Industrial 1   | 382330                  | 217240 |
| Industrial 2   | 382401                  | 217222 |
| Industrial 3   | 382335                  | 217212 |
| Industrial 4   | 382330                  | 217197 |
| Industrial 5   | 382382                  | 217183 |
| Industrial 6   | 382269                  | 217020 |
| Industrial 7   | 382315                  | 217006 |

Note: Receptors have been modelled at 1.5m above ground level, representative of typical head height

3.20 The long and short-term standards apply at residential receptors. Only the short-term standards apply at the industrial receptors.

### Significance Criteria

3.21 As discussed in Section 2, the on-line EA guidance is for risk assessments and provides details for screening out substances for detailed assessment. In particular, it states that:

*“To screen out a PC for any substance so that you don’t need to do any further assessment of it, the PC must meet both of the following criteria:*

- *the short-term PC is less than 10% of the short-term environmental standard*
- *the long-term PC is less than 1% of the long-term environmental standard*

*If you meet both of these criteria you don’t need to do any further assessment of the substance.*

*If you don’t meet them you need to carry out a second stage of screening to determine the impact of the PEC.”*

3.22 It continues by stating that:

*“You must do detailed modelling for any PECs not screened out as insignificant.”*

3.23 It then states that further action may be required where:

- *“your PCs could cause a PEC to exceed an environmental standard (unless the PC is very small compared to other contributors – if you think this is the case contact the Environment Agency)*
- *the PEC is already exceeding an environmental standard”*

3.24 On that basis, the results of the detailed modelling presented in this report have been used as follows:

- The effects are not considered significant if the short-term PC is less than 10% of the short-term Air Quality Assessment Level (AQAL); and
- The effects are not considered significant if the PEC is below the AQAL.

3.25 The Air Quality Assessment Level refers to the AQS air quality objective and the EU limit value.

## Overview of Odour Assessment Tools Used

3.26 Most odours are mixtures of many chemicals that interact to produce what we detect as a smell. Odour-free air contains no odorous chemicals, whilst fresh air is usually perceived as being air that contains no chemicals or contaminants that are unpleasant (i.e. air that smells ‘clean’). Fresh air may contain odorous chemicals, but these odours will usually be pleasant in character, such as freshly-mown grass or sea spray. Perceptions of an odour - whether we find it acceptable, objectionable or offensive - are partly innate and hard-wired, and partly determined through life experiences and hence can be subjective to the individual.

3.27 Before annoyance or nuisance can occur, there must be odour exposure. For odour exposure to occur, all three links in the source-pathway-receptor chain must be present:

- an emission **source** - a means for the odour to get into the atmosphere.

- a **pathway** - for the odour to travel through the air to locations off site, noting that:
  - anything that increases dilution and dispersion of an odorous pollutant plume as it travels from source to receptor will reduce the concentration at the receptor, and hence reduce exposure.
  - dilution and dispersion increase as the length of the pathway increases.
  - increasing the length of the pathway (e.g. by releasing the emissions from a high stack) will – all other things being equal – increase the dilution and dispersion.
- The presence of **receptors** (people) that could experience an adverse effect, noting that different people vary in their sensitivities to odour.

3.28 By convention, the term odour impact is restricted to the negative appraisal by a human receptor of the odour exposure. This appraisal, occurring over a matter of seconds or minutes, involves many complex psychological and socio-economic factors. Once exposure to odour has occurred, the process can lead to annoyance, nuisance and possibly complaints.

3.29 Both, or either, annoyance and nuisance can lead to loss of amenity and complaint action. However, a lack of complaints does not necessarily prove there is no loss of amenity, annoyance or nuisance. On the other hand, there needs to be an underlying level of annoyance before complaints are generated. The responses of annoyance and nuisance can change over time.

3.30 Several methods have been used as part of the assessment of the odour impact at the proposed development:

- The first tool used was a qualitative predictive assessment of the potential for odour impact, carried out using the source-pathway-receptor concept and following the method in the 2018 IAQM odour guidance. This assessment tool considers: the emission source; the presence of odour controls (both engineering controls and odour management procedures and with the assumption that regulators will properly and effectively enforce these); the prevailing wind direction relative to the locations and distances of the proposed receptors, and their sensitivity to the type of odour in question.
- Quantitative assessment of the odour impacts on the surrounding area from the stack emissions, by atmospheric dispersion modelling. A “new generation” Gaussian dispersion model, ADMS 5, was used. This predicts the odour impacts under the full range of meteorological conditions likely to be experienced over a year.

## Methodology - Qualitative Predictive Odour Impact Assessment

3.31 A qualitative prediction of the odour impact of emissions from the proposed scrubber on the surrounding area was carried out using the risk-based assessment method in the IAQM Guidance

Appendix 1, which provides examples of risk factors for odour source potential, pathway effectiveness and receptor sensitivity (set out in Table 3.6).

**Table 3.6: IAQM Examples of Risk Factors for Odour Source, Pathway and Receptor**

| Source Odour Potential   | Pathway Effectiveness   | Receptor  |
|--|---|---|
| <p>Factors affecting the source odour potential include:</p> <ul style="list-style-type: none"> <li>▪ the magnitude of the odour release (taking into account odour-control measures)</li> <li>▪ how inherently odorous the compounds are</li> <li>▪ the unpleasantness of the odour</li> </ul>  | <p>Factors affecting the odour flux to the receptor are:</p> <ul style="list-style-type: none"> <li>▪ distance from source to receptor the frequency (%) of winds from the source to receptor (or, qualitatively, the direction of receptors from source with respect to prevailing wind)</li> <li>▪ the effectiveness of any mitigation/control in reducing flux to the receptor</li> <li>▪ the effectiveness of dispersion/ dilution in reducing the odour flux to the receptor</li> <li>▪ topography and terrain</li> </ul>      | <p>For the sensitivity of people to odour, the IAQM recommends that the air quality practitioner uses professional judgement to identify where on the spectrum between high and low sensitivity a receptor lies, taking into account the following general principles:</p>  |
| <p><b>Large Source Odour Potential</b></p> <p>Magnitude - Larger Permitted processes of odorous nature or large STWs; materials usage hundreds of thousands of tonnes/m<sup>3</sup> per year; area sources of thousands of m<sup>2</sup>.</p> <p>The compounds involved are very odorous (e.g. mercaptans), having very low Odour Detection Thresholds (ODTs) where known.</p> <p>Unpleasantness - processes classed as “Most offensive” in H4; or (where known) compounds/odours having unpleasant (-2) to very unpleasant (-4) hedonic score.</p> <p>Mitigation/control - open air operation with no containment, reliance solely on good management techniques and best practice.</p> | <p><b>Highly Effective Pathway for Odour Flux to Receptor</b></p> <p>Distance - receptor is adjacent to the source/site; distance well below any official set-back distances <sup>a</sup>.</p> <p>Direction - high frequency (%) of winds from source to receptor (or, qualitatively, receptors downwind of source with respect to prevailing wind).</p> <p>Effectiveness of dispersion/dilution - open processes with low-level releases, e.g. lagoons, uncovered effluent treatment plant, landfilling of putrescible wastes.</p> | <p><b>High Sensitivity Receptor</b></p> <p>- surrounding land where:</p> <ul style="list-style-type: none"> <li>▪ users` can reasonably expect enjoyment of a high level of amenity; and</li> <li>▪ the people would reasonably be expected to be present here continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land.</li> </ul> <p>Examples may include residential dwellings, hospitals, schools/education and tourist/cultural.</p> |
| <p><b>Medium Source Odour Potential</b></p> <p>Magnitude - smaller Permitted processes or small Sewage Treatment Works (STWs); materials usage thousands of tonnes/m<sup>3</sup> per year; area sources of hundreds of m<sup>2</sup>.</p> <p>The compounds involved are moderately odorous.</p> <p>Unpleasantness - processes classed in H4 as “Moderately offensive”; or (where known) odours having neutral (0) to unpleasant (-2) hedonic score.</p>  | <p><b>Moderately Effective Pathway for Odour Flux to Receptor</b></p> <p>Distance - receptor is local to the source.</p> <p>Where mitigation relies on dispersion/dilution - releases are elevated, but compromised by building effects.</p>  | <p><b>Medium Sensitivity Receptor</b></p> <p>- surrounding land where:</p> <ul style="list-style-type: none"> <li>▪ users` would expect to enjoy a reasonable level of amenity, but wouldn't reasonably expect to enjoy the same level of amenity as in their home; or</li> <li>▪ people wouldn't reasonably be expected to be present here continuously or regularly</li> </ul>  |

| Source Odour Potential   | Pathway Effectiveness   | Receptor   |
|--|---|--|
| Mitigation/control - some mitigation measures in place, but significant residual odour remains.  |   | for extended periods as part of the normal pattern of use of the land.<br><br>Examples may include places of work, commercial/retail premises and playing/recreation fields.   |
| <p><b>Small Source Odour Potential</b></p> <p>Magnitude - falls below Part B threshold; materials usage hundreds of tonnes/m<sup>3</sup> per year; area sources of tens m<sup>2</sup>.</p> <p>The compounds involved are only mildly odorous, having relatively high ODTs where known.</p> <p>Unpleasantness - processes classed as “Less offensive” in H4; or (where known) compounds/odours having neutral (0) to very pleasant (+4) hedonic score.</p> <p>Mitigation/control - effective, tangible mitigation measures in place (e.g. BAT, BPM) leading to little or no residual odour.</p> | <p><b>Ineffective Pathway for Odour Flux to Receptor</b></p> <p>Distance - receptor is remote from the source; distance exceeds any official set-back distances.</p> <p>Direction - low frequency (%) of winds from source to receptor (or, qualitatively, receptors upwind of source with respect to prevailing wind).</p> <p>Where mitigation relies on dispersion/ dilution - releases are from high level (e.g. stacks, or roof vents &gt; 3 m above ridge height) and are not compromised by surrounding buildings</p> | <p><b>Low Sensitivity Receptor</b></p> <p>- surrounding land where:</p> <ul style="list-style-type: none"> <li>▪ the enjoyment of amenity would not reasonably be expected; or</li> <li>▪ there is transient exposure, where the people would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land.</li> </ul> <p>Examples may include industrial, farms, footpaths and roads.</p> |

Notes: <sup>a</sup> Minimum setback distances may be defined for some odorous activities

3.32 The first step of this qualitative assessment is to estimate the odour-generating potential of the site activities, termed the “Source Odour Potential”. This takes into account three factors:

- The scale (magnitude) of the release from the odour source, taking into account the effectiveness of any odour control or mitigation measures that are already in place. This involves judging the relative size of the release rate after mitigation and taking account of any pattern of release (e.g. intermittency). The assumption has been made, as required by the NPPF, that any pollution-control regimes applying to potentially-odorous sites will operate effectively and that the appropriate BAT standards of odour control will be enforced.
- How inherently odorous the emission is. In some cases it may be known whether the release has a low, medium or high odour detection threshold (ODT); this is the concentration at which an odour becomes detectable to the human nose. In most instances the odours released by a source will be a complex mixture of compounds and the detectability will not be known. However, for some industrial processes the odour will be due to one or a small number of known compounds and the detection thresholds will be a good indication of whether the release is highly odorous or mildly odorous.



- The relative pleasantness/unpleasantness\* of the odour. Lists of relative pleasantness of different substances are given in the Environment Agency guidance H4 Odour Management [12].

3.33 Using the example risk ranking in Table 3.6, the Source Odour Potential can be categorised as small, medium or large.

**Table 3.7: H4 Offensiveness of Odour Emission Sources**

| Offensiveness        | Odour Emission Sources   |
|----------------------|--|
| Most Offensive       | Processes involving decaying animal or fish remains<br>Processes involving septic effluent or sludge<br>Biological landfill odours |
| Moderately Offensive | Intensive livestock rearing<br>Fat frying (food processing)<br>Sugar beet processing<br>Well aerated green waste composting        |
| Less Offensive       | Brewery<br>Confectionary<br>Coffee   |

3.34 Next, the effectiveness of the pollutant pathway as the transport mechanism for odour through the air to the receptor, versus the dilution/dispersion in the atmosphere, needs to be estimated. Anything that increases dilution and dispersion of the odorous pollutant plume as it travels from source (e.g. processes and plant) to receptor will reduce the concentration at the receptor, and hence reduce exposure. Important factors to consider here are:

- The distance of sensitive receptors from the odour source.
- Whether these receptors are downwind (with respect to the predominant prevailing wind direction). Odour episodes often tend to occur during stable atmospheric conditions with low wind speed, which gives poor dispersion and dilution; receptors close to the source in all directions around it can be affected under these conditions. When conditions are not calm, it will be the downwind receptors that are affected. Overall, therefore, receptors that are downwind with respect to the prevailing wind direction tend to be at higher risk of odour impact.
- The effectiveness of the point of release in promoting good dispersion, e.g. releasing the emissions from a high stack will - all other things being equal - increase the pathway, dilution and dispersion.

\* This can be measured in the laboratory as the hedonic tone, and when measured by the standard method and expressed on a standard nine-point scale it is termed the hedonic score.

- The topography and terrain between the source and the receptor. The presence of topographical features such as hills and valleys, or urban terrain features such as buildings can affect air flow and therefore increase, or inhibit dispersion and dilution.
- 3.35 Using the example risk ranking in Table 3.6, the pollutant pathway from source to receptor can be categorised as ineffective, moderately effective, or highly effective.
- 3.36 In the third step, the estimates of Source Odour Potential and the Pathway Effectiveness are considered together to predict the risk of odour exposure (impact) at the receptor location, as shown by the example matrix in Table 3.8.

**Table 3.8: Risk of Odour Exposure (Impact) at the Specific Receptor Location**

|                       |                      | Source Odour Potential |                 |             |
|-----------------------|----------------------|------------------------|-----------------|-------------|
|                       |                      | Small                  | Medium          | Large       |
| Pathway Effectiveness | Highly effective     | Low Risk               | Medium Risk     | High Risk   |
|                       | Moderately effective | Negligible Risk        | Low Risk        | Medium Risk |
|                       | Ineffective          | Negligible Risk        | Negligible Risk | Low Risk    |

- 3.37 The next step is to estimate the effect of that odour impact on the exposed receptor, taking into account its sensitivity, as shown by the example matrix in Table 3.9. The odour effects may range from negligible, through slight adverse and moderate adverse, up to substantial adverse.

**Table 3.9: Likely Magnitude of Odour Effect at the Specific Receptor Location**

| Risk of Odour Exposure | Receptor Sensitivity  |                         |                            |
|------------------------|-----------------------|-------------------------|----------------------------|
|                        | Low                   | Medium                  | High                       |
| High                   | Slight Adverse Effect | Moderate Adverse Effect | Substantial Adverse Effect |
| Medium                 | Negligible Effect     | Slight Adverse Effect   | Moderate Adverse Effect    |
| Low                    | Negligible Effect     | Negligible Effect       | Slight Adverse Effect      |
| Negligible             | Negligible Effect     | Negligible Effect       | Negligible Effect          |

- 3.38 This procedure results in a prediction of the likely odour effect at each sensitive receptor. The next step is to estimate the overall odour effect on the surrounding area, taking into account the different magnitude of effects at different receptors, and the number of receptors that experience these different effects\*. This requires the competent and suitably experienced Air Quality Practitioner to apply professional judgement.

\* Unless there is only a small number of local receptors, then a representative selection of receptors will have been used in the assessment. This final stage of considering the overall effect needs to take into account how many receptors these selected ones represent.

## Methodology - Odour Dispersion Modelling

### Stack Parameters used in the Model

3.39 The values of the stack emissions characteristics that were modelled are provided in

3.40 Table 3.2. These are based on information provided by Permal.

**Table 3.10 Stack Characteristics**

| Parameter           | Unit                | P2             |
|---------------------|---------------------|----------------|
| Location (x, y)     | -                   | 382377, 217173 |
| Stack height        | m                   | 14.3           |
| Internal diameter   | m                   | 1.1            |
| Efflux velocity     | m.s <sup>-1</sup>   | 4.6            |
| Efflux temperature  | °C                  | 17             |
| Odour emission rate | ouE.s <sup>-1</sup> | 1137           |

### Emissions Rates used in the Model

3.41 For the Scrubber (P2), the phenol and formaldehyde emissions rates were provided, and an odour emission rate of 1137 ouE.s<sup>-1</sup> was calculated. The calculations are shown in Table 3.11. The odour detection threshold (ODT) have been taken from Table 9.4 of the Environment Agency, 2007, *Review of odour character and thresholds* report.

**Table 3.11 Odour Emission Rates**

| Species      | Emission Rate (g.s <sup>-1</sup> ) | Emission Rate (mg.s <sup>-1</sup> ) | Volumetric Flow (m <sup>3</sup> .s <sup>-1</sup> ) | Emission Concentration (mg.m <sup>3</sup> ) | ODT (ppm) at 293k | ODT (mg.m <sup>-3</sup> ) at 293k | Odour Emission Concentration (Oue.m <sup>-3</sup> ) | Odour emission rate (Ou.s <sup>-1</sup> ) for 1 flue |
|--------------|------------------------------------|-------------------------------------|--|---|-------------------|-----------------------------------|---|--|
| Phenol       | 0.025                              | 25.000                              | 4.4  | 5.682                                       | 0.0056            | 0.022                             | 258.26  | 1136   |
| Formaldehyde | 0.0002                             | 0.200                               |  | 0.045                                       | 0.50              | 0.614                             | 0.07  | 0.326  |
| Total        |                                    |                                     |  |   |                   |                                   |   | 1137   |

## Model Outputs

### Receptors

3.42 The odour assessment predicts the impacts at relevant sensitive receptors. The *IAQM Guidance on the Assessment of Odour for Planning* provides examples of receptor sensitivity to odour which are summarised in Table 3.12.

**Table 3.12 Receptor sensitivity to odours**

|   |   |
|---|---|
| For the sensitivity of people to odour, the IAQM recommends that the Air Quality Practitioner uses professional judgement to identify where on the spectrum between high and low sensitivity a receptor lies, taking into account the following general principles: |   |
| <b>High sensitivity receptor</b>  | <p>Surrounding land where:</p> <ul style="list-style-type: none"> <li>• Users can reasonably expect enjoyment of a high level of amenity;</li> <li>• People would reasonably be expected to be present here continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land.</li> </ul> <p>Examples may include residential dwellings, hospitals, schools/education and tourist/cultural.</p>  |
| <b>Medium sensitivity receptor</b>  | <p>Surrounding land where:</p> <ul style="list-style-type: none"> <li>• Users would expect to enjoy a reasonable level of amenity, but wouldn't reasonably expect to enjoy the same level of amenity as in their home; or</li> <li>• People wouldn't reasonably expect to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land.</li> </ul> <p>Examples may include places of work, commercial/retail premises and playing/recreational fields.</p> |
| <b>Low sensitivity receptor</b>   | <p>Surrounding land where:</p> <ul style="list-style-type: none"> <li>• The enjoyment of amenity would not reasonably be expected; or</li> <li>• There is transient exposure, where the people would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land.</li> </ul> <p>Examples may include industrial use, farms, footpaths and roads.</p>   |

3.43 The modelling assessment predicted the odour impacts across the modelled domain: a grid of 3 km by 3 km with a grid spacing of 30 m.

3.44 In addition, the odour impacts of the facility have been predicted at the façades of representative discrete local existing receptors. All human receptors have been modelled at a height of 1.5 m, representative of typical head height. The locations of these discrete receptors are listed in Table 3.5.

### Significance Criteria - Odour Stack Impacts

3.45 In accordance with convention, odour levels across the project site have been predicted by the model as the 98th percentiles of the 1-hour average concentrations. Formaldehyde and phenol odours would not be expected to be at the 'most offensive' end of the spectrum and can be considered 'moderately offensive' odours.

3.46 The 2018 IAQM odour guidance for planning categorises the odour effects likely to result from various 98 percentile 1-hour average odour exposure levels, as reproduced in Table 3.13.

**Table 3.13 IAQM Proposed Odour Effect Descriptors for Impacts Predicted by Modelling (Moderately Offensive Odours)**

| Odour Exposure Level<br>$C_{98, OUE} / m^3$ | Receptor Sensitivity |             |             |
|---|----------------------|-------------|-------------|
|   | Low                  | Medium      | High        |
| $\geq 10$                                   | Moderate             | Substantial | Substantial |
| 5- <10                                      | Slight               | Moderate    | Moderate    |
| 3- <5                                       | Negligible           | Slight      | Moderate    |
| 1.5- <3                                     | Negligible           | Negligible  | Slight      |
| 0.5- <1.5                                   | Negligible           | Negligible  | Negligible  |
| <0.5  | Negligible           | Negligible  | Negligible  |

## Uncertainty

- 3.47 All air quality assessment tools, whether models or monitoring measurements, have a degree of uncertainty associated with the results. The choices that the practitioner makes in setting-up the model, choosing the input data, and selecting the baseline monitoring data will decide whether the final predicted impact should be considered a central estimate, or an estimate tending towards the upper bounds of the uncertainty range (i.e. tending towards worst-case).
- 3.48 The atmospheric dispersion model itself contributes some of this uncertainty, due to it being a simplified version of the real situation: it uses a sophisticated set of mathematical equations to approximate the complex physical and chemical atmospheric processes taking place as a pollutant is released and as it travels to a receptor. The predictive ability of even the best model is limited by how well the turbulent nature of the atmosphere can be represented.
- 3.49 Each of the data inputs for the model, listed earlier, will also have some uncertainty associated with them. Where it has been necessary to make assumptions, these have mainly been made towards the upper end of the range informed by an analysis of relevant, available data.
- 3.50 The main components of uncertainty in the total predicted concentrations include those summarised in Table 3.14.

**Table 3.14 Approaches to Dealing with Uncertainty used Within the Modelling Assessment**

| Source of Uncertainty               | Approach to Dealing with Uncertainty  | Comments   |
|-------------------------------------|---|--|
| Emissions and stack characteristics | Emission rates have been derived using a number of conservative assumptions.<br>This is likely to be a central estimate, with associated uncertainty attached.  | The predicted concentration is likely to be between a central estimate and the top of the uncertainty range. |
| Meteorological Data                 | Uncertainties arise from any differences between the conditions at the met station and the development site, and between the historical met years and the future years. These have been minimised by using meteorological data collated at a representative measuring site. The model has been run for five full years of meteorological conditions. This means that the conditions in 43,800 hours have been considered in the assessment. |  |
| Receptors                           | Receptor locations have been identified where concentrations are expected to be the highest or where the greatest changes are expected.   |  |

3.51 The analysis of the component uncertainties indicates that, overall, the predicted total concentration is likely fall between a central estimate and the top of the uncertainty range (i.e. tending towards worst-case).

## 4 Baseline Air Quality Conditions

### Overview

- 4.1 The background concentration often represents a large proportion of the total pollution concentration, so it is important that the background concentration selected for the assessment is realistic. EPUK/IAQM guidance highlight public information from Defra and local monitoring studies as potential sources of information on background air quality.
- 4.2 For this assessment, the background air quality has been characterised by drawing on information from the following public sources:
- Defra maps [13], which show estimated pollutant concentrations across the UK in 1 km grid squares;
  - published results of local authority Review and Assessment (R&A) studies of air quality, including local monitoring and modelling studies; and
  - results published by national monitoring networks.
- 4.3 There is no urban background monitoring NO<sub>2</sub> or PM<sub>10</sub> in the vicinity of the site so the background concentrations have been derived from the Defra mapped background concentration estimate at the site. The background concentrations used in the assessment are set out in Table 4.1.

**Table 4.1 Summary of Assumed Background Concentrations**

| Pollutant        | Averaging Period             | Concentration (µg.m <sup>-3</sup> ) | Data Source   |
|------------------|------------------------------|-------------------------------------|---|
| NO <sub>2</sub>  | 1 hour (99.79th percentile)  | 35.4(a)                             | Defra mapped (2018)   |
|                  | 1 hour (annual mean)         | 17.7                                |   |
| PM <sub>10</sub> | 24 hour (90.41st percentile) | 15.5                                |   |
|                  | 24 hour (annual mean)        | 15.5                                |   |
| Benzene (b)      | 1 hour (annual mean)         | 0.75                                | Average of data collected at Bath Roadside, Newport, Oxford Centre Roadside and Oxford St Ebbes (2014-2019) |
|                  | 24 hour (daily mean)         | 1.5 (a)                             |   |

Note:

- (a) Short-term background data approximately equate to the 90th percentile, which is approximately equivalent to 2 x the annual mean.
- (b) Benzene has been used as a proxy for background VOCs

## 5 Assessment of Air Quality Impacts

### Results of Stack Emissions Modelling

Table 5.1 to \*includes the 73.03 and 39.40  $\mu\text{g.m}^{-3}$  from P7.

- 5.1 Table 5.7 summarise the maximum predicted PCs across the modelled grid for each of the proposed stacks and for all of the meteorological years modelled. Where the PCs are greater than 1% of the long-term EAL or greater than 10% of the short-term EAL, the Predicted Environmental Concentration (PEC) has been shown. The PEC is calculated as the PC from the proposed stacks added to the PC from the existing stacks plus the ambient concentration (AC) derived in Table 4.1.
- 5.2 Figure 4 to Figure 6 show contour plots for  $\text{NO}_2$  and VOC concentrations from proposed stacks. The 2018 meteorological year has been used for the annual-mean  $\text{NO}_2$  contour and the 2017 meteorological year has been used for the annual-mean and 30-minute mean VOC contours. The meteorological year selected for each contour has been determined using the year in which the maximum concentration across the grid for each pollutant is predicted.
- 5.3 There may be some discrepancies between the contours and the concentrations predicted at the discrete sensitive receptors. This is because the location of the maximum predicted impact varies with each year of meteorological data and the maximum concentration at each sensitive receptor is often predicted in a different meteorological year to the maximum predicted concentration across the grid.



**Table 5.1 Maximum Predicted Contributions at across the grid – P1**

| Pollutant                         | Averaging Period     | EAL (µg.m <sup>-3</sup> ) | Max PC (µg.m <sup>-3</sup> ) | Max PC as % of EAL | Criteria (%) | PC is Potentially Significant? | AC including existing stacks (µg.m <sup>-3</sup> ) | PEC (µg.m <sup>-3</sup> ) | PEC as % of EAL | PEC is Potentially Significant ? |
|-----------------------------------|----------------------|---------------------------|------------------------------|--------------------|--------------|--------------------------------|--|---------------------------|-----------------|----------------------------------|
| VOCs (assumed to be 100% Benzene) | 24 hour (daily mean) | 30                        | 15.91                        | 53                 | 10           | Yes                            | 69.25*   | 85.16                     | 284             | Yes                              |
|                                   | 1 hour (annual mean) | 5                         | 1.33                         | 27                 | 1            | Yes                            | 16.10*   | 17.43                     | 349             | Yes                              |

\*includes the 2.96 and 0.91 µg.m<sup>-3</sup> from P2.

**Table 5.2 Maximum Predicted Contributions at across the grid – P2**

| Pollutant                         | Averaging Period     | EAL (µg.m <sup>-3</sup> ) | Max PC (µg.m <sup>-3</sup> ) | Max PC as % of EAL | Criteria (%) | PC is Potentially Significant? | AC including existing stacks (µg.m <sup>-3</sup> ) | PEC (µg.m <sup>-3</sup> ) | PEC as % of EAL | PEC is Potentially Significant ? |
|-----------------------------------|----------------------|---------------------------|------------------------------|--------------------|--------------|--------------------------------|--|---------------------------|-----------------|----------------------------------|
| VOCs (assumed to be 100% Benzene) | 24 hour (daily mean) | 30                        | 2.96                         | 10                 | 10           | No                             | -  | -                         | -               | -                                |
|                                   | 1 hour (annual mean) | 5                         | 0.91                         | 18                 | 1            | Yes                            | 16.72*   | 17.63                     | 353             | Yes                              |
| Formaldehyde                      | 1 hour (annual mean) | 5                         | 0.02                         | 0                  | 1            | No                             | -  | -                         | -               | -                                |
|                                   | 30 minute (maximum)  | 100                       | 0.38                         | 0                  | 10           | No                             | -  | -                         | -               | -                                |
| Phenol                            | 1 hour (annual mean) | 200                       | 47.47                        | 1                  | 1            | No                             | -  | -                         | -               | -                                |
|                                   | 1 hour (annual mean) | 3900                      | 2.27                         | 1                  | 10           | No                             | -  | -                         | -               | -                                |

\*includes the 1.33 µg.m<sup>-3</sup> from P1.

**Table 5.3 Maximum Predicted Contributions at across the grid – P3**

| Pollutant        | Averaging Period             | EAL<br>( $\mu\text{g.m}^{-3}$ ) | Max PC<br>( $\mu\text{g.m}^{-3}$ ) | Max PC as<br>% of EAL | Criteria<br>(%) | PC is<br>Potentially<br>Significant? | AC<br>including<br>existing<br>stacks<br>( $\mu\text{g.m}^{-3}$ ) | PEC<br>( $\mu\text{g.m}^{-3}$ ) | PEC as %<br>of EAL | PEC is<br>Potentially<br>Significant<br>? |
|------------------|------------------------------|---------------------------------|------------------------------------|-----------------------|-----------------|--------------------------------------|---|---------------------------------|--------------------|---|
| PM <sub>10</sub> | 24 hour (90.41st percentile) | 50                              | 0.15                               | 0                     | 10              | No                                   | -   | -                               | -                  | -   |
|                  | 24 hour (annual mean)        | 40                              | 0.08                               | 0                     | 1               | No                                   | -   | -                               | -                  | -   |

**Table 5.4 Maximum Predicted Contributions at across the grid – P4**

| Pollutant        | Averaging Period             | EAL<br>( $\mu\text{g.m}^{-3}$ ) | Max PC<br>( $\mu\text{g.m}^{-3}$ ) | Max PC as<br>% of EAL | Criteria<br>(%) | PC is<br>Potentially<br>Significant? | AC<br>including<br>existing<br>stacks<br>( $\mu\text{g.m}^{-3}$ ) | PEC<br>( $\mu\text{g.m}^{-3}$ ) | PEC as %<br>of EAL | PEC is<br>Potentially<br>Significant<br>? |
|------------------|------------------------------|---------------------------------|------------------------------------|-----------------------|-----------------|--------------------------------------|---|---------------------------------|--------------------|---|
| PM <sub>10</sub> | 24 hour (90.41st percentile) | 50                              | 0.83                               | 2                     | 10              | No                                   | -   | -                               | -                  | -   |
|                  | 24 hour (annual mean)        | 40                              | 0.31                               | 1                     | 1               | No                                   | -   | -                               | -                  | -   |

**Table 5.5 Maximum Predicted Contributions at across the grid – P5**

| Pollutant        | Averaging Period             | EAL<br>( $\mu\text{g.m}^{-3}$ ) | Max PC<br>( $\mu\text{g.m}^{-3}$ ) | Max PC as<br>% of EAL | Criteria<br>(%) | PC is<br>Potentially<br>Significant? | AC<br>including<br>existing<br>stacks<br>( $\mu\text{g.m}^{-3}$ ) | PEC<br>( $\mu\text{g.m}^{-3}$ ) | PEC as %<br>of EAL | PEC is<br>Potentially<br>Significant<br>? |
|------------------|------------------------------|---------------------------------|------------------------------------|-----------------------|-----------------|--------------------------------------|---|---------------------------------|--------------------|---|
| PM <sub>10</sub> | 24 hour (90.41st percentile) | 50                              | 0.85                               | 2                     | 10              | No                                   | -   | -                               | -                  | -   |
|                  | 24 hour (annual mean)        | 40                              | 0.32                               | 1                     | 1               | No                                   | -   | -                               | -                  | -   |

**Table 5.6 Maximum Predicted Contributions at across the grid – P6**

| Pollutant       | Averaging Period            | EAL (µg.m <sup>-3</sup> ) | Max PC (µg.m <sup>-3</sup> ) | Max PC as % of EAL | Criteria (%) | PC is Potentially Significant? | AC including existing stacks (µg.m <sup>-3</sup> ) | PEC (µg.m <sup>-3</sup> ) | PEC as % of EAL | PEC is Potentially Significant ? |
|-----------------|-----------------------------|---------------------------|------------------------------|--------------------|--------------|--------------------------------|--|---------------------------|-----------------|----------------------------------|
| NO <sub>2</sub> | 1 hour (99.79th percentile) | <b>200</b>                | 73.03                        | 37                 | 10           | Yes                            | 111.28*  | 184.31                    | 92              | No                               |
|                 | 1 hour (annual mean)        | <b>40</b>                 | 43.62                        | 109                | 1            | Yes                            | 59.02*   | 102.64                    | 257             | Yes                              |

\*includes the 73.03 and 39.40 µg.m<sup>-3</sup> from P7.

**Table 5.7 Maximum Predicted Contributions at across the grid – P7**

| Pollutant       | Averaging Period            | EAL (µg.m <sup>-3</sup> ) | Max PC (µg.m <sup>-3</sup> ) | Max PC as % of EAL | Criteria (%) | PC is Potentially Significant? | AC including existing stacks (µg.m <sup>-3</sup> ) | PEC (µg.m <sup>-3</sup> ) | PEC as % of EAL | PEC is Potentially Significant ? |
|-----------------|-----------------------------|---------------------------|------------------------------|--------------------|--------------|--------------------------------|--|---------------------------|-----------------|----------------------------------|
| NO <sub>2</sub> | 1 hour (99.79th percentile) | <b>200</b>                | 73.03                        | 37                 | 10           | Yes                            | 111.28   | 184.31                    | 92              | No                               |
|                 | 1 hour (annual mean)        | <b>40</b>                 | 39.40                        | 98                 | 1            | Yes                            | 63.24  | 102.64                    | 257             | Yes                              |

\*includes the 73.03 and 43.62 µg.m<sup>-3</sup> from P6.

- 5.4 The maximum PCs across the modelled grid does not exceed 1% of the EAL for long-term and 10% of the EAL for short-term averaging periods for all pollutants except VOCs for P1 and P2 and NO<sub>2</sub> for P6 and P7 and the impacts for those other pollutants are not considered to cause a significant effect.
- 5.5 Based on the PC alone, the VOC and NO<sub>2</sub> impacts are potentially significant however, when the PCs are added to the background concentrations, the resulting maximum PEC is below the relevant EAL for 99.79th percentile NO<sub>2</sub>. On that basis, the effects are not considered to be significant for

short-term NO<sub>2</sub>. For VOCs and long-term NO<sub>2</sub>, the PCs at the nearest sensitive receptors have been considered and are presented in Table 5.8 and Table 5.9.

**Table 5.8 Maximum Predicted Contributions at Sensitive Receptors - VOCs**

| Receptor | PC Proposed (P1 and P2) (µg.m <sup>-3</sup> ) | Existing sources (µg.m <sup>-3</sup> ) | AC (µg.m <sup>-3</sup> ) | Annual Mean   |   |     | 30 Minute Mean                                |                                 |   |   |   |
|----------|---|--|--------------------------|---|---|-----|---|---------------------------------|---|---|---|
|          |   |  |                          | Proposed PC as %EAL (assumed to be 100% formaldehyde) | Proposed PC is Potentially Significant? | PEC | PEC as %EAL (assumed to be 100% formaldehyde) | PEC is Potentially Significant? | PC Proposed (P1 and P2) (µg.m <sup>-3</sup> ) | Proposed PC as %EAL (assumed to be 100% formaldehyde) | Proposed PC is Potentially Significant? |
| R1       | 0.2   | 0.6                                    | -                        | 4   | Yes                                     | 0.8 | 16  | No                              | 0.2   | 0   | No                                      |
| R2       | 0.3   | 0.9                                    |                          | 6   |   | 1.2 | 25  |                                 | 0.3   | 0   |   |
| R3       | 0.5   | 0.7                                    |                          | 11  |   | 1.3 | 26  |                                 | 0.6   | 1   |   |
| R4       | 0.5   | 0.7                                    |                          | 10  |   | 1.2 | 24  |                                 | 0.5   | 1   |   |
| R5       | 0.4   | 0.8                                    |                          | 7   |   | 1.1 | 22  |                                 | 0.4   | 0   |   |
| R6       | 0.4   | 0.7                                    |                          | 8   |   | 1.1 | 22  |                                 | 0.4   | 0   |   |
| R7       | 0.5   | 2.2                                    |                          | 11  |   | 2.8 | 56  |                                 | 0.5   | 1   |   |
| R8       | 0.5   | 2.9                                    |                          | 10  |   | 3.5 | 69  |                                 | 0.5   | 1   |   |
| R9       | 0.4   | 2.6                                    |                          | 8   |   | 3.1 | 61  |                                 | 0.4   | 0   |   |
| R10      | 0.3   | 1.8                                    |                          | 6   |   | 2.1 | 43  |                                 | 0.3   | 0   |   |
| R11      | 0.2   | 1.2                                    |                          | 5   |   | 1.5 | 29  |                                 | 0.2   | 0   |   |
| I1       | N/A   |  |                          |   |   |     |   | 0.6                             | 1   |   |   |
| I2       | N/A   |  |                          |   |   |     |   | 0.9                             | 1   |   |   |
| I3       | N/A   |  |                          |   |   |     |   | 1.1                             | 1   |   |   |
| I4       | N/A   |  |                          |   |   |     |   | 0.3                             | 0   |   |   |

| Receptor | PC Proposed (P1 and P2) ( $\mu\text{g.m}^{-3}$ ) | Existing sources ( $\mu\text{g.m}^{-3}$ ) | AC ( $\mu\text{g.m}^{-3}$ ) | Annual Mean  |   |     | 30 Minute Mean                                 |                                 |  |  |   |
|----------|--|---|-----------------------------|--|---|-----|--|---------------------------------|--|--|---|
|          |  |   |                             | Proposed PC as %EAL (assumed to be 100% formaldehyd e) | Proposed PC is Potentially Significant? | PEC | PEC as %EAL (assumed to be 100% formaldehyd e) | PEC is Potentially Significant? | PC Proposed (P1 and P2) ( $\mu\text{g.m}^{-3}$ ) | Proposed PC as %EAL (assumed to be 100% formaldehyd e) | Proposed PC is Potentially Significant? |
| 15       |  |   |                             |  |   |     |  |                                 | 1.4  | 1  |   |
| 16       |  |   |                             |  |   |     |  |                                 | 0.3  | 0  |   |
| 17       |  |   |                             |  |   |     |  |                                 | 0.3  | 0  |   |

Usually as recommended by the EAs on-line guidance, where the exact substances that make up the VOCs are unknown it is assumed to be 100% benzene and is compared with the EAL for benzene. In this case, benzene is not being emitted by P1, so it has been assumed to be 100% formaldehyde and compared to the EAL for formaldehyde.

PCs/PECs as a % of the EAL that exceed the relevant criteria are shaded in grey.

**Table 5.9 Maximum Predicted Contributions at Sensitive Receptors – NO<sub>2</sub>**

| Receptor | PC Proposed (P6 & P7) ( $\mu\text{g.m}^{-3}$ ) | Existing sources ( $\mu\text{g.m}^{-3}$ ) | AC ( $\mu\text{g.m}^{-3}$ ) | Annual Mean |                                |      |             |                                 |
|----------|--|---|-----------------------------|-------------|--------------------------------|------|-------------|---------------------------------|
|          |  |   |                             | PC as %EAL  | PC is Potentially Significant? | PEC  | PEC as %EAL | PEC is Potentially Significant? |
| R1       | 0.30   | 0.05                                      | 17.7                        | 1           | No                             | -    | -           | -                               |
| R2       | 0.96   | 0.09                                      |                             | 2           | Yes                            | 18.8 | 47          | No                              |
| R3       | 0.57   | 0.08                                      |                             | 1           | No                             | -    | -           | -                               |
| R4       | 0.49   | 0.07                                      |                             | 1           | No                             | -    | -           | -                               |
| R5       | 0.60   | 0.08                                      |                             | 2           | Yes                            | 18.4 | 46          | No                              |
| R6       | 0.42   | 0.07                                      |                             | 1           | No                             | -    | -           | -                               |
| R7       | 0.38   | 0.15                                      |                             | 1           | No                             | -    | -           | -                               |
| R8       | 0.60   | 0.20                                      |                             | 1           | No                             | -    | -           | -                               |
| R9       | 0.60   | 0.21                                      |                             | 2           | Yes                            | 18.5 | 46          | No                              |

| Receptor | PC Proposed (P6 & P7) ( $\mu\text{g.m}^{-3}$ ) | Existing sources ( $\mu\text{g.m}^{-3}$ ) | Annual Mean                 |            |                                |     |             |                                 |
|----------|--|---|-----------------------------|------------|--------------------------------|-----|-------------|---------------------------------|
|          |  |   | AC ( $\mu\text{g.m}^{-3}$ ) | PC as %EAL | PC is Potentially Significant? | PEC | PEC as %EAL | PEC is Potentially Significant? |
| R10      | 0.54   | 0.11                                      |                             | 1          | No                             | -   | -           | -                               |
| R11      | 0.47   | 0.09                                      |                             | 1          | No                             | -   | -           | -                               |
| I1       | N/A  |   |                             |            |                                |     |             |                                 |
| I2       |  |   |                             |            |                                |     |             |                                 |
| I3       |  |   |                             |            |                                |     |             |                                 |
| I4       |  |   |                             |            |                                |     |             |                                 |
| I5       |  |   |                             |            |                                |     |             |                                 |
| I6       |  |   |                             |            |                                |     |             |                                 |
| I7       |  |   |                             |            |                                |     |             |                                 |

- 5.6 Based on the PC alone, the NO<sub>2</sub> impacts are potentially significant however, when the PCs are added to the background concentrations, the resulting PECs are all below the relevant EALs. On that basis the effects are not considered to be significant.
- 5.7 Based on the PC alone, the VOC impacts are potentially significant however, when the PCs are added to the background concentrations, the resulting PECs are all below the relevant EALs. On that basis the effects are not considered to be significant. This is a conservative assessment as it assumes that all VOCs are formaldehyde which has the lowest (most stringent) EAL of the VOCs emitted.

## Significance of Effects

- 5.8 As set out in Section 3, it is generally considered good practice that, where possible, an assessment should communicate effects both numerically and descriptively. Professional judgement by a competent, suitably qualified professional is required to establish the significance associated with the consequence of the impacts.
- 5.9 The impacts at existing receptors are shown to be not significant even for this conservative scenario. Consequently, further sensitivity analysis has not been undertaken and, in practice, the impacts at sensitive receptors are likely to be lower than those reported in this conservative assessment.

## 6 Assessment of Odour Impacts

### Qualitative Predictive Odour Impact

#### Source Odour Potential

- 6.1 The first step in the qualitative assessment of odour impact is to estimate the odour source potential which has been determined based on the guidance set out in Table 3.6. The factors affecting the Source Odour Potential are the magnitude of the odour release, how inherently odorous the compounds are, and the unpleasantness of the odour.
- 6.2 The total scrubber emission rate is 1137  $\text{OU}_{\text{E}}\cdot\text{s}^{-1}$ , a relatively small scale of release.
- 6.3 The compounds involved are likely to be moderately odorous, with the compounds having moderate Odour Detection Thresholds.
- 6.4 Regarding the unpleasantness of the odours and how inherently odorous the constituent compounds are the Environment Agency odour guidance H4 gives paint a hedonic score of -0.75. As this is towards the middle of the typical range of -4 to +4, the unpleasantness can be expected to fall into the “moderately offensive” category shown in Table 3.7.
- 6.5 Based on the above factors, RPS has conservatively categorised the Source Odour Potential as ‘medium’.

#### Pathway Effectiveness

- 6.6 The odour flux from the odour sources is dependent on the effectiveness of odour transport to the receptors, versus the mitigating effect of dilution/dispersion in the atmosphere.
- 6.7 The locations of the proposed development site and the nearest sensitive receptors are shown in Figure 3. The nearest residential receptors are approximately 85 m to the southeast and 105 m to the east of the scrubber stack. The nearest industrial receptors are approximately 10 m north of the stack.
- 6.8 The average wind directions centred on the site are shown in Figure 1. This data indicates that the prevailing wind direction is south-westerly.
- 6.9 The guidance examples in Table 3.6 suggest that releases from the stack to receptors adjacent to the site would be ‘highly effective’. The nearest industrial receptor is 10 m north of the stack which is mostly downwind. The nearest residential receptor downwind of the stack is further away at a distance of 105 m east from the stack. On that basis the pathway effectiveness is categorised as “moderately effective”.



## Receptor Sensitivity

- 6.10 The residential receptors are deemed to be “high sensitivity”.
- 6.11 The industrial receptors are deemed to be “medium sensitivity”.

## Risk of Odour Exposure (Impact)

- 6.12 When the small source odour potential (ignoring mitigation) is considered in the context of the pathway effectiveness (Table 3.8), the risk of odour exposure (impact) is “low risk”.

## Likely Magnitude of Odour Effect

- 6.13 When the above risk of odour exposure impact is considered in the context of the sensitivity of the receptors using the matrix in Table 3.9, the likely resulting odour effect is predicted to be “slightly adverse” at residential receptors and “negligible” at industrial receptors.

## Results of Stack Emissions Modelling

- 6.14 Table 6.1 presents the 98<sup>th</sup> percentile hourly-mean odour concentrations predicted at the nearest sensitive receptors.

**Table 6.1 98<sup>th</sup> Percentile of Hourly Odour Concentrations (ou<sub>E</sub>.m<sup>-3</sup>)**

| Receptor ID    | Receptor Sensitivity | 98 <sup>th</sup> Percentile Hourly-mean Odour Concentration (ou <sub>E</sub> .m <sup>-3</sup> ) | Odour Effect Descriptor |
|----------------|----------------------|---|-------------------------|
| Residential 1  | High                 | 0.03  | Negligible              |
| Residential 2  |                      | 0.06  | Negligible              |
| Residential 3  |                      | 0.06  | Negligible              |
| Residential 4  |                      | 0.06  | Negligible              |
| Residential 5  |                      | 0.07  | Negligible              |
| Residential 6  |                      | 0.07  | Negligible              |
| Residential 7  |                      | 0.08  | Negligible              |
| Residential 8  |                      | 0.12  | Negligible              |
| Residential 9  |                      | 0.14  | Negligible              |
| Residential 10 |                      | 0.13  | Negligible              |
| Residential 11 |                      | 0.08  | Negligible              |
| Industrial 1   | Medium               | 0.14  | Negligible              |
| Industrial 2   |                      | 0.15  | Negligible              |
| Industrial 3   |                      | 0.16  | Negligible              |

| Receptor ID  | Receptor Sensitivity | 98 <sup>th</sup> Percentile Hourly-mean Odour Concentration (ouE.m <sup>-3</sup> ) | Odour Effect Descriptor |
|--------------|----------------------|--|-------------------------|
| Industrial 4 |                      | 0.12   | Negligible              |
| Industrial 5 |                      | 0.20   | Negligible              |
| Industrial 6 |                      | 0.06   | Negligible              |
| Industrial 7 |                      | 0.07   | Negligible              |

6.15 Table 6.1 shows that the predicted 98<sup>th</sup> percentile hourly odour concentrations at the nearest sensitive receptor locations are all well below the 1.5 ouE.m<sup>-3</sup> benchmark at residential receptors and the 3 ouE.m<sup>-3</sup> benchmark at industrial receptors and the resulting odour effect descriptor at all receptors is negligible.

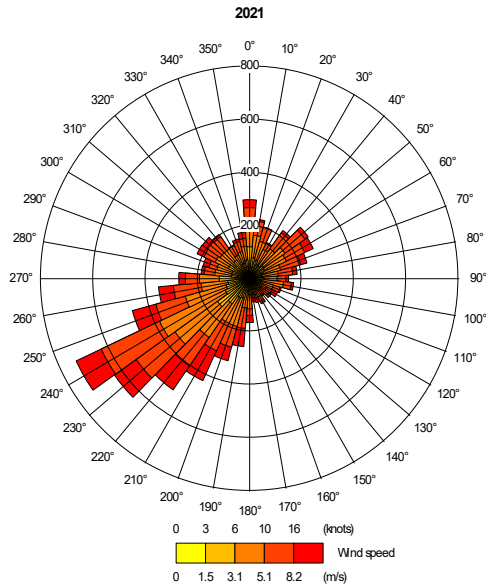
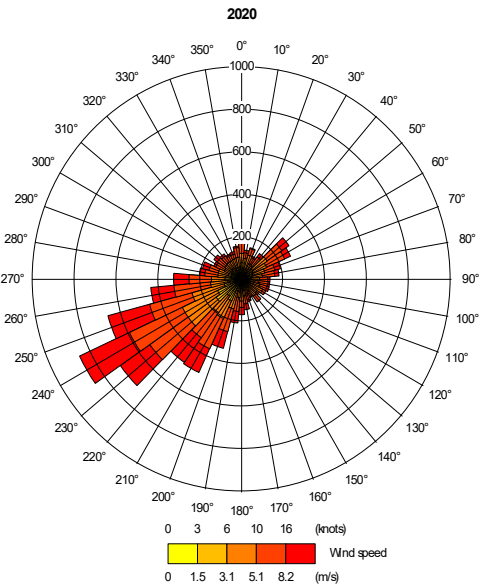
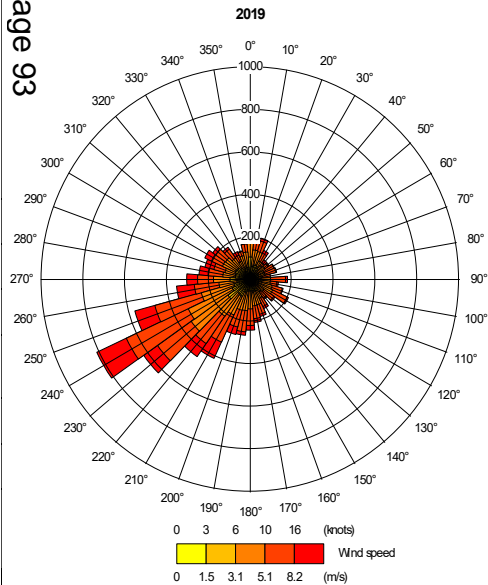
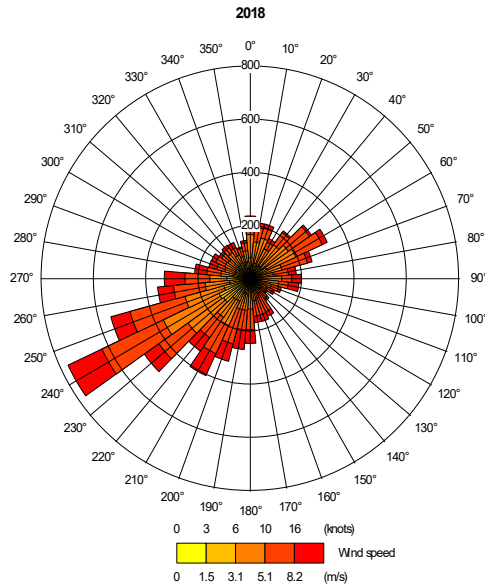
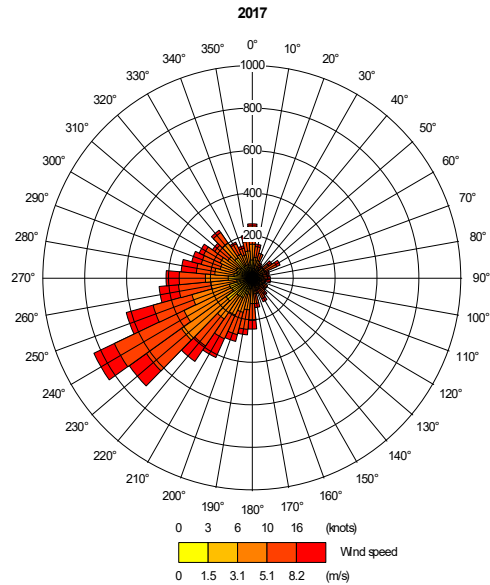
## Significance of Effects

- 6.16 It is generally considered good practice that, where possible, an assessment should communicate effects both numerically and descriptively. Professional judgement by a competent, suitably qualified professional is required to establish the significance associated with the consequence of the impacts.
- 6.17 The impacts predicted at individual receptors and the geographical extent over which such impacts occur, can be used to inform the judgement on the impact on the surrounding area as a whole, and whether the resulting overall effect is significant or not.
- 6.18 Using professional judgement, the resulting odour effect is considered to be 'not significant' overall.

## 7 Conclusions

- 7.1 This report details the air quality assessment undertaken to accompany the application to vary the permit for the Permal, Gloucester site.
- 7.2 The assessment covers an evaluation of the impacts on the local area of NO<sub>2</sub>, PM<sub>10</sub>, VOC, formaldehyde, phenol, and odour emissions from the proposed and existing stacks operated on the site.
- 7.3 Detailed atmospheric dispersion modelling has been undertaken to predict contributions from the varied operations. Modelling has been undertaken using five years of hourly sequential meteorological data. Concentrations have been predicted across a grid and at selected, representative receptors and compared with the relevant air quality standards.
- 7.4 The results show that, with the new stacks, the predicted concentrations associated with operations at the site are below the relevant air quality standards at sensitive receptors and the effects of the impacts are not considered to be significant.
- 7.5 Using professional judgement and experience of similar projects, the resulting air quality effect of the proposed variation is considered to be 'not significant' overall.

## Figures



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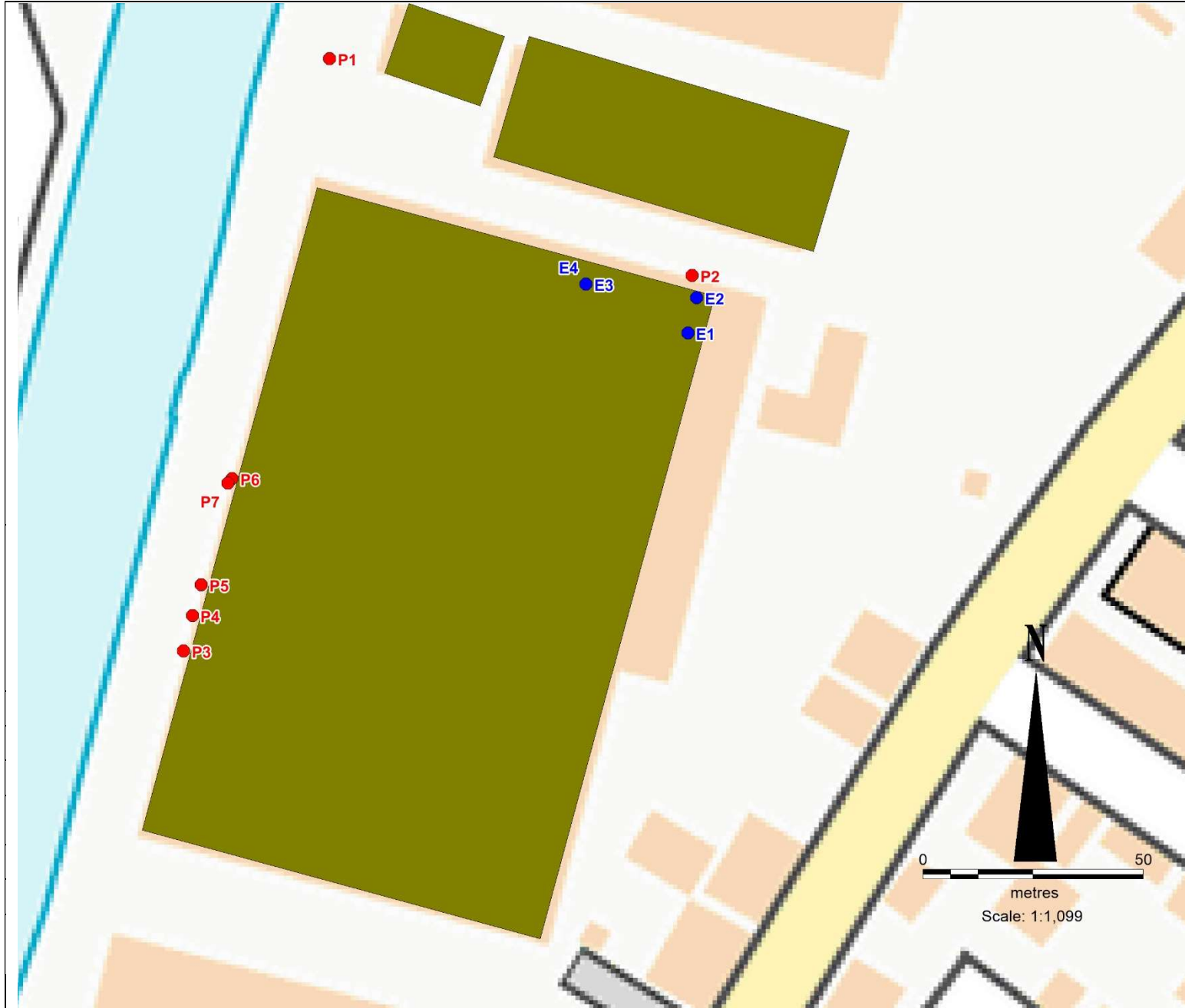
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**Figure 1: Wind Roses – NWP Data centred on 382376, 217160 (2017 – 2022)**

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**Legend**

-  Buildings Modelled
-  Proposed Sources
-  Existing Sources

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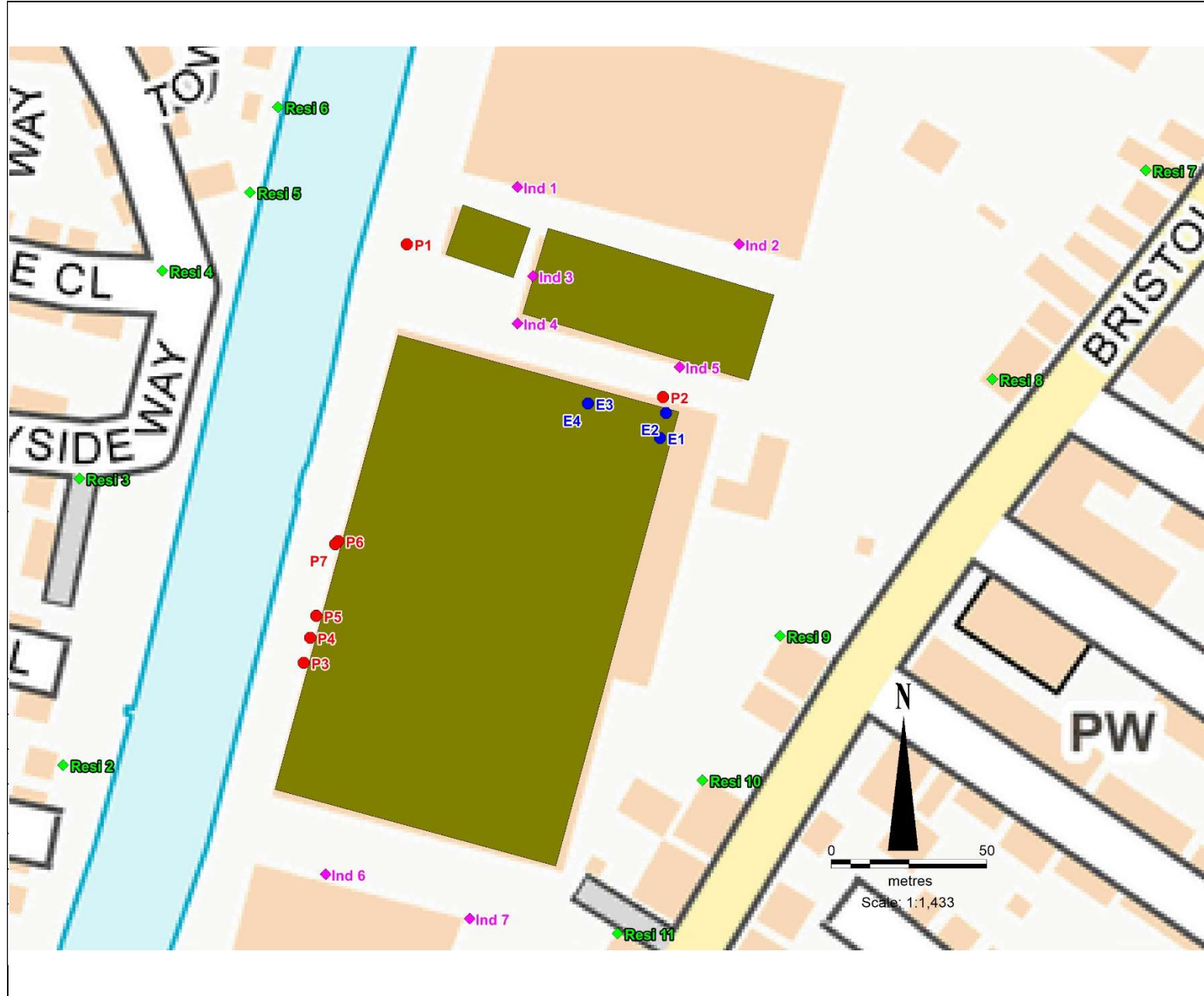
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**Figure 2: Stacks and Buildings Modelled**

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**Legend**

- Buildings Modelled
- Proposed Sources
- Existing Sources
- ◆ Residential Sensitive Receptors
- ◆ Industrial Sensitive Receptors

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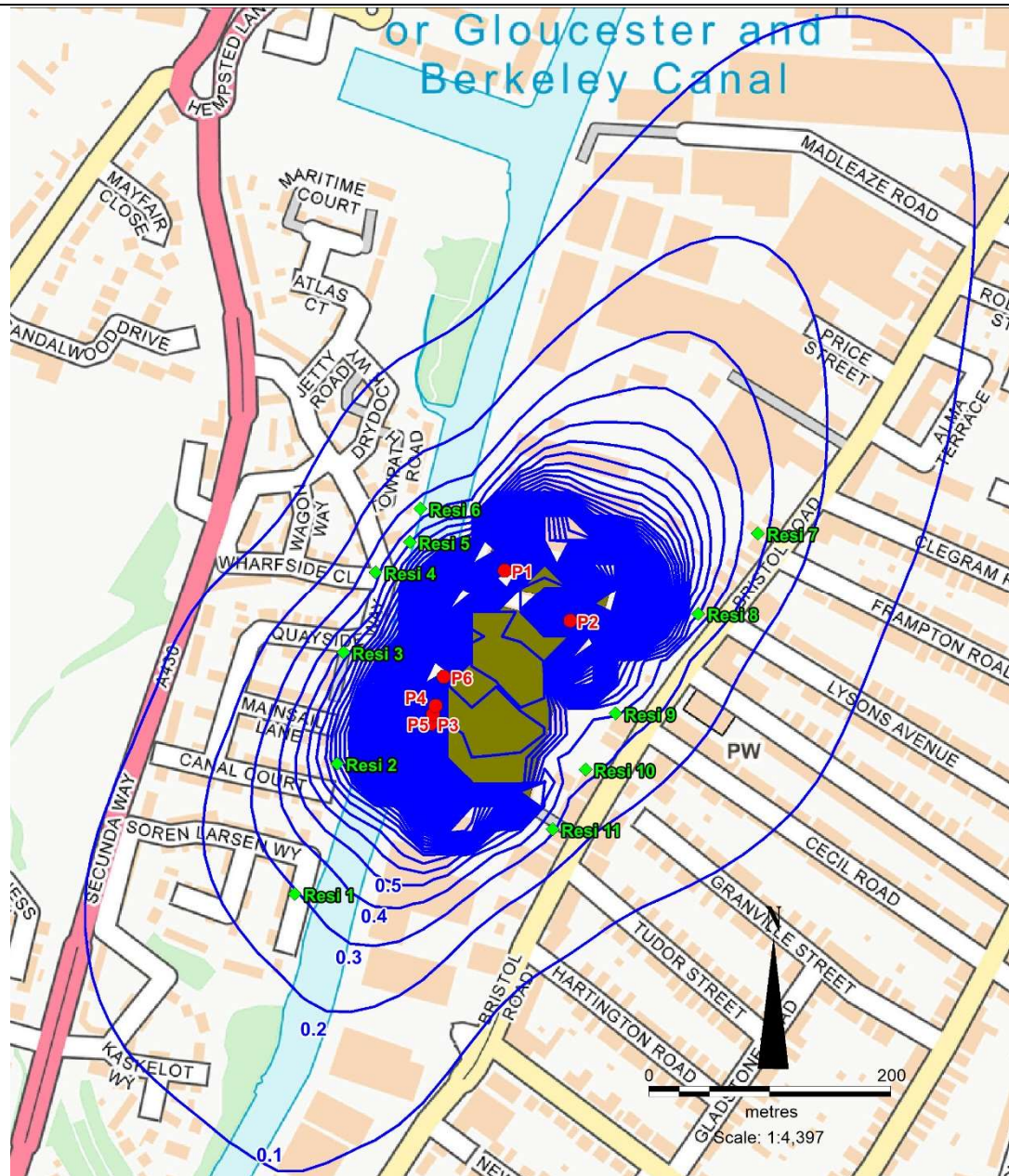
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**Figure 3: Modelled Sensitive Receptors**

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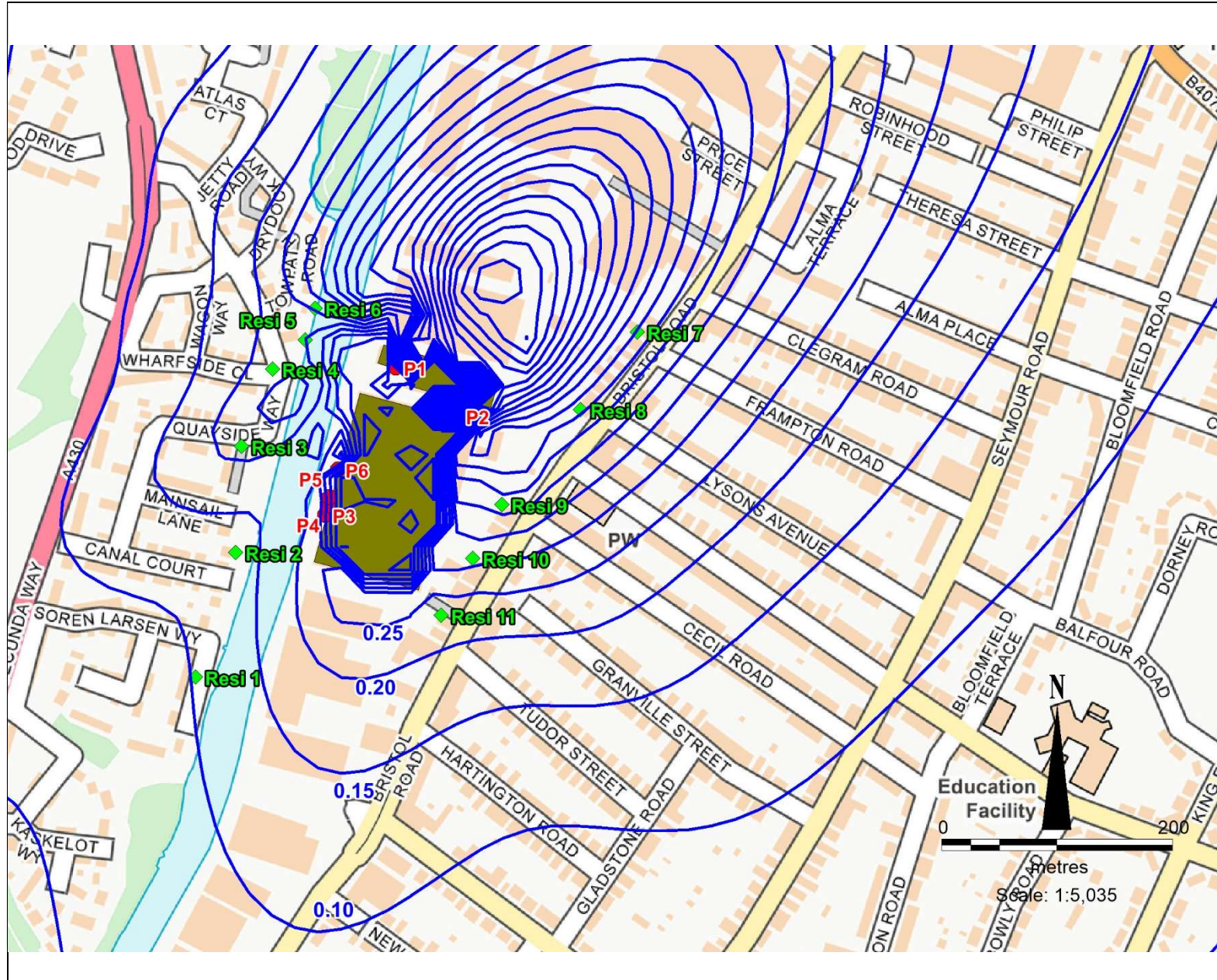
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Figure 4: Annual Mean NO<sub>2</sub> PCs ( $\mu\text{g}/\text{m}^3$ )

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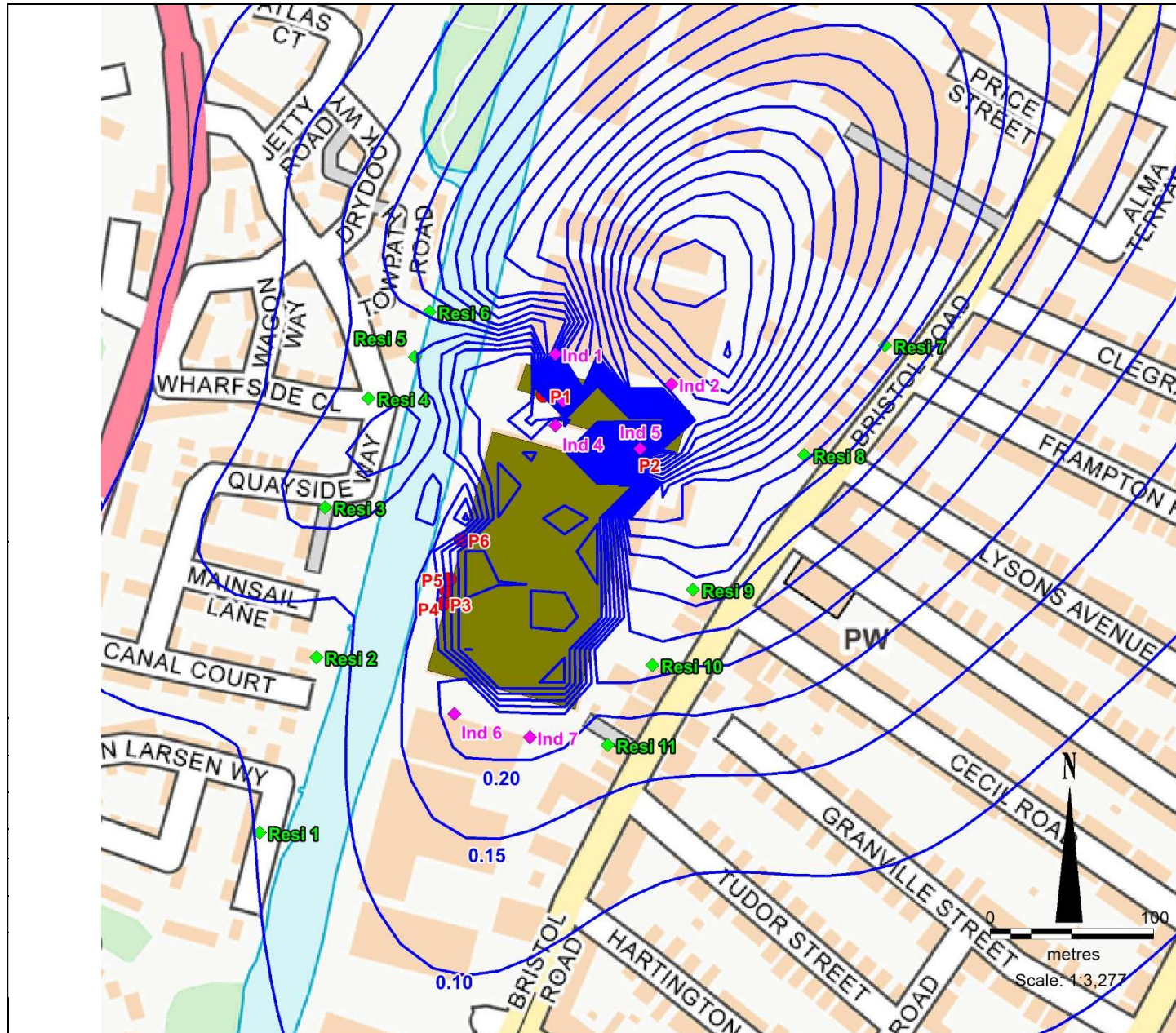
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Figure 5: Annual Mean VOC PCs (ug/m³)

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**Figure 6: 30 Minute Mean VOCs (Formaldehyde) PCs (ug/m³)**

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# Appendices

## Appendix A: Stack Height Determination

A stack height determination has been undertaken to establish the height at which there is minimal additional environmental benefit associated with the cost of further increasing the generator stacks. The Environment Agency removed their detailed guidance, Horizontal Guidance Note EPR H1 (EA, 2010), for undertaking risk assessments on 1 February 2016; however, the approach used here by RPS is consistent with that EA guidance which required the identification of “an option that gives acceptable environmental performance but balances costs and benefits of implementing it.”

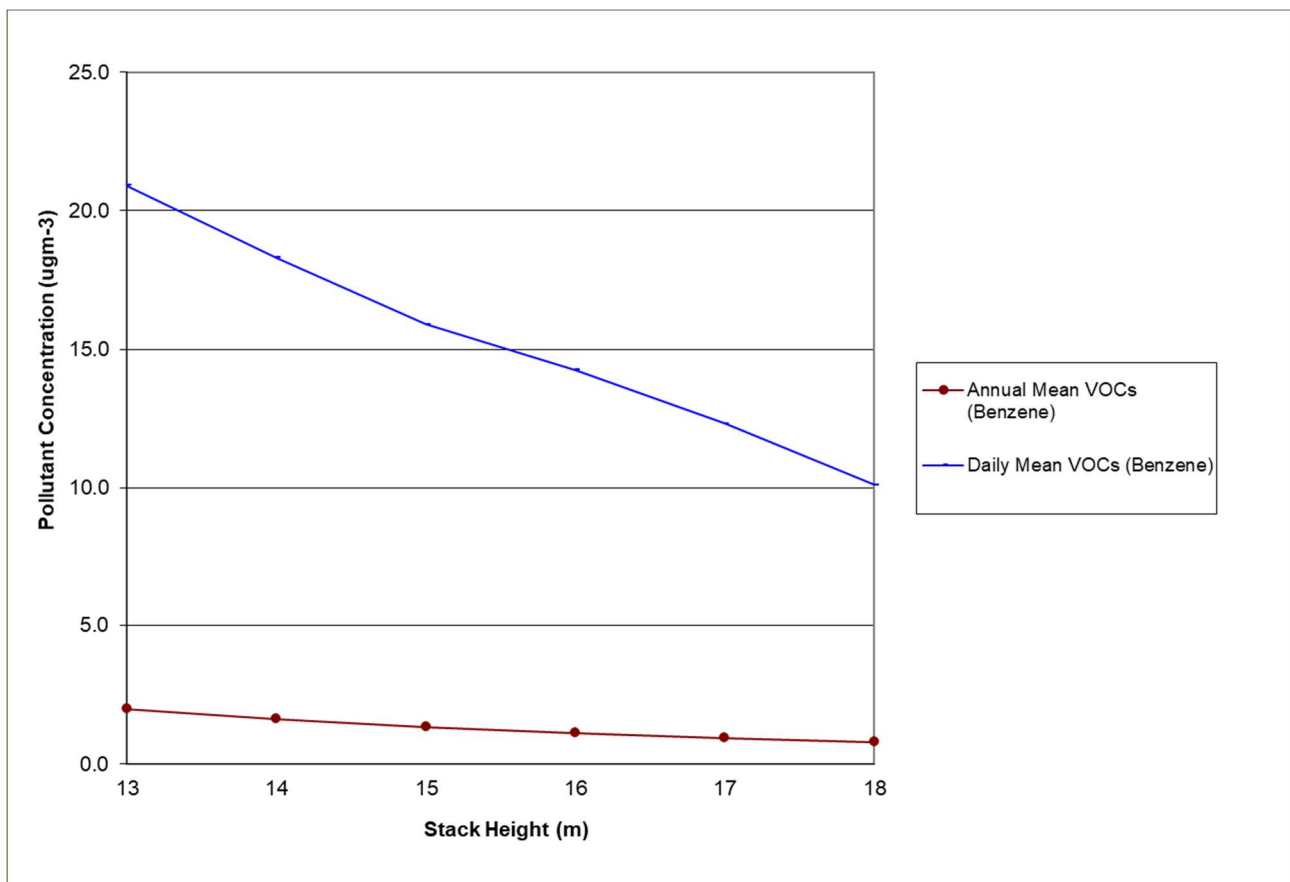
The emissions data used in the stack height determination are summarised in Section 3 of the report. Simulations have been run using ADMS 5 to determine what stack height is required to provide adequate dispersion/dilution and to overcome local building wake effects.

The stack height determination considers ground level concentrations over the averaging periods relevant to the air quality assessment, together with the full range of all likely meteorological conditions using five years of hourly sequential NWP meteorological data centred on 382376, 217160 between 2017 and 2021.

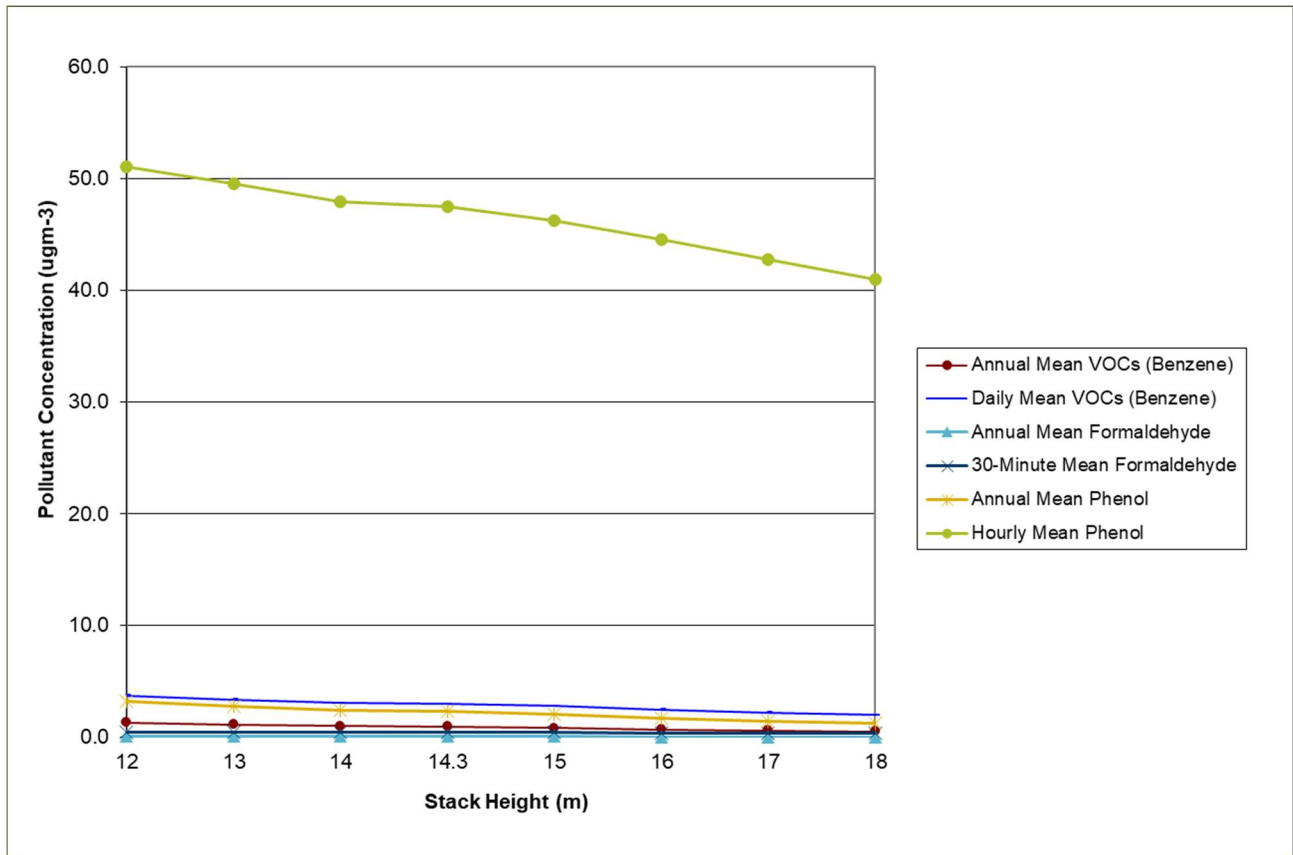
The dispersion modelling for the purposes of stack height determination assumed a domain of 3 km by 3 km centred on the proposed development and with a grid spacing of 30 m.

The maximum predicted contributions have been plotted against height to determine if there is a height at which no benefit is gained from increases in stack heights for each type of proposed stack in the graphs below.

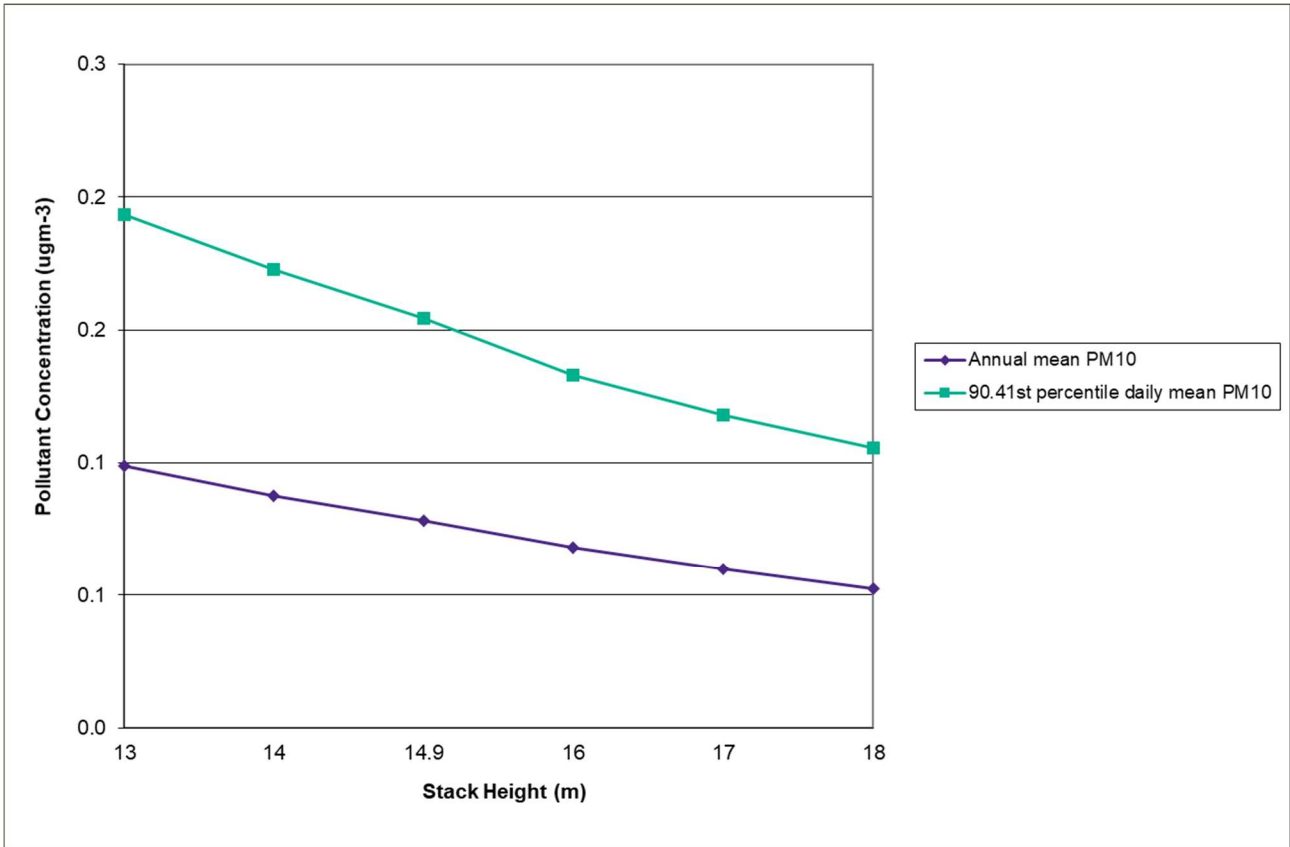
**Graph A.1 Variation in Concentration (as  $\mu\text{g}\cdot\text{m}^{-3}$ ) with Stack Height (m) – Stack P1**



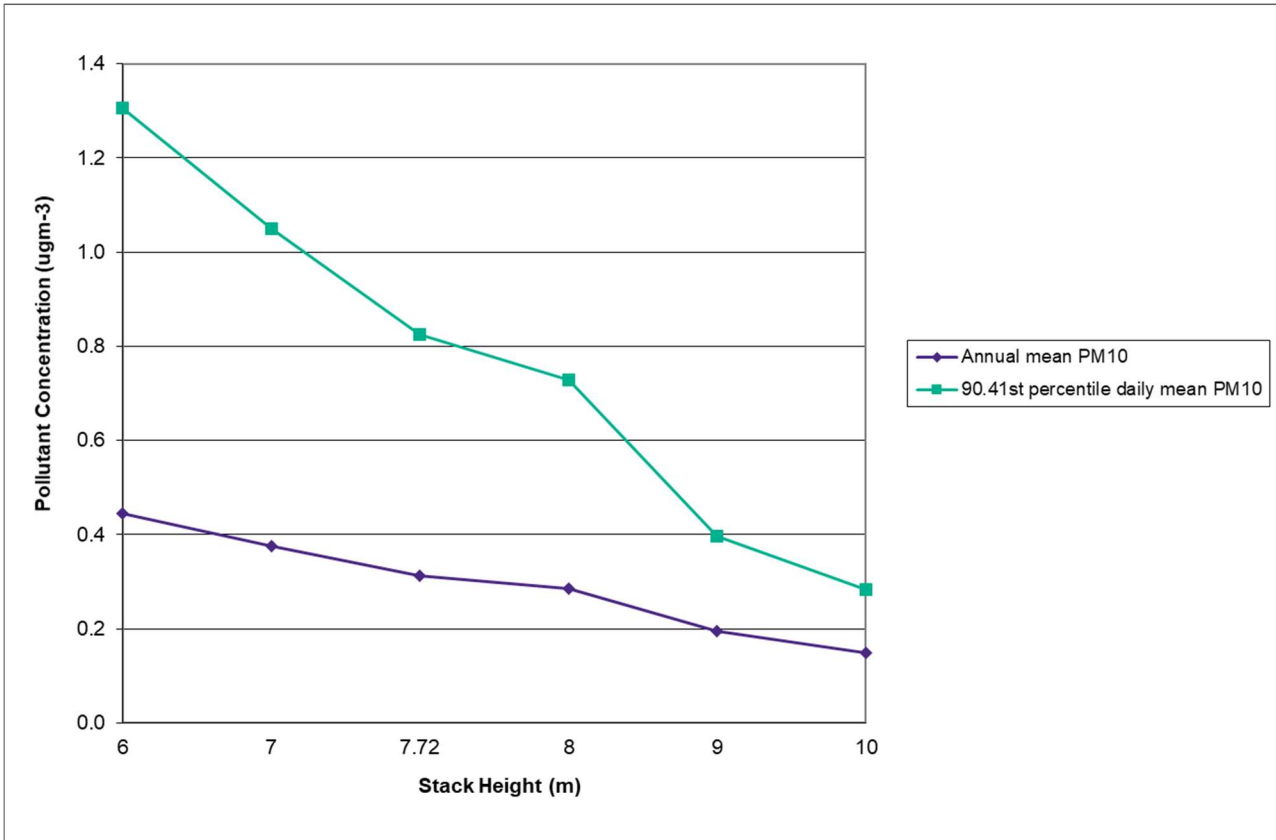
**Graph A.2 Variation in Concentration (as  $\mu\text{g.m}^{-3}$ ) with Stack Height (m) – Stack P2**



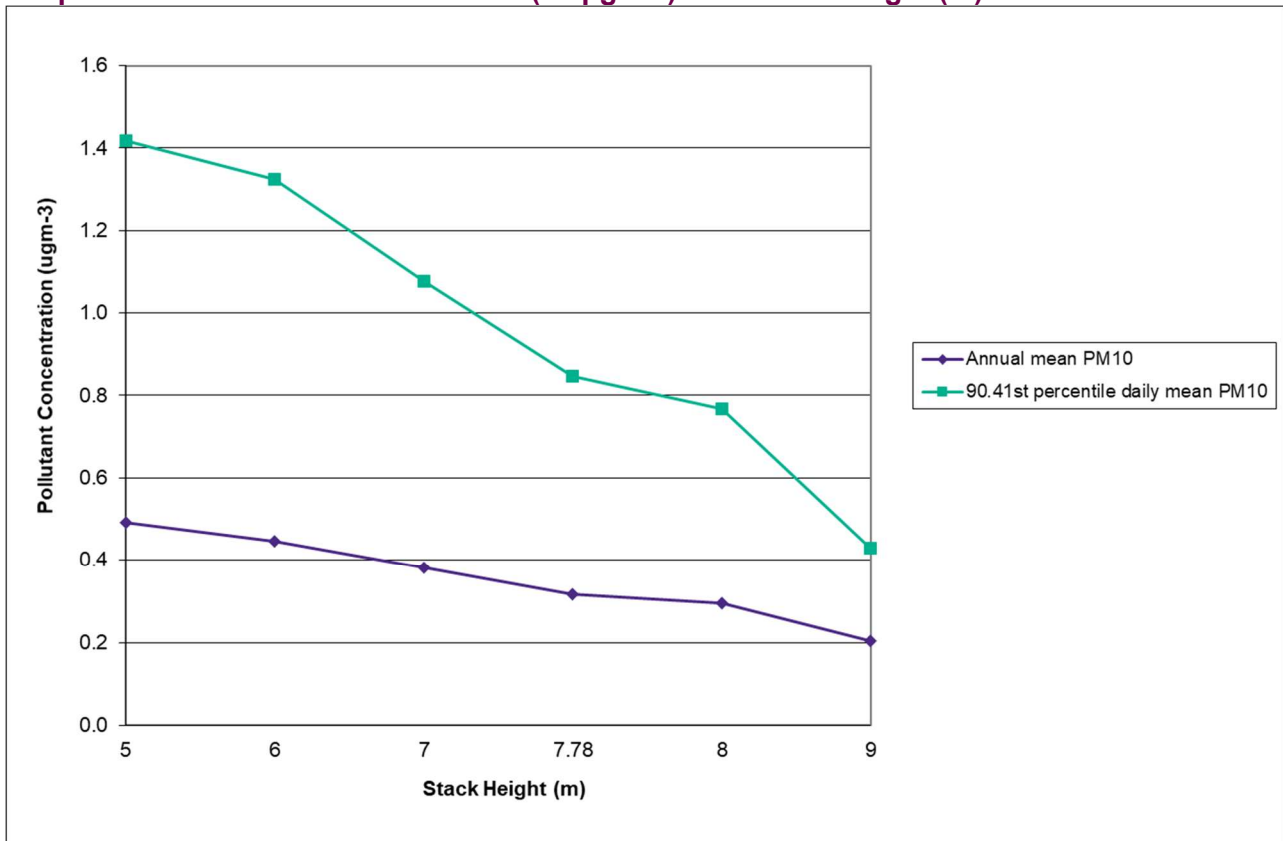
**Graph A.3 Variation in Concentration (as  $\mu\text{g.m}^{-3}$ ) with Stack Height (m) – Stack P3**



**Graph A.4 Variation in Concentration (as  $\mu\text{g.m}^{-3}$ ) with Stack Height (m) – Stack P4**

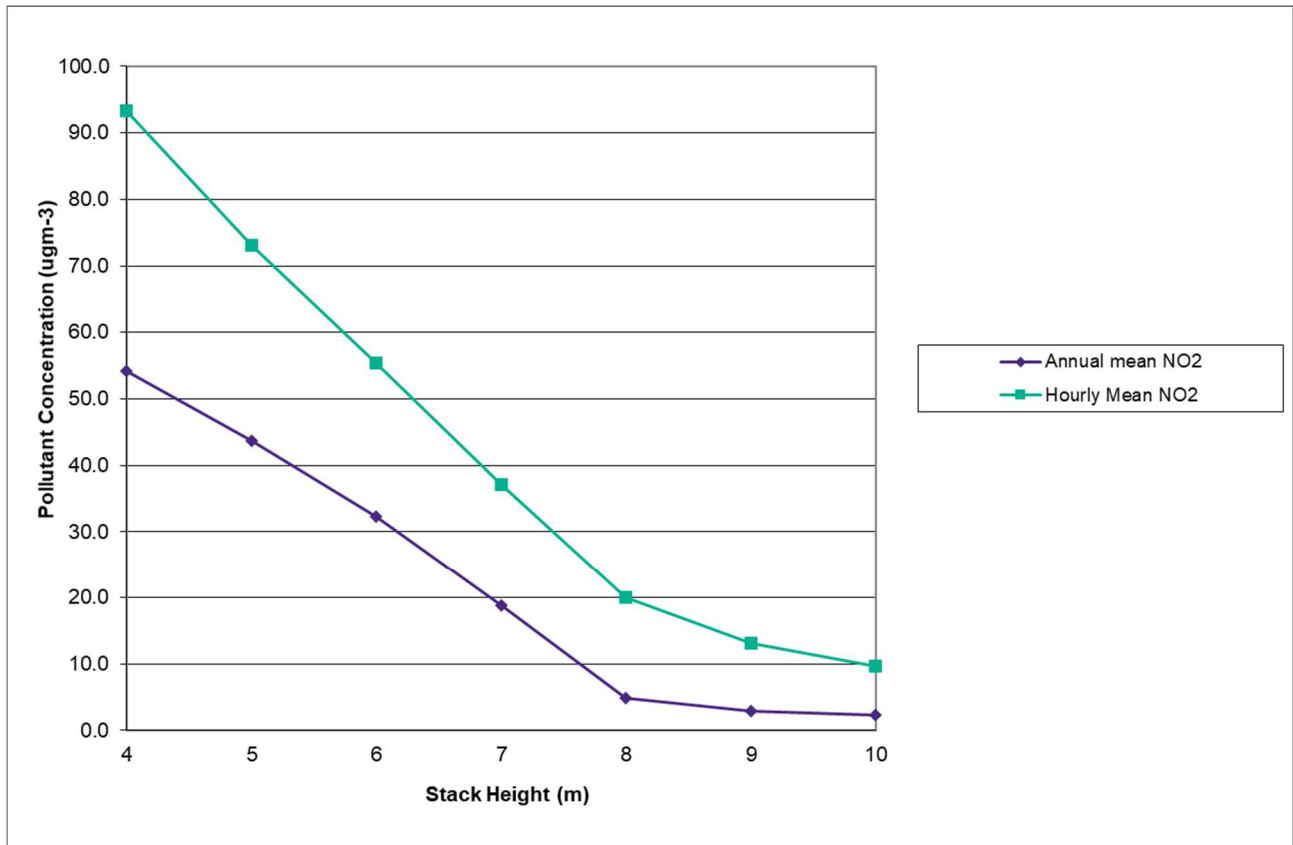


**Graph A.5 Variation in Concentration (as  $\mu\text{g.m}^{-3}$ ) with Stack Height (m) – Stack P5**

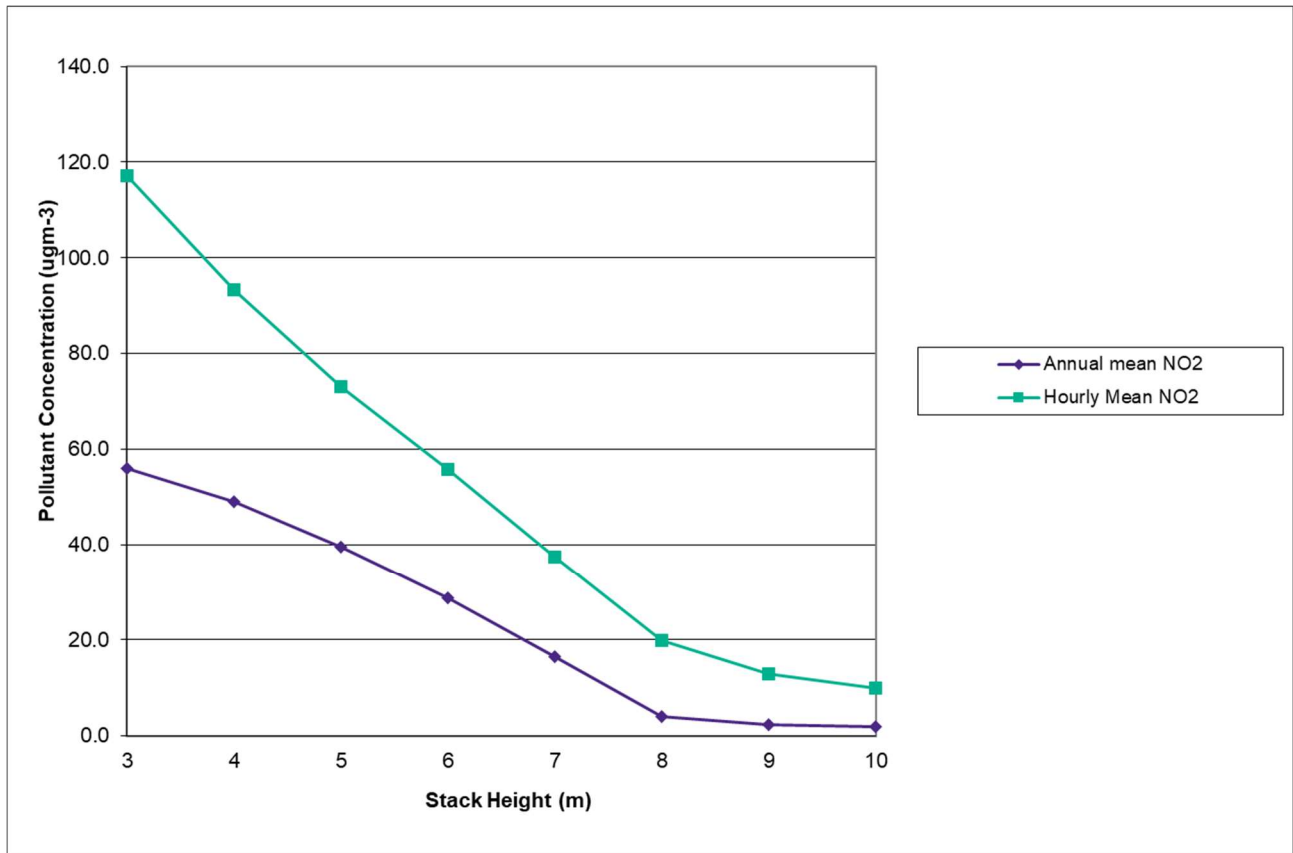




**Graph A.6 Variation in Concentration (as  $\mu\text{g}\cdot\text{m}^{-3}$ ) with Stack Height (m) – Stack P6**



**Graph A.7 Variation in Concentration (as  $\mu\text{g.m}^{-3}$ ) with Stack Height (m) – Stack P7**



7.6 The graph does not indicate that there would be any appreciable improvement in an increase in the stack height above the heights modelled for this assessment for stacks P1 to P5. The graph for P6 and P7 indicates an improvement 8 m and above; however, the results of the assessment undertaken for a 5 m P6 and P7 stack indicate that the NO<sub>2</sub> PCs can be screened-out as not significant at sensitive receptors.

7.7 The stack height used in this assessment is 15.00 m for stack P1, 14.30 m for stack P2, 14.9 m for stack P3, 7.72 m for stack P4, 7.78 m for stack P5, 5 m for stack P6 and 5 m for P7.

## References

- 1 IAQM (2018) Guidance on the assessment of odour for planning
- 2 Directive 1996/61/EC of 24 September 1996 concerning Integrated Pollution Prevention and Control
- 3 OPSI (2016) The Environmental Permitting (England and Wales) Regulations 2016
- 4 Environment Agency 2016, Environmental management – guidance. Air emissions risk assessment for your environmental permit. .gov.uk website: <https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit#environmental-standards-for-air-emissions>.
- 5 Defra (2011) Environmental Permitting Guidance – Statutory Nuisance s79 (10) Environmental Protection Act 1990 – for the Environmental Permitting (England and Wales) Regulations 2010.
- 6 Defra, 2010, The Air Quality Standards Regulations.
- 7 The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020
- 8 Defra, 2007, The Air Quality Strategy for England, Scotland, Wales and Northern Ireland. Volume 2.
- 9 World Health Organisation Guidelines (<http://www.who.int/en/>)
- 10 Expert Panel on Air Quality Standards ([www.defra.gov.uk/environment/airquality/panels/aqs/index.htm](http://www.defra.gov.uk/environment/airquality/panels/aqs/index.htm))
- 11 Defra (2016) Local Air Quality Management Technical Guidance 2016
- 12 Environment Agency: H4 Odour Management. March 2011
- 13 Drawn from Defra Maps at <http://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018>

# NOISE IMPACT ASSESSMENT FOR ENVIRONMENTAL PERMITTING

For Tenmat, Permali, Gloucester

JAJ02805-REPT-01-R0  
Noise Impact  
Assessment for  
Environmental  
Permitting  
R0  
01 December 2022

## REPORT

### Document status

| Version | Purpose of document | Authored by | Reviewed by | Approved by | Review date |
|---------|---------------------|-------------|-------------|-------------|-------------|
| R0      | Report Issue        | CI          | LWT         | LWT         | 05/12/2022  |

### Approval for issue

Lise W. Tjellesen

Technical Director Acoustics

7 December 2022

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Appendix C Environmental Sound Survey Sheets

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# 1 Introduction

- 1.1.1 The Acoustics Team of RPS Planning and Environmental (RPS) has been appointed by Permali Gloucester Ltd to provide a noise impact assessment of the operational noise levels from the Permali facility at 270 Bristol Road, Gloucester, GL1 5TT. The site is located within the local authorities of Gloucestershire County Council (GSCC) and Gloucester City Council (GCC).
- 1.1.2 This noise impact assessment has been prepared to support the application for the Environmental Permit (EP) for the existing Permali manufacturing facility of composite and PU material solutions.
- 1.1.3 An environmental sound survey was undertaken on site, at locations representative of the nearest noise sensitive receptors (NSRs) to establish the baseline sound conditions.
- 1.1.4 Details of the type of new plant proposed to operate at the facility with associated noise emissions were provided by the client.
- 1.1.5 A 3D sound model of the facility was built, considering the provided plant noise levels, to predict specific sound levels from the facility at the NSRs. An assessment of the impact of the predicted specific sound levels was undertaken based on the methodology detailed in British Standard (BS) 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound'<sup>1</sup>.
- 1.1.6 The assessment is based upon appropriate information regarding the proposed development provided by the design team and the client. RPS is a member of the Association of Noise Consultants (ANC), the representative body for acoustics consultancies, having demonstrated the necessary professional and technical competence. The assessment has been undertaken with integrity, objectivity and honesty in accordance with the Code of Conduct of the Institute of Acoustics (IOA) and ethically, professionally and lawfully in accordance with the Code of Ethics of the ANC.
- 1.1.7 The technical content of this assessment has been provided by RPS personnel, all of whom are members of the IOA (the UK's professional body for those working in acoustics, noise and vibration). This report has been peer reviewed within the RPS team to ensure that it is technically robust and meets the requirements of our Integrated Management System. Our Personnel and Individual Qualifications are given in Appendix A.

---

<sup>1</sup> British Standards Institution (BSI). British Standard 4142:2014+A1:2019. Methods for rating and assessing industrial and commercial sound. 2019.



## 2 REGULATIONS, STANDARDS AND GUIDANCE

### Environmental Permitting Regulations

- 2.1.1 The Environmental Permitting (England and Wales) Regulations 2010 (EPR) designate the Environment Agency (EA) as the 'Regulator' responsible for enforcing the regime. As part of its role as regulator, the Environment Agency is responsible for producing guidance for use in enforcing the EPR. However, such guidance has not yet been produced and, in the interim period, it is understood that the existing guidance documents for the old IPPC regime may continue to be used.
- 2.1.2 The Regulations require that installations should be operated in such a way that all appropriate preventative measures are taken against pollution, in particular with the application BAT. BAT includes both the technology used and the way in which the installation is designed, built, operated and decommissioned.

### Noise and vibration management: environmental permits

- 2.1.3 The Environment Agency, Scottish Environment Protection Agency (SEPA), Natural Resources Wales and Northern Ireland Environment Agency have produced a guidance<sup>2</sup> on environmental permits to help holders and potential holders of permits apply for, vary, and comply with their permits. The guidance was published on 23 July 2021, and it replaces the H3 guidance.
- 2.1.4 For each particular case, the environment agencies have to decide whether or not a proposed facility is causing (or are likely to cause) unacceptable noise pollution, even if appropriate measures are used. It is the applicant's responsibility to avoid significant pollution and to demonstrate that BAT or appropriate measures are used to prevent, or where that is not practicable, to minimise noise impact.

### Standards

#### British Standard 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound'

- 2.1.5 BS 4142:2014+A1:2019 primarily provides a numerical method by which to determine the significance of sound of an industrial nature (i.e. the 'specific sound'<sup>3</sup> from the proposed development) at residential noise sensitive receptors. The specific sound level may then be corrected for the character of the sound (e.g. perceptibility of tones and/or impulses), if appropriate, and it is then termed the 'rating level', whether or not a rating penalty is applied. The 'residual sound' is defined as the ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound.
- 2.1.6 The specific sound levels should be determined separately in terms of the  $L_{Aeq,T}$  index over a period of 1-hour during the daytime and 15-minutes during the night-time. For the purposes of the Standard, daytime is typically between 07:00 and 23:00 hours, and night-time is typically

---

<sup>2</sup> A website link to the guidance is given here: <https://www.gov.uk/government/publications/noise-and-vibration-management-environmental-permits/noise-and-vibration-management-environmental-permits>

<sup>3</sup> equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, Tr.

between 23:00 and 07:00 hours although these time periods can be varied based on local circumstances.

- 2.1.7 With regards to the character correction, paragraph 9.2 of BS 4142:2014+A1:2019 states:

*“Tonality*

*For sound ranging from not tonal to prominently tonal the Joint Nordic Method gives a correction of between 0 dB and +6 dB for tonality. Subjectively, this can be converted to a rating penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible.*

*Impulsivity*

*A correction of up to +9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible.*

*Intermittency*

*When the specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time. ... If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.*

*Other sound characteristics*

*Where the specific sound features characteristics that are neither tonal nor impulsive, nor intermittent, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.”*

- 2.1.8 The standard requires that the background sound levels<sup>4</sup> adopted for the assessment be representative for the period being assessed. The Standard recommends that the background sound level should be derived from continuous measurements of normally not less than 15-minute intervals, which can be contiguous or disaggregated. However, the Standard states that there are no ‘single’ background sound levels that can be derived from such measurements.

- 2.1.9 It is particularly difficult to determine what is ‘representative’ of the night-time period is because it can be subject to a wide variation in background sound level between the middle of the night and the shoulder periods. The accompanying note to paragraph 8.1.4 of the standard states that:

*“A representative level should account for the range of background sounds levels and should not automatically be assumed to be either the minimum or modal value.”*

- 2.1.10 An initial estimate of the impact of the specific sound is obtained by subtracting the measured background sound level from the rating level of the specific sound. In the context of the Standard, adverse impacts include, but are not limited to, annoyance and sleep disturbance. Typically, the greater this difference, the greater is the magnitude of the impact:

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<sup>4</sup> A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels.

- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
  - A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.
- 2.1.11 The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. As set out in the standard, where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.
- 2.1.12 The significance of the effect of the noise in should be determined on the basis of the initial estimate of impact significance with reference to the context of the sound.
- 2.1.13 Whilst there is a relationship between the significance of impacts determined by the method contained within the standard and the significance of effects described in the PPG-N (Ministry of Housing, Communities and Local Government, 2019b), there is not a direct link. It is not appropriate to ascribe numerical rating / background level differences to LOAEL and SOAEL because this fails to consider the context of the sound, which is a key requirement of the Standard.
- 2.1.14 The significance of the effect of the noise in question (i.e. whether above or below SOAEL and LOAEL) should be determined on the basis of the initial estimate of impact significance from the standard assessment with reference to the examples of outcomes described within the PPG-N, and after having considered the context of the sound. It is necessary to consider all pertinent factors, including:
- the absolute level of sound;
  - the character and level of the residual sound compared to the character and level of the specific sound; and
  - the sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:
    - facade insulation treatment;
    - ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and
    - acoustic screening.

## Guidance

### Guidelines for Community Noise

- 2.1.15 The World Health Organisation (WHO) published guidance on the desirable levels of environmental noise in 2000. In this document, Guidelines for Community Noise (GCN) (WHO, 2000), the authors consider that sleep disturbance criteria should be taken as an internal noise level of 30 dB  $L_{Aeq}$  or an external level of 45 dB  $L_{Aeq,8hr}$ , measured at 1 m from the façade (equivalent to a free-field level of 42 dB  $L_{Aeq}$ ). It is also suggested that internal instantaneous levels of 45 dB  $L_{Amax}$  and external instantaneous levels of 60 dB  $L_{Amax}$ , should not be exceeded.
- 2.1.16 The criteria for speech intelligibility and moderate annoyance during the daytime and evening should be taken as an internal noise level of 35 dB  $L_{Aeq}$ . For external daytime levels, it is considered that:

*“To protect the majority of people from being seriously annoyed during the daytime, the outdoor sound level from steady, continuous noise should not exceed 55 dB L<sub>Aeq</sub> on balconies, terraces, and outdoor living areas. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound level should not exceed 50 dB L<sub>Aeq</sub>. Where it is practical and feasible, the lower outdoor sound level should be considered the maximum desirable sound level for new development.”*

- 2.1.17 The major concern in Europe is with respect to noise from transportation systems, and most of the studies on which these guidelines are based relate to this type of noise source. There can be no certainty that the same effects will be observed from noise of an industrial nature, but in the absence of any more detailed information some weight should be attached to the WHO guidance when assessing industrial noise as well.
- 2.1.18 The WHO published more recent guidance in the Environmental Noise Guidelines for the European Region in 2018 (WHO, 2018). It provides guidance, primarily for policymakers, on protecting human health from harmful exposure to environmental noise and sets health-based recommendations on the average environmental noise exposure of five relevant sources of environmental noise. Industrial noise was not one of the categories included and, therefore, this guidance is not considered to be directly applicable to this assessment notwithstanding the fact that it is primarily for policymakers and does not apply to general assessments.

### Night Noise Guidelines for Europe

- 2.1.19 In 2009 a report was published presenting the conclusions of a World Health Organisation (WHO) working group responsible for preparing guidelines for exposure to noise during sleep entitled “Night Noise Guidelines for Europe” (NNG) (European Centre for Environment and Health, 2009). The document can be seen as an extension to the original WHO GCN. Various effects are described including biological effects, sleep quality, and well-being. The document gives threshold levels for observed effects expressed as L<sub>max, inside</sub> and L<sub>night, outside</sub>. The L<sub>night</sub> is a year-long average night-time noise level, not taking into account the façade effect of a building. In an exposed population a noise exposure of 40 dB L<sub>night, outside</sub> is stated as equivalent to the “lowest observed adverse effect level” for night noise. Above this level adverse health effects observed are self-reported sleep disturbance, environmental insomnia and increased use of somnifacient drugs and sedatives. Above 55 dB L<sub>night, outside</sub>, cardiovascular effects become the major public health concern. Threshold levels for waking in the night, and/or too early in the morning are given as 42 dB L<sub>Amax, inside</sub>. Lower thresholds are given that may change sleep structure.

**Table 2.1: Summary of Observed Health Effects in the Population (WHO NNG)**

| Noise Level, L <sub>night,outside</sub> | Observed Effect   |
|---|---|
| up to 30 dBA                            | No substantial biological effects are observed.   |
| 30 to 40 dBA                            | A number of effects are observed to increase: body movements, awakening, self-reported sleep disturbance, arousals. The intensity of the effect depends on the nature of the source and on the number of events, even in the worst cases the effects seem modest. |
| 40 to 55 dBA                            | Adverse health effects are observed among the exposed population. Many people have to adapt their lives to cope with the noise at night. Vulnerable groups are now severely affected.   |
| Above 55 dBA                            | The situation is considered increasingly dangerous for public health. Adverse health effects occur frequently, a high percentage of the population is highly annoyed and there is limited evidence that the cardiovascular system is coming under stress.         |

- 2.1.20 It is relevant to note that, taking into account the typical night to night variation in noise levels that will often occur due to meteorological effects and the effects of a façade, the night noise guidelines are similar to those previously given in the WHO GCN (i.e. an external façade noise level of 45 dB  $L_{Aeq}$ ), although defined in a different way.
- 2.1.21 The WHO guidelines have not been formally adopted into UK legislation or guidance; hence it remains a source of information reflecting a high level of health care with respect to noise, rather than a standard to be rigidly applied. The guideline values give the lowest threshold noise levels below which the occurrence rates of particular effects can be assumed to be negligible. Exceedances of the WHO guideline values do not necessarily imply significant noise impact and indeed, it may be that significant impacts do not occur until much higher degrees of noise exposure are reached.

### 3 BASELINE CONDITIONS

#### Site Location and Noise Sensitive Receptors

- 3.1.1 The site is located at 270 Bristol Road, Gloucester, GL1 5TT within a mixed-use industrial area as seen in Figure 3.1.
- 3.1.2 Light industrial/manufacturing facilities are located to the north and south of the site. Residential uses are located to the east and a supermarket is located immediately to the south. The Gloucester and Sharpness Canal is located to the west of the site with further residential uses beyond it.



Figure 3.1 Site Location

- 3.1.3 The nearest NSRs are identified in Figure 3.1 and listed below:
- NSR A: residential properties along Bristol Road, directly to the east of the site, and
  - NSR B: residential properties across the Canal, along Wharfside Close and Quaydisse Close, approx. 73 m to the west of the site.

## Site Description

3.1.4 It is understood that the site currently operates as a manufacturing facility of composite and PU material solutions. The current Permali process locations as well as current/proposed emission points are given in Figure 3.2.



**Figure 3.2 Permali Process Locations and Emission Points**

3.1.5 Currently the following new external plant is being considered for the facility:

- 1 thermal oxidiser
- 1 scrubber
- 2 boilers
- 1 Nederman dust plant
- 1 dust plant "3"
- 1 Cyclofilter

3.1.6 With regards to operational time, the site would initially be operational on a 24/7 basis, 5 days a week with a view to increase to a full 24/7 basis, 7 days a week.

## Baseline Survey Methodology

- 3.1.7 Representative baseline sound levels at the nearest NSRs have been determined through long-term sound monitoring at locations close to the nearest residential properties. The baseline sound monitoring locations can be seen in Figure 3.1.
- 3.1.8 One long term monitor (LT1) was installed next to the carpark outside the front of the Permali building, next to the wall just south of the carpark at a location that is considered representative of NSR A. Measurements were made between 13:15 hrs on 25 March 2022 and 12:00 hrs on 31 March 2022.
- 3.1.9 It should be noted that sound monitoring locations LT1 and LT2 were chosen to be located as far away as practically possible from any current noise sources on the Permali site, while still being representative of the relevant NSRs.
- 3.1.10 The main sound source at LT1 was road traffic on the local roads, in particular on Bristol Road. Other noise sources included vehicles entering and leaving the site, construction noise coming from the north and east of the site (including crashing noise and reverse alarms), operational noise from surrounding industrial uses and some pedestrian noise.
- 3.1.11 A second long term monitor (LT2) was installed across the Canal, in front of the houses on Quayside Way at a location that is considered representative of NSR B. Measurements were made between 14:30 hrs on 25 March 2022 and 12:30 hrs on 31 March 2022.
- 3.1.12 The main sound source at LT2 was a plant from the Permali site across the Canal. Other noise sources included residual traffic noise to the east on Bristol Road, occasional cars on Quayside way, bird song, occasional distant engine sounds.

## Instrumentation

- 3.1.13 Measurements were carried out using a 'Class 1' Rion NL-52 sound level meter (SLM) in accordance with BS 7445-2:1991(BS, 1991), with the microphone mounted on a pole at around 1.5 m above local ground level.
- 3.1.14 Details of the instrumentation used during the survey are provided in Table 3.1 below. Calibration certificates of the equipment are available upon request. Calibration of the equipment was carried out before and after measurements with no significant drift ( $< \pm 0.5$  dB) observed. Data were logged of the broadband, A weighted sound pressure level in 100 ms samples.

**Table 3.1: Baseline Sound Survey Instrumentation**

| Measurement Location | Make/Model | Serial Number                           | Calibration Ref/<br>Calibration Start<br>/Calibration End | Last Calibration Date |
|----------------------|------------|---|---|-----------------------|
| LT1                  | Rion NL52  | #165 / 998563                           | 94.0 / 93.9 / 124.0 (int cali) dB                         | 02/03/2022            |
| LT2                  | Rion NL52  | #167 / 998567                           | 94.0 / 93.9 / 124.2 (int cali) dB                         | 02/03/2022            |
| Calibrator           | Rion NC72  | #015 / 110090 /<br>Internal Calibration | n/a   | 19/04/202113          |

## Weather Conditions

- 3.1.15 A wind monitor and rain gauge were also set up alongside the noise monitor at location LT1 to properly quantify the weather conditions throughout the survey. Overall, there were no periods



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of wind speeds high enough to affect the results. There were some periods of rain, data recorded during these has been discounted so as not to interfere with the validity of results.

- 3.1.16 At LT1 on deployment it was 18°C, 34% relative humidity, 0.9ms<sup>-1</sup> wind from the west, 2 oktas of cloud.
- 3.1.17 At LT2 on deployment it was 20°C, 35% relative humidity, 1.9ms<sup>-1</sup> wind from the west, 4 oktas of cloud.

## Results

- 3.1.18 An analysis has been carried out of the measured baseline sound levels at the long-term sound monitoring locations. The data has been extracted and post-processed in 15-minute periods for the daytime (07:00 to 23:00 hrs) and night-time (23:00 to 07:00 hrs) periods. This analysis is provided in Table 3.2. Data are rounded to the nearest whole number. Further survey details and graphical plots of the survey data are provided in Appendix B and Appendix C.

**Table 3.2: 15-minute Baseline Sound Level Data (whole period) at LT1**

| Measurement Location | Daytime (07:00-23:00)               |   | Night-time (23:00-07:00)           |   |
|----------------------|-------------------------------------|---|------------------------------------|---|
|                      | Average L <sub>Aeq,16hr</sub> (dB)* | 50 <sup>th</sup> percentile L <sub>A90,15min</sub> (dB)** | Average L <sub>Aeq,8hr</sub> (dB)* | 50 <sup>th</sup> percentile L <sub>A90,15min</sub> (dB)** |
| LT1***               | 54                                  | 47  | 50                                 | 41  |
| LT2***               | 49                                  | 43  | 45                                 | 39  |

Notes:

All values have been rounded to the nearest whole number, where 0.5 is rounded up.

\* Logarithmic average of each 16-hour period, then arithmetic average of the various L<sub>Aeq,16hour</sub> periods.

\*\* 50<sup>th</sup> percentile L<sub>A90,15min</sub> (dB): A-weighted L<sub>90</sub> sound pressure level which is exceeded for 25 % of the measurement time .

\*\*\* Due to the distance of 1 m of this monitoring location from the wall, a correction of 3 dB was applied to the baseline sound levels

## Representative Baseline Sound Levels at Receptors

- 3.1.19 The sound levels at individual receptors have been based on professional judgement, a review of the sound levels at the long-term and the closest short-term sound monitoring location, where applicable.
- 3.1.20 LT1 has been considered representative of the residential properties along Bristol Road, i.e., NSR A, and LT2 has been considered representative of the residential properties to the west of the site, i.e., NSR B.
- 3.1.21 A summary of the representative baseline sound levels at each of the sensitive receptor groups identified is provided in Table 4.2 below.

**Table 3.3: Representative Baseline Sound Levels for Assessment**

| NSRs | Representative Baseline Sound Levels        |   |   |   |
|------|---|---|---|---|
|      | Daytime (07:00 to 23:00 hours)              |   | Night-time (23:00 to 07:00 hours)           |   |
|      | Residual Sound Level, L <sub>Aeq,T</sub> dB | Background Sound Level, L <sub>A90,T</sub> dB | Residual Sound Level, L <sub>Aeq,T</sub> dB | Background Sound Level, L <sub>A90,T</sub> dB |
|      |   |   |   |   |

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|   |    |    |    |    |
|---|----|----|----|----|
| NSR A – Bristol Rd                            | 54 | 47 | 50 | 41 |
| NSR B - Wharfside<br>Close/ Quayside<br>Close | 49 | 43 | 45 | 39 |

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## 4 3D Sound Model

- 4.1.1 In order to calculate specific sound levels associated with operation of the facility at NSRs a 3D model has been built using SoundPLAN v8.2 proprietary noise modelling software.
- 4.1.2 The model predicts sound levels under light down-wind conditions based on hemispherical sound propagation with corrections for atmospheric absorption, ground effects, screening and directivity based on the procedure detailed in ISO 9613-2:1996 'Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation'<sup>5</sup>.
- 4.1.3 Terrain contour data have been entered into the model based on OS land contours. The site buildings and local buildings have been included, and these provide some degree of screening as well as reflecting surfaces.
- 4.1.4 Specific sound levels have been calculated at ground and first floor levels for houses, 1.5 m and 4.0 m above ground level respectively. The maximum predicted specific sound level per receptor has been used in the assessment. The same noise modelling techniques have been used by RPS on numerous sites in the UK and worldwide and there is a high degree of confidence in the model.

### Description of Noise Sources

- 4.1.5 The new noise sources, as listed in paragraph 3.1.5 and Table 4.1, were implemented in the new model at the approximate locations shown in Figure 4.1 .
- 4.1.6 The noise emissions for the new noise sources, that were included in the 3D noise model, were based on measurement data of the plant from other Permali sites, as provided by the client and shown in Table 4.1. Further details on the new plant, such as the number of plant items, the height above local ground level and the on-time are also given in Table 4.1.
- 4.1.7 All noise sources were modelled as point sources.
- 4.1.8 The spectral information given in Table 4.1 was provided by the client unless stated otherwise. The spectral information for the Nederman dust plant, dust plant 3 and the thermal oxidiser was provided in sound pressure levels and was converted to sound power levels based on the information provided by the client on the plant dimensions. The provided technical datasheets can be seen in Appendix D.
- 4.1.9 Based on experience from similar plant items, the plant listed in Table 4.1 is not expected to present tonal characteristics<sup>6</sup> or have an impulsive character.

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<sup>5</sup> ISO. International Standard ISO 9613-2:1996. Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation.

<sup>6</sup> It should be noted that the provided plant noise emissions data was in octave bands and not in one-third octave bands. Therefore, it was not possible to check the presence of tones in accordance with the methodology described within Annex C of BS 4142:2014+A1:2019.

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Table 4.1: Modelled Plant

| Modelled Plant                       | Quantity | Sound Power Level (dB L <sub>WA</sub> ) | Height AGL (m) | 31 Hz | 63 Hz | 125 Hz | 250 Hz | 500 Hz | 1 kHz | 2 kHz | 4 kHz | 8 kHz | 16 kHz | On-time |
|--------------------------------------|----------|---|----------------|-------|-------|--------|--------|--------|-------|-------|-------|-------|--------|---------|
| Boiler*                              | 2        | 85                                      | 1.5            | 96    | 108   | 105    | 104    | 95     | 92    | 89    | 87    | 87    | n/a    | 100%    |
| Nederman dust plant                  | 1        | 88                                      | 2.3            | 90    | 90    | 89     | 88     | 78     | 85    | 78    | 78    | 72    | 65     | 100%    |
| Dust plant 3                         | 1        | 90                                      | 2.3            | 97    | 90    | 90     | 89     | 88     | 85    | 79    | 78    | 79    | 76     | 100%    |
| Cyclofilter V9 - free inlet/outlet** | 1        | 109                                     | 2.3            | n/a   | 111   | 111    | 111    | 106    | 102   | 99    | 97    | 94    | n/a    | 100%    |
| Cyclofilter V9 - casing              | 1        | 87                                      | 1.5            | n/a   | 99    | 95     | 89     | 84     | 80    | 77    | 75    | 70    | n/a    | 100%    |
| Scrubber*                            | 1        | 85                                      | 1.5            | 77    | 82    | 87     | 87     | 91     | 101   | 99    | 88    | 79    | n/a    | 100%    |
| Thermal Oxidiser                     | 1        | 93                                      | 1.5            | 84    | 88    | 86     | 89     | 93     | 89    | 82    | 79    | 73    | 79     | 100%    |

\* The spectral values for this plant were based on similar plant types from the RPS source term library

\*\* It is assumed that the inlet is located internally within the building and the outlet is located externally. As a result, only the Cyclofilter outlet has been considered as part of the external plant.

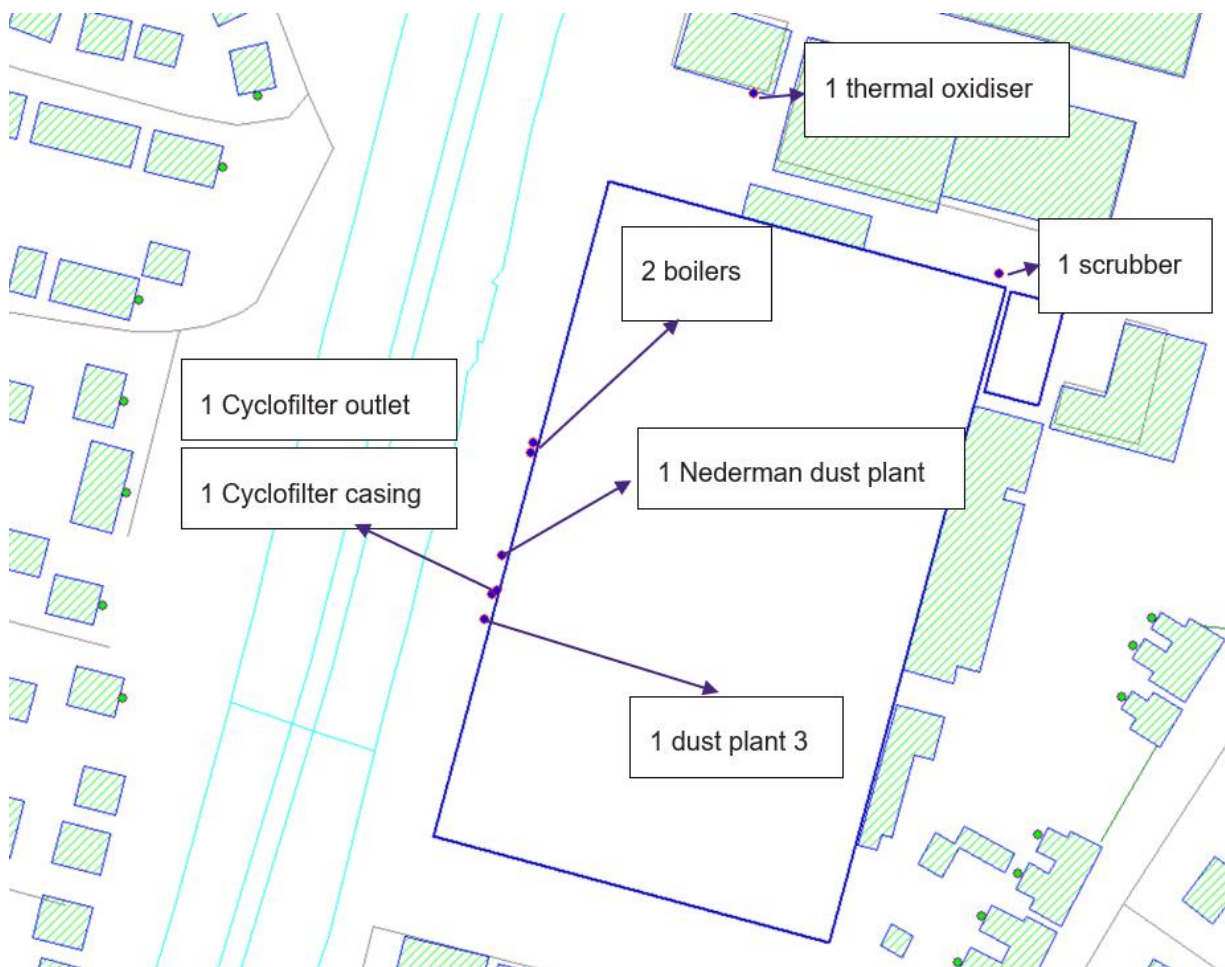


Figure 4.1 Location of plant on site

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- 4.1.10 It should be noted that the calculation uncertainty of the sound power levels of the noise sources on site has been reduced by peer review of the measurement data provided by the client and calculations.

## 5 Sound Modelling Results

- 5.1.1 The 3D sound model was used to predict the specific sound levels at the nearest NSRs, i.e., NSR A and NSR B.
- 5.1.2 As the facility is expected to operate on a 24/7 basis, both daytime and night-time assessment scenarios are considered for this noise assessment.
- 5.1.3 A summary of the predicted specific sound levels during daytime and night-time from the operational site are shown in Table 5.1. It should be noted that as 100% on-time is assumed for all plant during both daytime and night-time, the predicted specific sound levels are the same during daytime and night-time.

**Table 5.1: Specific Sound Levels at NSRs**

| Location / NSR                             | Specific Sound Level (dB L <sub>Aeq,Tr</sub> ) |            |
|--|--|------------|
|  | Daytime  | Night-time |
| NSR A - Bristol Rd                         | 42   | 42         |
| NSR B - Wharfside Close/<br>Quayside Close | 64   | 64         |

- 5.1.4 The NSR closest to the majority of the plant is NSR B, which is predicted to experience the highest levels of sound from the site. A breakdown of the partial specific sound levels from the plant at NSR B is provided in Table 5.2 below. It should be noted that as 100% on-time is assumed for the plant during both daytime and night-time, the partial specific sound levels are the same during daytime and night-time.

**Table 5.2: Daytime/Night-time Partial Specific Sound Levels at NSR B**

| Plant Item                      | Partial Specific Sound Level (dB L <sub>Aeq,Tr</sub> ) |
|---------------------------------|--|
| Boiler                          | 41   |
| Cyclofilter V9 - free outlet    | 64   |
| Cyclofilter V9 - outside casing | 42   |
| Dust Plant 3                    | 46   |
| Nederman dust plant             | 43   |
| RTO (thermal oxidiser)          | 27   |
| Scrubber                        | 10   |

## 6 BS 4142:2014+A1:2019 Assessment

- 6.1.1 An initial estimate of impact undertaken in accordance with BS 4142:2014+A1:2019 is provided in Table 6.1 and Table 6.2 for the daytime and night-time periods respectively.
- 6.1.2 As mentioned in Section 4, the proposed new plant is not considered to contain tones or be impulsive. Therefore, no penalty for tonality or impulsivity has been applied.
- 6.1.3 The proposed plant is assumed to operate with a 100% on-time. Therefore, no penalty for intermittency has been applied.
- 6.1.4 The predicted specific sound levels at NSR A are between 5 dB and 9 dB below the residual sound levels at NSR A. At NSR A the representative residual sound level is not expected to be ‘readily distinctive’ above road traffic movements and other activity in the area affecting the residual sound level. That is not to say the noise from the facility would not be audible, rather that it would not be readily distinctive against the residual acoustic environment, and thus warrant a correction.
- 6.1.5 The predicted specific sound levels at NSR B are between 15 dB and 19 dB above the residual sound levels at NSR B. Therefore, it is expected that the character of the acoustic environment at NSR B, which is closest to the facility plant, would be considered ‘readily distinctive’. Therefore, a penalty for the specific character of sound has only been applied for NSR B.

**Table 6.1: BS 4142:2014+A1:2019 Assessment - Daytime**

| NSRs Location                           | Representative Baseline Sound Levels |                                    | Specific Sound Level, dB<br>L <sub>s</sub> | Rating Penalty, dB | Rating Level, dB<br>L <sub>Ar,Tr</sub> | Rating - Background Level Difference, dB |
|---|--------------------------------------|------------------------------------|--|--------------------|--|--|
|   | Background, dB<br>L <sub>A90,T</sub> | Residual, dB<br>L <sub>Aeq,T</sub> |  |                    |  |  |
| NSR A - Bristol Rd                      | 44                                   | 51                                 | 42   | 0                  | 42                                     | -2                                       |
| NSR B - Wharfside Close/ Quayside Close | 43                                   | 49                                 | 64   | 3                  | 67                                     | +24                                      |

**Table 6.2: BS 4142:2014+A1:2019 Assessment – Night-time**

| NSRs Location                           | Representative Baseline Sound Levels |                                    | Specific Sound Level, dB<br>L <sub>s</sub> | Rating Penalty, dB | Rating Level, dB<br>L <sub>Ar,Tr</sub> | Rating - Background Level Difference, dB |
|---|--------------------------------------|------------------------------------|--|--------------------|--|--|
|   | Background, dB<br>L <sub>A90,T</sub> | Residual, dB<br>L <sub>Aeq,T</sub> |  |                    |  |  |
| NSR A - Bristol Rd                      | 38                                   | 47                                 | 42   | 0                  | 42                                     | +4                                       |
| NSR B - Wharfside Close/ Quayside Close | 39                                   | 45                                 | 64   | 3                  | 67                                     | +28                                      |

- 6.1.6 With regards to the rating/background level difference, BS 4142:2014+A1:2019 states:
- a difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context;

- a difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context; and
  - the lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.
- 6.1.7 On the basis of the above, and with reference to Table 6.1, as rating levels are 2 dB below the representative background sound level during daytime at NSR A, it is considered that there is a negligible risk for an adverse impact at this receptor due to the facility operation, depending on the context. At NSR B the rating levels are up to 24 dB above the representative background sound level during daytime. Therefore, there is a risk that operation of the facility would result in significant adverse impacts at this receptor, depending on the context.
- 6.1.8 With reference to Table 6.2, as rating levels are 4 dB above the representative background sound level during night-time at NSR A, it is considered that there is a low risk for an adverse impact at this receptor due to the facility operation, depending on the context. At NSR B are up to 28 dB above the representative background sound level during night-time. Therefore, there is a risk that operation of the facility would result in significant adverse impacts at this receptor, depending on the context.
- 6.1.9 With regards to the daytime and night-time period, consideration of the context does reduce the likelihood for adverse impacts at NSR A, but the likelihood of significant adverse impacts at NSR B is still significant, even following the consideration of the context. This is detailed below in terms of an assessment of the change in ambient sound level due to the specific sound as well as the character of the existing noise environment at the receptors.

### **Noise Change Assessment**

Ambient sound levels with and without the facility in operation are shown in Table 6.3 and



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6.1.10 Table 6.4 during daytime and night-time. The results show that sound from the plant is predicted to result in an increase in the ambient sound level during the daytime/night-time period by up to +1 dB at NSR A and up to +19 dB at NSR B.

**Table 6.3: Ambient Noise Level Change Assessment (daytime)**

| <b>Location</b>                            | <b>Baseline residual noise level, dB <math>L_{Aeq,T}</math></b> | <b>Specific sound level, dB <math>L_{Aeq,T}</math></b> | <b>Ambient noise level with site, dB <math>L_{Aeq,T}</math></b> | <b>Noise change, dB</b> |
|--|---|--|---|-------------------------|
| NSR A - Bristol Rd                         | 51  | 42   | 52  | <b>+1</b>               |
| NSR B - Wharfside Close/<br>Quayside Close | 49  | 64   | 64  | <b>+15</b>              |

**Table 6.4: Ambient Noise Level Change Assessment (night-time)**

| Location                                | Baseline residual noise level, dB L <sub>Aeq,T</sub> | Specific sound level, dB L <sub>Aeq,T</sub> | Ambient noise level with site, dB L <sub>Aeq,T</sub> | Noise change, dB |
|---|--|---|--|------------------|
| NSR A - Bristol Rd                      | 47   | 42  | 48   | +1               |
| NSR B - Wharfside Close/ Quayside Close | 45   | 64  | 64   | +19              |

6.1.11 On the basis that a + 3 dB change is generally taken as the minimum change which is perceptible to most people for steady sources of a similar character, and that the dominant noise source affecting the specific sound level is continuous and steady (i.e. the Cyclofilter outlet), it is considered that the change in ambient sound level would not be particularly noticeable at NSR A. As such, the likelihood for the noise to result in adverse impact is reduced.

6.1.12 At NSR B, the predicted +19 dB noise level change is going to be noticeable.

### Assessment Summary

6.1.13 On the basis of the above, when considering noise from the facility at NSR A, this would likely not be audible, noticeable or intrusive/incongruous when compared to the baseline acoustic environment. Therefore, a negligible adverse impact is predicted during daytime and a low risk for adverse impact is predicted during night-time at NSR A.

6.1.14 At NSR B, noise is highly likely to be clearly perceptible when compared to the baseline acoustic environment. As a result, noise from the facility is expected to lead to significant adverse impacts at NSR B which should be mitigated.

### Mitigation at Source

6.1.15 In order to reduce the predicted specific sound levels from the site operation at the nearest noise sensitive receptors, the following reduction in the plant noise emissions should be considered:

- 30 dB mitigation will be required for the noise emissions of the Cyclofilter outlet;
- 15 dB mitigation for the noise emissions of the thermal oxidiser;
- 12 dB mitigation will be required for the noise emissions of each boiler, and
- 10 dB mitigation will be required for the noise emissions of the Cyclofilter casing, the Nederman dust plant and dust plant 3.

6.1.16 It should be noted that the above mitigation refers only to mitigation of noise emission levels at source. The exact type of noise mitigation required will depend on the nature of the noise generating equipment and practical considerations, but could include for example:

- Attenuators to ducted noise sources (e.g. outlets, inlets etc.);
- Enclosures to non-ducted equipment, e.g. the Cyclofilter casing, and
- other noise control measures at source.

## BS 4142:2014+A1:2019 Assessment with Mitigation

6.1.17 An initial estimate of impact undertaken in accordance with BS 4142:2014+A1:2019 when noise reduction at source, as listed above is considered, is provided in Table 6.5 and Table 6.6 for the daytime and night-time periods respectively.

**Table 6.5: BS 4142:2014+A1:2019 Assessment - Daytime with Mitigation**

| NSRs Location                           | Representative Baseline Sound Levels |                                    | Specific Sound Level, dB<br>L <sub>s</sub> | Rating Penalty, dB | Rating Level, dB<br>L <sub>Ar,Tr</sub> | Rating - Background Level Difference, dB |
|---|--------------------------------------|------------------------------------|--|--------------------|--|--|
|   | Background, dB<br>L <sub>A90,T</sub> | Residual, dB<br>L <sub>Aeq,T</sub> |  |                    |  |  |
| NSR A - Bristol Rd                      | 44                                   | 51                                 | 41   | 0                  | 41                                     | -3                                       |
| NSR B - Wharfside Close/ Quayside Close | 43                                   | 49                                 | 40   | 3                  | 43                                     | 0  |

**Table 6.6: BS 4142:2014+A1:2019 Assessment – Night-time with Mitigation**

| NSRs Location                           | Representative Baseline Sound Levels |                                    | Specific Sound Level, dB<br>L <sub>s</sub> | Rating Penalty, dB | Rating Level, dB<br>L <sub>Ar,Tr</sub> | Rating - Background Level Difference, dB |
|---|--------------------------------------|------------------------------------|--|--------------------|--|--|
|   | Background, dB<br>L <sub>A90,T</sub> | Residual, dB<br>L <sub>Aeq,T</sub> |  |                    |  |  |
| NSR A - Bristol Rd                      | 38                                   | 47                                 | 41   | 0                  | 41                                     | +3                                       |
| NSR B - Wharfside Close/ Quayside Close | 39                                   | 45                                 | 40   | 3                  | 43                                     | +4                                       |

6.1.18 On the basis of the above, and with reference to Table 6.5, as rating levels are 3 dB below the representative background sound level during daytime at NSR A and equal to the representative background sound level during daytime at NSR B, it is considered that there is a negligible risk for an adverse impact at the receptors due to the facility operation, depending on the context.

6.1.19 With reference to Table 6.6, as rating levels are up to 4 dB above the representative background sound level during night-time at NSR A and NSR B, it is considered that there is a low risk for an adverse impact at these receptors due to the facility operation, depending on the context.

6.1.20 With regards to the daytime and night-time period, consideration of the context does reduce the likelihood for adverse impacts at NSR A and NSR B. This is detailed below in terms of an assessment of the change in ambient sound level due to the specific sound as well as the character of the existing noise environment at the receptors.

## Noise Change Assessment with Mitigation

6.1.21 Ambient sound levels with and without the facility in operation, when mitigation is being considered, are shown in Table 6.7 and Table 6.8 during daytime and night-time. The results show that sound from the plant is predicted to result in an increase in the ambient sound level during the daytime/night-time period by up to +1 dB at both NSR A and NSR B.

**Table 6.7: Ambient Noise Level Change Assessment (daytime) – With Mitigation**

| Location                                | Baseline residual noise level, dB LAeq,T | Specific sound level, dB LAeq,T | Ambient noise level with site, dB LAeq,T | Noise change, dB |
|---|--|---------------------------------|--|------------------|
| NSR A - Bristol Rd                      | 51                                       | 41                              | 51                                       | +0               |
| NSR B - Wharfside Close/ Quayside Close | 49                                       | 40                              | 50                                       | +1               |

**Table 6.8: Ambient Noise Level Change Assessment (night-time) – With Mitigation**

| Location                                | Baseline residual noise level, dB LAeq,T | Specific sound level, dB LAeq,T | Ambient noise level with site, dB LAeq,T | Noise change, dB |
|---|--|---------------------------------|--|------------------|
| NSR A - Bristol Rd                      | 47                                       | 41                              | 48                                       | +1               |
| NSR B - Wharfside Close/ Quayside Close | 45                                       | 40                              | 46                                       | +1               |

6.1.22 On the basis that a + 3 dB change is generally taken as the minimum change which is perceptible to most people for steady sources of a similar character, and that the dominant noise source affecting the specific sound level is continuous and steady, it is considered that the change in ambient sound level would not be particularly noticeable at any of the NSRs. As such, the likelihood for the noise to result in adverse impact is reduced.

### Absolute Noise Level Assessment

6.1.23 With reference to Table 6.7 and Table 6.8, the total ambient sound level of the specific sound and residual ambient sound is predicted to be up to 41 dB LAeq,T, 9 dB and 14 dB below the GCN guideline levels for the onset of moderate (50 dB LAeq,T) and serious annoyance (55 dB LAeq,T) for external levels respectively. On this basis, noise emissions from the facility would not be of a magnitude sufficient to give reasonable cause for annoyance at the NSRs.

6.1.24 In addition (on the basis that a partially open window provides 12 dB of attenuation), internal sound levels would be 29 dB LAeq,T during the night-time period, 1 dB below the level above which adverse effects are noted for the night-time periods (30 dB LAeq,T).

6.1.25 On the basis the above the total ambient sound level at NSR locations would not be of a magnitude likely to result in moderate annoyance or result in other adverse effects.

### Assessment Summary with Mitigation

6.1.26 On the basis of the above, when considering the mitigated noise emissions from the facility at both NSRs, this would:

- likely not be audible or noticeable or intrusive/incongruous when compared to the baseline acoustic environment; and
  - not result in overall ambient noise levels exceeding the level above which adverse effects would occur either in external amenity areas or internally within dwellings with windows partially open.
- 6.1.27 Consequently, it is considered that operational sound levels during the daytime and night-time would be of a magnitude below the LOAEL, i.e. that whilst noise may just be heard during otherwise quiet periods, it would not cause any change in behaviour, attitude or other physiological response and would not cause a change in the quality of life. There would also be no need to close windows at any time because of the noise. Significant adverse noise impacts on health and the quality of life is unlikely to occur.
- 6.1.28 Noise emissions from the facility, when mitigated as described, would not be of a magnitude sufficient to give reasonable cause for annoyance, and a high general level of protection of the environment is provided.
- 6.1.29 It should be noted that the mitigation described above is for reducing the noise at source. Mitigation could also be applied as a combination of reducing noise at source and implementing an acoustic absorptive barrier to the west of the site. At this stage it is understood that the priority is initially to mitigate the noise at source, and then consider any additional mitigation measures, as required.

## 7 Summary & Conclusions

- 7.1.1 The Acoustics Team of RPS Planning and Environmental (RPS) has been appointed by Permali Gloucester Ltd to provide a noise impact assessment of the operational noise levels from the Permali facility at 270 Bristol Road, Gloucester, GL1 5TT. The site is located within the local authorities of Gloucestershire County Council (GSCC) and Gloucester City Council (GCC).
- 7.1.2 This noise impact assessment has been prepared to support the application for the Environmental Permit (EP) for the existing Permali manufacturing facility of composite and PU material solutions.
- 7.1.3 An environmental sound survey was undertaken on site, at locations representative of the nearest noise sensitive receptors (NSRs) to establish the baseline sound conditions.
- 7.1.4 Details on the type and noise emissions of the new plant proposed to operate at the facility were provided by the client.
- 7.1.5 A 3D sound model of the facility was built, considering the provided plant noise levels, to predict specific sound levels from the facility at the NSRs.
- 7.1.6 An assessment of the noise from the facility has been carried out in accordance with BS 4142:2014+A1:2019, which is the cited standard to use in the Environmental Permitting Regulations.
- 7.1.7 The results of the noise assessment show that with the consideration of the following noise reduction:
- 30 dB mitigation will be required for the noise emissions of the Cyclofilter outlet;
  - 15 dB mitigation for the noise emissions of the thermal oxidiser;
  - 12 dB mitigation will be required for the noise emissions of each boiler, and
  - 10 dB mitigation will be required for the noise emissions of the Cyclofilter casing, the Nederman dust plant and dust plant 3.
- the operation of the facility would likely result in adverse effects below the LOAEL and that residential amenity would not be adversely affected. Significant adverse impacts/effects would be avoided.
- 7.1.8 On the basis of the above and in conclusion, sound from the facility is considered to be mitigated through the application of appropriate noise reduction at source, such that it does not cause an adverse impact.
- 7.1.9 Noise emissions from the facility would not be of a magnitude sufficient to give reasonable cause for annoyance and a high general level of protection of the environment as a whole is provided.



**APPENDICES**

## Appendix A

### Personnel and Individual Qualifications



**Lise W. Tjelleesen – Technical Director – Acoustics**

*MEngSc Acoustics; Member of the Institute of Acoustics; Member Acoustical Society of America; Member of Danish Acoustic Society; Member of Audio Engineering Society*

- A.1 Lise is Technical Director of the RPS Acoustics Team with more than 20 years of experience in acoustics. She is a specialist acoustic consultant with a wide range of experience gained in the UK, Denmark and worldwide. She has worked with electroacoustics, psychoacoustics, architectural acoustics, vibrations and environmental acoustics. She has gained particular experience in the fields of architectural acoustics (building and room) working with the construction industry on a variety of projects, including residential, commercial, education, health and entertainment.
- A.2 Lise is an expert on the subject of room acoustics and room acoustic computer simulations, as well as a leading expert on the emerging field of archaeoacoustics. She has published several papers on the above subjects and on acoustics of offices.
- A.3 Lise has been involved in many BS 4142 noise assessments for both the previous and current 2014 version of BS 4142. She has given evidence at public inquiries where BS 4142 has been the primary assessment methodology. On the basis of Lise's overall experience in acoustics (particularly in relation to environmental noise) combined with particular focus on BS 4142, she is deemed competent for BS 4142 assessments.
- A.4 For this project Lise has taken on the role of:
- Project Director responsible for overseeing and delivering the project.
- A.5 Lise was also responsible for
- reviewing and authorising the report, figures and appendices.

**Christina Ioannidou – Principal Consultant – Acoustics**

*MSc Engineering Acoustics; Member of the Institute of Acoustics; MSc Telecommunications; Electrical and Computer Engineering;*

- A.6 Christina is an Acoustic Consultant and environmental acoustics specialist with more than seven years' experience. She has an Electrical and Computer Engineering Degree Bachelor and Master's Degree and has also a Master's Degree in Engineering Acoustics. She has been a member of the Institute of Acoustics since 2015.
- A.7 Christina has project managed and undertaken noise assessments for a variety of developments, including: large scale mixed-use developments, incorporating commercial, retail, leisure and residential elements; energy from waste facilities; manufacturing facilities; distribution centres; retail units and minerals extraction and exploration. She has provided input into Environmental Impact Assessments (EIAs) since the start of her career in 2015 for residential, industrial, educational and mixed-use developments (including residential, hotel, commercial uses). She has also undertaken noise assessments to support planning applications and discharge planning conditions. She has a Continuous Professional Development (CPD) Record to support this competency and experience.

- A.8 Within the past years Christina has been involved BS 4142 noise assessments for both the previous and current 2014 version of BS 4142. She is familiar with the Standard and has attended relevant talks organised by the Institute of Acoustics. On the basis of Christina's overall experience in acoustics, combined with particular focus on BS 4142 and with the assistance of more experienced colleagues, she is deemed competent for BS 4142 assessments.
- A.9 For this project Christina has supported the Project Manager in the assessment and noise modelling. She was also responsible for reviewing the modelling and the report, figures and appendices.
- A.10 For this project Christina has taken on the role of
- Project Manager and has been responsible for overseeing the project.
  - Consultant responsible for carrying out the acoustic modelling.
- A.11 Christina was also responsible for
- undertaking the assessment;
  - undertaking the modelling;
  - preparing the report, figures and appendices; and

### **Ben Gray – Consultant – Acoustics**

*BSc (Hons) Mathematics;*

- A.12 Ben is an Acoustic Consultant and joined RPS in 2019 and has been an associate member of the Institute of Acoustics since 2019 also.
- A.13 Since joining RPS he has undertaken acoustic surveying and assessments for a number of commercial, residential, and industrial developments - both small and large scale - in addition to assisting more senior members of staff with the undertaking of their responsibilities.
- A.14 He has carried out acoustic survey, data processing and noise modelling experience, including, but not limited to: BS4142 Assessments, Vibration Surveys, Insulation testing and Environmental Impact Assessments, as well as contributing to reports on Building Acoustics and Noise Impact Assessments. Additionally, he has a Continuous Professional Development Record to support this competency and experience.
- A.15 For this project Ben has taken on the role of: ... (delete as appropriate) ...
- Consultant responsible for carrying out the acoustic surveying.
- A.16 Ben was also responsible for ... (delete as appropriate) ...
- undertaking the site visit;
  - carrying out sound monitoring;

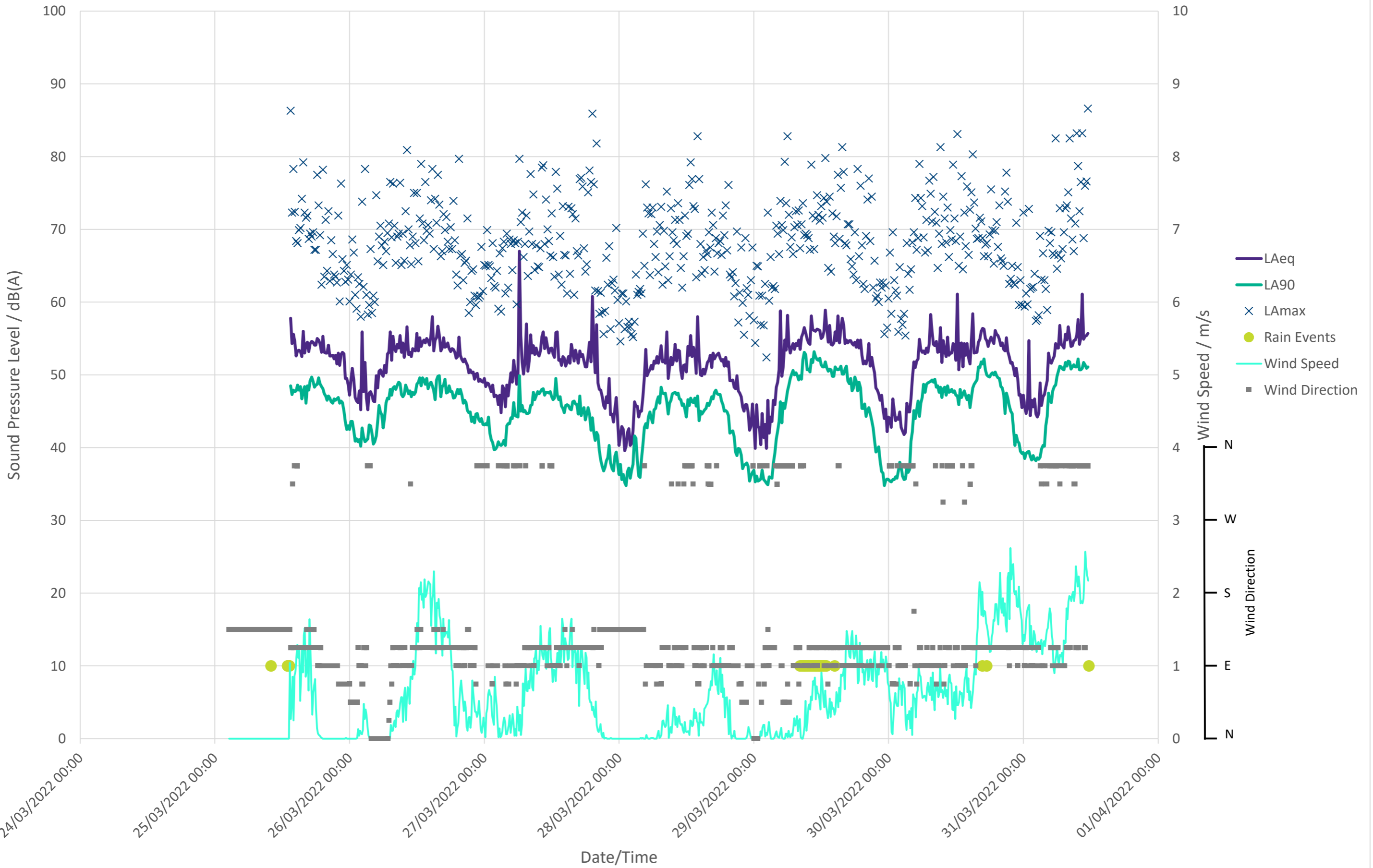
## REPORT

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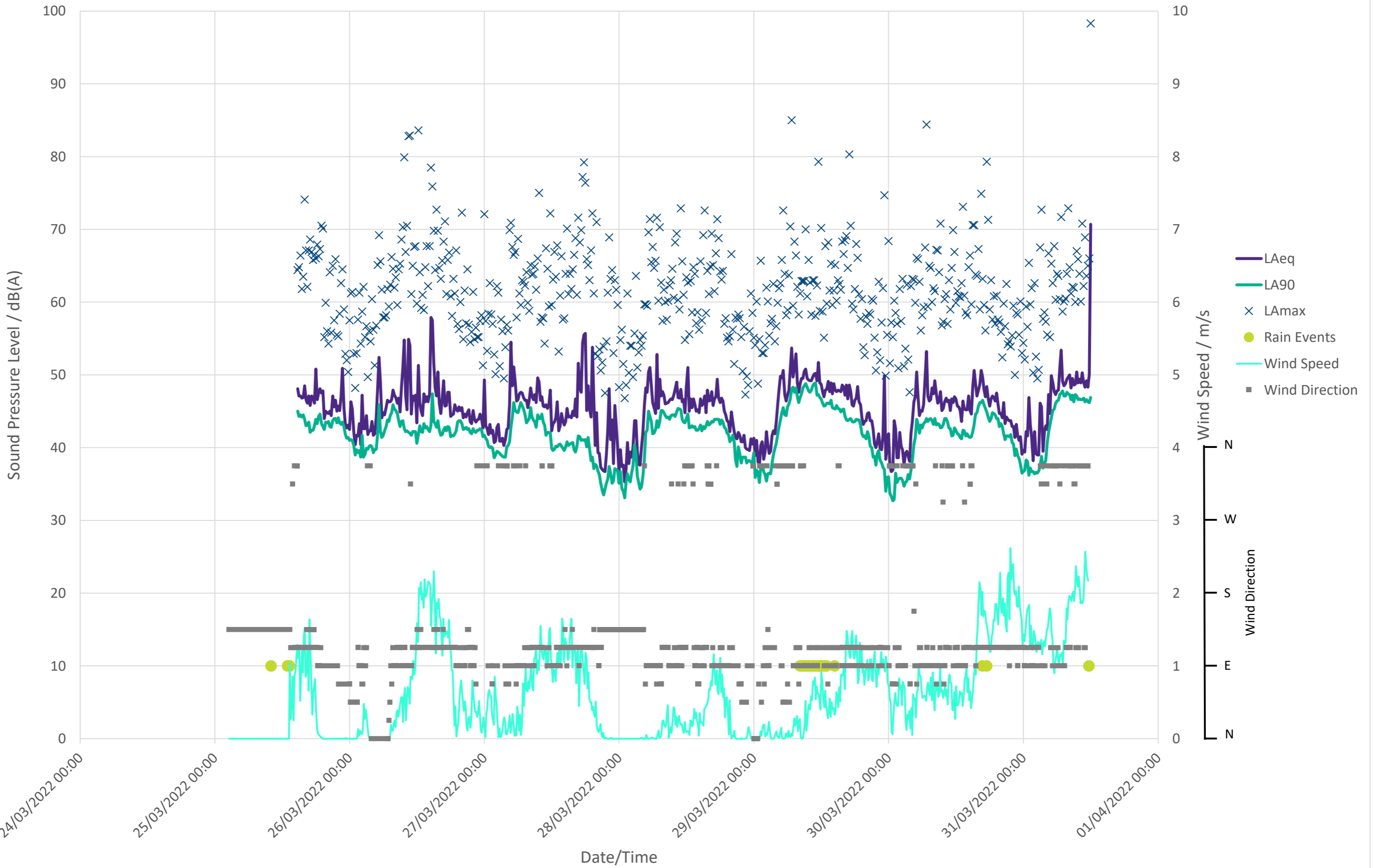
- downloading and processing the survey data;
- reviewing the modelling;

**Appendix B**  
**Time History Graphs**

# LT1 Time History



# LT2 Time History





## Appendix C


### Environmental Sound Survey Sheets

|   |                        |   |                |                       |                    |                |   |   |   |
|---|------------------------|---|----------------|-----------------------|--------------------|----------------|---|---|---|
| Location  |                        | LT1, Permali site, Bristol Road, Gloucester |                |                       |                    |                |   |   |   |
| Purpose of Monitoring   |                        | Permali / Tenmat, Bristol Road              |                |                       |                    |                |   |   |   |
| Relevant Guidance / Standard  |                        |   |                |                       |                    |                |   |   |   |
| <b>Sound Measurement System</b>   |                        |   |                |                       |                    |                |   |   |   |
| RPS ID  | Manufacturer / Model   |   | Serial Number  | Last Lab Verification | Filename           | Memory Card ID |   |   |   |
| 165   | Rion-NL-52             |   | 998563         | 02/03/2022            |                    |                |   |   |   |
| Mic Height  | Measurement Interval   | Dynamic Range (dB)                          | Time Weighting | Frequency Weighting   | Façade / Freefield | Photo?         |   |   |   |
| 1.5   | 15min / 100ms          |   | Fast           | A                     | Façade             |                |   |   |   |
| <b>START</b>  |                        |   |                | <b>END</b>            |                    |                |   |   |   |
| Personnel   |                        | BG  |                |                       | SDH                |                |   |   |   |
| Date / time   |                        | 25/03/2022 13:15                            |                |                       | 31/03/2022 1200    |                |   |   |   |
| <b>Calibrator</b>   | RPS ID                 |   | 15             |                       | internal           |                |   |   |   |
|   | Manufacturer / Model   |   | RION-NC-74     |                       |                    |                |   |   |   |
|   | Serial Number          |   | 110090         |                       |                    |                |   |   |   |
|   | Date last verification |   | 19/04/2021     |                       |                    |                |   |   |   |
|   | Reference level (dB)   |   | 94.0           |                       | 124.0              |                |   |   |   |
|   | Meter reading (dB)     |   | 93.9           |                       | 124.0              |                |   |   |   |
| Wind speed (m/s) & dir'n Av.  |                        | 0.9   | Eastwards      |                       | 2.8                | -              |   |   |   |
| Cloud cover (100%= 8 oktas)   |                        | 2   |                | 5-6 oktas             |                    |                |   |   |   |
| Temperature (degrees Celsius)   |                        | 18  |                | 10.6                  |                    |                |   |   |   |
| Relative Humidity (%)   |                        | 34  |                | 47%                   |                    |                |   |   |   |
| Likely temp. inversion / Precipitation / Fog / Wet ground / Frozen ground / Snow cover? (tick boxes)  |                        | TI  | P              | F                     | S                  | TI             | P | F | S |
|   |                        |   |                |                       |                    | x              | x | x | x |
| Subjective description / additional details   |                        |   |                |                       |                    |                |   |   |   |
| Description of site (location of equipment, general surroundings, nature of ground between NSR and sound source(s) (hard/ soft ground, topography, intervening features, reflecting surfaces))  |                        |   |                |                       |                    |                |   |   |   |
| <p>Survey location LT1 was located next to the carpark outside the front of the Permali building, next to the wall just south of the carpark. 15m south of the entrance road, 1m north of wall, 8.2m east of western corner of wall, 2.5m south of southernmost carpark white line. The microphone was set up 1.5 m above ground level (AGL), with an environmental windshield.</p>   |                        |   |                |                       |                    |                |   |   |   |
| Description of sound environment at start of survey (principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)  |                        |   |                |                       |                    |                |   |   |   |
| <p>At location LT1, at the time of deploying the survey, the main noise source on site was road traffic from Bristol Road, shielded by the site wall but still present, broadband hum from residual traffic sound from the north and south and individual pass bys, not overly loud but clearly audible. Also have noise from traffic entering and leaving the site, slower moving but closer so probably a touch louder, but less frequent on the traffic on Bristol Road. Have construction sounds to the north and east, assorted crashes and bashes as well as a high pitch beeping alarm. Distant so not too loud. Sound of what appears to be spray painting coming from the garage across the road from the Permali site. Broadband sound, and irregular. Some noise from pedestrians / workers moving into and out of site, talking, laughing etc. not overly loud but close. Crane to the northwest, making occasional whirring sound from winch, fairly loud.</p> |                        |   |                |                       |                    |                |   |   |   |
| Description of sound environment at end of survey (principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)  |                        |   |                |                       |                    |                |   |   |   |
| <p>On collection the sounds were the same, again dominated by road traffic, more wind noise though.</p>   |                        |   |                |                       |                    |                |   |   |   |



| Location  | LT1, Permali site, Bristol Road, Gloucester |
|---|---|
| Photographs of measurement location   |   |
|   |   |
|  |   |

|   |                        |                                   |                |                       |                    |                |   |   |   |
|---|------------------------|-----------------------------------|----------------|-----------------------|--------------------|----------------|---|---|---|
| Location  |                        | LT2, off Quayside Way, Gloucester |                |                       |                    |                |   |   |   |
| Purpose of Monitoring   |                        | Permali / Tenmat, Bristol Road    |                |                       |                    |                |   |   |   |
| Relevant Guidance / Standard  |                        |                                   |                |                       |                    |                |   |   |   |
| <b>Sound Measurement System</b>   |                        |                                   |                |                       |                    |                |   |   |   |
| RPS ID  | Manufacturer / Model   |                                   | Serial Number  | Last Lab Verification | Filename           | Memory Card ID |   |   |   |
| 167   | Rion-NL-52             |                                   | 998567         | 02/03/2022            |                    |                |   |   |   |
| Mic Height  | Measurement Interval   | Dynamic Range (dB)                | Time Weighting | Frequency Weighting   | Façade / Freefield | Photo?         |   |   |   |
| 1.5   | 15min / 100ms          |                                   | Fast           | A                     | Freefield          |                |   |   |   |
| <b>START</b>  |                        |                                   |                | <b>END</b>            |                    |                |   |   |   |
| Personnel   |                        | BG                                |                |                       | SDH                |                |   |   |   |
| Date / time   |                        | 25/03/2022 14:30                  |                |                       | 31/03/2022 1200    |                |   |   |   |
| <b>Calibrator</b>   | RPS ID                 |                                   | 15             |                       | internal           |                |   |   |   |
|   | Manufacturer / Model   |                                   | RION-NC-74     |                       |                    |                |   |   |   |
|   | Serial Number          |                                   | 110090         |                       |                    |                |   |   |   |
|   | Date last verification |                                   | 19/04/2021     |                       |                    |                |   |   |   |
|   | Reference level (dB)   |                                   | 94.0           |                       | 124.0              |                |   |   |   |
|   | Meter reading (dB)     |                                   | 93.9           |                       | 124.2              |                |   |   |   |
| Wind speed (m/s) & dir'n Av.  |                        | 1.9                               | Eastward       |                       | 2.8                | -              |   |   |   |
| Cloud cover (100%= 8 oktas)   |                        | 4                                 |                |                       | 5-6 oktas          |                |   |   |   |
| Temperature (degrees Celsius)   |                        | 20                                |                |                       | 10.6               |                |   |   |   |
| Relative Humidity (%)   |                        | 35                                |                |                       | 47%                |                |   |   |   |
| Likely temp. inversion / Precipitation / Fog / Wet ground / Frozen ground / Snow cover? (tick boxes)  |                        | TI                                | P              | F                     | S                  | TI             | P | F | S |
|   |                        |                                   |                |                       |                    | x              | x | x | x |
| Subjective description / additional details   |                        |                                   |                |                       |                    |                |   |   |   |
| Description of site (location of equipment, general surroundings, nature of ground between NSR and sound source(s) (hard/ soft ground, topography, intervening features, reflecting surfaces))  |                        |                                   |                |                       |                    |                |   |   |   |
| <p>Survey location LT2 was located on the other side of the river to the Permali site and LT1. On portion of grass between the river and houses on Quayside Way, attached to fence line. 21m west of western edge of pavement on riverbank, 4.5m north of southern extent of fence. The microphone was set up 1.5 m above ground level (AGL), with an environmental windshield.</p>   |                        |                                   |                |                       |                    |                |   |   |   |
| Description of sound environment at start of survey (principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)  |                        |                                   |                |                       |                    |                |   |   |   |
| <p>At location LT2, at the time of deploying the survey, the noise environment was quieter than LT1. Main sound is some plant at Permali site across the river, broadband hum / whirr, not sure what. Very faint broadband hum from residual traffic noise to the east on Bristol Road. Some other miscellaneous site sounds from there too, high pitch alarm, quiet though. Fishers on the bank, some sounds from talking and using their equipment but relatively quiet, however, it echoes of the walls of the Permali site across the river. Occasional car on Quayside way, not too close and slow moving so quiet. Bird song from all directions, reasonably loud. Wind noise, not so loud but ever present. Occasional distant engine sound, only the loudest ones and even then, pretty loud.</p> |                        |                                   |                |                       |                    |                |   |   |   |
| Description of sound environment at end of survey (principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)  |                        |                                   |                |                       |                    |                |   |   |   |
| <p>On collection the sounds were similar, dominated by distant traffic noise and construction sounds. Again, more wind noise than before</p>  |                        |                                   |                |                       |                    |                |   |   |   |

| Location  | LT2, off Quayside Way, Gloucester |
|---|-----------------------------------|
| Photographs of measurement location   |                                   |
|  The photographs show a grassy field with a wooden fence in the foreground. In the background, there are several blue houses with white window frames and a brick building. The sky is blue with some clouds. The photos are arranged in two rows: three in the top row and two in the bottom row. |                                   |

**Technical Datasheets/ Measurement Data**



Client

**Permal**

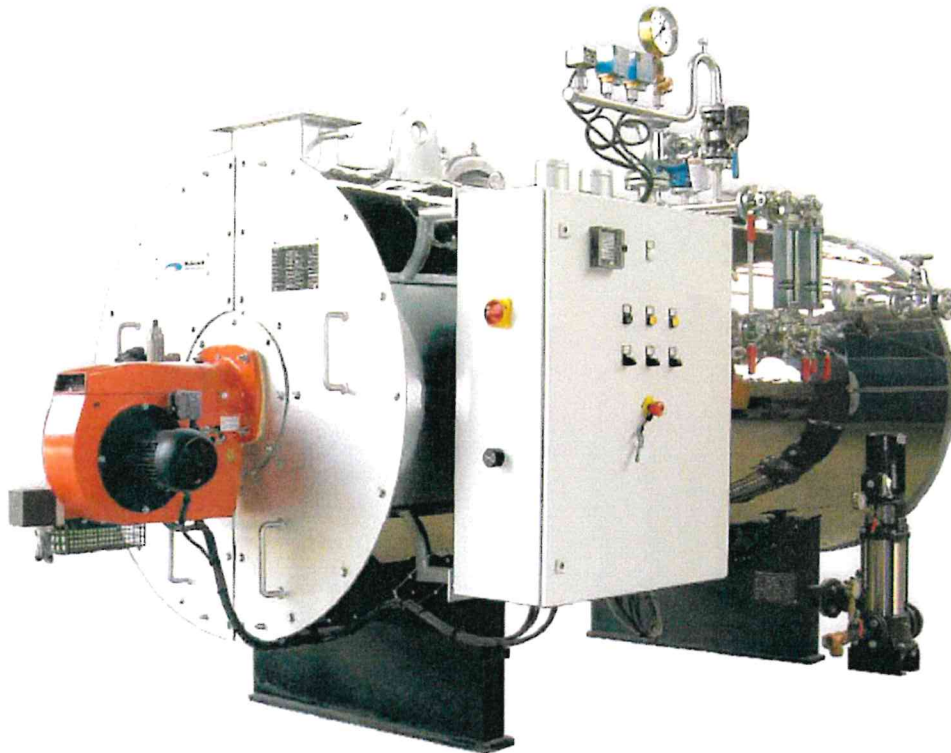
Offer No.

**VT15984**

Rev.

**B**

# 2 x NBWB 100 Premium Firetube Steam Boilers



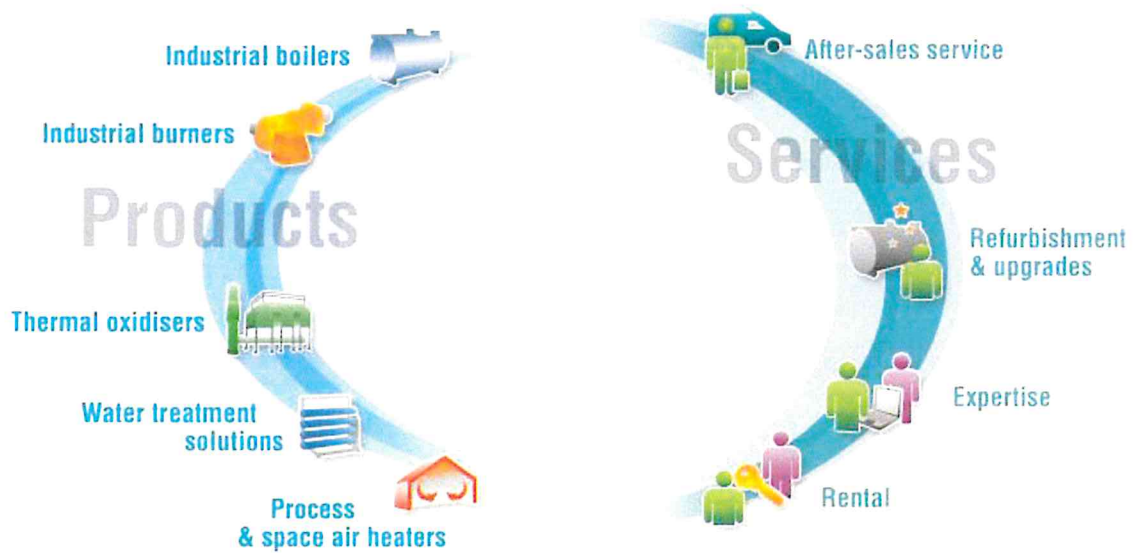
Sales Contact: **Tim Marchant**

Date: **28/02/2022**

Prepared: **DS**

Approved: **EF**

**BABCOCK WANSON** Provides a complete range of products and services to supply your process heat requirements. From Steam Boilers, Thermal Fluid Heaters, Rapid Steam Generators and Hot Water Boilers to VOC abatement and odour treatment by Thermal Oxidation, Water Treatment or Air Heating Solutions; we help you to optimise your energy use and production with high quality products and services.



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[www.babcock-wanson.co.uk](http://www.babcock-wanson.co.uk)

Permal  
270 Bristol Rd  
Gloucestershire  
GL1 5TT

For the attention of Ms. Ellie Taylor:

Dear Madam,

**Re: Steam Generating Equipment**

In response to your recent discussions with our Mr Tim Marchant, we have much pleasure in enclosing our quotation for the supply of TWO Model NBWB 100 Premium Steam Boilers complete with ancillary equipment. We will arrange for Amultra to attend site to look at the installation costs.

**NBWB**

The NBWB Firetube boiler is fully packaged and includes a fully matched burner, suitably equipped electrical control panel and a complete set of mountings. This boiler range comes with the longest continuous pedigree of any packaged Firetube Boiler, whilst incorporating all the latest design and performance features to comply with current legislation and expectations of industry. It also incorporates the benefit of over 50 years of continuous development ensuring long and reliable product life.

**BOILER UNATTENDED OPERATION – BG01 Guidance on Safe Operation of Boilers**

The boiler as offered is fitted with the Babcock Wanson **BW3DAY** control system and as such exceeds the operational requirements of **BG01 Typical Arrangement 2 for unattended operation**.

**BW3DAY UNATTENDED OPERATION**

In conjunction with the boiler house risk assessment mentioned below, the provision of any automatic water monitoring equipment required and planned maintenance, the Babcock Wanson **BW3DAY** control system permits uninterrupted operation for a period of up to 6 months and unattended boiler operation for up to 3 days.

**Babcock Wanson BW3DAY** controls offer the following key benefits:

- 1) Lower boiler operation cost,
  - Daily boiler water level control checks are replaced by a simple 15-minute test every 3 days.
  - The 3-day test can be undertaken without stopping the boiler thereby avoiding interference with normal production requirements.
  - The mandatory daily/weekly boiler water level control evaporation test is replaced with a 6 monthly test, thereby reducing overall manning and operational costs.

- 2) **Easy boiler operation** with self-checking burner controls enabling uninterrupted, unattended burner operation.

## BG01 Guidance on Safe Operation of Boilers

When specified with additional boiler mountings for automatic Total Dissolved Solids Control and Timed Bottom Blowdown plus remote monitoring of the feed tank and fault conditions, the NBWB 100 Premium boiler also meets the operational requirements of **BG01 Typical Arrangement 3 for unattended operation**.

Please note that compliance with BG01 Typical Arrangement 3 will require a boiler house risk assessment to be completed on both the boiler feed water and returning condensate conditions and may require further water analysis equipment to be fitted. Unless already available further boiler house protection systems such as fire detection may also be required to meet this high level of unattended operation. Our Engineers would be pleased to discuss these requirements further if required.

## **LOW NO<sub>x</sub> BURNERS – THE MEDIUM COMBUSTION PLANT DIRECTIVE (MCPD)**

Directive (EU) 2015/2193 relates to the limitation of pollutants into the air from medium combustion plants i.e. combustion of fuels in plants with a rated thermal input equal to or greater than 1 megawatt (MWth) and less than 50 MWth.

The emission limit values set in the MCPD has applied since 20/12/18 for new plants and will be applied by 2025 or 2030 for existing plants, depending on their size.

Babcock Wanson Low NO<sub>x</sub> Natural Gas burners guarantee NO<sub>x</sub> emissions of <100 mg/Nm<sup>3</sup>, this ensures compliance with the MCPD well into the future. This figure is based on dry flue gas and 3% O<sub>2</sub> as defined in the MCPD.

Babcock Wanson Low NO<sub>x</sub> burners offer the following advantages:

- Variable Speed Drive (VSD) Combustion Air Fan
- Improved burner control
- Lower electrical consumption
- Improved acoustic performance at low load
- Reduced maintenance of mechanical components

## **ECONOMISER**

The design of the NBWB 100 Premium boiler allows for the straightforward installation of a Flue Gas Economiser which can be selected at the time of order or ordered later as an upgrade. The economiser raises the efficiency of the boiler from 90% to 95% providing a significant fuel cost saving. We understand that you are considering the economiser as a standard feature future addition and have therefore provided a suitable spool piece transition piece within the cost for the twin wall flues which



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would allow the future installation of the economiser. In addition to the economiser, a flue transition piece would be required to affect the installation; we have not provided a cost for this item at this time.

## **REGULATORY FRAMEWORK**

Firetube Boiler “Assemblies” fall within the scope of the European Pressure Equipment Directive 2014/68/EU, Category IV.

A CE declaration of conformity is provided certifying design and manufacture according to European requirements, under the control of the notified organization.

With regard to design codes for the boiler pressure containing parts, our boilers are built in accordance with French Standard NFE 32-100. With regard to design codes for the control equipment, we follow the instructions of European Standard EN 12953-8 (2002) – EN 12953-6(2012)\* - EN 12953-10 (2004).  
\*: Except for operating mode NFE32020: Attended Mode

All our boilers are manufactured in line with these assessment procedures carried out by two notified bodies.



Lloyd's Register for the boiler pressure vessels;  
CE0038



Apave Group for the boiler equipment assembly;  
CE0060

## **AFTER SALES SERVICE**

Babcock Wanson is represented in both Sales and Service throughout Europe. We have an experienced and comprehensive team of Service Engineers whose responsibilities are to assist all Babcock Wanson clients with commissioning and ongoing service, plus staff instruction for safe operation of our products both at home and abroad.

With over 100 years as a successful boiler manufacturing group, Babcock Wanson has grown into a major, internationally recognised, and respected boiler producer. Babcock Wanson can offer a total steam-raising package tailor-made to the customer's specific requirements ensuring a Single-Source of Responsibility.

## **EXTENDED WARRANTY**

We offer an extension of our standard warranty on the boiler plant to up to 5 years from commissioning when a Babcock Wanson Service Agreement is entered into and maintained for the duration of the warranty period. This can provide our customers with peace of mind for operation of the plant without extensive cost or additional servicing needs.

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We are also pleased to offer a 5-year Corrosion Warranty for Babcock Wanson Firetube Steam boilers which are covered continuously from new by a Babcock Wanson Water Treatment Contract. All steam raising equipment requires suitably treated water to ensure safe and reliable operation, our high quality, cost effective and comprehensive service is tailor made for our boilers.

We feel that these services combined provide our clients with a single source solution and the peace of mind which comes along with this.

We trust that your requirements have been interpreted correctly, our proposal will be of interest to you and that it contains sufficient information for your project requirements, if not please call us.

Our team of Engineers and Specialists is available to provide answers to any questions that you may have and your local Babcock Wanson Engineer will make contact shortly to offer any assistance you may need.

There may be other products from our Company portfolio in which you may be interested and an introduction to them is enclosed for your information.

Yours faithfully,

For and on behalf of Babcock Wanson UK Limited,

**Dami Solaru**

Applications Engineer

PROCESS ENGINEERING DIVISION

[DSolaru@babcock-wanson.com](mailto:DSolaru@babcock-wanson.com)

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|                          |
|--------------------------|
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## PROJECT COST SUMMARY

### NBWB 100 Premium Fire tube Steam Boiler

2 x NBWB 100 Premium Fire-tube Steam Boilers including Modulating Burner and Sample Cooler

2 x Timed Bottom Blow Down (TBB)  
2 x Auto Total Dissolved Solids (TDS) Controls  
2 x Self-Checking Level and Burner Controls for Unattended Operation – BW3 Days  
2 x Economisers

### Ancillary Equipment

1 x 2000 L Feedwater Tank (Stainless)  
1 x BGW 75 Duplex Water Softener  
1 x Chemical Dosing Set (3 x Single On/Off Pumps)  
1 x Blowdown Vessel and Cooling System  
2 x 300mm Wall Mounted Chimneys At A Height Of 6.6m From FFL  
1 x TDS Controller – Probes & Controller Only

### Commissioning

1 x System Commissioning – *SIX working days (TOTAL) on site*

### Training

1 x Training For The Maintenance Team – *TWO working days on site*

### Transport

1 x Delivery to site, including Offloading & Positioning

**TOTAL PROJECT COST**

**£123,000**

## TECHNICAL DETAILS

### NBWB 100 Premium STEAM BOILER

TWO – NBWB 100 Premium Firetube Steam Boilers, with control panel, Babcock Wanson burner, burner management system, each mounted as a single unit, fully wired and tested. Process controllers are used to control the boiler.

#### Technical Specification for a Single Unit

|  |  |              |
|--|--|--------------|
| Model  | NBWB 100 Premium                         |              |
| Maximum Steam Output at MCR                            | kg/h                                     | 1,000        |
| Maximum steam output F/A 100°C                         | kg/h                                     | 1,121        |
| Design Pressure  | barg                                     | 12           |
| Max Operating Pressure                                 | barg                                     | 10           |
| Fuel Type  | Natural Gas (10.17 kWh/Nm <sup>3</sup> ) |              |
| Nominal Gas Consumption at MCR                         | Nm <sup>3</sup> /h                       | 76.5 approx. |
| Minimum Gas Supply Pressure                            | mbarg                                    | 42 – 300     |
| Efficiency at MCR (on NCV of Natural Gas EN12953)      | %  | 90           |
| LNTG1.16/RS M Burner                                   | Modulating                               |              |
| NOx  | <150 mg/Nm <sup>3</sup>                  |              |
| Burner Turn Down                                       | 4 : 1                                    |              |
| Ignition   | Spark                                    |              |
| Main Electrical supply (three phase)                   | 400 V 50 Hz                              |              |
| Control supply (single phase)                          | 220 V 50 Hz                              |              |
| Feedwater Control                                      | Modulating                               |              |
| Boiler water sample cooler mounted on the boiler shell | Included                                 |              |
| Weight, Flooded  | 5,065 kg                                 |              |
| Weight, Dry  | 3,700 kg                                 |              |
| Cladding   | Aluzinc.                                 |              |

\*Maximum Continuous Rating (MCR) is based on producing steam at 10 barg from water at 60 °C for NBWB 25-250 Units

A full description of the above equipment is given in our General NBWB Firetube Boiler Technical Specification, a copy of which is enclosed.

## STEAM BOILER MOUNTED EQUIPMENT

### Sample Cooler

TWO – Boiler Water Sample Coolers supplied mounted on the boiler shell.

### Auto TDS Controls

TWO – Sets of automatic Total Dissolved Solids (TDS) control systems complete with digital controller, conductivity probe, and electrically actuated valves mounted on the boiler shell.

### Timed Bottom Blowdown

TWO – Sets of Automatic Timed Bottom Blowdown (TBB) including the Control Panel, mounted electronic controller and pneumatically actuated bottom blowdown valve supplied loose (with associated connecting piece) for fitting to the boiler shell.

## ANCILLARY EQUIPMENT

### Feedwater Tank

ONE – Stainless Steel feedwater Tank, complete with all necessary connections for condensate return, steam injection, soft water make-up, feed outlet(s), drain and chemical dosing (where appropriate).

Tank supplied with water preheating steam injector including steam solenoid valve as appropriate and instrument controlling the supply of steam for heating and opening the soft water make up valve to provide cooling, sight gauge and level control.

Insulation has not been included because it could get damaged during transportation and/or during the installation into a container.

### Blowdown Vessel

ONE - Blowdown Vessel suitable for use with offered Firetube Boiler(s). Vessel designed constructed and CE marked in accordance with the PED or ASME equivalent. Please note that if containerization is accepted then the header will be manufactured and installed. If the items are bought separately it is supplied without headers required to allow for multiple boiler installations as these would form part of the site pipework installation works.

The following equipment has been included:

- Automatic cooling control valve.
- Isolating and Non-return Valves and Drain Valves required in accordance with the requirements of PM60

## Water Softener

Base Exchange Water Softener with control head and brine system. The softener size is based on the following operating conditions and is fitted with 24 V controls:

- 50% condensate returned
- 300 mg/l total water hardness
- 24 hours per day operation
- 2 to 8.5 barg mains water supply pressure
- 12.3 hours capacity between regeneration at 1,090 kg/h service flow
- 3,000 kg/h maximum service flow

## Chemical Dosing Set(s)

ONE – Chemical Dosing Set comprising an on / off output injection pump mounted on a chemical storage tank (excluding chemicals) for Oxygen Removal.

ONE – Chemical Dosing Set comprising on / off output injection pump mounted on a chemical storage tank (excluding chemicals) for Acidity Correction.

ONE – Chemical Dosing Set comprising on / off output injection pump mounted on a chemical storage tank (excluding chemicals) for Sludge Conditioning.

|                |
|----------------|
| <b>CHIMNEY</b> |
|----------------|

## Chimney – Wall Mounted

TWO – 300mm bore stainless steel twin-wall wall-mounted CHIMNEY complete with a branch to the rear of the unit, drain plate, weather apron and wall brackets. Please note we have allowed a typical chimney height of 6.64 m from Finished Floor Level; the chimney would be supplied in sections 1.2 m long.

The above offer and attached technical detail is for a twin-wall type chimney of a nominal height. The offered equipment does not need a specific height of chimney to operate correctly and therefore the final design must be confirmed to suit site requirements. This may mean the final height needs to be adjusted and we would be happy to discuss this aspect with you further. The chimney type offered requires it to be supported from your building or local steelwork with no more than 3M of free-standing section.

Please note that depending on the final height additional brackets and / or guy wires may be required to support / steady the chimney.

## COMMISSIONING AND DELIVERY

### Commissioning

The above price includes for commissioning and the instruction of site personnel in operation and maintenance techniques. This work should take up to SIX working days (for both boilers) on site which is assumed to be uninterrupted and in normal hours. Should our engineer be delayed through causes beyond our control, we reserve the right to charge for additional hours at the rates shown on the attached sheet.

### Commissioning Assumptions

Unless stated otherwise, our quotation is based on work being carried out during normal working hours and that free and unrestricted access to the working area will be made available at all times.

The commissioning visit can be undertaken as a continuous operation with all necessary fuel, power, and heat consumption services being available as required.

A lockable storage facility for tools and materials will be required and we assume that temporary lighting, first aid and sanitary facilities will be made freely available to our operatives during the course of the contract.

No asbestos-bearing material or other substance hazardous to health is likely to be encountered by our operatives during the course of the works and if discovered, will be safely removed by the client.

### Delivery

Approximately 10 working weeks from an order being placed before 4<sup>th</sup> March 2022.

### Transportation

Delivery to site as a single consignment is included, along with offloading and positioning.



## TERMS AND CONDITIONS

### Terms and Conditions

This offer is made in accordance with our Terms and Conditions of Sale and would note that all prices quoted in this tender are exclusive of VAT and the addition of any customs tariffs that may be applied following the UK's departure from the EU.

### Tender Validity

Unless previously withdrawn, this tender is open for acceptance for 30 days from the date thereof and is subject to confirmation at the time of acceptance.

### Terms of Payment

30% with order.

60% on notification that the equipment is ready for and prior to despatch.

10% after commissioning or 60 days from delivery, whichever is the sooner.

### Customer Responsibilities

The extent of our supply is strictly limited to the equipment described above. Your attention is drawn to the following specific exclusions.

- Mechanical and electrical installation work.
- Fused mains isolator or any interconnecting wiring or local isolation required on site.
- Electrical power connections to skid (as appropriate) and boiler control panel.
- Ducting or chimney **NB** we have offered a typical flue arrangement only.
- Additional ducting to chimney **NB** we have offered a typical flue arrangement only.
- Ladder and access platforms including any temporary access facilities required for commissioning purposes to access high-level equipment and valves etc.
- Fuel supply to the heater including any valves, strainers or fire valves. LPG supply where required for Liquid Fuel Pilot Ignition. It is assumed that there is a suitable gas meter local to the unit which can be used to facilitate commissioning.
- Interconnecting pipe work or additional valves (beyond skid where appropriate).
- Insurance Company and/or Independent Inspection Authority tests and expenses. **NB** attendance by our commissioning engineer to facilitate these tests, if required, would be chargeable.
- Water Treatment Chemicals and or Consumables.
- Fuel, Water and Water Treatment Chemicals for Commissioning and Testing

### Documentation

TWO copies of our Operation and Maintenance Manuals in the English Language are included in our proposed scope of supply. These are provided in electronic format on CD-ROM.

## **After Sales Services**

Babcock Wanson UK Ltd. has a team of Service Engineers providing after sales service for all Babcock Wanson products both in the United Kingdom and Overseas. Spare parts are available from our Works at Borehamwood and from the Babcock Wanson Organisation and its licensees in most major countries.

## **Enclosures**

For your general guidance and information, we enclose the following documents:

Terms and Conditions of Sale – BW/COB/9724  
NBWB Technical Specification  
Product Guide  
Service and Commissioning charge rates.

For and on behalf of Babcock Wanson UK Limited

### **Dami Solaru**

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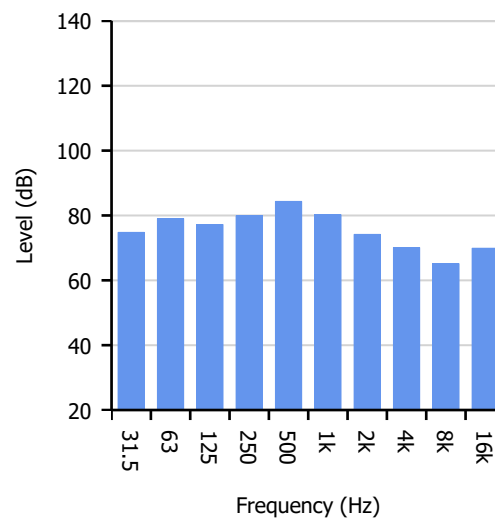
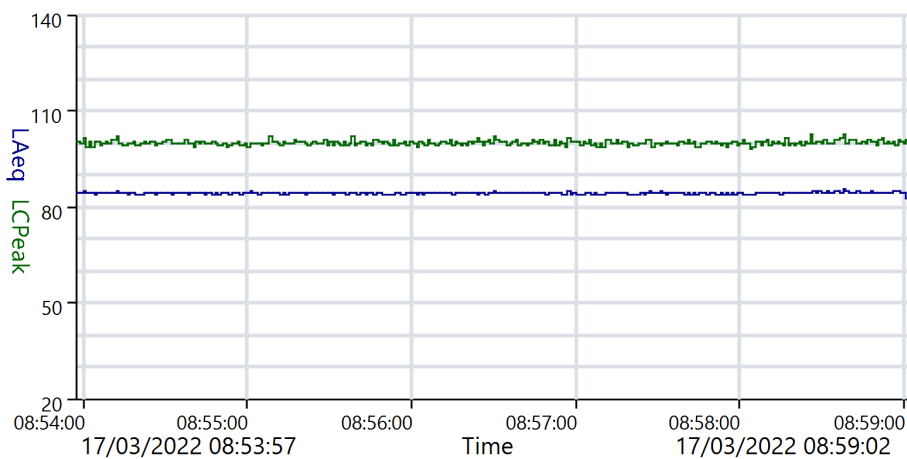
# Measurement Summary Report

**Name** Thermal Oxidiser at 1m from fan  
**Time** 17/03/2022 08:53:57 **Person** **Place** **Project**  
**Duration** 00:05:05 Stephen Crewe Tenmat Ltd Site Move Project  
**Instrument** PN1218, Model 45 HSSE

**Calibration**

**Before** 17/03/2022 08:53 Offset 0.29 dB **After** 17/03/2022 10:53 Offset 0.46 dB

| Basic Values |          | Projected Exposure |         |
|--------------|----------|--------------------|---------|
| LAeq         | 84.2 dB  | 30 Minutes         | 72.2 dB |
| LCPeak       | 102.5 dB | 1 Hour             | 75.2 dB |
| C-A          | 3.7 dB   | 2 Hours            | 78.2 dB |
| LEPd         | 64.5 dB  | 4 Hours            | 81.2 dB |
| LAFMax       | 86.0 dB  | 6 Hours            | 83.0 dB |
|              |          | 8 Hours            | 84.2 dB |
|              |          | 10 Hours           | 85.2 dB |
|              |          | 12 Hours           | 86.0 dB |





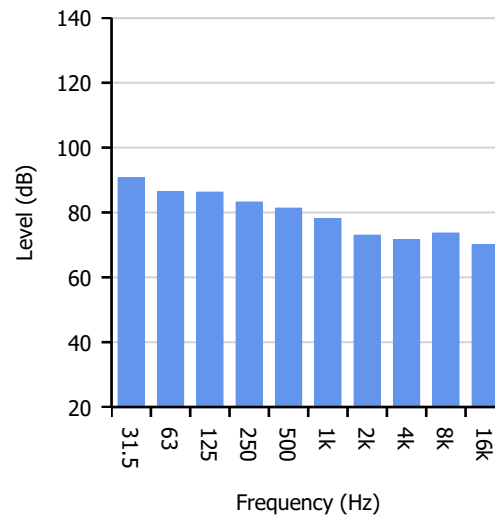
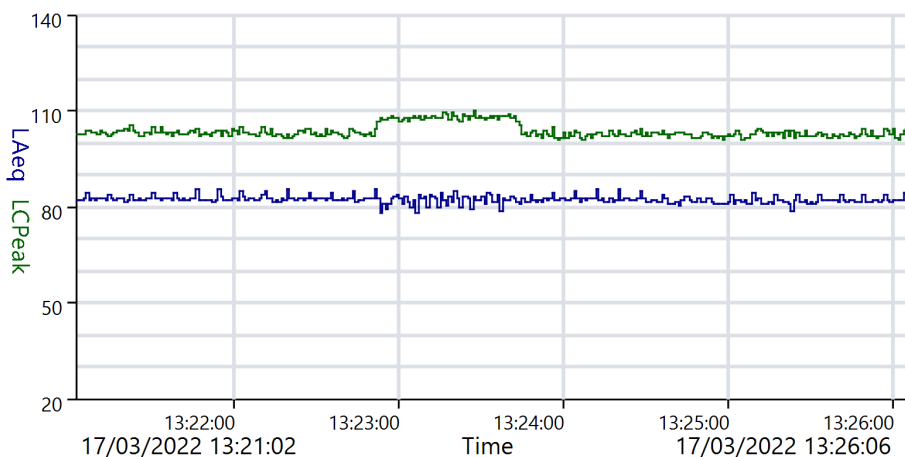
# Measurement Summary Report

**Name** Dust plant 3 1m from fan  
**Time** 17/03/2022 13:21:02      **Person**                      **Place**                      **Project**  
**Duration** 00:05:04                      Stephen Crewe              Tenmat Ltd                      Site Move Project  
**Instrument** PN1218, Model 45                      HSSE

**Calibration**

**Before** 17/03/2022 13:20      Offset 0.42 dB      **After** 17/03/2022 13:43      Offset 0.28 dB

| Basic Values |          | Projected Exposure |         |
|--------------|----------|--------------------|---------|
| LAeq         | 82.4 dB  | 30 Minutes         | 70.4 dB |
| LCPeak       | 110.0 dB | 1 Hour             | 73.4 dB |
| C-A          | 10.4 dB  | 2 Hours            | 76.4 dB |
| LEPd         | 62.6 dB  | 4 Hours            | 79.4 dB |
| LAFMax       | 88.8 dB  | 6 Hours            | 81.2 dB |
|              |          | 8 Hours            | 82.4 dB |
|              |          | 10 Hours           | 83.4 dB |
|              |          | 12 Hours           | 84.2 dB |





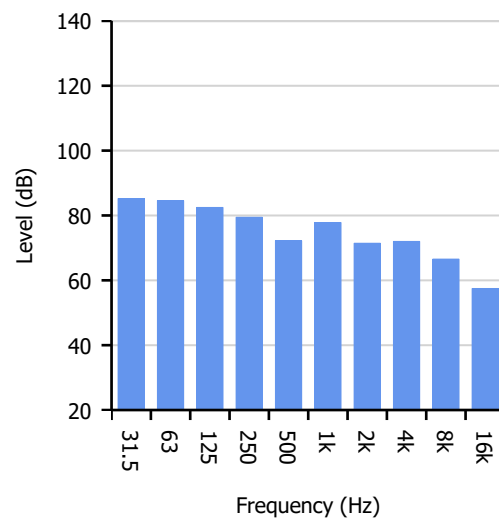
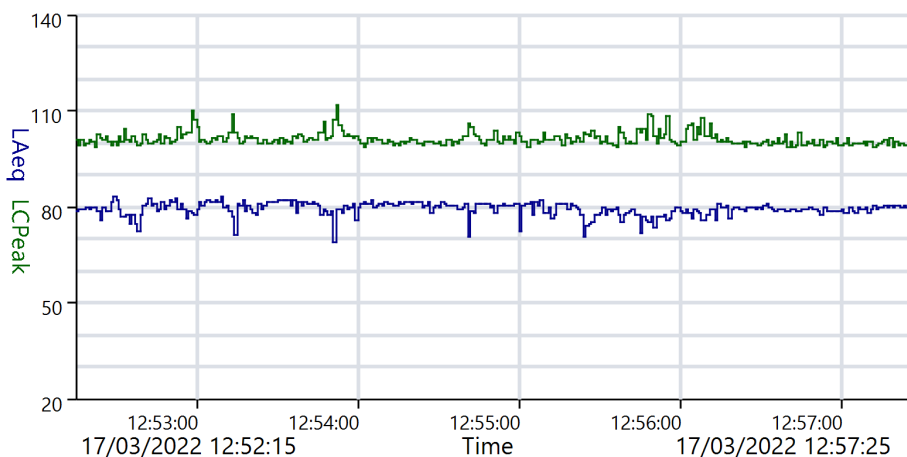
# Measurement Summary Report

**Name** Nederman dust plant 1m from fan  
**Time** 17/03/2022 12:52:15 **Person** **Place** **Project**  
**Duration** 00:05:10 Stephen Crewe Tenmat Ltd Site Move Project  
**Instrument** PN1218, Model 45 HSSE

**Calibration**

**Before** 17/03/2022 12:51 Offset 0.42 dB **After** 17/03/2022 13:20 Offset 0.42 dB

| Basic Values |          | Projected Exposure |         |
|--------------|----------|--------------------|---------|
| LAeq         | 79.6 dB  | 30 Minutes         | 67.6 dB |
| LCPeak       | 111.6 dB | 1 Hour             | 70.6 dB |
| C-A          | 9.7 dB   | 2 Hours            | 73.6 dB |
| LEPd         | 59.9 dB  | 4 Hours            | 76.6 dB |
| LAFMax       | 84.2 dB  | 6 Hours            | 78.4 dB |
|              |          | 8 Hours            | 79.6 dB |
|              |          | 10 Hours           | 80.6 dB |
|              |          | 12 Hours           | 81.4 dB |



# APPLICATION FOR AN ENVIRONMENTAL PERMIT

Environmental Risk Assessment

Permal Gloucester Limited



JER9222

1

3

24 February 2023

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## Document status

| Version | Revision | Authored by   | Reviewed by       | Approved by | Review date      |
|---------|----------|---------------|-------------------|-------------|------------------|
| 1       | 0        | Tim Colebrook | -                 | -           | [Date]           |
| 1       | 1        | Tim Colebrook | Jennifer Stringer | -           | [Date]           |
| 1       | 2        | Tim Colebrook | Roger Newman      | -           | 7 December 2022  |
| 1       | 3        | Roger Newman  | Jennifer Stringer |             | 24 February 2023 |

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## Approval for issue

Jennifer Stringer      Technical Director

24 February 2023

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## File Name

230224\_JER9222\_R\_RN\_Per mali Environmental Risk Assessment\_V1R3

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---

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### Prepared for:

**Per mali Gloucester**

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## Appendices

Appendix A maps



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# 1 INTRODUCTION

- 1.1.1 This environmental risk assessment (ERA) has been carried out in support of an application for an Environmental Permit for the Permali production facility in Gloucester.
- 1.1.2 It includes an assessment of the risk to the environment and human health from the proposed activities at the site. As there is no specific guidance for producing an ERA for part A2 environmental permit applications, the Environment Agency's (EA's) Risk Assessments for your environmental permit<sup>1</sup> guidance has been used as a best practice and covers a range of environmental risks. Those aspects relevant to the production activities at the Permali facility are covered within this ERA.
- 1.1.3 This document provides the nearby sensitive receptors at the site and relevant risk assessments covering the following aspects:
- Amenity and Accidents; and
  - Emissions to Air.

---

<sup>1</sup> <https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit>

---

## 2 SITE DETAILS

### 2.1 The Site

2.1.1 The site is located in Gloucester at the following address:

Permali Gloucester Limited  
Bristol Road  
Gloucester  
Gloucestershire  
GL1 5TT

2.1.2 The centre of the site is at National Grid Reference (NGR) SO 82313 17107.

2.1.3 Site layout plans can be found in Appendix A.

### 2.2 Sensitive Receptors

2.2.1 A 2km radius screening of designated ecological receptors has identified two local nature reserves (LNR) as follows:

- Alney Island LNR (to the north)
- Robinswood Hill LNR (to the southeast)

2.2.2 There are no identified Ramsar, Special Areas of Conservation (SAC), Special Protection Areas (SPA) or Sites of Special Scientific Interest (SSSI) within 2km.

2.2.3 A 10km radius screening of designated ecological receptors has identified the following sites:

#### **Local Nature Reserves**

- Alney Island
- Barnwood Arboretum
- Coopers Hill, Gloucester
- Hucclecote Meadows
- Robinswood Hill
- Green Farm Orchard
- Quedgeley Arboretum
- Saintbridge Balancing Pond

#### **National Nature Reserve**

- Cotswold Commons and Beechwoods

#### **Ramsar Sites**

- Walmore Common

#### **Sites of Special Scientific Interest**

- Badgeworth SSSI
- Coombe Hill Canal SSSI
- Robin's Wood Hill Quarry SSSI

- Cotswold Commons and Beechwoods SSSI
- Edge Common SSSI
- Range Farm Fields SSSI
- Crickley Hill and Barrow Wake SSSI
- Haresfield Beacon SSSI
- Hucclecote Meadows SSSI
- Wainlode Cliff SSSI
- Innsworth Meadow SSSI
- Walmore Common SSSI
- Ashleworth Ham SSSI

#### **Special Areas of Conservation**

- Cotswold Beechwoods

#### **Special Protection Areas**

- Walmore Common

- 2.2.4 The closest residential properties are located on the eastern boundary of the site with the Bristol Road. There are further residential properties approximately 0.07km to the west of the site located at Mainsail Lane on the opposite side of the Gloucester and Sharpness Canal.
- 2.2.5 The site is located adjacent to the Gloucester and Sharpness Canal which runs along the western boundary of the facility.
- 2.2.6 The site is not situated in an air quality management area (AQMA)<sup>2</sup>.
- 2.2.7 The nearest Nitrate Vulnerable Zone (NVZ) is the North and South Streams in the Lydden Valley which is located approximately 100 metres to the south.
- 2.2.8 The site is not situated in a source protection zone.
- 2.2.9 The site is located on a Secondary (undifferentiated) aquifer (bedrock) and Secondary (undifferentiated) aquifer (superficial deposit). The groundwater vulnerability classification for the site is Medium.
- 2.2.10 The British Geological Survey Geology of Britain Viewer<sup>3</sup> has been reviewed and it shows that the site is located on the following geology:
- Bedrock geology: Blue Lias Formation and Charmouth Mudstone Formation - Mudstone. Sedimentary bedrock formed between 209.5 and 182.7 million years ago during the Triassic and Jurassic periods.
  - Superficial deposits: Tidal Flat Deposits - Clay, silt and sand. Sedimentary superficial deposit formed between 11.8 thousand years ago and the present during the Quaternary period.
- 2.2.11 Site plans are included as Appendix A.

<sup>2</sup> <https://uk-air.defra.gov.uk/aqma/maps/>

<sup>3</sup> <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>

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## 2.3 Surrounding Area

2.3.1 The site is located within an area of mixed use which includes residential, commercial and industrial properties. The immediate surrounding area is as follows:

- **North** – Manufacturing/commercial and industrial units
- **South** - Manufacturing/commercial and industrial units
- **East** – Residential properties on the Bristol Road. There are further residential properties across the Bristol Road located on Linden Road, Cecil Road and Granville Street
- **West** – The Gloucester and Sharpness Canal is located on the boundary of the site, across the canal there are residential properties on Quayside Way, Mainsail Lane and Canal Court.

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### 3 ENVIRONMENTAL RISKS AND EFFECTS: AMENITY AND ACCIDENTS

- 3.1.1 This section provides an assessment of risks to environmental amenity and from potential accidents/incidents that could arise from the production activities. The assessment has been completed in accordance with the EA's "Risk Assessments for your environmental permit".
- 3.1.2 The scope of the assessment has covered the following aspects:
- odour;
  - noise and vibration;
  - fugitive emissions;
  - visible emissions; and
  - accidents.
- 3.1.3 Point source emissions are considered separately.
- 3.1.4 For each of the above, the approach to the assessment has followed the following six stage process:
- a. identify and consider the risks for the site;
  - b. identify the receptors at risk;
  - c. identify the possible pathways from the sources of the risks to the receptors;
  - d. assess the risks and check they're acceptable and can be screened out;
  - e. state appropriate control measures if the risks are too high; and
  - f. present the assessment of overall risk.
- 3.1.5 Results of the assessment are provided in the following tables.
- Table 3-2 Assessment of odour risks
  - Table 3-3 Assessment of noise and vibration risks
  - Table 3-4 Assessment of fugitive emission risks
  - Table 3-5 Accidents risk assessment and management plan
- 3.1.6 The risk assessment methodology has used a scoring mechanism whereby scores are assigned to:
- the likelihood of the hazard occurring; and
  - the consequence of the hazard to the environment or human health.
- 3.1.7 Scores are assigned as low, medium or high.
- 3.1.8 The risk assessment has been completed by scoring the hazard areas outlined above using a risk matrix as shown in Table 3-1 below:

**Table 3-1: Risk Matrix**

| Consequence | Probability |          |          |          |
|-------------|-------------|----------|----------|----------|
|             | High        | Medium   | Low      | Very Low |
| High        | High        | Medium   | Low      | Low      |
| Medium      | Medium      | Medium   | Low      | Very Low |
| Low         | Low         | Low      | Low      | Very Low |
| Very Low    | Low         | Very Low | Very Low | Very Low |

- 3.1.9 In completing the assessment, prevention and control measures proposed by Permali are assumed to be in place. Where relevant, details of these measures are identified within the assessment.
- 3.1.10 The environmental risk assessment for the site is set out below:

**Table 3-2: Odour risk assessment and management plan**

| Hazard   | Receptor   | Pathway to Receptor | Risk management techniques  | Probability of exposure  | Consequence   | Overall risk  |
|--|--|---------------------|---|--|---|---|
| Odorous emissions from the permitted activities (storage, delivery and use of chemicals) | The closest residential properties are located on the eastern boundary of the site with the Bristol Road. There are further residential properties approximately 0.07km to the west of the site located at Mainsail Lane on the opposite side of the Gloucester and Sharpness Canal. | Air                 | <p>Solvents by their nature may have some odour potential, however, they will be delivered in sealed containers, stored and used within the process building with doors kept shut where possible. There is some external storage of solvents in bunded containers.</p> <p>Thermal oxidiser/scrubber abatement systems are used to minimise risk of odour from the process.</p> <p>The following procedures are incorporated into the site management system to manage the risk from the facility:</p> <p>Inspection, pre-planned maintenance and management procedures reduce the likelihood of leaks and incidents from handling and internal transport of raw materials.</p> <p>Emergency response and shutdown procedures minimise the impact of incidents and ensure that emergencies are dealt with swiftly and safely,</p> <p>Complaints procedure will log any contact with the site from local residents, businesses or the regulator and ensure that an immediate investigation is undertaken.</p> <p>A review of raw materials will be routinely undertaken to identify alternative materials with a lower pollution / odour potential.</p> | Medium - There is the potential for abatement failure. Leaks and spills are possible | Low - Temporary odour annoyance due to low volume of potentially odorous materials used at any one time in the process. | Low – subject to correct management systems being used. |

Table 3-3: Noise and vibration risk assessment and management plan

| Hazard   | Receptor   | Pathway to Receptor | Risk management techniques   | Probability of exposure              | Consequence  | Overall risk |
|--|--|---------------------|--|--------------------------------------|--|--------------|
| Operational activities giving rise to noise and or vibration | The closest residential properties are located on the eastern boundary of the site with the Bristol Road. There are further residential properties approximately 0.07km to the west of the site located at Mainsail Lane on the opposite side of the Gloucester and Sharpness Canal. | Land, air           | <p>A Noise Management Plan will be developed as part of the EMS to ensure:</p> <p>Mitigation of noise from the plant identified in the Noise Assessment Report will be implemented to reduce noise emissions and avoid adverse impacts on residential amenity.</p> <p>All new items of plant are subject to a noise assessment</p> <p>All items of plant and equipment are serviced and maintained following manufacturers recommendations.</p> <p>The complaints procedure is followed in the event that noise or vibration complaints are received.</p> <p>The noise management plan will be regularly reviewed, and the noise assessment repeated periodically and following any major change to the noise profile of the site.</p> | Low (with noise mitigation measures) | High for some residents without noise mitigation measures<br>Noise or Vibration Nuisance | Low          |



Table 3-4: Fugitive emissions risk assessment and management plan

| Hazard  | Receptor   | Pathway to Receptor  | Risk management techniques   | Probability of exposure | Consequence   | Overall risk   |
|---|--|--|--|-------------------------|---|--|
| External storage, handling and use of chemicals – leaks and spillages | The closest residential properties are located on the eastern boundary of the site with the Bristol Road. There are further residential properties approximately 0.07km to the west of the site located at Mainsail Lane on the opposite side of the Gloucester and Sharpness Canal. The site is located adjacent to the Gloucester and Sharpness Canal which runs along the western boundary of the facility. | Air, land, water course. Surface Water Drainage system (release to Canal)  | All hazardous substances stored externally are stored within bunded containers.<br>Externally there are IBCs of waste oil/water stored.<br>As part of the site management systems, emergency response procedures are in place with staff being trained in spillage response.<br>Storage and delivery areas are located on impermeable surfacing with sealed drainage systems.<br>Spillage kits are located nearby to storage areas for use should a spillage occur.  | Low                     | Medium - Release of hazardous liquids, vapours, dust etc, contamination of water course or land | Low– subject to correct management systems being used. |
| Internal storage, handling and use of chemicals – leaks and spillages | Immediate internal area / internal sealed drainage system (below presses)  | Air via uncontrolled release from building, land, water course (internal drainage), Surface Water Drainage system (release to Canal) | All hazardous substances stored internally are kept in dedicated bunded storage areas. All internal surfaces are impermeable.<br>Resin mixing area is internally bunded with impermeable surfacing and sealed drainage.<br>All dispensing of raw materials shall be carried out by trained staff or using automatic systems. Spillage kits are available within the storage and dispensing areas.<br>As part of the site management systems, emergency response procedures will be in place with staff being trained in spillage response. | Low                     | Low - Release of hazardous vapours, dust etc.   | Low – subject to correct management systems being used |

Table 3-5: Accidents risk assessment and management plan

| Hazard  | Receptor  | Pathway to Receptor                      | Risk management techniques  | Probability of exposure | Consequence   | Overall risk   |
|---|---|--|---|-------------------------|---|--|
| Operator error  | Air/land/ groundwater   | Various – dependent on nature of error   | <p>All operational staff will be fully trained and experienced in the key processes for which they are responsible. This includes undertaking activities in line with the standard operating procedures (SOP's) and site environmental management system (EMS).</p> <p>Training will include hazard and fault awareness, and the potential implications of failure to control the associated impact on the environment, as well actions to take in the event of an issue.</p> | Low                     | Low however could be variable depending upon nature of incident.                    | Low - provided operating procedures are followed.      |
| External - Loss / spillage of raw materials / waste during delivery, storage or removal | The closest residential properties are located on the eastern boundary of the site with the Bristol Road. There are further residential properties approximately 0.07km to the west of the site located at Mainsail Lane on the opposite side of the Gloucester and Sharpness Canal. The site is located adjacent to the Gloucester and | Air, surface run off, land, water course | <p>Generally, solvents and chemicals are stored internally in bunded areas. Some solvents are stored externally in dedicated bunded chemical stores. Spillage kits are located nearby to storage areas for use should a spillage occur.</p> <p>As part of the site management systems, emergency response procedures will be in place with staff being trained in spillage response.</p>  | Medium                  | Low - Release of hazardous vapours, dust etc, contamination of water course or land | Low– subject to correct management systems being used. |

| Hazard  | Receptor  | Pathway to Receptor  | Risk management techniques  | Probability of exposure  | Consequence  | Overall risk  |
|---|---|--|---|--|--|---|
|   | Sharpness Canal which runs along the western boundary of the facility.  |  | Storage and delivery areas are located on impermeable surfacing with sealed drainage systems.   |  |  |   |
| Internal - Loss / spillage of raw materials / waste during delivery, storage or removal | Immediate internal area / internal sealed drainage system (below presses)   | Air via uncontrolled release from building, land, water course (internal drainage) | <p>All hazardous substances are kept in dedicated internally bunded storage areas. All internal surfaces are impermeable.</p> <p>All dispensing of raw materials shall be carried out by trained staff or using automatic systems. Spillage kits are available within the storage and dispensing areas.</p> <p>Internal areas (resin mixing area) are bunded and have impermeable surfaces and sealed drain.</p> <p>As part of the site management systems, emergency response procedures will be in place with staff being trained in spillage response.</p> | Low  | Low - Release of hazardous vapours, dust etc.                | Low – subject to correct management systems being used  |
| Failure of thermal oxidiser / scrubber abatement system for the point source emission   | The closest residential properties are located on the eastern boundary of the site with the Bristol Road. There are further residential properties approximately 0.07km | Air  | <p>Emergency response and shutdown procedures will be in place should an issue be detected.</p> <p>Thermal oxidiser and Scrubber systems will be subject to regular</p>   | Low - There is a potential for failure of the thermal oxidiser / scrubber system to fail leading to an abatement failure | Low - Release of hazardous vapours, gases to the environment | Low – subject to correct management systems being used. |

| Hazard  | Receptor   | Pathway to Receptor | Risk management techniques   | Probability of exposure | Consequence   | Overall risk  |
|---|--|---------------------|--|-------------------------|---|---|
|   | to the west of the site located at Mainsail Lane on the opposite side of the Gloucester and Sharpness Canal. The site is located adjacent to the Gloucester and Sharpness Canal which runs along the western boundary of the facility. |                     | inspections, pre-planned maintenance and management procedures<br><br>Failure alarm system with local and remote alert systems   |                         |   |   |
| Chemical reaction from storage of incompatible chemicals, potential for fire, explosion etc | Internal area and immediate area – other businesses and users within Discovery Park adjacent to the facility.  | Air, land, water    | All chemicals/solvents have been assessed to ensure no incompatible chemicals/solvents are stored in proximity.<br><br>All chemicals/solvents are stored in dedicated bunded storage areas internally and externally with sealed drainage / impermeable surfaces.<br><br>Should an incompatible chemical reaction occur, the emergency response procedure will be followed which will be produced as part of the site EMS. | Low                     | Low - Release of hazardous vapours, dust etc, contamination of water course or land | Low – subject to correct management systems being used. |
| Fire involving stored flammable solvents  | Internal area and immediate area – other businesses and users  | Air                 | All solvents are stored in dedicated storage areas to minimise risk of fire.   | Low                     | High - Release of hazardous vapours, dust etc,                                      | Low – subject to correct management systems being used. |

| Hazard                                 | Receptor  | Pathway to Receptor           | Risk management techniques  | Probability of exposure | Consequence   | Overall risk  |
|--|---|-------------------------------|---|-------------------------|---|---|
|  | within Discovery Park adjacent to the facility.       |                               | Only minimum volumes stored as required.<br><br>Staff will be trained in emergency fire procedures and actions to take in the event of a fire at the site.  |                         | contamination of water course or land   |   |
| Breach of site security, vandalism etc | Variable - dependent on nature of the theft/vandalism | Air, land, water              | Site is enclosed with securing fencing and dedicated access systems. Site has secure controlled entry for pedestrians and vehicles.   | Low                     | Low - Release of hazardous vapours, dust etc, contamination of water course or land   | Low – subject to correct management systems being used. |
| Flooding                               | Surface Water   | Surface Water Drainage System | The installation is in flood zone 2. This means it has a medium probability of flooding. (the extent of a flood from rivers or from the sea with up to a 0.1% (1 in 1000) chance of happening in any given year.) | Medium                  | Low - Release of hazardous materials, contamination of water course or land etc. unlikely due to hazardous materials being stored within building or sealed containers so protected from flood waters | Low   |

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## **4 EMISSIONS TO WATER**

### **4.1 Surface Water Runoff**

4.1.1 There are no point source emissions to surface water of wastewaters from the production activities. Clean uncontaminated surface water from outside areas and roof drainage is discharged to the adjacent canal.

### **4.2 Discharge to Sewer**

4.2.1 There are no point source emissions to sewer from the production activities. Waste waters from the presses are collected and oils separated and reused on site. Wastewater from this process is collected in IBC's and sent for processing at permitted facility off site.

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## 5 EMISSIONS TO AIR

### 5.1 Introduction

5.1.1 This section provides an overview of the air quality modelling assessment of point source emissions to air from the installation. The full report is provided in Appendix E of the main application document.

5.1.2 The scope of the assessment has covered the following aspects:

- Emission sources - release point characteristics.
- Emissions screening for further assessment.

### 5.2 Emission Sources

5.2.1 There are eleven emission points to air from the facility, these are as follows:

- thermal oxidiser – VOCs, NO<sub>x</sub>, CO
- scrubber – odour
- dust abatement (x3) – Particulates
- spray booths (x2) – VOCs and Particulates
- gas boilers (x4) – NO<sub>x</sub> and CO

The boilers do not require a permit until 01 January 2029 when the two existing 1.16 MWth boilers fall under the Medium Combustion Plant Directive (MCPD). Two new 700 kWth boilers are below the thresholds for control under either the EP Regulations 2016 or the MCPD).

### 5.3 Emissions Screening

5.3.1 Emissions have been screened for significance against appropriate environmental standards for long-term and short-term exposure in the Air Quality Assessment, included in the application as Appendix E to the main application document. Emissions standards are based on statutory air quality limits where available, and upon human health protection environmental assessment levels (EALs).

5.3.2 For each pollutant considered the Process Environmental Contribution (PEC) is not considered significant at receptors.

5.3.3 Odour from the wet scrubber emissions is not expected to cause any disamenity to residential receptors.

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## 6 CONCLUSIONS

- 6.1.1 The ERA report has been undertaken to assess the likelihood of risk to amenity and sensitive environmental receptors from accidents, incidents and emissions resulting from the activities at the Permali facility.
- 6.1.2 The results of the ERA show that the risk of harm or impact upon amenity from odour, noise and vibration, fugitive emissions, visible plumes, and accidents is “Low”, provided that the current and recommended control measures are implemented, maintained and regularly reviewed.
- 6.1.3 The AQ assessment concludes that the predicted concentrations associated with operations at the site are below the relevant air quality standards at sensitive receptors and the effects of the impacts are not considered to be significant. The resulting air quality effect of the proposed activities is considered to be “not significant” overall.



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## REFERENCES

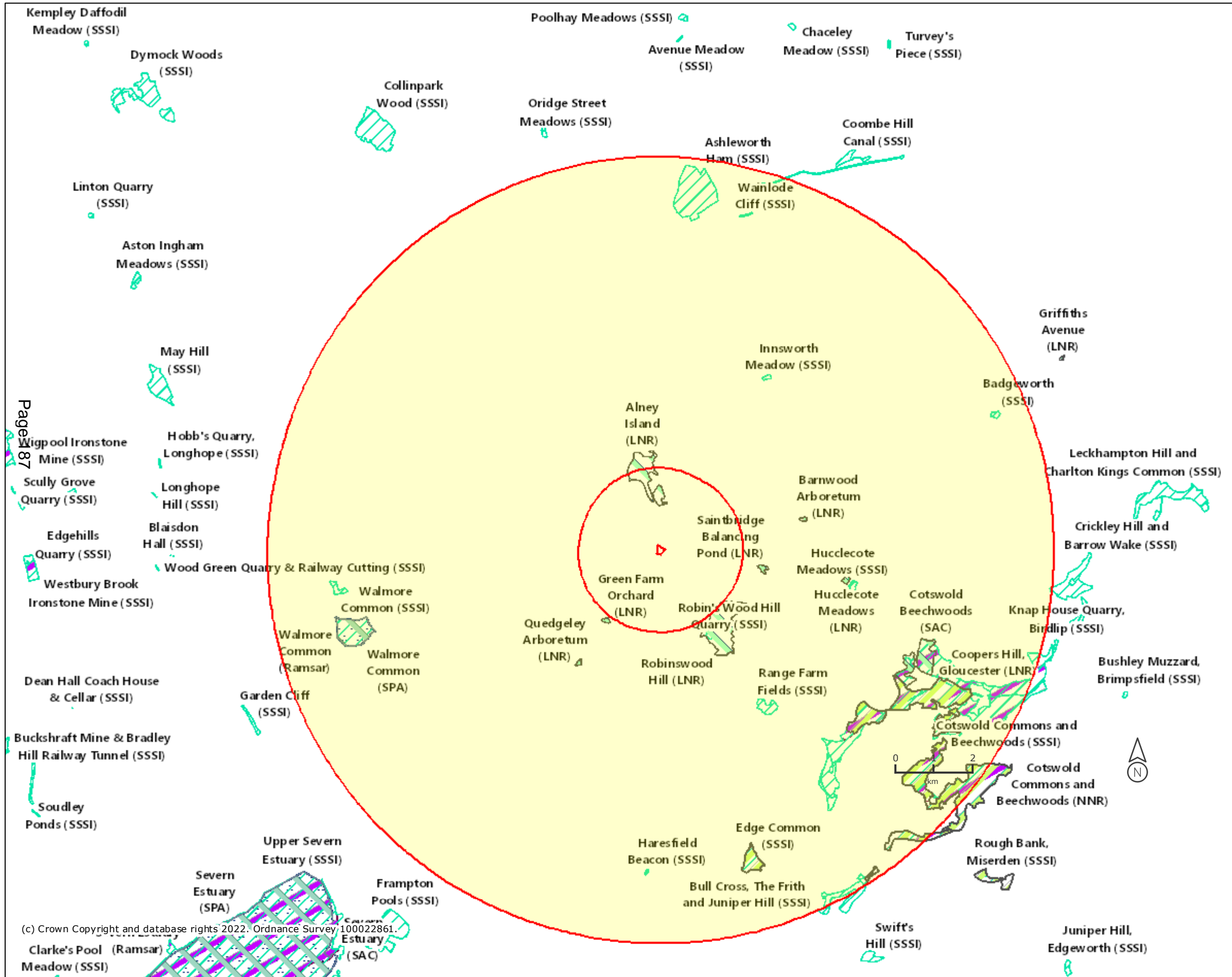
1. Environment Agency's (EA's) Risk Assessments for your environmental permit - <https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit>
1. DEFRA Air Quality Management Area Maps - <https://uk-air.defra.gov.uk/aqma/maps/>
2. British Geological Survey Geology of Britain Viewer - <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>

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## Appendix A MAPS



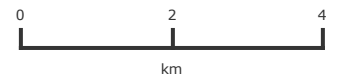
# Permalite 10km Designated Sites Screening



## Legend

-  Local Nature Reserves (England)
-  National Nature Reserves (England)
-  Ramsar Sites (England)
-  Sites of Special Scientific Interest (England)
-  Special Areas of Conservation (England)
-  Special Protection Areas (England)

Projection = OSGB36  
 xmin = 356000  
 ymin = 206200  
 xmax = 406800  
 ymax = 231000



Map produced by MAGIC on 20 September, 2022.  
 Copyright resides with the data suppliers and the map must not be reproduced without their permission. Some information in MAGIC is a snapshot of the information that is being maintained or continually updated by the originating organisation. Please refer to the metadata for details as information may be illustrative or representative rather than definitive at this stage.

# Flood map for planning

|                         |                             |                          |
|-------------------------|-----------------------------|--------------------------|
| Your reference          | Location (easting/northing) | Created                  |
| <b>Permal Flood Map</b> | <b>382328/217128</b>        | <b>12 Sep 2022 17:18</b> |

**Your selected location is in flood zone 2, an area with a medium probability of flooding.**

## This means:

- you must complete a flood risk assessment for development in this area
- you should follow the Environment Agency's standing advice for carrying out a flood risk assessment (see [www.gov.uk/guidance/flood-risk-assessment-standing-advice](http://www.gov.uk/guidance/flood-risk-assessment-standing-advice))

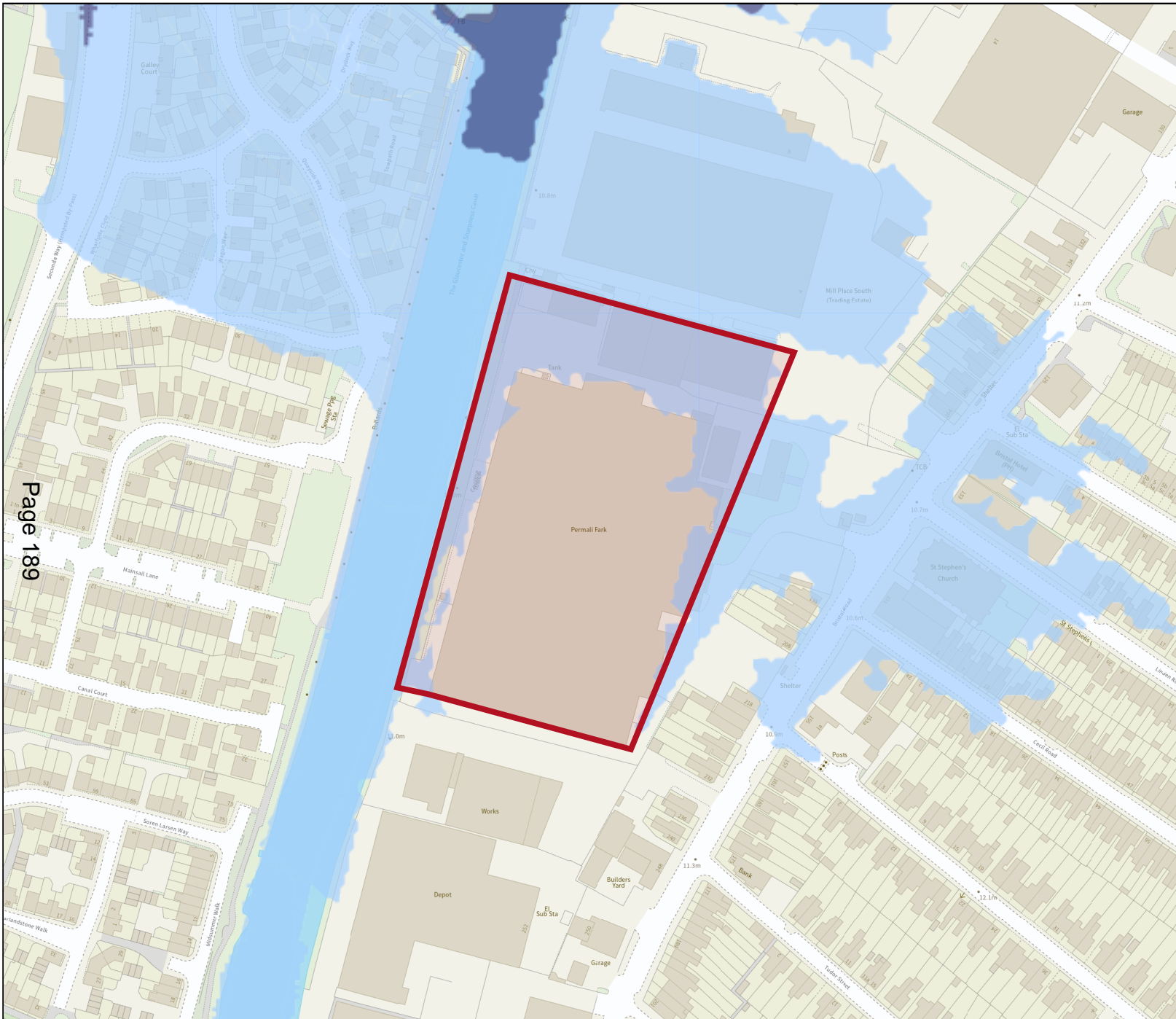
## Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

Flood risk data is covered by the Open Government Licence which sets out the terms and conditions for using government data. <https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2021 OS 100024198. <https://flood-map-for-planning.service.gov.uk/os-terms>



### Flood map for planning

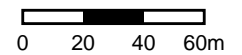
Your reference  
**Permall Flood Map**

Location (easting/northing)  
**382328/217128**

Scale  
**1:2500**

Created  
**12 Sep 2022 17:18**

- Selected area
- Flood zone 3
- Flood zone 3: areas benefiting from flood defences
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Water storage area



# APPLICATION FOR AN ENVIRONMENTAL PERMIT

## Permal Gloucester

### Environmental Risk Assessment (ERA) 2023-02-24

JER9222

1

3

#### Contact

Platform  
New Station Street  
Leeds  
LS1 4JB

+44 1132 206 190

| Customer                  | Customer Site Address | Date       | Ticket | Quantity | Container                     | Material            | EWC Code | Weight (KG)  | Sale Value       |
|---------------------------|-----------------------|------------|--------|----------|-------------------------------|---------------------|----------|--------------|------------------|
| Permal Gloucester Limited | Bristol Road          | 07/05/2021 | 092330 | 1        | 12 cu yd open skip            | Bulky General Waste | 20 03 01 | 0            | £220.00          |
| Permal Gloucester Limited | Bristol Road          | 11/05/2021 | 092512 | 1        | (FWM) 40 cu yd open container | Bulky General Waste | 20 03 01 | 5680         | £1,393.48        |
| Permal Gloucester Limited | Bristol Road          | 26/05/2021 | 093167 | 1        | 12 cu yd open skip            | Bulky General Waste | 20 03 01 | 1400         | £515.40          |
| Permal Gloucester Limited | Bristol Road          | 12/07/2021 | 095050 | 1        | 12 cu yd open skip            | Bulky General Waste | 20 03 01 | 2120         | £667.32          |
| Permal Gloucester Limited | Bristol Road          | 19/08/2021 | 096592 | 1        | 12 cu yd open skip            | Bulky General Waste | 20 03 01 | 1420         | £519.62          |
| Permal Gloucester Limited | Bristol Road          | 15/09/2021 | 097849 | 1        | 12 cu yd open skip            | Bulky General Waste | 20 03 01 | 1200         | £473.20          |
| Permal Gloucester Limited | Bristol Road          | 21/10/2021 | 099407 | 1        | 12 cu yd open skip            | Bulky General Waste | 20 03 01 | 2020         | £646.22          |
| <b>Material Totals:</b>   |                       |            |        | <b>7</b> |                               |                     |          | <b>13840</b> | <b>£4,435.24</b> |

| Customer                  | Customer Site Address | Date       | Ticket | Quantity | Container                   | Material              | EWC Code | Weight (KG)  | Sale Value     | Rebate Unit | Rebate Value   |
|---------------------------|-----------------------|------------|--------|----------|-----------------------------|-----------------------|----------|--------------|----------------|-------------|----------------|
| Permal Gloucester Limited | Bristol Road          | 15/02/2021 | 089215 | 1        | FWM 40 cu yd comp container | Cardboard - Compacted | 15 01 01 | 1780         | £220.00        | £44.00      | £78.32         |
| Permal Gloucester Limited | Bristol Road          | 29/03/2021 | 090677 | 1        | FWM 40 cu yd comp container | Cardboard - Compacted | 15 01 01 | 1920         | £220.00        | £54.00      | £103.68        |
| Permal Gloucester Limited | Bristol Road          | 28/06/2021 | 094379 | 1        | FWM 40 cu yd comp container | Cardboard - Compacted | 15 01 01 | 3420         | £220.00        | £47.00      | £160.74        |
| Permal Gloucester Limited | Bristol Road          | 04/10/2021 | 098748 | 1        | FWM 40 cu yd comp container | Cardboard - Compacted | 15 01 01 | 3140         | £220.00        | £60.00      | £188.40        |
| <b>Material Totals:</b>   |                       |            |        | <b>4</b> |                             |                       |          | <b>10260</b> | <b>£880.00</b> |             | <b>£531.14</b> |

| Customer                  | Customer Site Address | Date       | Ticket | Quantity  | Container                   | Material          | EWC Code | Weight (KG)   | Sale Value        |
|---------------------------|-----------------------|------------|--------|-----------|-----------------------------|-------------------|----------|---------------|-------------------|
| Permal Gloucester Limited | Bristol Road          | 18/01/2021 | 088179 | 1         | FWM 40 cu yd comp container | General Dry Waste | 20 03 01 | 8000          | £1,363.00         |
| Permal Gloucester Limited | Bristol Road          | 03/02/2021 | 088793 | 1         | FWM 40 cu yd comp container | General Dry Waste | 20 03 01 | 6840          | £1,193.64         |
| Permal Gloucester Limited | Bristol Road          | 15/02/2021 | 089093 | 1         | FWM 40 cu yd comp container | General Dry Waste | 20 03 01 | 3180          | £659.28           |
| Permal Gloucester Limited | Bristol Road          | 02/03/2021 | 089783 | 1         | FWM 40 cu yd comp container | General Dry Waste | 20 03 01 | 7560          | £1,298.76         |
| Permal Gloucester Limited | Bristol Road          | 15/03/2021 | 090140 | 1         | FWM 40 cu yd comp container | General Dry Waste | 20 03 01 | 5000          | £925.00           |
| Permal Gloucester Limited | Bristol Road          | 01/04/2021 | 091004 | 1         | FWM 40 cu yd comp container | General Dry Waste | 20 03 01 | 6400          | £1,129.40         |
| Permal Gloucester Limited | Bristol Road          | 19/04/2021 | 091491 | 1         | FWM 40 cu yd comp container | General Dry Waste | 20 03 01 | 3760          | £743.96           |
| Permal Gloucester Limited | Bristol Road          | 05/05/2021 | 092256 | 1         | FWM 40 cu yd comp container | General Dry Waste | 20 03 01 | 6020          | £1,073.92         |
| Permal Gloucester Limited | Bristol Road          | 19/05/2021 | 092907 | 1         | FWM 40 cu yd comp container | General Dry Waste | 20 03 01 | 5180          | £951.28           |
| Permal Gloucester Limited | Bristol Road          | 09/06/2021 | 093475 | 1         | FWM 40 cu yd comp container | General Dry Waste | 20 03 01 | 6320          | £1,171.44         |
| Permal Gloucester Limited | Bristol Road          | 21/06/2021 | 094200 | 1         | FWM 40 cu yd comp container | General Dry Waste | 20 03 01 | 4460          | £884.07           |
| Permal Gloucester Limited | Bristol Road          | 14/07/2021 | 094879 | 1         | FWM 40 cu yd comp container | General Dry Waste | 20 03 01 | 6660          | £1,223.97         |
| Permal Gloucester Limited | Bristol Road          | 29/07/2021 | 095742 | 1         | FWM 40 cu yd comp container | General Dry Waste | 20 03 01 | 5400          | £1,029.30         |
| Permal Gloucester Limited | Bristol Road          | 12/08/2021 | 096232 | 1         | FWM 40 cu yd comp container | General Dry Waste | 20 03 01 | 6040          | £1,128.18         |
| Permal Gloucester Limited | Bristol Road          | 20/08/2021 | 096631 | 1         | FWM 40 cu yd comp container | General Dry Waste | 20 03 01 | 5580          | £1,057.11         |
| Permal Gloucester Limited | Bristol Road          | 06/09/2021 | 097315 | 1         | FWM 40 cu yd comp container | General Dry Waste | 20 03 01 | 4960          | £961.32           |
| Permal Gloucester Limited | Bristol Road          | 22/09/2021 | 098080 | 1         | FWM 40 cu yd comp container | General Dry Waste | 20 03 01 | 5720          | £1,078.74         |
| Permal Gloucester Limited | Bristol Road          | 25/11/2021 | 100968 | 1         | FWM 40 cu yd comp container | General Dry Waste | 20 03 01 | 3980          | £809.91           |
| <b>Material Totals:</b>   |                       |            |        | <b>18</b> |                             |                   |          | <b>101060</b> | <b>£18,682.28</b> |

| Customer                  | Customer Site Address | Date       | Ticket | Quantity | Container                     | Material          | EWC Code | Weight (KG) | Sale Value |
|---------------------------|-----------------------|------------|--------|----------|-------------------------------|-------------------|----------|-------------|------------|
| Permal Gloucester Limited | Bristol Road          | 04/01/2021 | 087484 | 1        | (FWM) 40 cu yd open container | General Dry Waste | 20 03 01 | 3620        | £723.52    |
| Permal Gloucester Limited | Bristol Road          | 26/01/2021 | 088439 | 1        | (FWM) 40 cu yd open container | General Dry Waste | 20 03 01 | 5460        | £992.16    |
| Permal Gloucester Limited | Bristol Road          | 10/02/2021 | 089037 | 1        | (FWM) 40 cu yd open container | General Dry Waste | 20 03 01 | 5200        | £954.20    |
| Permal Gloucester Limited | Bristol Road          | 25/02/2021 | 089601 | 1        | (FWM) 40 cu yd open container | General Dry Waste | 20 03 01 | 5520        | £1,000.92  |
| Permal Gloucester Limited | Bristol Road          | 09/03/2021 | 090053 | 1        | (FWM) 40 cu yd open container | General Dry Waste | 20 03 01 | 480         | £296.00    |
| Permal Gloucester Limited | Bristol Road          | 10/03/2021 | 090072 | 1        | (FWM) 40 cu yd open container | General Dry Waste | 20 03 01 | 3980        | £776.08    |
| Permal Gloucester Limited | Bristol Road          | 29/03/2021 | 090678 | 1        | (FWM) 40 cu yd open container | General Dry Waste | 20 03 01 | 3960        | £773.16    |
| Permal Gloucester Limited | Bristol Road          | 19/04/2021 | 091492 | 1        | (FWM) 40 cu yd open container | General Dry Waste | 20 03 01 | 4940        | £916.24    |
| Permal Gloucester Limited | Bristol Road          | 03/06/2021 | 093474 | 1        | (FWM) 40 cu yd open container | General Dry Waste | 20 03 01 | 5720        | £1,030.12  |
| Permal Gloucester Limited | Bristol Road          | 13/07/2021 | 095052 | 1        | (FWM) 40 cu yd open container | General Dry Waste | 20 03 01 | 6080        | £1,134.36  |
| Permal Gloucester Limited | Bristol Road          | 10/08/2021 | 096067 | 1        | (FWM) 40 cu yd open container | General Dry Waste | 20 03 01 | 4340        | £865.53    |
| Permal Gloucester Limited | Bristol Road          | 20/08/2021 | 096632 | 1        | (FWM) 40 cu yd open container | General Dry Waste | 20 03 01 | 5060        | £976.77    |
| Permal Gloucester Limited | Bristol Road          | 02/09/2021 | 097262 | 1        | (FWM) 40 cu yd open container | General Dry Waste | 20 03 01 | 4340        | £865.53    |
| Permal Gloucester Limited | Bristol Road          | 24/09/2021 | 098187 | 1        | (FWM) 40 cu yd open container | General Dry Waste | 20 03 01 | 4620        | £908.79    |
| Permal Gloucester Limited | Bristol Road          | 30/09/2021 | 098507 | 1        | (FWM) 40 cu yd open container | General Dry Waste | 20 03 01 | 0           | £235.00    |
| Permal Gloucester Limited | Bristol Road          | 12/10/2021 | 099030 | 1        | (FWM) 40 cu yd open container | General Dry Waste | 20 03 01 | 4600        | £905.70    |
| Permal Gloucester Limited | Bristol Road          | 20/10/2021 | 099324 | 1        | (FWM) 40 cu yd open container | General Dry Waste | 20 03 01 | 4620        | £908.79    |
| Permal Gloucester Limited | Bristol Road          | 27/10/2021 | 099546 | 1        | (FWM) 40 cu yd open container | General Dry Waste | 20 03 01 | 2920        | £646.14    |
| Permal Gloucester Limited | Bristol Road          | 03/11/2021 | 099864 | 1        | (FWM) 40 cu yd open container | General Dry Waste | 20 03 01 | 2700        | £612.15    |
| Permal Gloucester Limited | Bristol Road          | 10/11/2021 | 100152 | 1        | (FWM) 40 cu yd open container | General Dry Waste | 20 03 01 | 3600        | £751.20    |
| Permal Gloucester Limited | Bristol Road          | 17/11/2021 | 100446 | 1        | (FWM) 40 cu yd open container | General Dry Waste | 20 03 01 | 4280        | £856.26    |
| Permal Gloucester Limited | Bristol Road          | 24/11/2021 | 100824 | 1        | (FWM) 40 cu yd open container | General Dry Waste | 20 03 01 | 2960        | £652.32    |
| Permal Gloucester Limited | Bristol Road          | 01/12/2021 | 101097 | 1        | (FWM) 40 cu yd open container | General Dry Waste | 20 03 01 | 4600        | £905.70    |
| Permal Gloucester Limited | Bristol Road          | 08/12/2021 | 101427 | 1        | (FWM) 40 cu yd open container | General Dry Waste | 20 03 01 | 4380        | £871.71    |
| Permal Gloucester Limited | Bristol Road          | 15/12/2021 | 101871 | 1        | (FWM) 40 cu yd open container | General Dry Waste | 20 03 01 | 3220        | £692.49    |

**Material Totals:** 25 101200 £20,250.84

| Customer                  | Customer Site Address | Date       | Ticket | Quantity | Container                 | Material    | EWC Code | Weight (KG)  | Sale Value        |
|---------------------------|-----------------------|------------|--------|----------|---------------------------|-------------|----------|--------------|-------------------|
| Permal Gloucester Limited | Bristol Road          | 10/02/2021 | 088784 | 1        | (FWM) Artic Curtain Sided | Garnet Sand | 12 01 17 | 12420        | £1,561.20         |
| Permal Gloucester Limited | Bristol Road          | 12/03/2021 | 090097 | 1        | (FWM) Rigid Curtainsider  | Garnet Sand | 12 01 17 | 15120        | £1,858.20         |
| Permal Gloucester Limited | Bristol Road          | 12/05/2021 | 092332 | 1        | (FWM) Artic Curtain Sided | Garnet Sand | 12 01 17 | 23400        | £2,769.00         |
| Permal Gloucester Limited | Bristol Road          | 06/07/2021 | 094542 | 1        | (FWM) Artic Curtain Sided | Garnet Sand | 12 01 17 | 13240        | £1,651.40         |
| Permal Gloucester Limited | Bristol Road          | 16/09/2021 | 097438 | 1        | (FWM) Artic Curtain Sided | Garnet Sand | 12 01 17 | 16320        | £1,990.20         |
| Permal Gloucester Limited | Bristol Road          | 15/10/2021 | 098750 | 1        | (FWM) Artic Curtain Sided | Garnet Sand | 12 01 17 | 8060         | £1,081.60         |
| <b>Material Totals:</b>   |                       |            |        | <b>6</b> |                           |             |          | <b>88560</b> | <b>£10,911.60</b> |

| Customer                  | Customer Site Address | Date       | Ticket | Quantity  | Container                     | Material             | EWC Code | Weight (KG)   | Sale Value        |
|---------------------------|-----------------------|------------|--------|-----------|-------------------------------|----------------------|----------|---------------|-------------------|
| Permal Gloucester Limited | Bristol Road          | 04/01/2021 | 087485 | 1         | (FWM) 40 cu yd open container | Wood - Dirty Grade C | 17 02 01 | 1860          | £336.25           |
| Permal Gloucester Limited | Bristol Road          | 20/01/2021 | 088212 | 1         | (FWM) 40 cu yd open container | Wood - Dirty Grade C | 17 02 01 | 1340          | £303.75           |
| Permal Gloucester Limited | Bristol Road          | 04/02/2021 | 088794 | 1         | (FWM) 40 cu yd open container | Wood - Dirty Grade C | 17 02 01 | 2060          | £348.75           |
| Permal Gloucester Limited | Bristol Road          | 25/02/2021 | 089600 | 1         | (FWM) 40 cu yd open container | Wood - Dirty Grade C | 17 02 01 | 2200          | £220.00           |
| Permal Gloucester Limited | Bristol Road          | 10/03/2021 | 090073 | 1         | (FWM) 40 cu yd open container | Wood - Dirty Grade C | 17 02 01 | 1620          | £321.25           |
| Permal Gloucester Limited | Bristol Road          | 30/03/2021 | 090867 | 1         | (FWM) 40 cu yd open container | Wood - Dirty Grade C | 17 02 01 | 1980          | £343.75           |
| Permal Gloucester Limited | Bristol Road          | 26/04/2021 | 091807 | 1         | (FWM) 40 cu yd open container | Wood - Dirty Grade C | 17 02 01 | 1940          | £341.25           |
| Permal Gloucester Limited | Bristol Road          | 11/05/2021 | 092513 | 1         | (FWM) 40 cu yd open container | Wood - Dirty Grade C | 17 02 01 | 1960          | £342.50           |
| Permal Gloucester Limited | Bristol Road          | 26/05/2021 | 093184 | 1         | (FWM) 40 cu yd open container | Wood - Dirty Grade C | 17 02 01 | 2520          | £377.50           |
| Permal Gloucester Limited | Bristol Road          | 21/06/2021 | 094058 | 1         | (FWM) 40 cu yd open container | Wood - Dirty Grade C | 17 02 01 | 2260          | £361.25           |
| Permal Gloucester Limited | Bristol Road          | 03/07/2021 | 095051 | 1         | (FWM) 40 cu yd open container | Wood - Dirty Grade C | 17 02 01 | 2400          | £370.00           |
| Permal Gloucester Limited | Bristol Road          | 02/08/2021 | 095743 | 1         | (FWM) 40 cu yd open container | Wood - Dirty Grade C | 17 02 01 | 1780          | £331.25           |
| Permal Gloucester Limited | Bristol Road          | 11/08/2021 | 096255 | 1         | (FWM) 40 cu yd open container | Wood - Dirty Grade C | 17 02 01 | 1900          | £338.75           |
| Permal Gloucester Limited | Bristol Road          | 02/09/2021 | 097261 | 1         | (FWM) 40 cu yd open container | Wood - Dirty Grade C | 17 02 01 | 2460          | £373.75           |
| Permal Gloucester Limited | Bristol Road          | 27/09/2021 | 098188 | 1         | (FWM) 40 cu yd open container | Wood - Dirty Grade C | 17 02 01 | 1880          | £337.50           |
| Permal Gloucester Limited | Bristol Road          | 12/10/2021 | 099029 | 1         | (FWM) 40 cu yd open container | Wood - Dirty Grade C | 17 02 01 | 1840          | £335.00           |
| Permal Gloucester Limited | Bristol Road          | 29/10/2021 | 099767 | 1         | (FWM) 40 cu yd open container | Wood - Dirty Grade C | 17 02 01 | 1820          | £333.75           |
| Permal Gloucester Limited | Bristol Road          | 15/11/2021 | 100396 | 1         | (FWM) 40 cu yd open container | Wood - Dirty Grade C | 17 02 01 | 1800          | £332.50           |
| <b>Material Totals:</b>   |                       |            |        | <b>18</b> |                               |                      |          | <b>35620</b>  | <b>£6,048.75</b>  |
| <b>Site Totals:</b>       |                       |            |        | <b>78</b> |                               |                      |          | <b>350540</b> | <b>£61,208.71</b> |

£531.14



## Further Information Notice

Information Request ref: Permali1

**Gloucester City Council**  
**The Environmental Permitting (England and Wales) Regulations 2016 Schedule 5, paragraph 4**

### Further Information Notice

To: Permali Gloucester Limited, 170 Bristol Road, Gloucester, GL1 5TT.

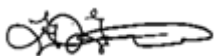
Gloucester City Council (“the Council”), in the exercise of the powers conferred upon it by paragraph 4 of Schedule 5 of the Environmental Permitting (England and Wales) Regulations 2016 (“the 2016 Regulations”) hereby requires you-

- (a) to furnish the Council at the address set out below the information specified in the Schedule attached to this Notice (“the Schedule”), being information which the Council requires for the purpose of determining your application dated 3<sup>rd</sup> March 2023;
- (b) to furnish that information in writing / in electronic format;
- (c) to furnish that information by the date specified in the Schedule attached to this Notice.

Worcestershire Regulatory Services  
Wyre Forest House  
Finepoint Way  
Kidderminster  
DY11 7WF

Email: [enquires@worcsregservices.gov.uk](mailto:enquires@worcsregservices.gov.uk)

Signed on behalf of Gloucester City Council




..... Dated: 27 July 2023  
Gupti Gosine (Community Wellbeing Manager)  
An authorised officer of the Council.

## SCHEDULE

| INFORMATION TO BE SUPPLIED TO THE COUNCIL   | FORMAT OF THE SUBMISSION         | DEADLINE FOR THE SUBMISSION  |
|---|----------------------------------|------------------------------|
| Updated site layout drawing for publication detailing all abated and unabated emission points for the solvent impregnation activity.  | In writing or electronic format. | 5 <sup>th</sup> October 2023 |
| A Noise Action Plan detailing the actual noise mitigation measures to be employed to the thermal oxidiser, carbon filter and the dust abatement plants adjacent to the canal and their predicted cumulative impact (when assessed in line with BS4142:2014+A1:2019) | In writing or electronic format. | 5 <sup>th</sup> October 2023 |
| A Noise Management Plan (NMP) detailing the company policy and operational measures to be employed to minimise noise from the installation, noise monitoring, dealing with noise complaints and maintaining the NMP.  | In writing or electronic format. | 5 <sup>th</sup> October 2023 |
| An Odour Management Plan (OMP) detailing the company policy and the operational measures to be employed to minimise odour from the installation, odour monitoring, dealing with odour complaints and maintaining the OMP.   | In writing or electronic format. | 5 <sup>th</sup> October 2023 |
| An emissions test report for the new thermal oxidiser to demonstrate compliance with the 20mg/m <sup>3</sup> VOC emission limit.  | In writing or electronic format. | 5 <sup>th</sup> October 2023 |
| Details of extraction flow rates and on-times from all unabated press and lay-up (emission point 8) emissions to atmosphere at the expected full production capacity.   | In writing or electronic format. | 5 <sup>th</sup> October 2023 |

|   |   |                                    |
|---|---|------------------------------------|
| <p>An emission(s) test report from a representative press / presses &amp; the lay-up activity (emission point 8) which shall separately identify potentially odorous components and total VOCs.</p> | <p>In writing or electronic format.</p> | <p>5<sup>th</sup> October 2023</p> |
|---|---|------------------------------------|

Signed on behalf of Gloucester City Council



.....  
 Gupti Gosine (Community Wellbeing Manager)  
 An authorised officer of the Council

Dated: 27 July 2023

## **Guidance for operators receiving a Further Information Notice**

(This guidance does not form part of the Further Information Notice, but it is for the guidance of those served with the notice. More guidance can be found in the PPC [General Guidance Manual](#).)

### Dealing with a Further Information Notice

The Council has accepted your application for a PPC permit as duly-made, but considers it requires further information in order to determine the application.

The legal person/individual named in this Notice is required to supply the information detailed in the Notice or attached Schedule within the timescale specified.

### Confidentiality

An applicant may request certain information to remain confidential, i.e. not be placed on the public register. The applicant must request the exclusion from the public register of confidential information at the time of supply of the information requested by this notice or any other notice. The applicant should provide clear justification for each item wishing to be kept from the register. The onus is on the applicant to provide a clear justification for each item to be kept from the register.

The test of whether information is confidential for the purposes of being withheld from the public register is complex and is explained, together with the procedures, in chapter 8 of the PPC General Guidance Manual.

### National security

Information may be excluded from the public register on the grounds of national security. If it is considered that the inclusion of information on a public register is contrary to the interests of national security, the applicant may apply to the Secretary of State/Welsh Ministers, specifying the information and indicating the apparent nature of risk to national security. The applicant must inform the local authority of such an application, who will not include the information on the public register until the Secretary of State/Welsh Ministers has decided the matter.

### Failure to comply, and appeals

**If an applicant fails to provide the information specified in a Further Information Notice by the deadline given, the local authority may serve a further notice on the applicant stating that the application is deemed to be withdrawn.** The applicant is not entitled to the return of his/her application fee in such cases.

The applicant has 15 working days from the date the notice of deemed withdrawal is served within which to appeal under regulation 31(1)(d) against the deemed withdrawal.



**PERMALI GLOUCESTER LTD**  
**Bristol Road, Gloucester**

**NOISE IMPACT ASSESSMENT**  
**&**  
**BARRIER / MITIGATION DESIGN**

**Giles Parker MA Cantab, MIOA, MIMechE**

**September 2023**

# Document Control Sheet

|                       |  |
|-----------------------|--|
| <b>Project Title</b>  | <b>Permali Gloucester Ltd</b>                                    |
| <b>Document Title</b> | <b>Noise Impact Assessment &amp; Barrier / Mitigation Design</b> |
| <b>Issue Version</b>  | <b>04</b>  |
| <b>Status</b>         | <b>Final</b>   |
| <b>Control Date</b>   | <b>29<sup>th</sup> September 2023</b>                            |

## *Record of Issue*

| Issue     | Status          | Author      | Date            | Check      | Date            | Authorised | Date |
|-----------|-----------------|-------------|-----------------|------------|-----------------|------------|------|
| <b>01</b> | <b>Replaced</b> | <b>GFHP</b> | <b>28/06/23</b> | <b>BDS</b> | <b>29/06/23</b> |            |      |
| <b>02</b> | <b>Replaced</b> | <b>GFHP</b> | <b>20/07/23</b> | <b>BDS</b> | <b>20/07/23</b> |            |      |
| <b>03</b> | <b>Replaced</b> | <b>GFHP</b> | <b>21/09/23</b> | <b>BDS</b> | <b>22/09/23</b> |            |      |
| <b>04</b> | <b>Final</b>    | <b>GFHP</b> | <b>29/09/23</b> | <b>BDS</b> | <b>29/09/23</b> |            |      |

## **Confidentiality & Copyright**

*This report is supplied in trust and on the understanding that the sum and all parts thereof will be held confidentially and not disclosed to any third parties without the prior written consent of Sound Barrier Solutions Ltd. All rights reserved.*

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Map 4: Permali Site – Night – No Mitigation

Map 5: Permali Site – Night – 6m x 125m Barrier + 44m Temp + Add Mitign

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# 1. INTRODUCTION

## **Aim of the Study**

- 1.1. Sound Barrier Solutions Ltd have been instructed by Permal Gloucester Ltd to provide a noise mitigation design scheme for their existing factory on Bristol Road, Gloucester to protect residential homes situated on the opposite bank of the Gloucester & Sharpness Canal.
- 1.2. For context, the factory has been operating for well over 50 years and so the current background sound climate will include for an existing industrial component. In contrast the housing opposite is relatively new. What is being assessed here is the impact of recent on-site development and the inclusion of new operating equipment located external to the factory building itself and situated within the canal facing boundary.
- 1.3. The noise mitigation scheme will comprise fundamentally of a suitable noise barrier scheme in combination with proposed mitigation of operating plant at source. This study will examine the inclusion of noise barriers of different heights and then determine what level of mitigation, if any, will be required for the operating plant for both day and night conditions.
- 1.4. This assessment has been carried out in accordance with the standard BS4142:2014+A1:2019 ‘Methods for Rating and Assessing Industrial and Commercial Sound’ and makes reference to WHO guidelines for day/night noise and to the change in noise level associated with the factory operation. This will be in line with the Environmental Permitting Regulations (EPR) using Best Available Techniques (BAT).
- 1.5. This assessment is based on a combination of on-site noise measurements in close proximity to the sources and on industry standard noise modelling predictive calculation. Background and residual noise measurements obtained from previous studies prior to the new operating plant being installed (see below) are utilised in the assessment to determine the level of day/night noise mitigation that is required.

## **Phasing the Barrier Installation**

- 1.6. This assessment proposes noise mitigation measures in order for the operating site to meet the noise criteria of the standard and guidelines for both daytime and night-time conditions. The optimum mitigation scheme in the assessment includes a 125m long 6m high plastic absorptive noise barrier. The recommended specification was for a high performance plastic absorptive barrier system: PolySoundBlok which is supplied and installed by Gramm Barrier Systems. The mitigation scheme also requires the attenuation by 2dB off three dominant sources from their current sound state: The V9 Cyclo-Filter & Valve the V9 Fan and the Dust Plant-5.
- 1.7. A 44m long northern barrier section will also be required to shield the Regenerative Thermal Oxidiser – RTO which has been fitted with a housing for noise attenuation treatment at source. This barrier section will be treated as “Phase 2”. The object of this study was also to confirm its dimensions to ensure the requirements of the Environmental Permit are fully met. In the mean-time, a temporary noise barrier

structure has been installed in front of the RTO to enable normal operations to continue. The acoustic performance of the interim temporary barrier will therefore also be confirmed in this study.

## **Background and Previous Studies**

- 1.8. Whilst the factory has been operating for many decades, new operating plant has been installed and is either already in full operation or in the process of being installed and commissioned. This plant is covered in this assessment, is listed in Chapter 4 and includes: The V9 Cyclo-Filter Fan Housing, the V9 Cyclo-Filter & Rotary Valve, the Dust Plant-5, two Water Cooling Towers, the Boiler Building, Scrubbers, the new Regenerative Thermal Oxidiser and a Carbon Filter. We also observed the transient impact of an existing Boiler Vent, though its mitigation was considered outside the scope of this study.
- 1.9. Previous studies had been carried out by both RPS Group plc and by INVC (Industrial Noise & Vibration Centre). Both of these studies are referenced in this study where they provide an important foundation to the analysis here and provide useful data relevant to the design and mitigation stages. This ensures a seamless approach connecting this assessment and design to past work and avoids unnecessary duplication.
- 1.10. As stated above, the RPS Report : Noise Impact Assessment for Environmental Permitting (Dec 2022) provided an initial predictive permitting noise assessment of the proposed operations prior to their installation. It also provides useful measured background and residual noise levels prior to the new plant being installed. This would otherwise be difficult to obtain without shutting off all the new plant since the new plant is assumed to operate relatively continuously.
- 1.11. The INVC Report : Best Practicable Means (BPM) Noise Control Audit (Jun 2023) provides an analysis of the noise mitigation methodology for the specific operating plant at source. This also provides useful noise measurement data at a control location on the opposite canal bank from the factory for different combinations of operating plant sources. This will be used in our analysis to validate the computer noise model.

## **2. ASSESSMENT CRITERIA**

### **Noise Policy Statement for England: NPSE**

- 2.1. The NPSE: Noise Policy Statement for England aims *‘through the effective management and control of environmental, neighbour a neighbourhood noise within the context of Government policy on sustainable development to:*
- *avoid significant adverse impacts on health and quality of life;*
  - *mitigate and minimise adverse impacts on health and quality of life; and*
  - *where possible, contribute to the improvement of health and quality of life.*
- 2.2. NPSE provides guidance which enables decisions to be made regarding the acceptable noise burden to place on society, using three key phrases – the No Observed Effect Level (NOEL), the Lowest Observed Adverse

Effect Level (LOAEL) and the Significant Observed Adverse Effect Level (SOAEL). LOAEL is defined in NPSE as the level above which adverse effects on health and quality of life can be detected.

- 2.3. These key phrases are referred to in this study. There are also the NPPG Observed Effect Level descriptions provided in Appendix D. These describe the perception, example of outcome and potential action associated with each observed effect level.

## **EPR and BAT**

- 2.4. This assessment will be in line with the Environmental Permitting Regulations (EPR) using Best Available Techniques (BAT). The Environmental Permit was obtained through the RPS noise assessment. EPR requires that installations should be operated in such a way that all appropriate preventative measures are taken against pollution. BAT includes both the technology used and the way in which the installation is designed, built, operated and decommissioned.
- 2.5. As experts in the noise barrier industry, Sound Barrier Solutions Ltd have chaired the BSI committee for road traffic noise barrier design for over 20 years. In this role we have co-authored all the specification standards for UK and European road traffic noise barriers. These specifications have fed directly into the Industrial market also and are considered Best Practicable Means (BPM) in the industry. They cover the acoustic, mechanical, structural performance of the noise barrier system as well as its physical and performance durability. Applying this level of specification the barrier scheme design in this study will provide the required BAT approach.

## **BS4142:2014+A1:2019 Requirements**

- 2.6. BS4142:2014+A1:2019 – ‘Methods for Rating and Assessing Industrial and Commercial Sound’ is the most applicable standard for the assessment of noise from the Permali Gloucester factory. This study used BS4142:2014+A1:2019 to assess the Specific Noise Impact associated with the new plant listed in Chapter 4 and para 1.8 above for both day and night conditions.
- 2.7. Chapter 4 in this study identifies each plant element and provides the measured noise levels generated by the plant in close proximity and at different heights. These measurements are used to predict the overall cumulative Specific Noise Level of all the plant elements that is transmitted to the residential noise sensitive receivers (NSRs) on the opposite bank of the canal. The Specific noise level is calculated directly from validated noise modelling (which is in line with clause 7.3.6 of BS4142).
- 2.8. A feature correction factor is added to the Specific Noise Level to give the Rating level. This factor is dependent on whether it is tonal, impulsive, intermittent or generally distinctive in nature and then whether this characteristic is just perceptible, clearly perceptible or highly perceptible.

- 2.9. During the daytime (07:00 to 23:00), the standard requires the Rating level to be determined from the  $L_{Aeq_{1hour}}$  for daytime operations. In other words, it needs to take into account a typical 1-hour period during which the process being assessed was active.
- 2.10. During the early morning and night-time (23:00 to 07:00), the standard requires the Rating level to be determined from the  $L_{Aeq_{15min}}$  for night-time operations. In other words, it needs to take into account a typical 15-minute period during which the process being assessed was active.
- 2.11. For Permal Gloucester Ltd it is assumed that all the new plant is active relatively continuously, for both day and night conditions. In other words for any typical daytime hour, or any typical night time 15 minute period, all the plant is 100% operational.
- 2.12. The Rating level is then compared to the Background noise level. A difference of +10dB over the background indicates a Significant Adverse Impact (SOAEL). A difference of 5 to 9dB indicates an Adverse Impact, a difference of -9 to 4 dB indicates a Low Impact (LOAEL) and a difference of -10dB or lower indicates No Impact (NOEL). This is all depending on the context.

### WHO Guidelines for Community Noise

- 2.13. Consistent with the RPS report our assessment will consider the noise impact in accordance with the WHO Guidelines for Community Noise. For external daytime levels it is considered desirable for a new development that the outdoor sound level should not exceed 50dBA  $L_{Aeq,T}$ . This is equivalent to a free field level of 47dBA  $L_{Aeq}$  at a distance of 1m from a property façade.
- 2.14. At night, the limit for sleep disturbance is equivalent to an internal noise level of 30 dBA  $L_{Aeq_{8hr}}$ . Assuming a partially open window this is equivalent to an external level of 45 dBA  $L_{Aeq_{8hr}}$  or a free field external level of 42 dBA  $L_{Aeq_{8hr}}$  at a distance of 1m from a property façade.
- 2.15. These criteria are also in broad agreement with the Night Noise Guidelines for Europe.

### IOA/CIEH Guidelines for Level Change

- 2.16. The IOA/CIEH Working party produced guidelines to assess the impact of a change to the ambient noise level in terms of the subjective response and its significance. The impact scale adopted in the assessment is shown in the table below. This scale is now readily accepted in environmental noise assessments for transport, industrial and construction applications.

| Change in Noise Level<br>dB(A) | Subjective Response                        | Significance       |
|--------------------------------|--|--------------------|
| 0                              | No change                                  | No Impact          |
| 0.1 - 2.9                      | Barely Perceptible                         | Minor Impact       |
| 3.0 - 4.9                      | Noticeable                                 | Moderate Impact    |
| 5.0 - 9.9                      | Up to a doubling or halving of<br>loudness | Substantial Impact |

- 2.17. This scale can be related directly to the NPSE guidance effect levels (see below). Avoiding an increase in the cumulative noise level of +3dB would be to avoid adverse impact.

| Change in Noise Level<br>dB(A) | NPSE Effect Level |
|--------------------------------|-------------------|
| 0                              | NOEL              |
| 0.1 - 2.9                      | LOAEL             |
| 3.0 - 4.9                      | ADVERSE           |
| 5.0 - 9.9                      | SOAEL             |

### 3. SOURCE NOISE SURVEY – JUN & SEP 2023

#### Survey Approach – On Site Sources

- 3.1. On Thursday 8<sup>th</sup> June 2023, an 01-dB Fusion real-time noise analyser was used to carry out short term close-proximity measurements to characterise the noise of the specific plant sources on site. On Wednesday 12<sup>th</sup> July 2023, a further short term noise survey was carried out in close-proximity (1.0m) from the Fan/Motor of the operating RTO once it had been installed and commissioned. This highlighted the existence of high frequency tonal noise from the RTO Fan/Motor.
- 3.2. The Fan/Motor has subsequently been attenuated and an acoustic housing installed over it. A further survey was therefore been carried out on Thursday 7<sup>th</sup> September 2023 of the RTO (housed) and the recently installed Carbon Filter in operation. Table 1 provides a list of all the sources individually monitored, the distance from the source and importantly the height of monitoring.
- 3.3. A max 10 metre high tripod was utilised to determine the variation in noise transmitted from each source at different heights. The V9 Cyclo-Filter Fan Housing is generating noise through its casing as is the Cyclo-Filter itself (it was not all concentrated at the Valve). This was also true for the Dust Plant 5 Outlet and Inlet and for the Water Cooling Towers.
- 3.4. Previous studies had based their noise predictive analysis on assumed relatively low-height noise sources. It was however essential to characterise the noise being transmitted at higher positions especially when considering the installation of noise barriers at different heights. Full 1/3 octave frequency spectra were also measured to correctly simulate the noise sources in the model. All the sources monitored were continuous in nature so relatively short duration measurements were required.
- 3.5. Depending on the noise source, measurements were therefore taken up to a height of more than 8.5 metres. So for example, should a 5 metre high barrier be installed it is essential to know what quantity of the source noise is still being transmitted unshielded at heights of 5 – 8.5 metres.

## Measurement Apparatus

3.6. For the noise survey the following was deployed:

|                                 |                            |  |
|---------------------------------|----------------------------|--|
| Integrating Real Time Analysers | 01-dB type FUSION (type 1) | Calibrated:<br>26 <sup>th</sup> Oct 2021 |
| Microphones:                    | 01-dB type 40CD half inch  | Calibrated:<br>26 <sup>th</sup> Oct 2021 |
| Calibrator:                     | 01-dB type CAL31 (class 1) | Calibrated:<br>26 <sup>th</sup> Oct 2021 |
| 10m tripod:                     | N/A                        | N/A                                      |

3.7. The analyser was verified according to the procedure given in BS7580:1997. The analyser also conforms to BS7580:1997 verifying conformance to BSEN60851:1994 Type 1, BSEN60804:1994 Type 1. Calibration certificates are available on request.

3.8. Weather conditions during the monitoring time were good, there was no rain and wind speeds were very low. Conditions were ideal for this type of noise monitoring.

## 4. CHARACTERISING THE SPECIFIC NOISE SOURCES

### V9 Cyclo-Filter Fan-Housing

4.1. Figure 3 covers the survey of the V9 Cyclo-Filter Fan-Housing. This is situated directly opposite the green in front of 55-57 Quayside Way. Whilst the airflow was concentrated at the outflow itself, the noise was monitored up to a height of 6.7 metres and was relatively consistent at a level of 78 dBA LAeq at 1.8m distance. The noise source itself had a high low-frequency component but was not perceptively tonal. In the noise model it was characterised as a vertical line source to simulate the spread of noise up its height and incorporating its octave band frequency spectra.

### V9 Cyclo-Filter & Rotary Valve

4.2. Figure 4 covers the survey of the V9 Cyclo-Filter Rotary Valve. This is situated directly opposite the green in front of 55-57 Quayside Way. This source is positionally localised at a height of 2.22 metres with a measured level of 82 dBA LAeq at 1.8m distance. The noise source itself had a high low-frequency component but was not perceptively tonal. In the noise model it was characterised as a single point source to simulate its location and incorporating its octave band frequency spectra.

4.3. Figure 5 covers the survey of the V9 Cyclo-Filter itself the casing of which rises above the Rotary Valve to a height of approximately 14 metres. This is again situated directly opposite the green in front of 55-57 Quayside Way. The noise was monitored up to a height of 8.56 metres. At 2 metres distance, the noise level falls from 78 dBA LAeq at a height of 1.82 metres to 72 dBA at a height of 8.56 metres. The noise source itself had a high low-frequency component but was not perceptively tonal. In the noise model it was characterised as a vertical line source to simulate the spread of noise up its height and incorporating its octave band frequency spectra.

- 4.4. The Rotary Valve and filter Casing were considered together in the mitigation analysis. Whilst the majority of generated noise emanated from the Valve there was a clear contribution from higher up the casing.

### **Dust Plant-5 (Outlet and Inlet)**

- 4.5. The Dust Plant-5 Outlet and Inlet are also considered together in the mitigation analysis. Figure 6 covers the survey of the Dust Plant-5 Outlet. This is situated facing out toward the canal itself, directly opposite the green in front of 55-57 Quayside Way. The noise source which appeared to be primarily localised at the outlet itself at a height of 5.62 metres was consistently 79 dBA LAeq at 1.6m distance. The noise source had some tonality in the 160Hz to 315Hz band range – though this was not perceptively evident at the NSR locations on the opposite canal bank. In the noise model it was characterised as a single point source to simulate its location and incorporating its octave band frequency spectra.
- 4.6. Figure 7 covers the survey of the Dust Plant-5 Inlet. This is situated to the rear of the outlet close to the factory wall, directly opposite the green in front of 55-57 Quayside Way. Noise is being transmitted from the full inlet to a height of about 5.82 metres and was consistently 82dBA LAeq at 0.8m distance. The noise source had some tonality in the 160Hz band range – though later this was not perceptively evident at the NSR locations on the opposite canal bank. In the noise model it was characterised as a vertical line source to simulate the spread of noise up its height and incorporating its octave band frequency spectra.

### **Regenerative Thermal Oxidiser (RTO)**

- 4.7. Figures 8a and 8b cover the survey carried out in September 2023 of the Regenerative Thermal Oxidiser (RTO). This is situated at the northern end of the site boundary past the main factory building, directly opposite 45-47 Quayside Way. The RTO is a large rectangular unit up to 6 metres, though the primary noise sources are positioned lower down.
- 4.8. Figure 8a shows the noise from the Motor/Fan. The housing around it currently has two openings either side though the intention will be to fill these in. At a distance of 1.0m from the housing opening, the RTO Fan/Motor was generating continuous noise levels of 68dBA LAeq at a height of 1.5 metres. Previously, the RTO Motor/Fan was generating high frequency tonal noise, especially at 4KHz. This is still apparent though noticeably attenuated. Further measurements were taken at the front of the housing facing the temporary wall, however these were masked by the dominant noise of the Burner Motor (see below).
- 4.9. Figure 8b shows the noise from the Burner Motor and the Outlet Pipe. The Burner Motor is situated at the far northern end of the RTO and is currently generating continuous noise levels of 80dBA LAeq at a height of 1.0 metres and a distance of 1.0 metres. The Burner Motor is also generating high levels of tonal noise at 400Hz. Without attenuation, this would be very noticeable on the far bank of the canal. To the rear of the RTO was a outlet pipe that was generating levels of 67dBA LAeq at a height of 2.0 metres and a distance of 1.0 metres. This was a less significant source but included as a point source in the noise model for completion.



## **Water Cooling Towers (Canal and Side-facing)**

- 4.10. The two Water Cooling Towers were also considered together in the mitigation analysis, though when it came to mitigation only the contribution of the Canal Facing WCT was found to have any impact on the noise transmitted to the NSRs.
- 4.11. Figure 9 covers the survey of the Canal Facing Water Cooling Tower. This is situated facing out toward the canal itself, directly opposite 44 Wharfside Close. The noise was measured from 1.82 metres to 7.68 metres. Whilst the majority of the noise was generated at the lower outlet grille at a height of 1.82 metres recording 76dBA LAeq at 1.2 metres distance, there was a contribution of noise to the full height of the WCT. The noise source was relatively broadband and non-tonal in character. In the noise model it was characterised as a single point source at 1.82 metres height and a lesser vertical line source to simulate the spread of noise up its full height and incorporating its octave band frequency spectra.
- 4.12. Figure 10 covers the survey of the Side Facing Water Cooling Tower. This is situated adjacent to the north side of the building and is substantially shielded. The noise was measured from 1.82 metres to 6.70 metres. Whilst the majority of the noise was generated at the lower outlet grille at a height of 1.82 metres recording 76dBA LAeq at 0.9 metres distance, there was a contribution of noise to the full height of the WCT. The noise source has some low frequency tonality in the 63Hz band though the shielding by the factory building ensured this did not transmit to NSRs on the far canal bank. In the noise model it was characterised as a single point source at 1.82 metres height and a lesser vertical line source to simulate the spread of noise up its full height and incorporating its octave band frequency spectra.

## **Boiler Doors**

- 4.13. Figure 11 covers the survey of the Boiler Doors. These is situated directly opposite 44 Wharfside Close. This is considered a minor source but was included for completion. The noise was monitored up to a height of 1.82 metres and was relatively consistent at 59dBA LAeq at 0.8m distance from the closed doors. In the noise model it was characterised as a vertical surface source on the outside of the boiler building and incorporating its octave band frequency spectra.

## **Scrubbers**

- 4.14. Figure 12 covers the survey of the Scrubbers. These is situated adjacent to the north side of the building and is substantially shielded. The noise was monitored at a height of 1.82 metres and was relatively consistent at 78dBA LAeq at 2.0 metres distance. The noise source has some higher frequency tonality in the 3.15KHz band though the shielding by the factory building ensured this did not transmit to NSRs on the far canal bank. In the noise model it was characterised as a single point source at 1.82 metres height and incorporating its octave band frequency spectra.

## Boiler Vent

- 4.15. Figure 13 covers the survey of the Boiler Vent. This was a transient source that operates as a short burst every 8 hours. The noise was monitored during a burst at a height of 6.70 metres build up to 125dBA LAeq at 2.4 metres distance from its outlet. Whilst it does need attenuation it was not considered as part of this mitigation design. If possible it will require encasing and/or substantial re-routing.

## Carbon Filter

- 4.16. Figure 14 covers the survey carried out in September 2023 of the Operating Carbon Filter. The motor for the Carbon Filter is located within an enclosure building. This would normally be kept shut. This was monitored first with the door open in order to characterise the source of noise, but its contribution to the noise model was assuming the doors closed. With the doors closed, the noise level measured was 63dBA LAeq at 1.5 metres height and 1.0 metres distance, however this level was still influenced by the louder Water Cooling Tower to the south.

## 5. RPS BACKGROUND & RESIDUAL NOISE LEVELS

### RPS - Background Sound Levels

- 5.1. As stated in para 1.8 above, the RPS report provides useful measured background and residual noise levels prior to the new plant being installed. This would otherwise be difficult to obtain without shutting off all the new plant since the new plant is assumed to operate relatively continuously. These are necessary in each of the analysis steps covered below.
- 5.2. RPS based their analysis in part on a survey position “B” on the green in front of 55-57 Quayside Way. This position has also been simulated in Figure 2 of this study as NSR A. In Para 3.1.21 of their report, RPS recorded representative background sound levels at NSR A of **43 dBA LA90,T** for daytime conditions and of **39 dBA LA90,T** for night-time conditions. These values have been carried forward in the following analysis in this study.

### RPS – Residual Noise Levels

- 5.3. RPS also recorded the residual noise levels at NSR A for day and night time conditions based on current historically industrial activity and in the absence of the new plant operating. In Para 3.1.18 of their report, RPS recorded representative residual noise levels at NSR A of **49 dBA LAeq16hr** for daytime conditions and of **45 dBA LAeq8hr** for night-time conditions. These values have been carried forward in the following analysis in this study.

## 6. METHOD OF ANALYSIS

### **CadnaA Computer Noise Model**

- 6.1. In order to carry out the assessment, the computer noise modelling software package CadnaA 2023 was used. This is a three-dimensional computational system allowing for precise acoustic modelling of particular noise sources: road, rail traffic or industrial sources of noise. It shows how the noise interacts with adjacent buildings, taking into account different ground conditions, and it examines the impact at different noise frequencies.
- 6.2. The specific noise sources in the model were calibrated using the on-site noise measurements to accurately simulate the new Permali factory plant noise sources individually and to predict the noise level each would transmit to the ground, first and second floor façades of the most exposed residential NSRs on the opposite canal bank. For this application, CadnaA calculates the spread of noise using the industry standard calculation method ISO 9613-2. This allows for different noise barrier designs and additional mitigation measures to be incorporated and assessed acoustically. Whilst ISO9613-2 has been developed to predicted propagated sound levels from 63Hz to 8Khz, using CadnaA for this assessment the range has been expanded to also include the 31.5 Hz Octave band.
- 6.3. The model takes into account accurate topographical LIDAR data as well as all existing buildings surrounding the Permali Factory. The noise modelling and calculations assumes reflective ground in the vicinity of the factory and a ground absorption of 0.6 for semi-soft ground away from the site. ISO613-2 also takes into account two orders of reflection for all reflective surfaces. The new plant sources have been simulated in the model in line with the descriptions provide in Chapter 4 of this study.

### **Validating the Modelled Noise Sources using INVC data**

- 6.4. In CadnaA, by simulating each source measurement position and distance (as described in Chapter 4 and using the values given in Table 1), each predicted source sound value can be calibrated or validated against the measured level. Each source was calibrated against the measurement for both the broadband LAeq value and in each octave band from 31.5Hz to 8KHz.
- 6.5. In addition to this, in their study, INVC took a series of night-time noise measurements at NSR A on 23<sup>rd</sup> May 2023 as detailed in Chapter 4 of their report. These noise measurements included for different combinations of the primary noise sources. As a result they estimated the contribution of each specific noise source in the cumulative measurement at position A. This validation does not cover the RTO which was commissioned at a later date. The validation of the RTO is covered in para 6.9 : RTO Tonality.
- 6.6. Using CadnaA the same source combinations were simulated in our noise model and the predicted noise levels at NSR A compared against the INVC values. These are tabulated below using the INVC values in Tables 1 and 2 of Chapter 4 in their report.

| Description<br>(operating plant)  | INVC<br>Measured<br>Level<br>LAeq dBA | SBS<br>Predicted<br>Level<br>LAeq dBA |
|---|---------------------------------------|---------------------------------------|
| V9 CYCLO-FILTER FAN,V9 CYCLO-FILTER ROTARY VALVE,<br>DUST PLANT-5 (INLET & OUTLET), SCRUBBER, BOILERS | 56                                    | 56                                    |
| V9 CYCLO-FILTER ROTARY VALVE, DUST PLANT-5 (INLET<br>& OUTLET), SCRUBBER, BOILERS                     | 53                                    | 54                                    |
| DUST PLANT-5 (INLET & OUTLET), SCRUBBER, BOILERS  | 50                                    | 51                                    |

| Description<br>(operating plant) | INVC<br>Derived<br>Level<br>LAeq dBA | SBS<br>Predicted<br>Level<br>LAeq dBA |
|----------------------------------|--------------------------------------|---------------------------------------|
| V9 CYCLO-FILTER FAN              | 54                                   | 52                                    |
| V9 CYCLO-FILTER ROTARY VALVE     | 50                                   | 50                                    |
| DUST PLANT-5 (INLET & OUTLET)    | 48                                   | 50                                    |
| SCRUBBER, BOILERS                | < 35                                 | 24                                    |

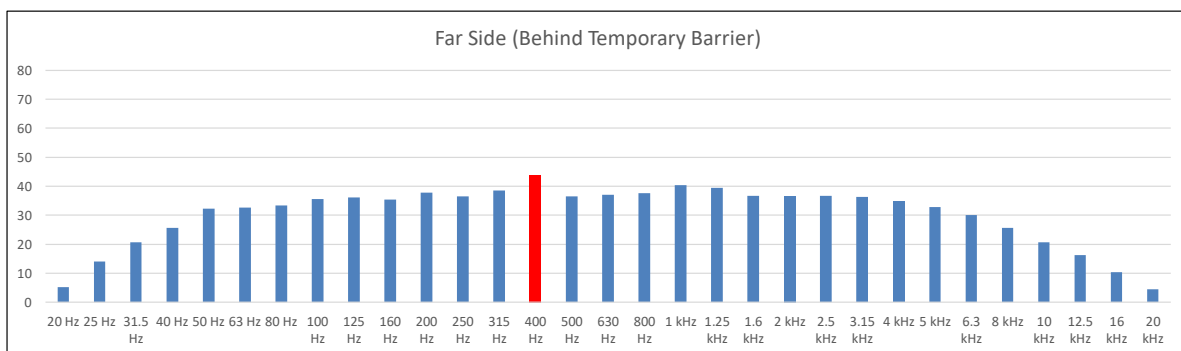
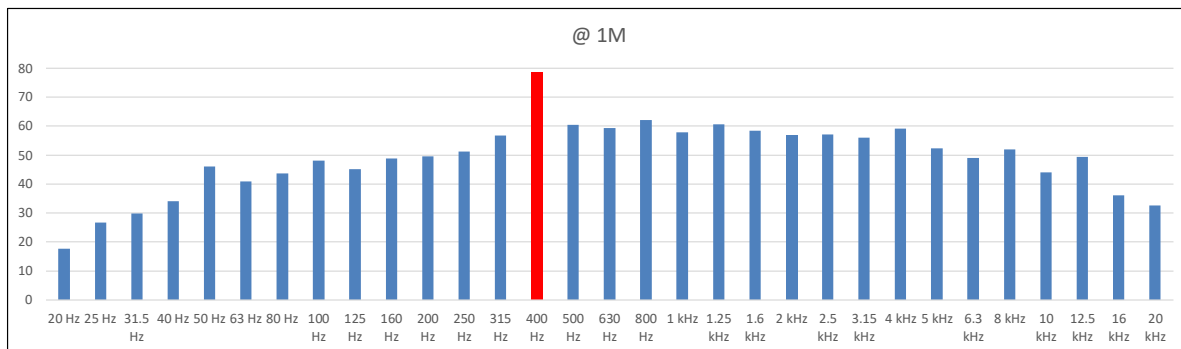
- 6.7. There is very good agreement overall especially with the cumulative measured and predicted noise results. The only variation being that the specific Dust Plant-5 source is predicted to be slightly higher in this study than the derived INVC value when including both the inlet and outlet. However the specific V9 Cyclo-Filter Fan source is predicted to be slightly lower than the derived INVC value.

### Noise Sensitive Receptors (NSRs)

- 6.8. Tables 2 to 7 list the 26 residential Noise Sensitive Receptors included in the noise model and assessment. These are also illustrated by their ID reference in Figure 2. Each NSR is assessed at their most exposed ground, first and (where relevant) second floor façade. All 26 are spread like a ribbon adjacent to the canal and opposite the Permalı factory. As such those in the north will be affected by different noise sources to those in the south. This is borne out in the study.

### RTO Tonality

- 6.9. With the housing in place, the dominant RTO noise source was the Burner Motor which at 1.0m distance generated 1/3 octave tonal noise in the 400Hz bands as illustrated in Figure 8b. At the time of the noise survey the temporary noise barrier was in place. With a surface density of 2.2kg/sqm this would attenuate 400Hz by 12 dB through its surface, giving an overall attenuation of about 10dB on the far side of the canal, which, although not high would be sufficient to reduce the tonality.
- 6.10. The LAeq noise spectra below show the dominance of the 400Hz bands in close proximity at 1 metre. It also shows how this dominance is reduce on the far side of the canal with the RTO behind the temporary noise barrier. The Tonality will be taken into account and a feature correction added as appropriate to the BS4142 assessment for Tonal character.



- 6.11. Fortunately, bespoke, noise barrier systems are particularly effective at attenuating mid to high frequency noise components both in terms of sound transmission through the barrier surface and in terms of sound diffraction over the top of the barrier. The PolySoundBlok noise barrier, with a surface density of 23 kg/sqm would attenuate 400Hz by 32 dB through its surface giving an overall attenuation of about 20dB on the far side of the canal.

### Analysis Uncertainty

- 6.12. In BS4142:2014 para 10.3, ISO9613-2 is specifically mentioned as a validated method of calculating sound levels. In its purest form independent of measured data, ISO9613-2 estimates its accuracy for broadband noise for heights of 0 to 5m as being +/-3dB. However, this is based on a single ray calculation for a singular point. The CadnaA noise model for this assessment is built up of the order of 100 ray calculations for typically 5,000 separate analysis points. The accuracy is therefore greatly enhanced.

Furthermore, this analysis is based on a noise model that has also been calibrated to accurately measured noise levels. We would therefore estimate the uncertainty of predicted noise calculations in this analysis as being in the region of +/-1dB.

## 7. NOISE MITIGATION DESIGN

### Noise Impact Assessment (Day/Night)

- 7.1. It is assumed that all the new plant will be operating continuously both for day and night time conditions. This assessment will cover the impact of the free field façade noise levels in accordance with the BS4142:2014+A1:2019 criteria, the WHO criteria and the impact of the predicted change in the ambient

noise level. The daytime assessment will be based on the external façade noise at ground floor level. The night-time assessment will be based on the external façade noise level (and subsequent internal room level) at first and second floor level. In so doing the potential ‘worst-case’ scenarios will be covered.

## **BS4142 Feature Correction**

- 7.2. The Specific Noise Level being assessed is the cumulative or combined level of all the separate noise sources due to the new plant. According to BS4142, a feature correction factor is added to the Specific Noise Level to give the Rating Level if it is perceived to be tonal, impulsive, intermittent or generally distinctive in nature and then whether this characteristic is just perceptible, clearly perceptible or highly perceptible.
- 7.3. In fact with the new Permali plant, unmitigated, the combined noise is both distinctive and tonal when assessed in the model at the receptors. In this case, the tonality is due to the Burner Motor of the RTO. Two separate correction factors are therefore added to the SNL. Where the combined Specific Noise Level is predicted to be considerably more than the Residual Noise Level it is deemed to be **Distinctive** giving a feature correction of **+3dB**.
- 7.4. In accordance with BS4142 (see para 2.8 above), if the noise is perceived at the receptor to be **highly tonal** a further feature correction of **+6dB** is added. If the noise is perceived at receptor to be **clearly tonal** a further feature correction of **+4dB** is added. If the noise is perceived at receptor to be **just tonal** a further feature correction of **+2dB** is added. The combined feature correction will be determined for each receptor individually for both day/night conditions. This is then be added to the Specific Noise Level to give a Rating Level for the BS4142 Assessment.
- 7.5. For the analysis we decided to adopt the following methodology. If the SNL is greater than the Residual then it is assumed to be Distinctive (Correction +3dB). If the RTO noise is greater than the Residual the noise is assumed to be Highly Tonal (Correction +6dB).
- 7.6. If the RTO noise is 0 to 5 dB less than the Residual the noise is assumed to be Clearly Tonal (Correction +4dB). If the RTO noise is 5 to 9 dB less than the Residual the noise is assumed to be Just Tonal (Correction +2dB). If the RTO noise is 10 dB less than the Residual the noise is assumed to be NOT Tonal (No Correction).
- 7.7. So for example, referring to Table 5. In the nighttime, unmitigated, at 45 Quayside Way, the SNL (52) is greater than the Residual (49). The contribution of the RTO is also greater than the Residual. As a result the noise will be both distinctive and highly tonal (Correction = + 3 + 6 dB = 9dB).
- 7.8. However, once mitigated, especially with a noise barrier the tonality will rapidly fall and the distinctiveness of the noise will become negligible. As a result the feature correction will be significantly reduced.

## Barrier Phase Sections - Coordinates

- 7.9. Figure 2 of this report provides the optimised noise barrier length (discussed below), of 125m with the southern section removed for future consideration and a further 44 m at the northern end shielded with a temporary noise barrier structure built as an interim measure, to be replaced by a final permanent barrier section (to be dimensioned and specified in this analysis).

### Central Section (Phase 1)

- 7.10. The central 125m long section will shield the V9 Cyclo-Filter Fan Housing, the V9 Cyclo-Filter & Rotary Valve, the Dust Plant-5, the western Water Cooling Tower, the Boiler Building, and a Carbon Filter. This will be 6 metres in height and 125m in length. This is Phase 1 of the barrier scheme. The modelled coordinates are given below (these will need to be confirmed at installation).

**Table 3.14: Phase 1 modelled coordinates**

|   |          |          |
|---|----------|----------|
| X | 382252.6 | 217077.0 |
| Y | 382284.8 | 217197.9 |

### Northern Section (Phase 2)

- 7.11. The northern section of the barrier will shield the Regenerative Thermal Oxidiser (RTO). This will be of the same specification as the phase 1 section, 44m metres in length and height to be determine in this study. The modelled coordinates are given below (these will need to be confirmed at installation).

**Table 3.15: Phase 2 modelled coordinates**

|   |          |          |
|---|----------|----------|
| X | 382284.8 | 217197.9 |
| Y | 382296.3 | 217240.6 |

- 7.12. Until the Phase 2 barrier design is confirmed, this section will be shielded with a temporary noise barrier, the details of which are discussed below. It will be acoustically ‘tight’ (no gaps) and structurally sound. This will enable the RTO to remain operational until the final Phase 2 barrier is installed.

### Southern Section (Phase 3) - Removed

- 7.13. To the south of the Phase 1 barrier, the site will remain unshielded. There is scope for a Phase 3 barrier section in the future, should it be deemed necessary or due to future site developments or operational changes.

## Additional Mitigation at Source

- 7.14. It was immediately apparent from the analysis that the dominant plant noise sources for all NSR’s are:

**V9 Cyclo-Filter Fan**

**V9 Cyclo-Filter & Valve**

**Dust Plant-5 (Outlet & Inlet)**

**RTO**

- 7.15. It was also apparent that different sources dominate for different NSRs dependent on where they are located facing the factory building. In addition to the barriers, a level of noise mitigation would therefore be determined and applied to each of these sources equally. This level of additional mitigation would be sufficient so that all the NSRs would achieve compliance with the noise criteria in Chapter 2.
- 7.16. The RPS report in para 6.1.15 considers levels of noise mitigation that may be applied to each of the sources. The INVC report goes into considerably more detail to describe the methodology in attenuating each specific plant noise at source. This report determines the level of attenuation that might be required for those sources in combination with a specific noise barrier design height to achieve compliance with the noise criteria.
- 7.17. According to this assessment the additional mitigation required for each of the sources is tabulated below for each of the barrier design heights so as to achieve compliance for day and night conditions. This is based on a Phase 1 barrier length of 125 metres and a Phase 2 barrier length of 44 metres, both being absorptive in performance. Not surprisingly the required additional mitigation for night-time is higher than for the daytime. The Table below gives the required additional mitigation values at night-time which will therefore take precedence to ensure compliance for both day and night conditions.

#### Required Additional Attenuation at Source dependent the Phase 1 & Phase 2 Barrier Height

| NIGHT | Barrier Height |    |    |    |
|-------|----------------|----|----|----|
|       | 3m             | 4m | 5m | 6m |
| VALVE | 12             | 9  | 5  | 2  |
| FAN   | 12             | 9  | 5  | 2  |
| DUST  | 12             | 9  | 5  | 2  |
| RTO   | 12             | 2  | 0  | 0  |

- 7.18. With the housing, the dominance and tonality of the RTO has been considerably reduced, even at night, and the need for additional mitigation for the RTO is also reduced. In the case of the 5 to 6 metre high barriers, we now do not identify a need for any further mitigation of the RTO to meet the standard. **It was also found that, with the Phase 1 barrier at 6 metres, the Phase 2 section could now be reduced to 4 metres without requiring more mitigation for the RTO.**

#### Temporary & Permanent Noise Barriers

- 7.19. Appendix A provides the Technical Performance sheets for the Gramm Barrier Systems PolySoundBlok Absorptive Noise Barrier panel. **Gramm Poly SoundBlok** is a plastic cassette-based absorptive noise barrier system, highly durable and with a surface density of **23 kg/sqm** and a tested airborne sound insulation of **28dB DL<sub>R</sub>** it provides a high level of sound insulation while preventing the transmission of low frequency noise. It also has a high tested sound absorption of **16dB DL<sub>α</sub>** thus preventing the build-up of reflected noise in open factory space. This makes it ideal for the Permali site



- 7.20. Other less durable, lower performance plastic-based systems are on the market but these should be avoided as durability and high performance and a prerequisite for the 6 metre high Permal barrier.
- 7.21. Appendix B give a photograph of the temporary noise barrier system being used at Permal as a short-term interim measure. It is built 5 metres high and the intention is to only use it over the most northern 44m length. With a surface density of 2.2kg/sqm its ability to act as an insulating layers is limited. For low frequency levels under 125 Hz it is unlikely to provide any noise mitigation at all. We have included its surface density in the model which shows that as long as its use is confined to the Phase 2, RTO end of the site it is predicted to provide adequate attention in the short term.

## 8. BS4142 ASSESSMENT

### Current Conditions – No Mitigation\*

- 8.1. According to Table 2, the unmitigated daytime ground floor façade noise levels at the Noise Sensitive Receptors (NSRs) ranges from 46 to 56dBA LAeq,T. At 55 Quayside Way is predicted to be **56dBA LAeq,T**. This is equivalent a free-field Specific Noise Level of **53dBA LAeq,T**. A feature correction of +3dB is added to the SNL to give a Rating Level of **56dBA LA<sub>r</sub>**, which exceeds the daytime background sound level by **+13dB**. According to the standard this would be likely to cause a Significant Adverse Impact or SOAEL and mitigation would be recommended.
- 8.2. According to Table 5, the unmitigated night-time top floor façade noise level at 55 Quayside Way is predicted to be **57dBA LAeq,T**. This is equivalent a free-field Specific Noise Level of **54dBA LAeq,T**. A feature correction of +5dB is added to the SNL to give a Rating Level of **59dBA LA<sub>r</sub>**, which exceeds the night-time background sound level by **+20dB**. According to the standard this would be likely to cause a Significant Adverse Impact or SOAEL and mitigation would be recommended.
- 8.3. Noise Maps 1 and 4 illustrate the how the specific noise generated by Permal spreads with no mitigation present across the canal towards the NSRs during the daytime at ground floor level (Map 1) and during the night time at first floor level (Map 4). For both, noise levels up to 55 dBA are shown by the orange band reaching to the NSR properties.
- 8.4. *\*For this study, “No Mitigation” assumes no barriers, and the RTO is in its current state with the housing, as surveyed in September 2023, the Carbon Filter is also in its enclosure, door closed, but, as yet, the V9 Cyclo-Filter, Fan & Valve and Dust Plants are assumed unattenuated.*

### 6m x 125m Noise Barrier + 44m Temporary Barrier + Additional Mitigation

- 8.5. According to Table 3, with a 6m x 125m high absorptive barrier plus the 44m temporary barrier in place and -2dB additional mitigation to the 3 identified sources, the highest daytime ground floor façade noise level at 55 Quayside Way predicted to be **48dBA LAeq,T**. This is equivalent a free-field Specific Noise Level of **45dBA LAeq,T**. No feature correction added to SNL so the Rating Level is also **45dBA LA<sub>r</sub>**.

which exceeds the night-time background sound level by only **+2 dB**. According to the standard this would be rated as Low Impact or LOAEL.

- 8.6. According to Table 6, with a 6m x 125m high absorptive barrier plus the 44m temporary barrier in place and -2dB additional mitigation to the 3 identified sources, the night-time top floor façade noise level for 55 Quayside Way is predicted to be reduced to **46dBA LAeq,T**. This is equivalent a free-field Specific Noise Level of **43dBA LAeq,T**. No feature correction is added to SNL so the Rating Level is also **43dBA LA<sub>r</sub>**, which exceeds the night-time background sound level by only **+4 dB**. According to the standard this would be rated as Low Impact or LOAEL.
- 8.7. Noise Maps 2 and 5 illustrate the how the specific noise generated by Permali (with the 6m x 125m high absorptive barrier plus the 44m temporary barrier in place and -2dB additional mitigation to the 3 identified sources) spreads across the canal towards the NSRs during the daytime at ground floor level (Map 2) and during the night time at first floor level (Map 5). For both, noise levels up to 45 dBA are shown by the yellow band reaching to the NSR properties.

### **(6m x 125m + 4m x 44m) Noise Barrier + Additional Mitigation**

- 8.8. According to Table 4, with a 6m x 125m high absorptive barrier plus a further 4m x 44m high absorptive noise barrier in place and -2dB additional mitigation to the 3 identified sources, the highest daytime ground floor façade noise level at 55 Quayside Way predicted to be **46dBA LAeq,T**. This is equivalent a free-field Specific Noise Level of **43dBA LAeq,T**. No feature correction is added to SNL so the Rating Level is also **43dBA LA<sub>r</sub>**, which is the same as the night-time background sound level. According to the standard this would be rated as Low Impact or LOAEL.
- 8.9. According to Table 7, with a 6m x 125m high absorptive barrier plus a further 4m x 44m high absorptive noise barrier in place and -2dB additional mitigation to the 3 identified sources, the night-time top floor façade noise level for 55 Quayside Way is predicted to be reduced to **46dBA LAeq,T**. This is equivalent a free-field Specific Noise Level of **43dBA LAeq,T**. No feature correction is added to SNL so the Rating Level is also **43dBA LA<sub>r</sub>**, which exceeds the night-time background sound level by only **+4 dB**. According to the standard this would be rated as Low Impact or LOAEL.
- 8.10. Noise Maps 2 and 5 illustrate the how the specific noise generated by Permali (with a 6m x 125m high absorptive barrier plus a further 4m x 44m high absorptive noise barrier in place and -2dB additional mitigation to the 3 identified sources) spreads across the canal towards the NSRs during the daytime at ground floor level (Map 2) and during the night time at first floor level (Map 5). For both, noise levels up to 45 dBA are shown by the yellow band reaching to the NSR properties.

## 9. NOISE CHANGE ASSESSMENT

### Daytime Noise Change

- 9.1. According to the IOA/CIEH Guidelines of Level Change (para 2.16 above), an increase in the cumulative noise of less than +3dB would be barely perceptible in the medium to long term and have only a minor impact. This would be considered LOAEL in accordance with NPSE guidance. The predicted daytime ambient noise level can be determined by adding the residual noise level to the highest predicted free field Specific Noise Level in the day. The change in ambient noise is therefore how much this value exceeds the residual noise level.
- 9.2. Table 9.3 determines the change in the daytime ambient noise level for each of the mitigated options determined above. These are based on the assumed Phase 1 and Phase 2 barrier heights together with the additional mitigation levels required at source for the dominant plant noise sources listed above.

**Table 9.3**

| Phase 1 Barrier | Phase 2 Barrier | Additional Mitigation | SNLff LAeq | Residual LAeq | Ambient LAeq | Noise Change |
|-----------------|-----------------|-----------------------|------------|---------------|--------------|--------------|
| 125m            | 44m             | dB                    | dBA        | dBA           | dBA          | dB           |
| <b>0</b>        | <b>0</b>        | -                     | 53         | 49            | 54           | <b>5</b>     |
| <b>6m Poly</b>  | <b>Temp</b>     | <b>-2</b>             | 45         | 49            | 50           | <b>1</b>     |
| <b>6m Poly</b>  | <b>4m Poly</b>  | <b>-2</b>             | 43         | 49            | 50           | <b>1</b>     |

- 9.3. The first line is for the unmitigated scenario which determines an increase in the ambient noise of 5dB. According to the guidance this would be considered a substantial impact or SOAEL. For the interim scenario with the temporary barrier and for the completed Phase 1 and Phase 2 barriers with the proposed additional mitigation the increase in ambient noise would be 1dB. According to the guidance this would be considered a minor impact or LOAEL.

### Nighttime Noise Change

- 9.4. Similarly, the predicted night-time ambient noise level can be determined by adding the residual noise level to the highest predicted free field Specific Noise Level at night. The change in ambient noise is therefore how much this value exceed the residual noise level. Table 9.6 determines the change in the night-time ambient noise level for each of the mitigated options determined above. These are based on the assumed Phase 1 and Phase 2 barrier heights together with the additional mitigation required at source for the dominant plant noise sources listed above.

**Table 9.6**

| Phase 1 Barrier | Phase 2 Barrier | Additional Mitigation | SNLff LAeq | Residual LAeq | Ambient LAeq | Noise Change |
|-----------------|-----------------|-----------------------|------------|---------------|--------------|--------------|
| 125m            | 44m             | dB                    | dBA        | dBA           | dBA          | dB           |
| <b>0</b>        | <b>0</b>        | -                     | 54         | 45            | 54           | <b>9</b>     |
| <b>6m Poly</b>  | <b>Temp</b>     | <b>-2</b>             | 43         | 45            | 47           | <b>2</b>     |
| <b>6m Poly</b>  | <b>4m Poly</b>  | <b>-2</b>             | 43         | 45            | 47           | <b>2</b>     |

The first line is for the unmitigated scenario which determines an increase the ambient noise of 9dB. According to the guidance this would be considered a substantial impact or SOAEL. For the interim scenario with the temporary barrier and for the completed Phase 1 and Phase 2 barriers with the proposed additional mitigation the increase in ambient noise would be 2dB. According to the guidance this would be considered a minor impact or LOAEL.

## 10. ABSOLUTE NOISE LEVEL ASSESSMENT

### Daytime Noise Level Assessment

- 10.1. According to the WHO Guidelines for Community Noise, For external daytime levels it is considered desirable for a new development that the outdoor sound level should not exceed 50dBA LAeq,T. This is equivalent to a free field level of 47dBA LAeq at a distance of 1m from a property façade.
- 10.2. Table 9.3 above shows for all the mitigation schemes (barrier height design + additional mitigation at source) the predicted daytime free-field Specific Noise Level is not predicted to exceed 45dBA LAeq,T. This is equivalent to an external façade noise level of 48dBA LAeq,T. 1m from the property façade which is compliant with the WHO Guidelines for Community Noise for daytime.

### Night-time Noise Level Assessment

- 10.3. At night, the limit for sleep disturbance is equivalent to an internal noise level of 30 dBA LAeq<sub>8hr</sub>. Assuming a partially open window this is equivalent to an external level of 45 dBA LAeq<sub>8hr</sub> or a free field external level of 42 dBA LAeq<sub>8hr</sub> at a distance of 1m from a property façade.
- 10.4. Table 9.6 above shows for all the mitigation schemes (barrier height design + additional mitigation at source) the predicted night-time free-field Specific Noise Level is only predicted to exceed 42dBA LAeq,T. for 2 or 26 properties (and then only by 1dB) This is equivalent to an external façade noise level of 45dBA LAeq,T. 1m from the property façade which is compliant with the WHO Guidelines for Community Noise for night.

## 11. CONCLUSIONS & RECOMMENDATIONS

### Compliance with the Standard (BS4142:2014+A1:2019)

- 11.1. This study has determined the optimum noise mitigation option to attenuate the noise generated by new plant at the Permal Gloucester factory. This comprises a 125 metre long, 6 metre high absorptive noise barrier, with a further 44m long temporary barrier section as an interim to be replaced with a further 44 metre long, 4 metre high absorptive noise barrier. The barriers to be installed along the western perimeter of the site adjacent to the Gloucester & Sharpness Canal.
- 11.2. With the barriers an additional 2dB level of noise mitigation at source has been proposed for the dominant plant noise sources in order to comply with the noise criteria in the standard BS4142:2014+A1:2019. These include: The V9 Cyclo-Filter Fan Housing, the V9 Cyclo-Filter & Rotary Valve and the Dust Plant-5.
- 11.3. In all 26 residential NSRs were assessed. As detailed In Chapter 8 above, with the proposed mitigation measures in place, the predicted facade Rating Level according to BS4142 would exceed the background sound level by less than 5 dB for both day and night time conditions. This would be considered Low Impact according to the standard and LOAEL according to NPSE.

### Compliance with the Guidelines

- 11.4. With the proposed mitigation measures in place, the change in the Ambient noise level for both day and night time conditions is predicted to be less than +3dB at all floor façades of all the residential NSRs assessed in this study for both day and night time conditions. This is detailed in Chapter 9 above. According to the IOA/CIEH Guidelines of Level Change such an increase in the cumulative noise of less than +3dB would be barely perceptible in the medium to long term and have only a minor impact. This would be considered LOAEL in accordance with NPSE guidance.
- 11.5. With the proposed mitigation measures in place, the external free field Specific Noise Levels due to the cumulative noise of the new plant, at all floor facades of all the residential NSRs assessed in this study are predicted to be no more than 47dBA LAeq during the daytime and 42dBA at night. This complies with the requirements of the WHO Guidelines for Community Noise.

### Recommended Mitigation Measures

- 11.6. We would therefore recommend as a first phase to install the 6 metre high, 125m long absorptive noise Phase 1 barrier together with an additional, but proportionate level mitigation at source of 2dB attenuation for the V9 Cyclo-Filter Fan Housing, the V9 Cyclo-Filter & Rotary Valve and the Dust Plant-5. At the same time we would recommend the installation of the 44m long temporary noise barrier in front of the RTO as an interim. The temporary noise barrier will need to be durable, acoustically 'tight' (no gaps) and structurally sound in order for the site to meet the noise criteria of the standards and guidelines for day and night conditions.

- 11.7. The temporary barrier acts as an interim measure and will ultimately require replacing with a permanent structure. Phase 2 of the barrier installation will be to replace the temporary barrier with a final 4 metre high, 44m long absorptive noise barrier system, to the same specification as the Phase 1 barrier. Again this will meet the noise criteria of the standards and guidelines for day and night conditions.

### **Gramm Poly SoundBlok Noise Barrier System**

- 11.8. In close proximity to the canal, timber-based barrier options have been discounted completely. Whilst a Metal based barrier would provide a durable acoustic performance, the potential of water ingress from the canal may limit its durability. We would therefore recommend the Gramm Poly SoundBlok design and have provided specification details in Appendix A.
- 11.9. **Gramm Poly SoundBlok** is a plastic cassette-based absorptive noise barrier system, highly durable and with a surface density of **23 kg/sqm** and a tested airborne sound insulation of **28dB DL<sub>R</sub>** it provides a high level of sound insulation while preventing the transmission of low frequency noise. It also has a high tested sound absorption of **16dB DL<sub>α</sub>** thus preventing the build-up of reflected noise in open factory space. The temporary barrier being utilised at Permalı is shown in Appendix B. The surface density for the temporary barrier has been incorporated into the computer model.

### **Installer Involvement Regarding Foundations**

- 11.10. We would also strongly recommend asking Gramm Barrier Systems to revisit and have input regarding the practicality of installing a 5 – 6 metre high noise barrier system in close proximity to the canal. We would recommend involving them as soon as possible to ensure that any practical hurdles are highlighted and overcome at an early enough stage.

### **Future Application of Diffracting Barrier Tops**

- 11.11. There is always the potential with any industrial site that operational uses will change for different site locations. It is therefore prudent to allow some flexibility to retro-fit a noise barrier to enhance its acoustic performance. Once built this is difficult to do and the primary barrier will already be 6 metres in height. One option could be to fit a top line diffractor to the barrier which will have the potential of increasing its performance without increasing the height. Diffractors work specifically on noise sources positioned below them. They diffract or bend the noise upwards away from receptors to reduce its impact.
- 11.12. In considering diffractors it may also be prudent to ensure the barriers foundations are sufficient to support the diffracting element also. An example the Whistop is given in Appendix D.

# 1. TABLES

**TABLE 1:**  
**SPECIFIC NOISE SOURCE MEASUREMENTS**

| SOURCE DESCRIPTION           | Distance(m) | Height (m) | LAeq | 31.5 | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 |
|------------------------------|-------------|------------|------|------|----|-----|-----|-----|------|------|------|------|
| V9 CYCLO-FILTER FAN-HOUSING  | 1.80        | 1.82       | 78   | 45   | 57 | 66  | 73  | 70  | 68   | 70   | 71   | 63   |
| V9 CYCLO-FILTER FAN-HOUSING  | 1.80        | 4.44       | 78   | 47   | 59 | 67  | 73  | 71  | 68   | 70   | 70   | 63   |
| V9 CYCLO-FILTER FAN-HOUSING  | 1.80        | 5.62       | 77   | 48   | 59 | 68  | 71  | 70  | 67   | 68   | 68   | 62   |
| V9 CYCLO-FILTER FAN-HOUSING  | 1.80        | 6.70       | 79   | 48   | 58 | 69  | 76  | 70  | 67   | 67   | 67   | 61   |
| V9 CYCLO-FILTER ROTARY VALVE | 1.20        | 2.22       | 82   | 46   | 55 | 69  | 76  | 71  | 74   | 76   | 72   | 63   |
| V9 CYCLO-FILTER              | 2.00        | 1.82       | 78   | 46   | 58 | 64  | 73  | 68  | 69   | 71   | 68   | 61   |
| V9 CYCLO-FILTER              | 2.00        | 4.44       | 76   | 44   | 54 | 63  | 71  | 67  | 68   | 70   | 67   | 60   |
| V9 CYCLO-FILTER              | 2.00        | 6.70       | 74   | 42   | 54 | 63  | 69  | 66  | 66   | 68   | 65   | 59   |
| V9 CYCLO-FILTER              | 2.00        | 8.56       | 72   | 41   | 55 | 62  | 66  | 63  | 64   | 64   | 61   | 54   |
| DUST PLANT-5 (OUTLET)        | 1.60        | 5.62       | 79   | 50   | 60 | 73  | 76  | 63  | 61   | 68   | 66   | 61   |
| DUST PLANT-5 (INLET)         | 0.80        | 5.82       | 82   | 39   | 53 | 60  | 59  | 62  | 70   | 76   | 79   | 74   |
| BOILER DOOR                  | 0.80        | 1.82       | 59   | 30   | 43 | 50  | 50  | 51  | 53   | 52   | 50   | 43   |
| WATER COOLING TOWER (SIDE)   | 0.90        | 1.82       | 76   | 26   | 45 | 50  | 54  | 64  | 69   | 70   | 72   | 67   |
| WATER COOLING TOWER (SIDE)   | 0.90        | 6.70       | 69   | 26   | 41 | 49  | 53  | 59  | 62   | 62   | 65   | 56   |
| WATER COOLING TOWER (CANAL)  | 1.20        | 1.82       | 76   | 33   | 47 | 60  | 69  | 71  | 69   | 67   | 68   | 65   |
| WATER COOLING TOWER (CANAL)  | 1.80        | 7.68       | 70   | 28   | 45 | 59  | 62  | 65  | 63   | 61   | 59   | 55   |
| BOILER VENT                  | 2.40        | 6.70       | 125  | 40   | 57 | 72  | 87  | 99  | 110  | 118  | 122  | 120  |
| SCRUBBERS                    | 2.00        | 1.82       | 78   | 27   | 47 | 55  | 62  | 67  | 66   | 70   | 77   | 60   |
| RTO PIPE                     | 1.00        | 2.00       | 67   | 32   | 41 | 53  | 56  | 62  | 64   | 55   | 51   | 42   |
| BURNER MOTOR                 | 1.00        | 1.00       | 80   | 35   | 51 | 53  | 58  | 79  | 66   | 62   | 61   | 54   |
| RTO OPENING                  | 1.00        | 1.50       | 68   | 32   | 44 | 50  | 53  | 66  | 57   | 52   | 60   | 53   |
| RTO FRONT                    | 0.50        | 1.50       | 74   | 32   | 47 | 52  | 54  | 73  | 59   | 54   | 57   | 51   |
| CARBON FILTER (CLOSED)       | 1.00        | 1.50       | 63   | 30   | 45 | 52  | 55  | 57  | 56   | 55   | 54   | 47   |

Measurements were taken in close proximity to each specific source and at varying heights up to almost 8 metres.



**TABLE 2 :**  
**BS4142: Daytime Assessment – No Mitigation**

| DAYTIME : UNMITIGATED |                    |       | Façade | Freefield | Feature  | Daytime | Backgrnd | BS4142 |
|-----------------------|--------------------|-------|--------|-----------|----------|---------|----------|--------|
| ID                    | Receptor Location  | Floor | Laeq   | SNL       | Correctn | Rating  | LA90     | Excess |
| 1                     | 3 Towpath          | GRND  | 46     | 43        | 2        | 45      | 43       | 2      |
| 2                     | 4 Towpath          | GRND  | 51     | 48        | 4        | 52      | 43       | 9      |
| 3                     | 45 Quayside Way    | GRND  | 52     | 49        | 4        | 53      | 43       | 10     |
| 4                     | 45a Quayside Way   | GRND  | 51     | 48        | 4        | 52      | 43       | 9      |
| 5                     | 47 Quayside Way    | GRND  | 51     | 48        | 4        | 52      | 43       | 9      |
| 6                     | 16 Quayside Way    | GRND  | 50     | 47        | 2        | 49      | 43       | 6      |
| 7                     | 18 Quayside Way    | GRND  | 50     | 47        | 2        | 49      | 43       | 6      |
| 8                     | 20 Quayside Way    | GRND  | 52     | 49        | 4        | 53      | 43       | 10     |
| 9                     | 39 Wharfside Close | GRND  | 52     | 49        | 2        | 51      | 43       | 8      |
| 10                    | 44 Wharfside Close | GRND  | 52     | 49        | 0        | 49      | 43       | 6      |
| 11                    | 42 Wharfside Close | GRND  | 52     | 49        | 3        | 52      | 43       | 9      |
| 12                    | 40 Wharfside Close | GRND  | 50     | 47        | 0        | 47      | 43       | 4      |
| 13                    | 22 Quayside Way    | GRND  | 52     | 49        | 3        | 52      | 43       | 9      |
| 14                    | 24 Quayside Way    | GRND  | 51     | 48        | 0        | 48      | 43       | 5      |
| 15                    | 49 Quayside Way    | GRND  | 55     | 52        | 5        | 57      | 43       | 14     |
| 16                    | 51 Quayside Way    | GRND  | 53     | 50        | 3        | 53      | 43       | 10     |
| 17                    | 55 Quayside Way    | GRND  | 56     | 53        | 3        | 56      | 43       | 13     |
| 18                    | 57 Quayside Way    | GRND  | 54     | 51        | 3        | 54      | 43       | 11     |
| 19                    | 35 Mainsail Lane   | GRND  | 55     | 52        | 3        | 55      | 43       | 12     |
| 20                    | 33 Mainsail Lane   | GRND  | 54     | 51        | 3        | 54      | 43       | 11     |
| 21                    | 38 Mainsail Lane   | GRND  | 53     | 50        | 3        | 53      | 43       | 10     |
| 22                    | 40 Mainsail Lane   | GRND  | 55     | 52        | 3        | 55      | 43       | 12     |
| 23                    | 27 Canal Court     | GRND  | 52     | 49        | 0        | 49      | 43       | 6      |
| 24                    | 25 Canal Court     | GRND  | 54     | 51        | 3        | 54      | 43       | 11     |
| 25                    | 30 Canal Court     | GRND  | 53     | 50        | 3        | 53      | 43       | 10     |
| 26                    | 32 Canal Court     | GRND  | 49     | 46        | 0        | 46      | 43       | 3      |

**Feature Corrections:** Applicable Feature Corrections are Added Arithmetically

If the SNL is more than the Residual then assume it is **Distinctive** (Correction +3dB)

RTO > Residual = **Highly Tonal** (Correction +6dB) / RTO is 0 to 5dB lower than the Residual = **Clearly Tonal** (Correction +4dB)

RTO is 5 to 9dB lower than the Residual = **Just Tonal** (Correction +2dB)

Daytime Residual Noise Level : 49dB

**TABLE 3 :**  
**BS4142: Daytime Assessment – 6m x 125 Barrier + 44m Temporary + Additional Mitigation**

| DAYTIME : 6m x 125m + TEMP + Additional |                    |       | Façade | Freefield | Feature  | Daytime | Backgrnd | BS4142 |
|---|--------------------|-------|--------|-----------|----------|---------|----------|--------|
| ID                                      | Receptor Location  | Floor | Laeq   | SNL       | Correctn | Rating  | LA90     | Excess |
| 1                                       | 3 Towpath          | GRND  | 37     | 34        | 0        | 34      | 43       | -9     |
| 2                                       | 4 Towpath          | GRND  | 42     | 39        | 0        | 39      | 43       | -4     |
| 3                                       | 45 Quayside Way    | GRND  | 43     | 40        | 0        | 40      | 43       | -3     |
| 4                                       | 45a Quayside Way   | GRND  | 43     | 40        | 0        | 40      | 43       | -3     |
| 5                                       | 47 Quayside Way    | GRND  | 43     | 40        | 0        | 40      | 43       | -3     |
| 6                                       | 16 Quayside Way    | GRND  | 43     | 40        | 0        | 40      | 43       | -3     |
| 7                                       | 18 Quayside Way    | GRND  | 43     | 40        | 0        | 40      | 43       | -3     |
| 8                                       | 20 Quayside Way    | GRND  | 44     | 41        | 0        | 41      | 43       | -2     |
| 9                                       | 39 Wharfside Close | GRND  | 44     | 41        | 0        | 41      | 43       | -2     |
| 10                                      | 44 Wharfside Close | GRND  | 44     | 41        | 0        | 41      | 43       | -2     |
| 11                                      | 42 Wharfside Close | GRND  | 45     | 42        | 0        | 42      | 43       | -1     |
| 12                                      | 40 Wharfside Close | GRND  | 43     | 40        | 0        | 40      | 43       | -3     |
| 13                                      | 22 Quayside Way    | GRND  | 45     | 42        | 0        | 42      | 43       | -1     |
| 14                                      | 24 Quayside Way    | GRND  | 44     | 41        | 0        | 41      | 43       | -2     |
| 15                                      | 49 Quayside Way    | GRND  | 47     | 44        | 0        | 44      | 43       | 1      |
| 16                                      | 51 Quayside Way    | GRND  | 45     | 42        | 0        | 42      | 43       | -1     |
| 17                                      | 55 Quayside Way    | GRND  | 48     | 45        | 0        | 45      | 43       | 2      |
| 18                                      | 57 Quayside Way    | GRND  | 46     | 43        | 0        | 43      | 43       | 0      |
| 19                                      | 35 Mainsail Lane   | GRND  | 46     | 43        | 0        | 43      | 43       | 0      |
| 20                                      | 33 Mainsail Lane   | GRND  | 46     | 43        | 0        | 43      | 43       | 0      |
| 21                                      | 38 Mainsail Lane   | GRND  | 45     | 42        | 0        | 42      | 43       | -1     |
| 22                                      | 40 Mainsail Lane   | GRND  | 47     | 44        | 0        | 44      | 43       | 1      |
| 23                                      | 27 Canal Court     | GRND  | 45     | 42        | 0        | 42      | 43       | -1     |
| 24                                      | 25 Canal Court     | GRND  | 46     | 43        | 0        | 43      | 43       | 0      |
| 25                                      | 30 Canal Court     | GRND  | 46     | 43        | 0        | 43      | 43       | 0      |
| 26                                      | 32 Canal Court     | GRND  | 43     | 40        | 0        | 40      | 43       | -3     |

**Feature Corrections:** Applicable Feature Corrections are Added Arithmetically

If the SNL is more than the Residual then assume it is **Distinctive** (Correction +3dB)

RTO > Residual = **Highly Tonal** (Correction +6dB) / RTO is 0 to 5dB lower than the Residual = **Clearly Tonal** (Correction +4dB)

RTO is 5 to 9dB lower than the Residual = **Just Tonal** (Correction +2dB)

Daytime Residual Noise Level : 49dB

**TABLE 4 :**  
**BS4142: Daytime Assessment – 6m x 125m Barrier + 4m x 44m Barrier + Additional Mitigation**

| DAYTIME : (6 x 125) + (4 x 44)M + Additional |                    |       | Façade | Freefield | Feature  | Daytime | Backgrnd | BS4142 |
|--|--------------------|-------|--------|-----------|----------|---------|----------|--------|
| ID   | Receptor Location  | Floor | Laeq   | SNL       | Correctn | Rating  | LA90     | Excess |
| 1  | 3 Towpath          | GRND  | 36     | 33        | 0        | 33      | 43       | -10    |
| 2  | 4 Towpath          | GRND  | 40     | 37        | 0        | 37      | 43       | -6     |
| 3  | 45 Quayside Way    | GRND  | 42     | 39        | 0        | 39      | 43       | -4     |
| 4  | 45a Quayside Way   | GRND  | 42     | 39        | 0        | 39      | 43       | -4     |
| 5  | 47 Quayside Way    | GRND  | 42     | 39        | 0        | 39      | 43       | -4     |
| 6  | 16 Quayside Way    | GRND  | 41     | 38        | 0        | 38      | 43       | -5     |
| 7  | 18 Quayside Way    | GRND  | 41     | 38        | 0        | 38      | 43       | -5     |
| 8  | 20 Quayside Way    | GRND  | 42     | 39        | 0        | 39      | 43       | -4     |
| 9  | 39 Wharfside Close | GRND  | 42     | 39        | 0        | 39      | 43       | -4     |
| 10   | 44 Wharfside Close | GRND  | 44     | 41        | 0        | 41      | 43       | -2     |
| 11   | 42 Wharfside Close | GRND  | 43     | 40        | 0        | 40      | 43       | -3     |
| 12   | 40 Wharfside Close | GRND  | 41     | 38        | 0        | 38      | 43       | -5     |
| 13   | 22 Quayside Way    | GRND  | 43     | 40        | 0        | 40      | 43       | -3     |
| 14   | 24 Quayside Way    | GRND  | 42     | 39        | 0        | 39      | 43       | -4     |
| 15   | 49 Quayside Way    | GRND  | 45     | 42        | 0        | 42      | 43       | -1     |
| 16   | 51 Quayside Way    | GRND  | 43     | 40        | 0        | 40      | 43       | -3     |
| 17   | 55 Quayside Way    | GRND  | 46     | 43        | 0        | 43      | 43       | 0      |
| 18   | 57 Quayside Way    | GRND  | 44     | 41        | 0        | 41      | 43       | -2     |
| 19   | 35 Mainsail Lane   | GRND  | 45     | 42        | 0        | 42      | 43       | -1     |
| 20   | 33 Mainsail Lane   | GRND  | 44     | 41        | 0        | 41      | 43       | -2     |
| 21   | 38 Mainsail Lane   | GRND  | 43     | 40        | 0        | 40      | 43       | -3     |
| 22   | 40 Mainsail Lane   | GRND  | 46     | 43        | 0        | 43      | 43       | -1     |
| 23   | 27 Canal Court     | GRND  | 43     | 40        | 0        | 40      | 43       | -3     |
| 24   | 25 Canal Court     | GRND  | 45     | 42        | 0        | 42      | 43       | -2     |
| 25   | 30 Canal Court     | GRND  | 44     | 41        | 0        | 41      | 43       | -2     |
| 26   | 32 Canal Court     | GRND  | 42     | 39        | 0        | 39      | 43       | -4     |

**Feature Corrections:** Applicable Feature Corrections are Added Arithmetically

If the SNL is more than the Residual then assume it is **Distinctive** (Correction +3dB)

RTO > Residual = **Highly Tonal** (Correction +6dB) / RTO is 0 to 5dB lower than the Residual = **Clearly Tonal** (Correction +4dB)

RTO is 5 to 9dB lower than the Residual = **Just Tonal** (Correction +2dB)

Daytime Residual Noise Level : 49dB

**TABLE 5 :**  
**BS4142: Night-time Assessment – No Mitigation**

| NIGHT-TIME : UNMITIGATED |                      |        | Façade | Freefield | Feature  | Night  | Backgrnd | BS4142 |
|--------------------------|----------------------|--------|--------|-----------|----------|--------|----------|--------|
| ID                       | Receptor Location    | Floor  | Laeq   | SNL       | Correctn | Rating | LA90     | Excess |
| 1                        | 3 Towpath            | FIRST  | 47     | 44        | 4        | 48     | 39       | 9      |
| 1                        | 3 Towpath_2nd        | SECOND | 47     | 44        | 4        | 48     | 39       | 9      |
| 2                        | 4 Towpath            | FIRST  | 51     | 48        | 9        | 57     | 39       | 18     |
| 2                        | 4 Towpath_2nd        | SECOND | 51     | 48        | 9        | 57     | 39       | 18     |
| 3                        | 45 Quayside Way      | FIRST  | 52     | 49        | 9        | 58     | 39       | 19     |
| 3                        | 45 Quayside Way_2nd  | SECOND | 53     | 50        | 9        | 59     | 39       | 20     |
| 4                        | 45a Quayside Way     | FIRST  | 52     | 49        | 9        | 58     | 39       | 19     |
| 4                        | 45a Quayside Way_2nd | SECOND | 53     | 50        | 9        | 59     | 39       | 20     |
| 5                        | 47 Quayside Way      | FIRST  | 52     | 49        | 9        | 58     | 39       | 19     |
| 5                        | 47 Quayside Way_2nd  | SECOND | 52     | 49        | 9        | 58     | 39       | 19     |
| 6                        | 16 Quayside Way      | FIRST  | 52     | 49        | 9        | 58     | 39       | 19     |
| 7                        | 18 Quayside Way      | FIRST  | 51     | 48        | 7        | 55     | 39       | 16     |
| 8                        | 20 Quayside Way      | FIRST  | 53     | 50        | 9        | 59     | 39       | 20     |
| 9                        | 39 Wharfside Close   | FIRST  | 53     | 50        | 7        | 57     | 39       | 18     |
| 10                       | 44 Wharfside Close   | FIRST  | 55     | 52        | 5        | 57     | 39       | 18     |
| 11                       | 42 Wharfside Close   | FIRST  | 54     | 51        | 3        | 54     | 39       | 15     |
| 12                       | 40 Wharfside Close   | FIRST  | 51     | 48        | 3        | 51     | 39       | 12     |
| 13                       | 22 Quayside Way      | FIRST  | 53     | 50        | 3        | 53     | 39       | 14     |
| 14                       | 24 Quayside Way      | FIRST  | 53     | 50        | 3        | 53     | 39       | 14     |
| 15                       | 49 Quayside Way      | FIRST  | 56     | 53        | 7        | 60     | 39       | 21     |
| 16                       | 51 Quayside Way      | FIRST  | 54     | 51        | 5        | 56     | 39       | 17     |
| 17                       | 55 Quayside Way      | FIRST  | 57     | 54        | 5        | 59     | 39       | 20     |
| 18                       | 57 Quayside Way      | FIRST  | 54     | 51        | 5        | 56     | 39       | 17     |
| 19                       | 35 Mainsail Lane     | FIRST  | 56     | 53        | 5        | 58     | 39       | 19     |
| 20                       | 33 Mainsail Lane     | FIRST  | 55     | 52        | 5        | 57     | 39       | 18     |
| 21                       | 38 Mainsail Lane     | FIRST  | 54     | 51        | 5        | 56     | 39       | 17     |
| 22                       | 40 Mainsail Lane     | FIRST  | 56     | 53        | 5        | 58     | 39       | 19     |
| 23                       | 27 Canal Court       | FIRST  | 53     | 50        | 3        | 53     | 39       | 14     |
| 24                       | 25 Canal Court       | FIRST  | 55     | 52        | 5        | 57     | 39       | 18     |
| 25                       | 30 Canal Court       | FIRST  | 54     | 51        | 5        | 56     | 39       | 17     |
| 26                       | 32 Canal Court       | FIRST  | 50     | 47        | 3        | 50     | 39       | 11     |

**Feature Corrections:** Applicable Feature Corrections are Added Arithmetically

If the SNL is more than the Residual then assume it is **Distinctive** (Correction +3dB)

RTO > Residual = **Highly Tonal** (Correction +6dB) / RTO is 0 to 5dB lower than the Residual = **Clearly Tonal** (Correction +4dB)

RTO is 5 to 9dB lower than the Residual = **Just Tonal** (Correction +2dB)

Night-time Residual Noise Level : 45dB

**TABLE 6 :**  
**BS4142: Night-time Assessment – 6m x 125 Barrier + 44m Temporary + Additional Mitigation**

| DAYTIME : 6m x 125m + TEMP + Additional |                      |        | Façade | Freefield | Feature  | Night  | Backgrnd | BS4142 |
|---|----------------------|--------|--------|-----------|----------|--------|----------|--------|
| ID                                      | Receptor Location    | Floor  | Laeq   | SNL       | Correctn | Rating | LA90     | Excess |
| 1                                       | 3 Towpath            | FIRST  | 38     | 35        | 0        | 35     | 39       | -4     |
| 1                                       | 3 Towpath_2nd        | SECOND | 39     | 36        | 0        | 36     | 39       | -3     |
| 2                                       | 4 Towpath            | FIRST  | 42     | 39        | 2        | 41     | 39       | 2      |
| 2                                       | 4 Towpath_2nd        | SECOND | 42     | 39        | 2        | 41     | 39       | 2      |
| 3                                       | 45 Quayside Way      | FIRST  | 43     | 40        | 2        | 42     | 39       | 3      |
| 3                                       | 45 Quayside Way_2nd  | SECOND | 44     | 41        | 2        | 43     | 39       | 4      |
| 4                                       | 45a Quayside Way     | FIRST  | 43     | 40        | 2        | 42     | 39       | 3      |
| 4                                       | 45a Quayside Way_2nd | SECOND | 44     | 41        | 2        | 43     | 39       | 4      |
| 5                                       | 47 Quayside Way      | FIRST  | 43     | 40        | 0        | 40     | 39       | 1      |
| 5                                       | 47 Quayside Way_2nd  | SECOND | 43     | 40        | 0        | 40     | 39       | 1      |
| 6                                       | 16 Quayside Way      | FIRST  | 42     | 39        | 0        | 39     | 39       | 0      |
| 7                                       | 18 Quayside Way      | FIRST  | 42     | 39        | 0        | 39     | 39       | 0      |
| 8                                       | 20 Quayside Way      | FIRST  | 43     | 40        | 2        | 42     | 39       | 3      |
| 9                                       | 39 Wharfside Close   | FIRST  | 43     | 40        | 0        | 40     | 39       | 1      |
| 10                                      | 44 Wharfside Close   | FIRST  | 45     | 42        | 0        | 42     | 39       | 3      |
| 11                                      | 42 Wharfside Close   | FIRST  | 44     | 41        | 0        | 41     | 39       | 2      |
| 12                                      | 40 Wharfside Close   | FIRST  | 42     | 39        | 0        | 39     | 39       | 0      |
| 13                                      | 22 Quayside Way      | FIRST  | 44     | 41        | 0        | 41     | 39       | 2      |
| 14                                      | 24 Quayside Way      | FIRST  | 43     | 40        | 0        | 40     | 39       | 1      |
| 15                                      | 49 Quayside Way      | FIRST  | 46     | 43        | 0        | 43     | 39       | 4      |
| 16                                      | 51 Quayside Way      | FIRST  | 44     | 41        | 0        | 41     | 39       | 2      |
| 17                                      | 55 Quayside Way      | FIRST  | 46     | 43        | 0        | 43     | 39       | 4      |
| 18                                      | 57 Quayside Way      | FIRST  | 45     | 42        | 0        | 42     | 39       | 3      |
| 19                                      | 35 Mainsail Lane     | FIRST  | 45     | 42        | 0        | 42     | 39       | 3      |
| 20                                      | 33 Mainsail Lane     | FIRST  | 45     | 42        | 0        | 42     | 39       | 3      |
| 21                                      | 38 Mainsail Lane     | FIRST  | 44     | 41        | 0        | 41     | 39       | 2      |
| 22                                      | 40 Mainsail Lane     | FIRST  | 46     | 43        | 0        | 43     | 39       | 4      |
| 23                                      | 27 Canal Court       | FIRST  | 44     | 41        | 0        | 41     | 39       | 2      |
| 24                                      | 25 Canal Court       | FIRST  | 45     | 42        | 0        | 42     | 39       | 3      |
| 25                                      | 30 Canal Court       | FIRST  | 45     | 42        | 0        | 42     | 39       | 3      |
| 26                                      | 32 Canal Court       | FIRST  | 43     | 40        | 0        | 40     | 39       | 1      |

**Feature Corrections:** Applicable Feature Corrections are Added Arithmetically

If the SNL is more than the Residual then assume it is **Distinctive** (Correction +3dB)

RTO > Residual = **Highly Tonal** (Correction +6dB) / RTO is 0 to 5dB lower than the Residual = **Clearly Tonal** (Correction +4dB)

RTO is 5 to 9dB lower than the Residual = **Just Tonal** (Correction +2dB)

Night-time Residual Noise Level : 45dB

**TABLE 7 :**  
**BS4142: Night-time Assessment – 6m x 125m Barrier + 4m x 44m Barrier + Additional Mitigation**

| DAYTIME : (6 x 125) + (4 x 44)M + Additional |                      |        | Façade | Freefield | Feature  | Daytime | Backgrnd | BS4142 |
|--|----------------------|--------|--------|-----------|----------|---------|----------|--------|
| ID   | Receptor Location    | Floor  | Laeq   | SNL       | Correctn | Rating  | LA90     | Excess |
| 1  | 3 Towpath            | FIRST  | 37     | 34        | 0        | 34      | 39       | -5     |
| 1  | 3 Towpath_2nd        | SECOND | 39     | 36        | 0        | 36      | 39       | -3     |
| 2  | 4 Towpath            | FIRST  | 41     | 38        | 0        | 38      | 39       | -1     |
| 2  | 4 Towpath_2nd        | SECOND | 42     | 39        | 0        | 39      | 39       | 0      |
| 3  | 45 Quayside Way      | FIRST  | 43     | 40        | 0        | 40      | 39       | 1      |
| 3  | 45 Quayside Way_2nd  | SECOND | 44     | 41        | 0        | 41      | 39       | 2      |
| 4  | 45a Quayside Way     | FIRST  | 42     | 39        | 0        | 39      | 39       | 0      |
| 4  | 45a Quayside Way_2nd | SECOND | 43     | 40        | 0        | 40      | 39       | 1      |
| 5  | 47 Quayside Way      | FIRST  | 42     | 39        | 0        | 39      | 39       | 0      |
| 5  | 47 Quayside Way_2nd  | SECOND | 43     | 40        | 0        | 40      | 39       | 1      |
| 6  | 16 Quayside Way      | FIRST  | 42     | 39        | 0        | 39      | 39       | 0      |
| 7  | 18 Quayside Way      | FIRST  | 42     | 39        | 0        | 39      | 39       | 0      |
| 8  | 20 Quayside Way      | FIRST  | 43     | 40        | 0        | 40      | 39       | 1      |
| 9  | 39 Wharfside Close   | FIRST  | 43     | 40        | 0        | 40      | 39       | 1      |
| 10   | 44 Wharfside Close   | FIRST  | 45     | 42        | 0        | 42      | 39       | 3      |
| 11   | 42 Wharfside Close   | FIRST  | 44     | 41        | 0        | 41      | 39       | 2      |
| 12   | 40 Wharfside Close   | FIRST  | 42     | 39        | 0        | 39      | 39       | 0      |
| 13   | 22 Quayside Way      | FIRST  | 44     | 41        | 0        | 41      | 39       | 2      |
| 14   | 24 Quayside Way      | FIRST  | 43     | 40        | 0        | 40      | 39       | 1      |
| 15   | 49 Quayside Way      | FIRST  | 46     | 43        | 0        | 43      | 39       | 4      |
| 16   | 51 Quayside Way      | FIRST  | 44     | 41        | 0        | 41      | 39       | 2      |
| 17   | 55 Quayside Way      | FIRST  | 46     | 43        | 0        | 43      | 39       | 4      |
| 18   | 57 Quayside Way      | FIRST  | 45     | 42        | 0        | 42      | 39       | 3      |
| 19   | 35 Mainsail Lane     | FIRST  | 45     | 42        | 0        | 42      | 39       | 3      |
| 20   | 33 Mainsail Lane     | FIRST  | 45     | 42        | 0        | 42      | 39       | 3      |
| 21   | 38 Mainsail Lane     | FIRST  | 44     | 41        | 0        | 41      | 39       | 2      |
| 22   | 40 Mainsail Lane     | FIRST  | 46     | 43        | 0        | 43      | 39       | 4      |
| 23   | 27 Canal Court       | FIRST  | 44     | 41        | 0        | 41      | 39       | 2      |
| 24   | 25 Canal Court       | FIRST  | 45     | 42        | 0        | 42      | 39       | 3      |
| 25   | 30 Canal Court       | FIRST  | 45     | 42        | 0        | 42      | 39       | 3      |
| 26   | 32 Canal Court       | FIRST  | 43     | 40        | 0        | 40      | 39       | 1      |

**Feature Corrections:** Applicable Feature Corrections are Added Arithmetically

If the SNL is more than the Residual then assume it is **Distinctive** (Correction +3dB)

RTO > Residual = **Highly Tonal** (Correction +6dB) / RTO is 0 to 5dB lower than the Residual = **Clearly Tonal** (Correction +4dB)

RTO is 5 to 9dB lower than the Residual = **Just Tonal** (Correction +2dB)

Night-time Residual Noise Level : 45dB

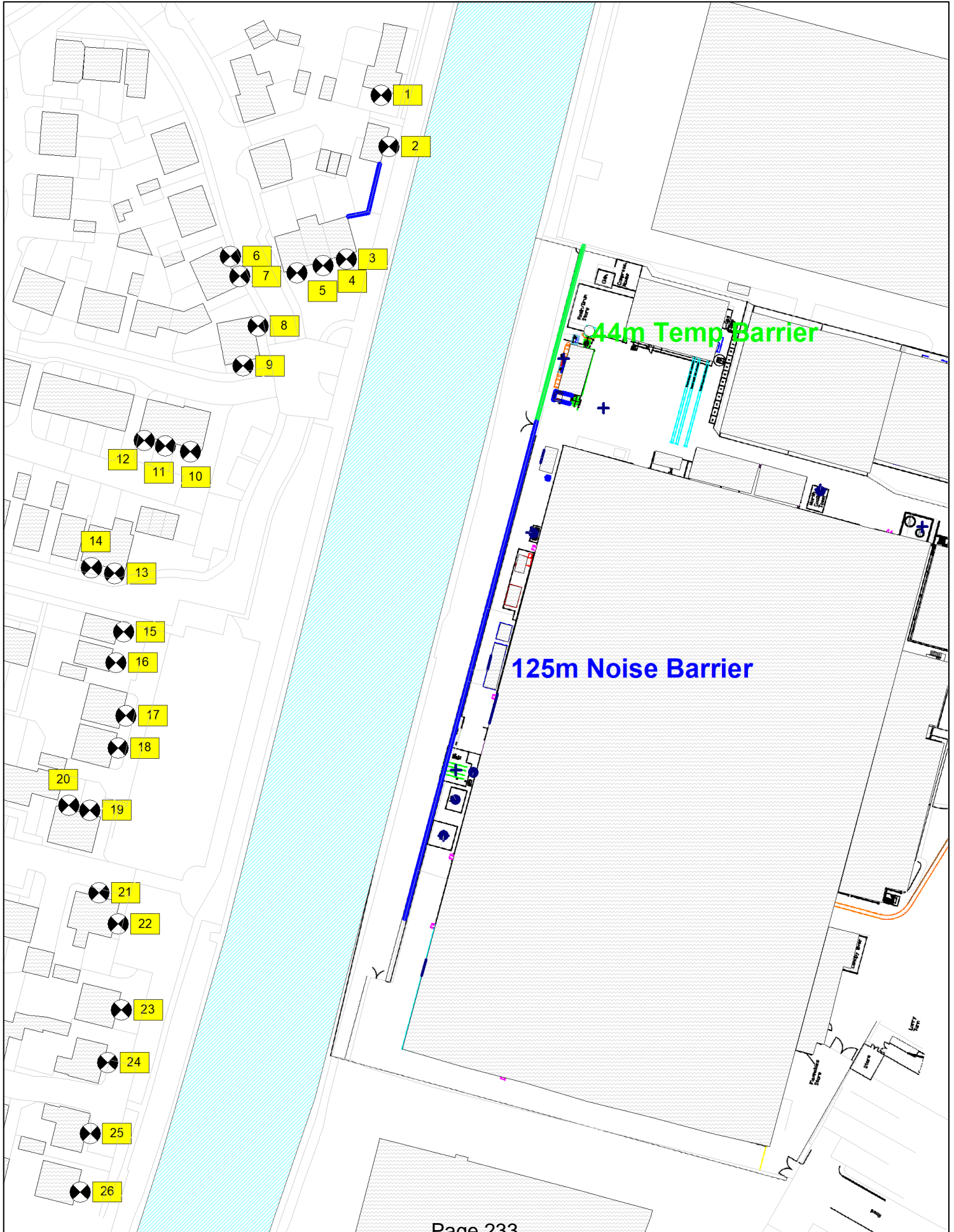
## **13. FIGURES**

**Fig 1 – Permal Gloucester - Site Location - and proximity to residential NSRs**

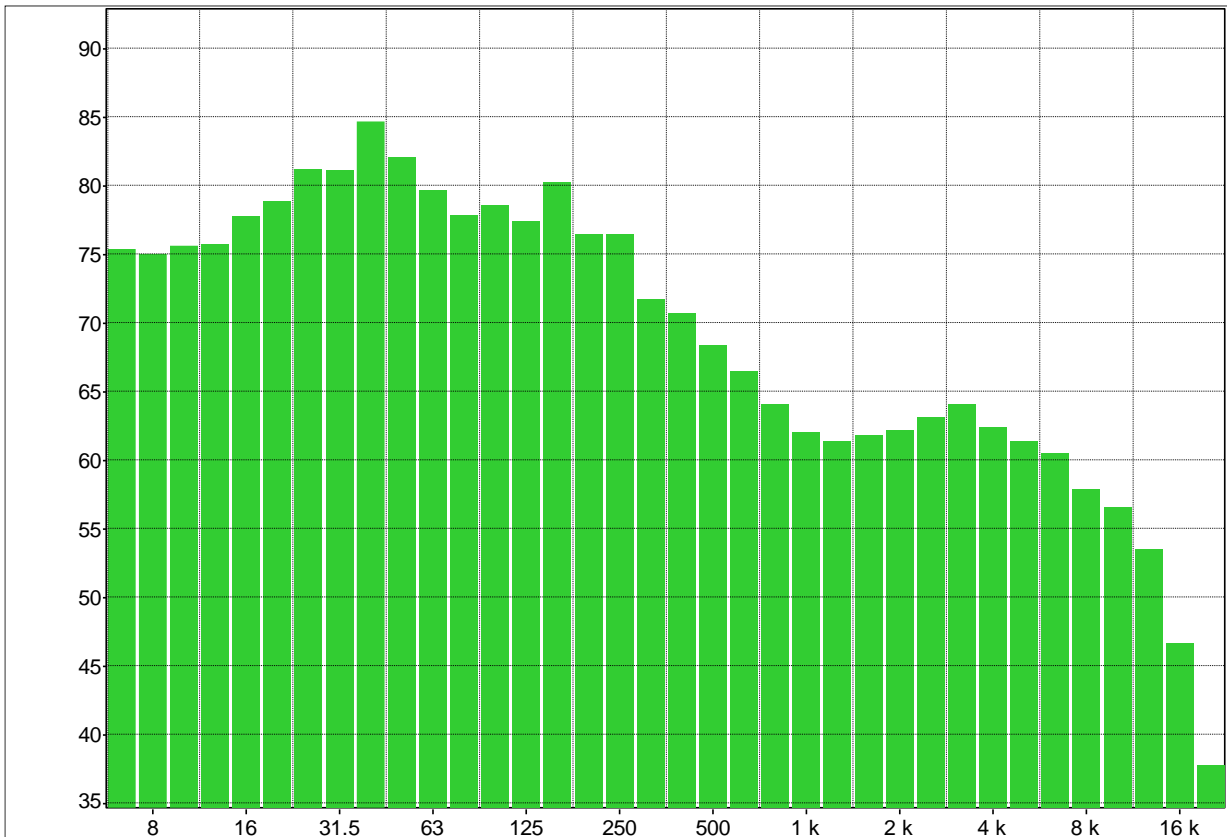
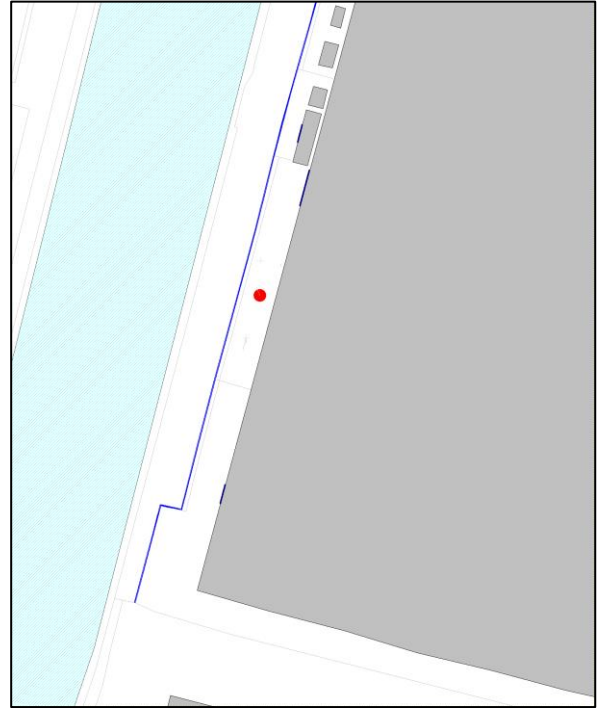




**Fig 2 – NSRs and Proposed Noise Barrier Sections**



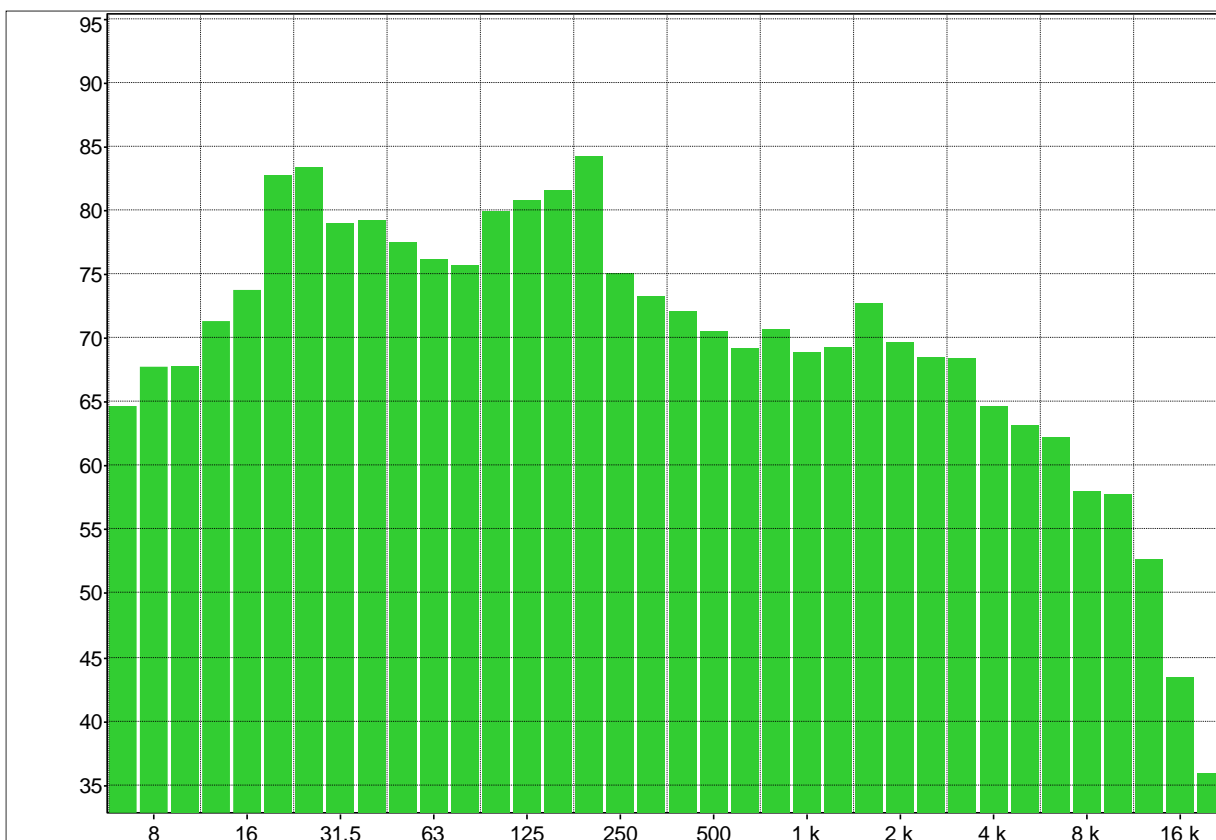
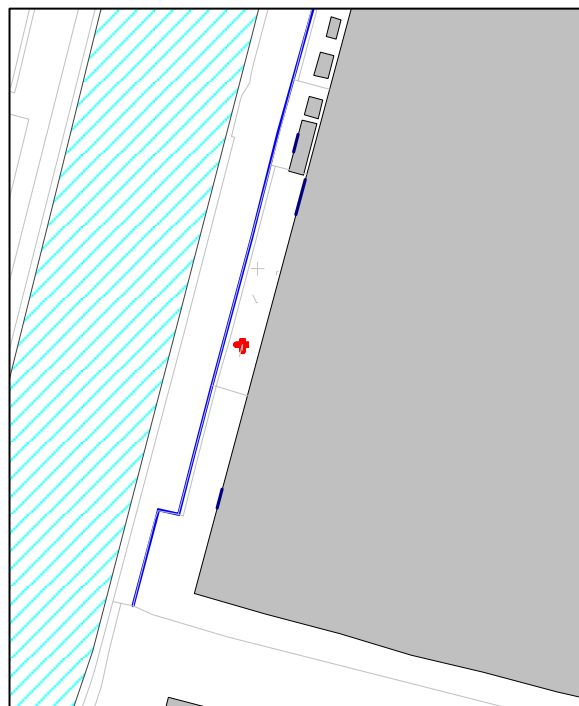
**Fig 3 – V9 Cyclo-Filter Fan-Housing**



1/3 Octave LLeq Spectrum at 1.80m distance and 5.62m height

| SOURCE DESCRIPTION      | D (m) | H (m) | LAeq | 31.5 | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 |
|-------------------------|-------|-------|------|------|----|-----|-----|-----|------|------|------|------|
| V9 C-FILTER FAN-HOUSING | 1.80  | 1.82  | 78   | 45   | 57 | 66  | 73  | 70  | 68   | 70   | 71   | 63   |
| V9 C-FILTER FAN-HOUSING | 1.80  | 4.44  | 78   | 47   | 59 | 67  | 73  | 71  | 68   | 70   | 70   | 63   |
| V9 C-FILTER FAN-HOUSING | 1.80  | 5.62  | 77   | 48   | 59 | 68  | 71  | 70  | 67   | 68   | 68   | 62   |
| V9 C-FILTER FAN-HOUSING | 1.80  | 6.70  | 79   | 48   | 58 | 69  | 76  | 70  | 67   | 67   | 67   | 61   |

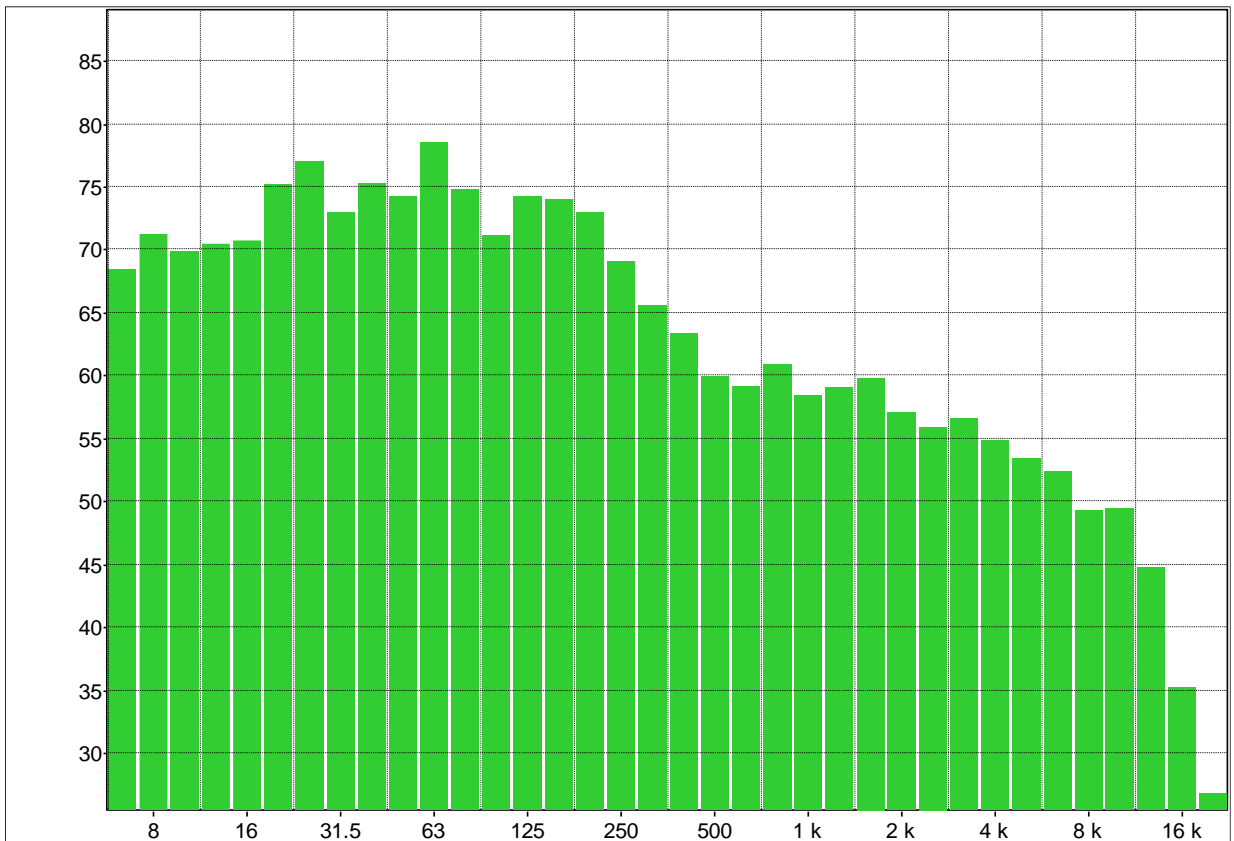
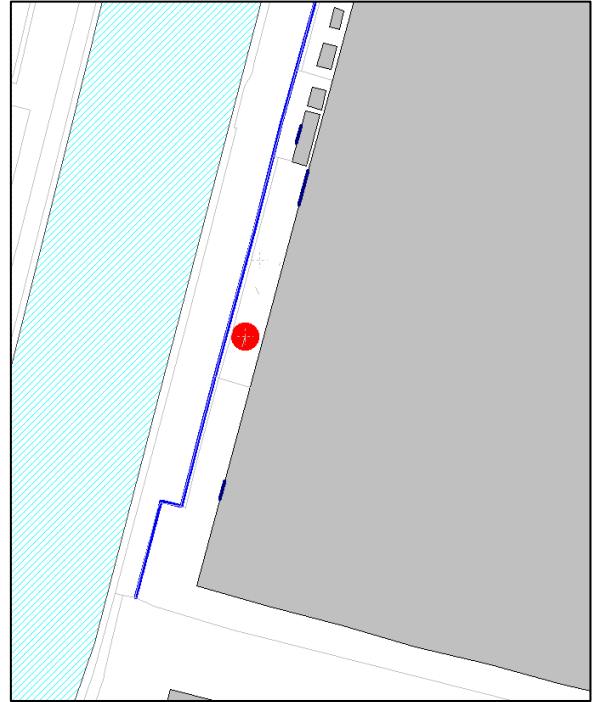
**Fig 4 – V9 Cyclo-Filter Rotary Valve**



1/3 Octave LLeq Spectrum at 1.80m distance and 2.22m height

| SOURCE DESCRIPTION              | D (m)       | H (m)       | LAeq      | 31.5      | 63        | 125       | 250       | 500       | 1000      | 2000      | 4000      | 8000      |
|---------------------------------|-------------|-------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| <b>V9 C-FILTER ROTARY VALVE</b> | <b>1.80</b> | <b>2.22</b> | <b>82</b> | <b>46</b> | <b>55</b> | <b>69</b> | <b>76</b> | <b>71</b> | <b>74</b> | <b>76</b> | <b>72</b> | <b>63</b> |

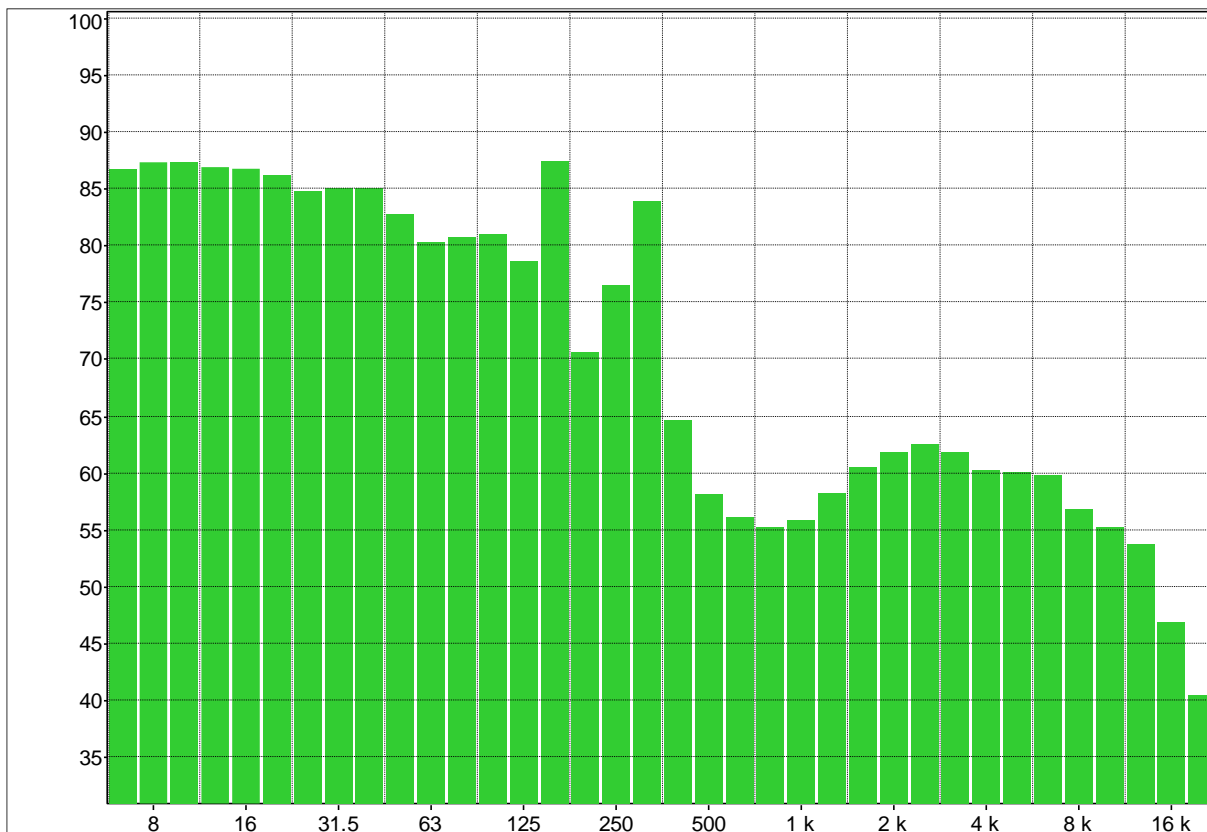
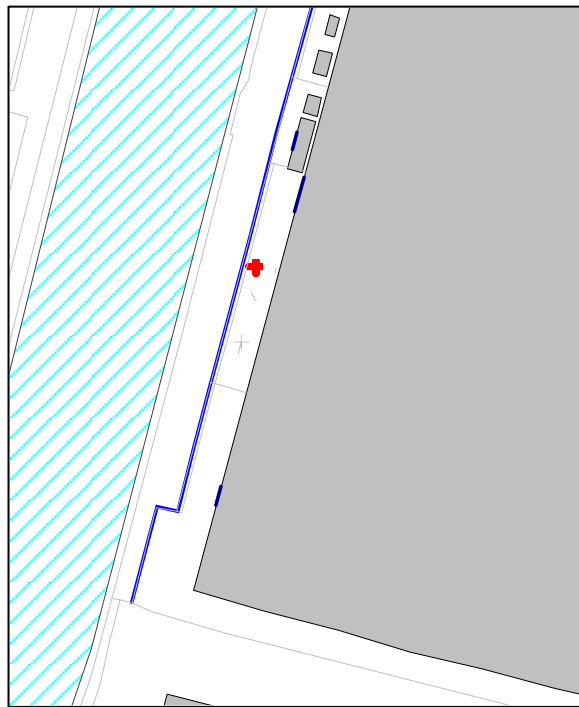
**Fig 5 – V9 Cyclo-Filter**



1/3 Octave LLeq Spectrum at 2.00m distance and 8.56m height

| SOURCE DESCRIPTION | D (m) | H (m) | L <sub>Aeq</sub> | 31.5 | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 |
|--------------------|-------|-------|------------------|------|----|-----|-----|-----|------|------|------|------|
| V9 CYCLO-FILTER    | 2.00  | 1.82  | 78               | 46   | 58 | 64  | 73  | 68  | 69   | 71   | 68   | 61   |
| V9 CYCLO-FILTER    | 2.00  | 4.44  | 76               | 44   | 54 | 63  | 71  | 67  | 68   | 70   | 67   | 60   |
| V9 CYCLO-FILTER    | 2.00  | 6.70  | 74               | 42   | 54 | 63  | 69  | 66  | 66   | 68   | 65   | 59   |
| V9 CYCLO-FILTER    | 2.00  | 8.56  | 72               | 41   | 55 | 62  | 66  | 63  | 64   | 64   | 61   | 54   |

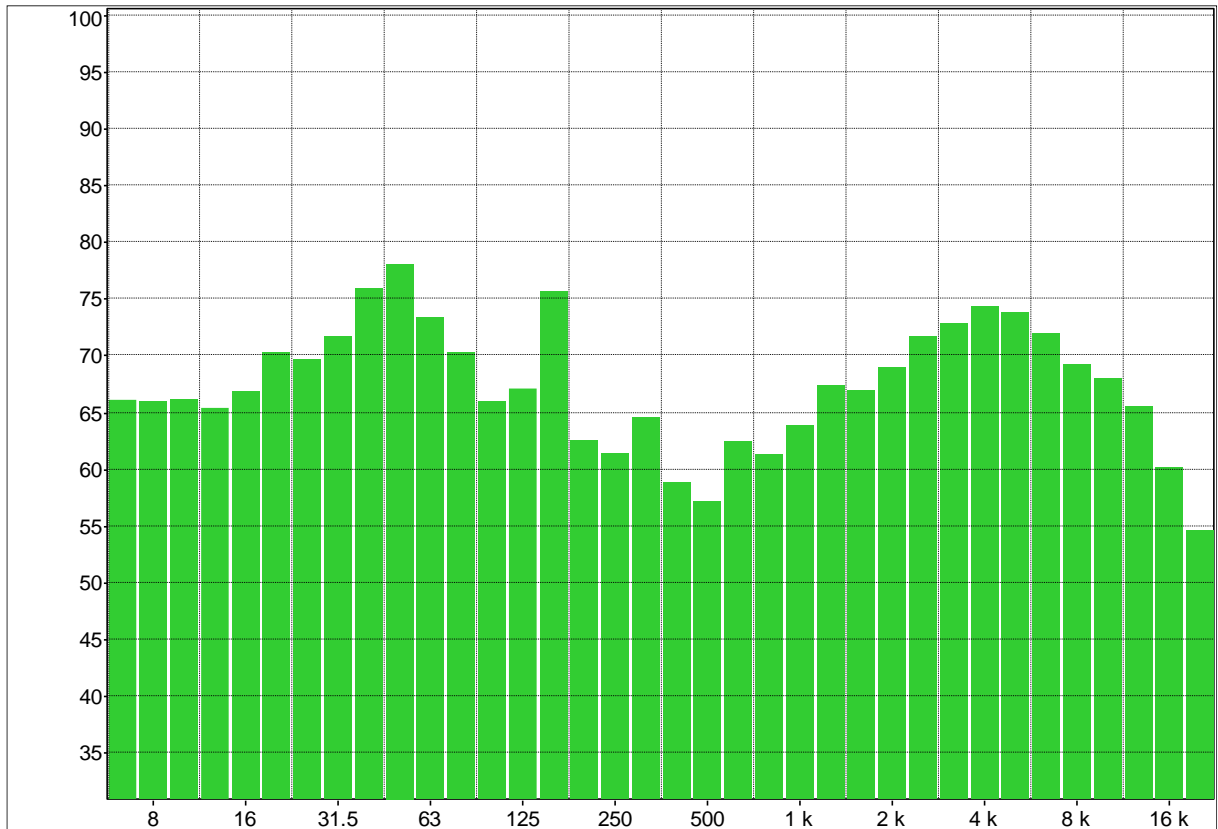
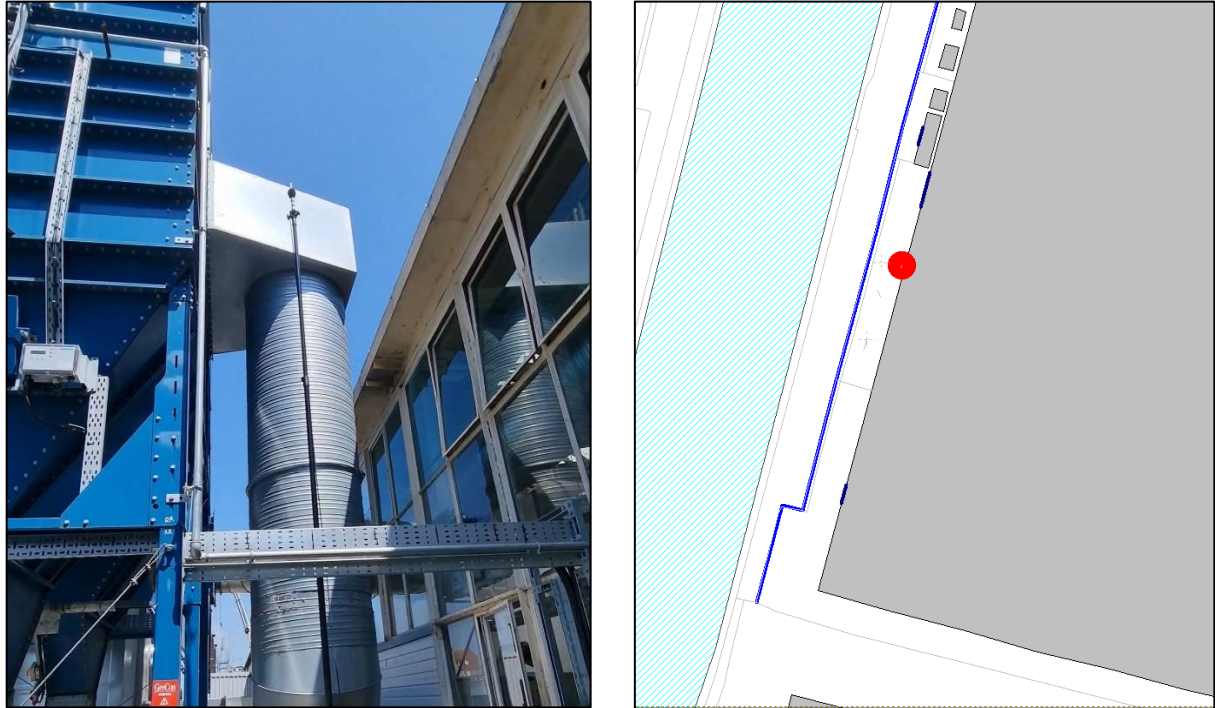
**Fig 6 – Dust Plant-5 (Outlet)**



1/3 Octave LLeq Spectrum at 1.60m distance and 5.62m height

| SOURCE DESCRIPTION           | D (m) | H (m) | L <sub>Aeq</sub> | 31.5      | 63        | 125       | 250       | 500       | 1000      | 2000      | 4000      | 8000      |
|------------------------------|-------|-------|------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| <b>DUST PLANT-5 (OUTLET)</b> | 1.60  | 5.62  | <b>79</b>        | <b>50</b> | <b>60</b> | <b>73</b> | <b>76</b> | <b>63</b> | <b>61</b> | <b>68</b> | <b>66</b> | <b>61</b> |

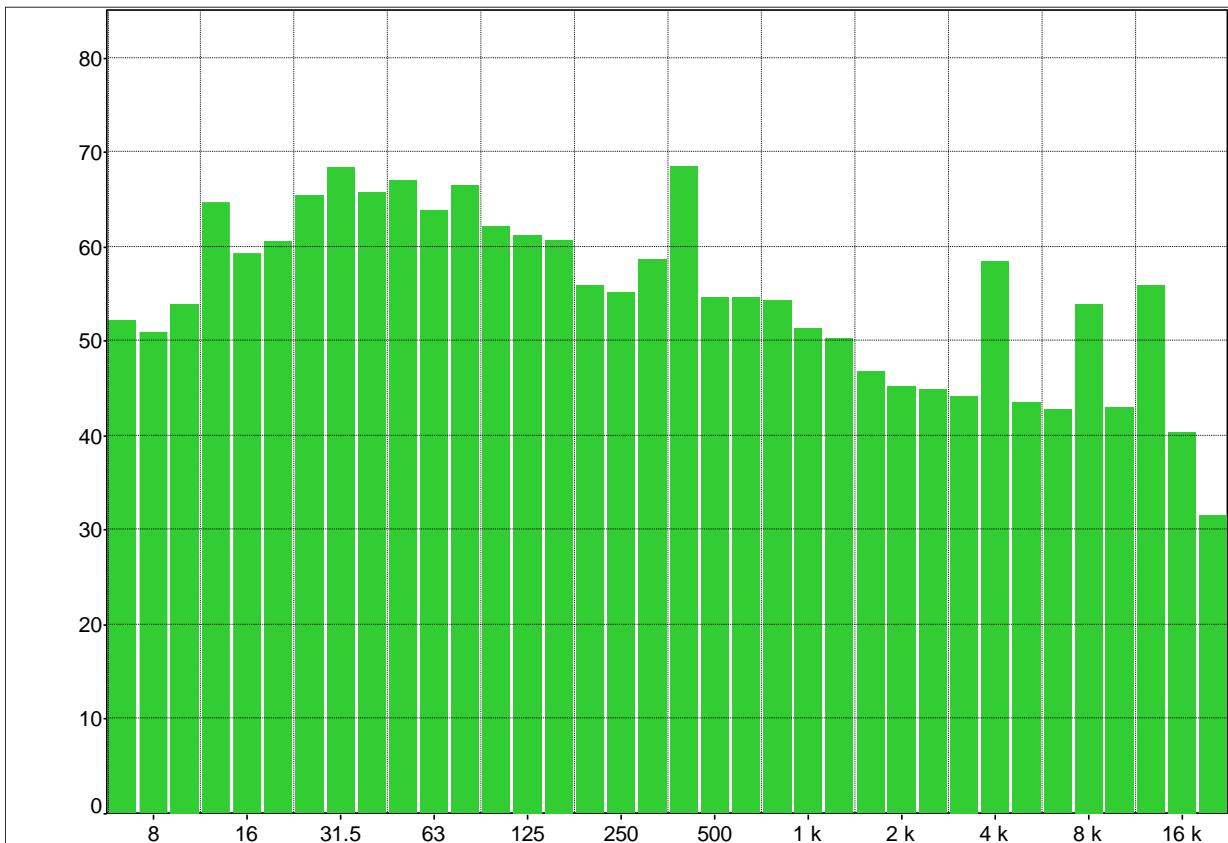
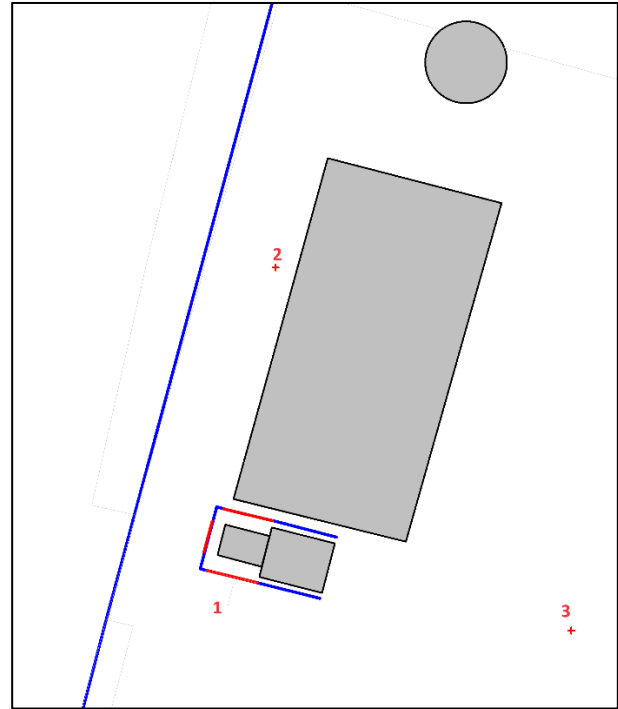
**Fig 7 – Dust Plant-5 (Inlet)**



1/3 Octave LLeq Spectrum at 0.80m distance and 5.82 height

| SOURCE DESCRIPTION   | D (m) | H (m) | LAeq | 31.5 | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 |
|----------------------|-------|-------|------|------|----|-----|-----|-----|------|------|------|------|
| DUST PLANT-5 (INLET) | 0.80  | 5.82  | 82   | 39   | 53 | 60  | 59  | 62  | 70   | 76   | 79   | 74   |

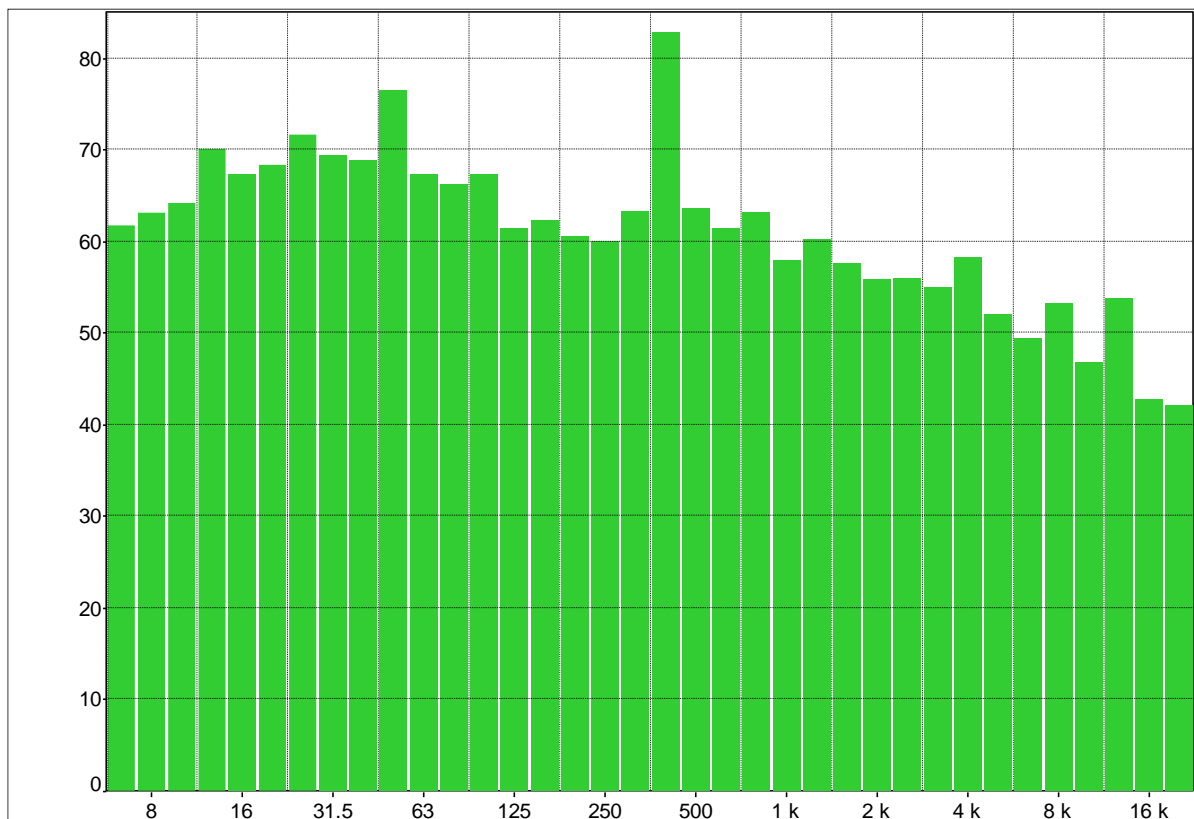
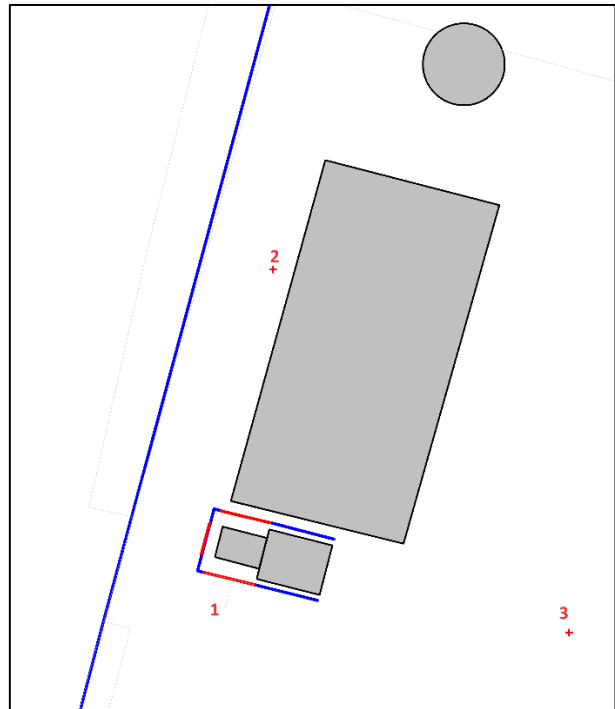
**Fig 8a – Regenerative Thermal Oxidiser (RTO)  
Motor/Fan in Housing - 1**



1/3 Octave LLeq Spectrum at 1.00m distance from Opening and 1.5 m height

| SOURCE DESCRIPTION | D (m) | H (m) | L <sub>Aeq</sub> | 31.5      | 63        | 125       | 250       | 500       | 1000      | 2000      | 4000      | 8000      |
|--------------------|-------|-------|------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| <b>RTO OPENING</b> | 1.00  | 1.50  | <b>68</b>        | <b>32</b> | <b>44</b> | <b>50</b> | <b>53</b> | <b>66</b> | <b>57</b> | <b>52</b> | <b>60</b> | <b>53</b> |

**Fig 8b – Regenerative Thermal Oxidiser (RTO)  
Burner Motor (2) & Outlet Pipe (3)**

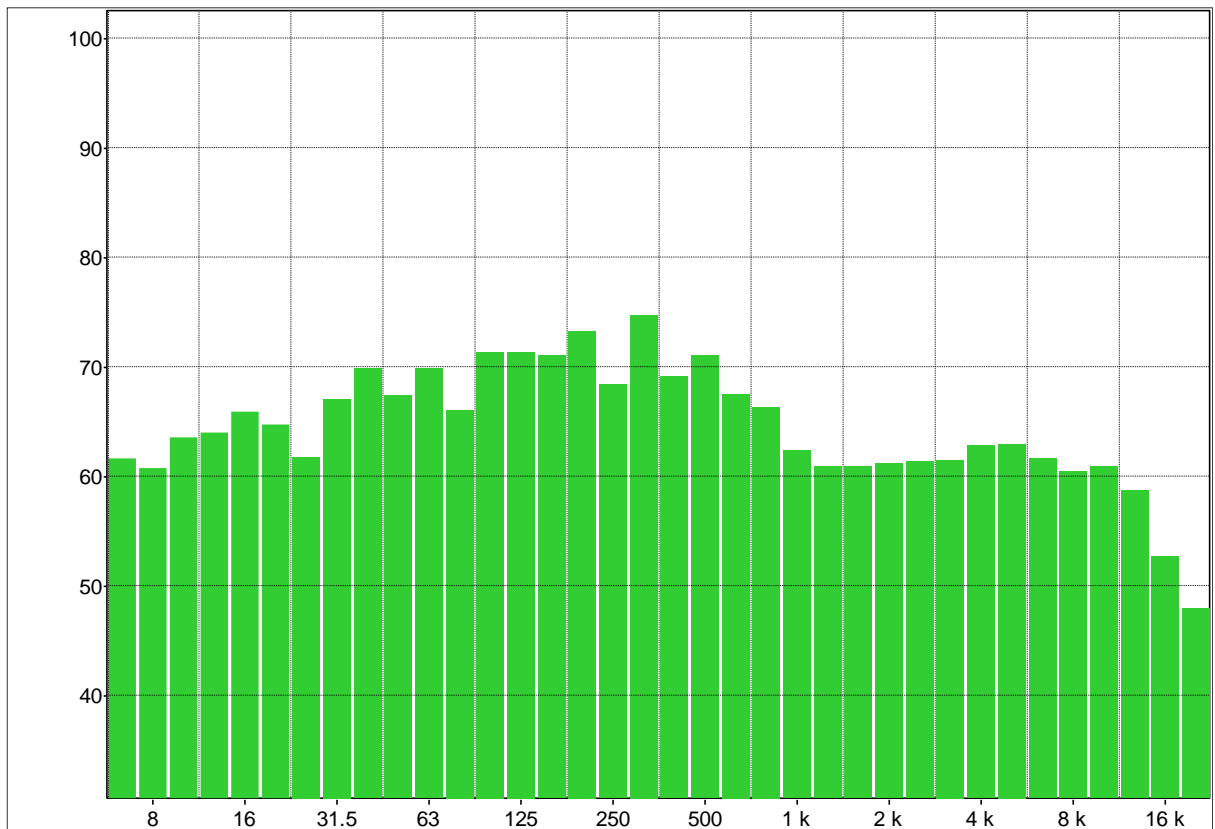
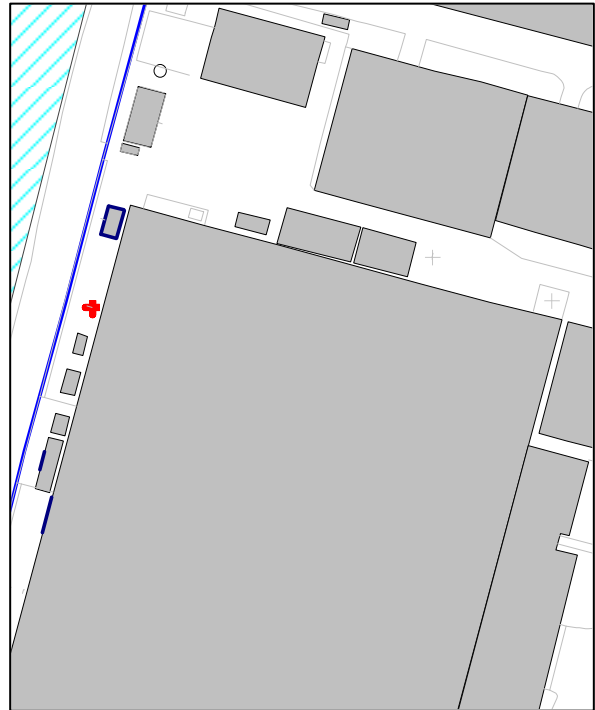


1/3 Octave LLeq Spectrum at 1.00m distance from the Burner Motor and 1.00 m height

| SOURCE DESCRIPTION  | D (m) | H (m) | LAeq      | 31.5      | 63        | 125       | 250       | 500       | 1000      | 2000      | 4000      | 8000      |
|---------------------|-------|-------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| <b>BURNER MOTOR</b> | 1.00  | 1.00  | <b>80</b> | <b>35</b> | <b>51</b> | <b>53</b> | <b>58</b> | <b>79</b> | <b>66</b> | <b>62</b> | <b>61</b> | <b>54</b> |
| <b>RTO PIPE</b>     | 1.00  | 2.00  | <b>67</b> | <b>32</b> | <b>41</b> | <b>53</b> | <b>56</b> | <b>62</b> | <b>64</b> | <b>55</b> | <b>51</b> | <b>42</b> |



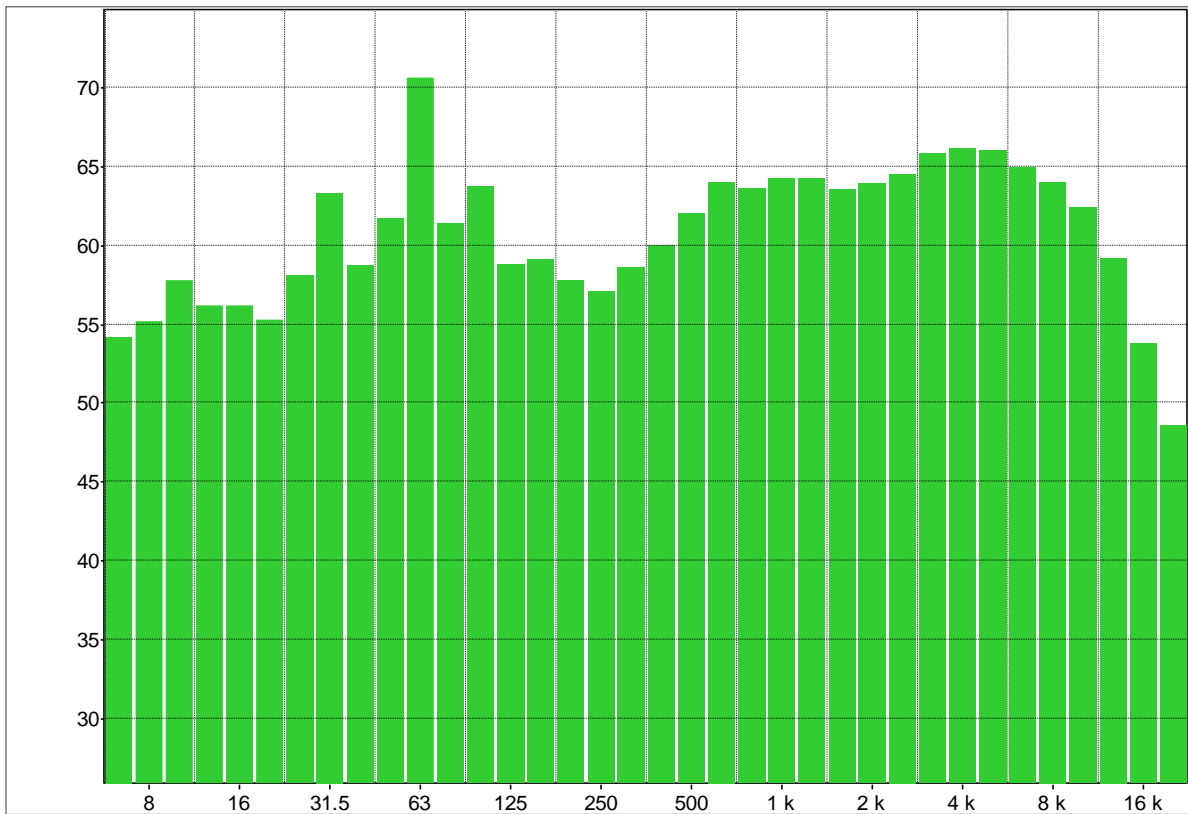
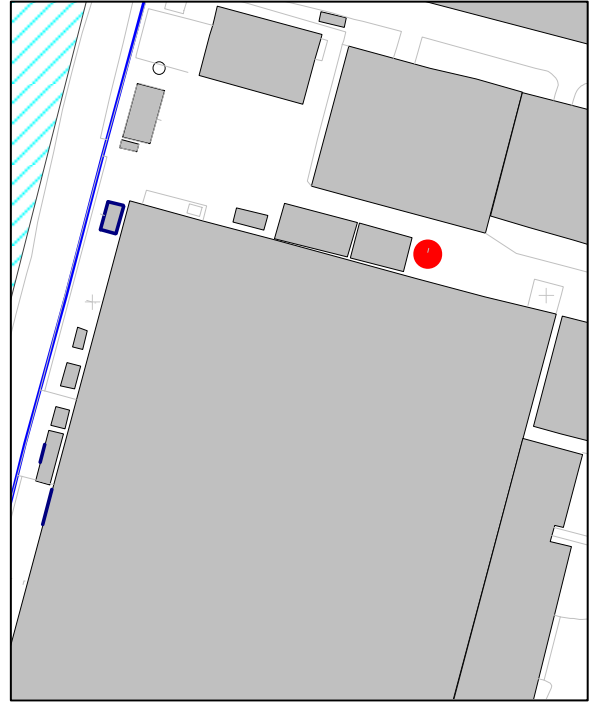
**Fig 9 – Water Cooling Tower (Canal-Facing)**



1/3 Octave LLeq Spectrum at 1.20m distance and 1.82m height

| SOURCE DESCRIPTION           | D (m) | H (m) | L <sub>Aeq</sub> | 31.5      | 63        | 125       | 250       | 500       | 1000      | 2000      | 4000      | 8000      |
|------------------------------|-------|-------|------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| <b>WATER COOLING (CANAL)</b> | 1.20  | 1.82  | <b>76</b>        | <b>33</b> | <b>47</b> | <b>60</b> | <b>69</b> | <b>71</b> | <b>69</b> | <b>67</b> | <b>68</b> | <b>65</b> |
| <b>WATER COOLING (CANAL)</b> | 1.80  | 7.68  | <b>70</b>        | <b>28</b> | <b>45</b> | <b>59</b> | <b>62</b> | <b>65</b> | <b>63</b> | <b>61</b> | <b>59</b> | <b>55</b> |

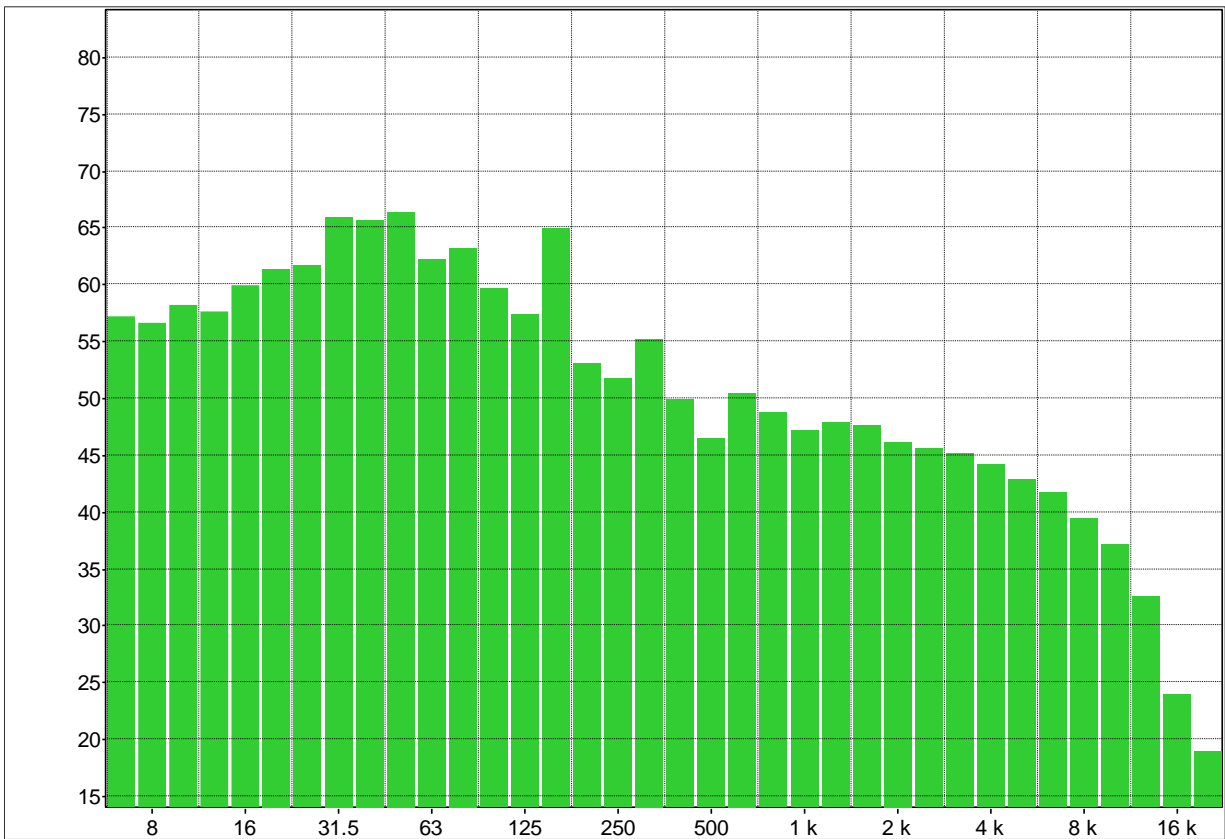
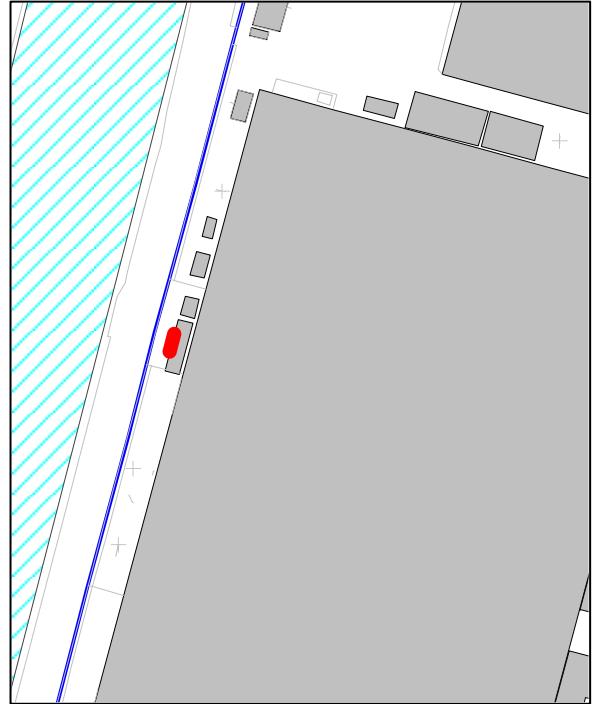
**Fig 10 – Water Cooling Tower (Side)**



1/3 Octave LLeq Spectrum at 0.90m distance and 1.82m height

| SOURCE DESCRIPTION          | D (m) | H (m) | L <sub>Aeq</sub> | 31.5      | 63        | 125       | 250       | 500       | 1000      | 2000      | 4000      | 8000      |
|-----------------------------|-------|-------|------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| <b>WATER COOLING (SIDE)</b> | 0.90  | 1.82  | <b>76</b>        | <b>26</b> | <b>45</b> | <b>50</b> | <b>54</b> | <b>64</b> | <b>69</b> | <b>70</b> | <b>72</b> | <b>67</b> |
| <b>WATER COOLING (SIDE)</b> | 0.90  | 6.70  | <b>69</b>        | <b>26</b> | <b>41</b> | <b>49</b> | <b>53</b> | <b>59</b> | <b>62</b> | <b>62</b> | <b>65</b> | <b>56</b> |

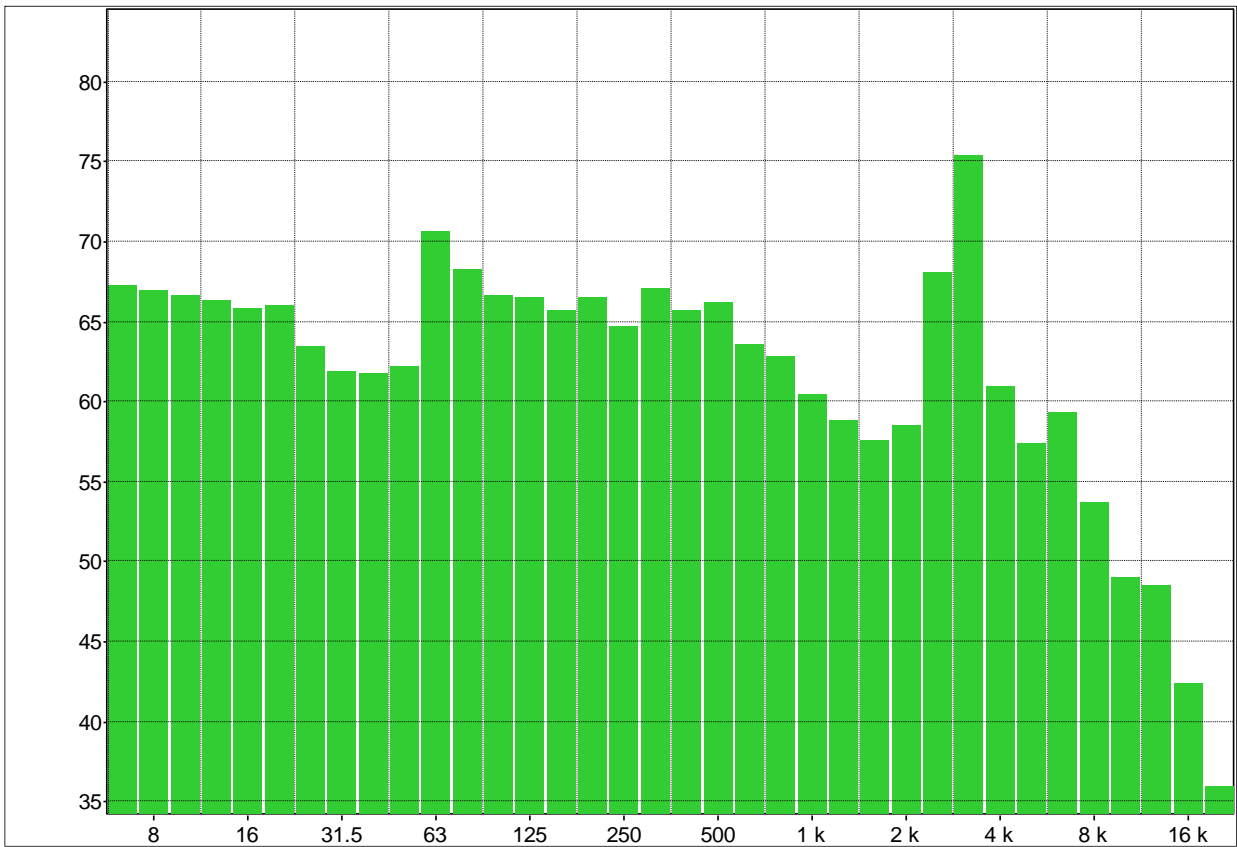
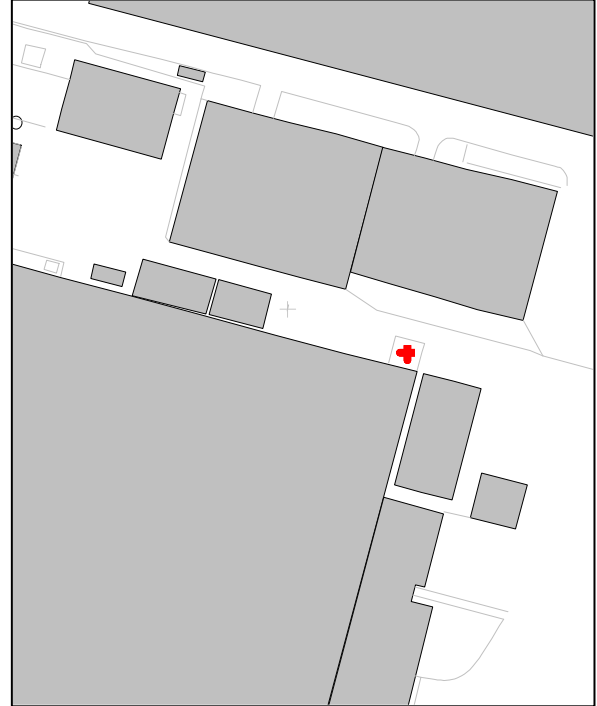
**Fig 11 – Boiler Doors**



1/3 Octave LLeq Spectrum at 0.80m distance and 1.82m height

| SOURCE DESCRIPTION  | D (m) | H (m) | LAeq      | 31.5      | 63        | 125       | 250       | 500       | 1000      | 2000      | 4000      | 8000      |
|---------------------|-------|-------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| <b>BOILER DOORS</b> | 0.80  | 1.82  | <b>59</b> | <b>30</b> | <b>43</b> | <b>50</b> | <b>50</b> | <b>51</b> | <b>53</b> | <b>52</b> | <b>50</b> | <b>43</b> |

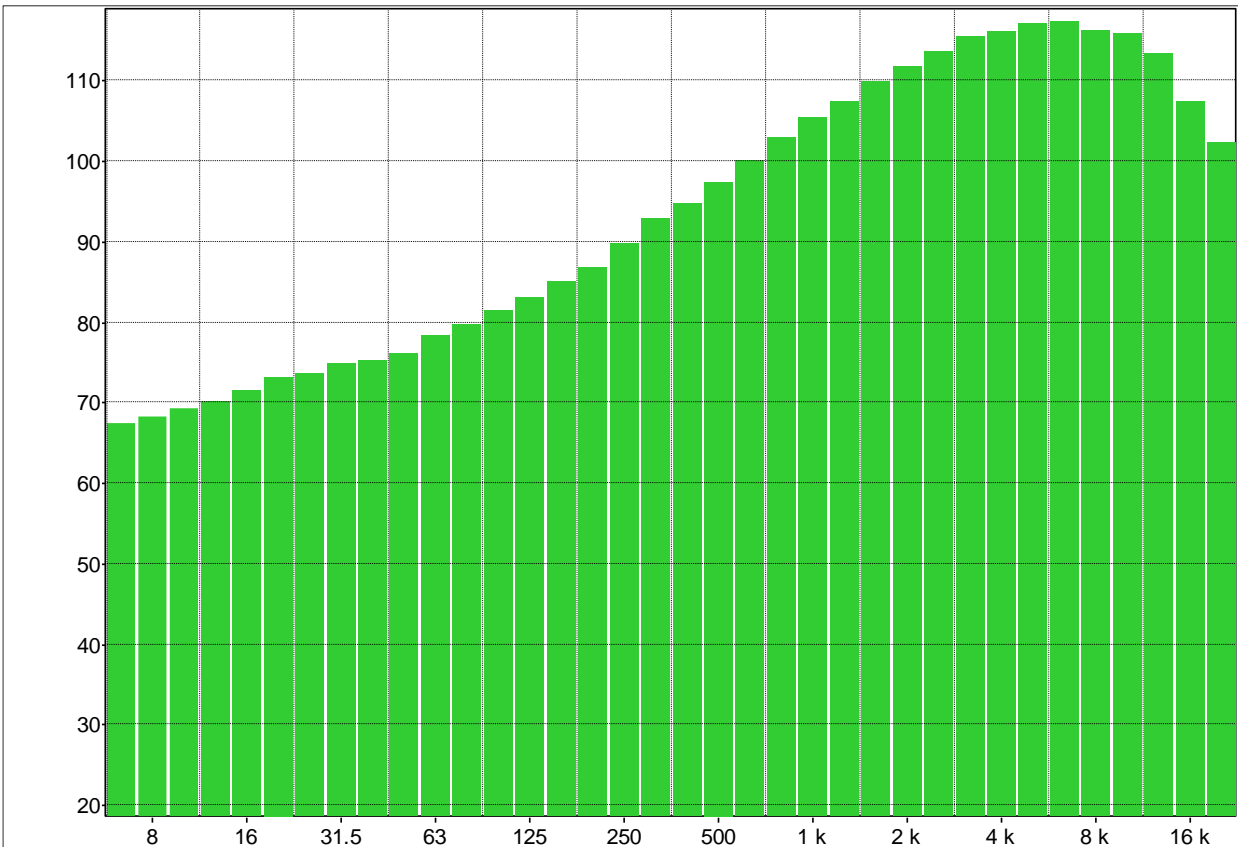
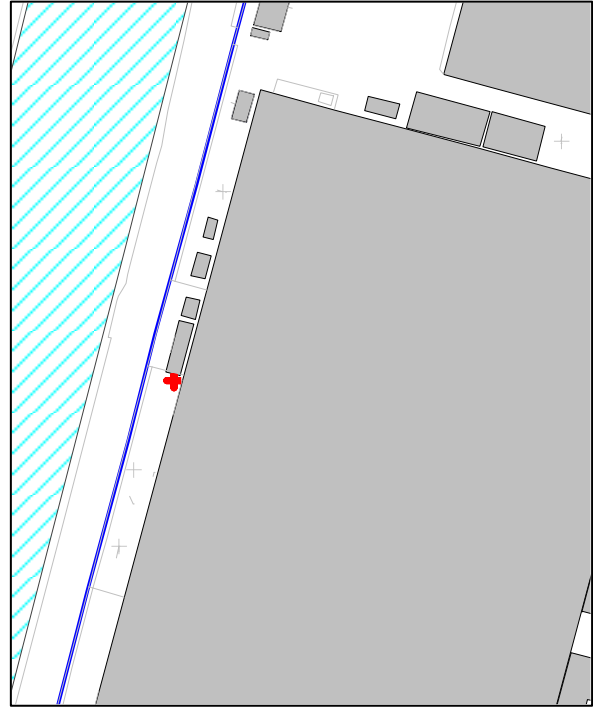
**Fig 12 – Scrubbers**



1/3 Octave LLeq Spectrum at 2.00m distance and 1.82m height

| SOURCE DESCRIPTION | D (m) | H (m) | LAeq      | 31.5      | 63        | 125       | 250       | 500       | 1000      | 2000      | 4000      | 8000      |
|--------------------|-------|-------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| <b>SCRUBBERS</b>   | 2.00  | 1.82  | <b>78</b> | <b>27</b> | <b>47</b> | <b>55</b> | <b>62</b> | <b>67</b> | <b>66</b> | <b>70</b> | <b>77</b> | <b>60</b> |

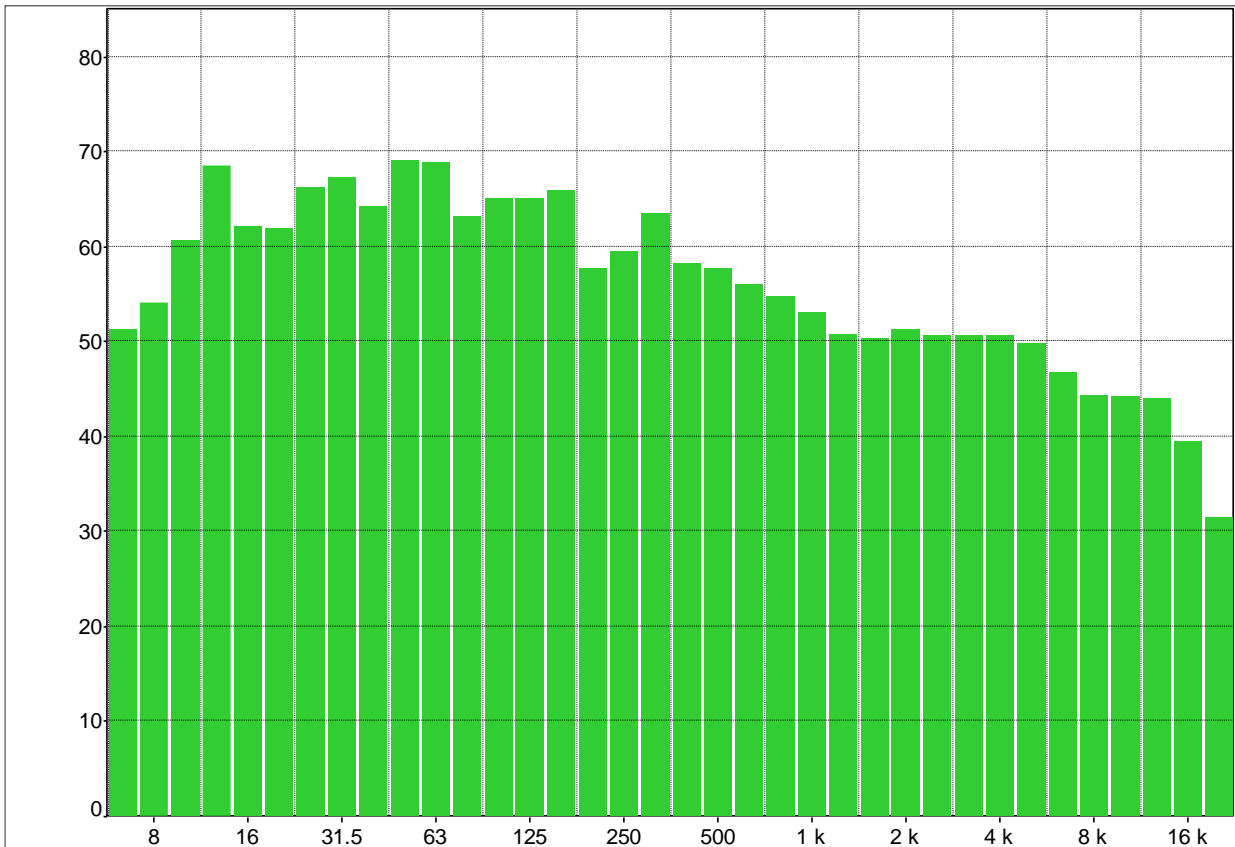
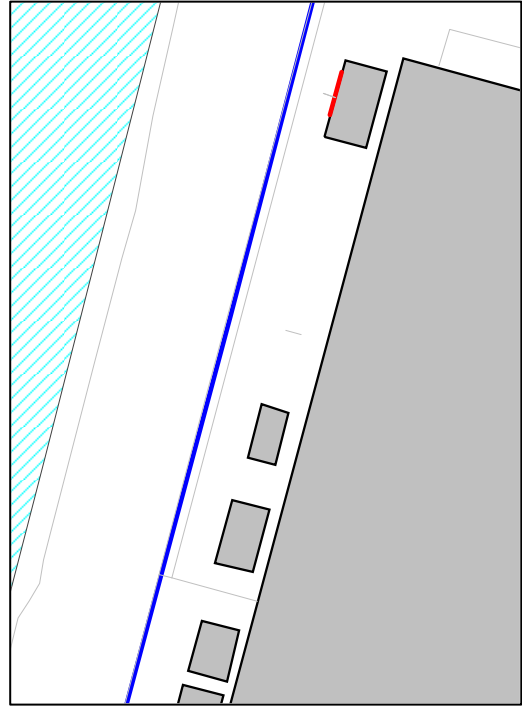
**Fig 13 – Boiler Vent**



1/3 Octave LLeq Spectrum at 2.40m distance and 6.70m height

| SOURCE DESCRIPTION | D (m) | H (m) | L <sub>Aeq</sub> | 31.5      | 63        | 125       | 250       | 500       | 1000       | 2000       | 4000       | 8000       |
|--------------------|-------|-------|------------------|-----------|-----------|-----------|-----------|-----------|------------|------------|------------|------------|
| <b>BOILER VENT</b> | 2.40  | 6.70  | <b>125</b>       | <b>40</b> | <b>57</b> | <b>72</b> | <b>87</b> | <b>99</b> | <b>110</b> | <b>118</b> | <b>122</b> | <b>120</b> |

**Fig 14 – Carbon Filter**



1/3 Octave LAeq Spectrum at 1.0m distance and 1.5m height with the door Open

| SOURCE DESCRIPTION            | D (m) | H (m) | LAeq      | 31.5      | 63        | 125       | 250       | 500       | 1000      | 2000      | 4000      | 8000      |
|-------------------------------|-------|-------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| <b>CARBON FILTER (CLOSED)</b> | 1.00  | 1.50  | <b>63</b> | <b>30</b> | <b>45</b> | <b>52</b> | <b>55</b> | <b>57</b> | <b>56</b> | <b>55</b> | <b>54</b> | <b>47</b> |

Octave LAeq Spectrum contribution form Carbon Filter at 1.0m distance and 1.5m height with the door Closed

## **14. NOISE MAPS**



**MAP 1: Permal: Day SNL Grnd Flr No Mitigation L<sub>Aeq</sub> (dBA)**





**MAP 2: Permal: Day SNL Grnd Flr 6x125m Bar/Temp/Added LAeq (dBA)**



**MAP 3: Permal: Day SNL Grnd Flr (6x125+4x44)m Bar/Added LAeq (dBA)**



**MAP 4: Permail : Night SNL First Flr No Mitigation LAeq (dBA)**



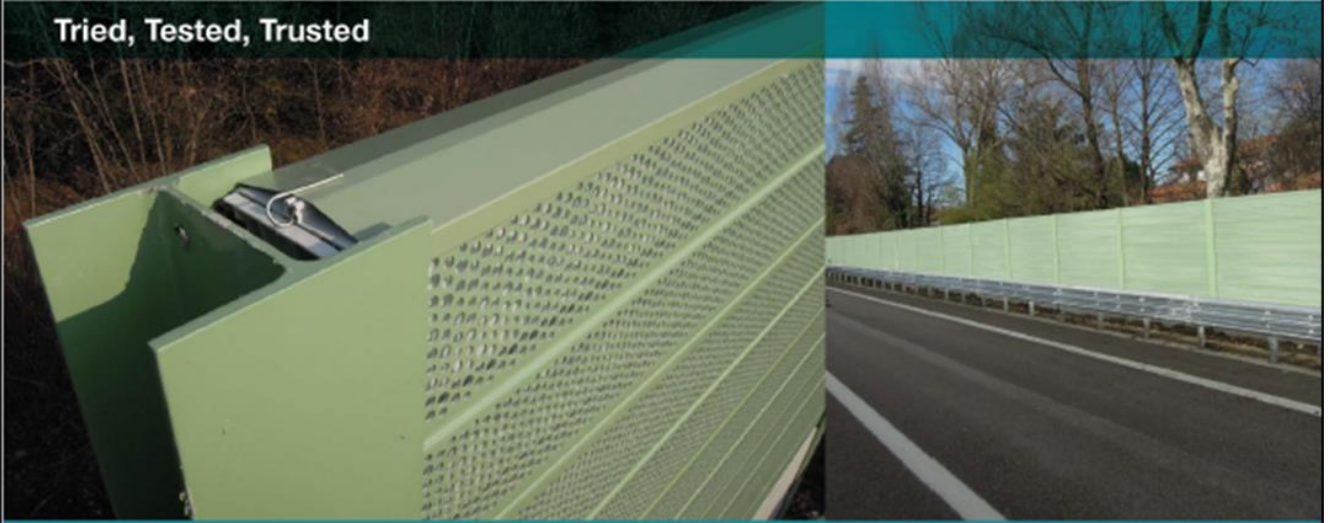


# **15: APPENDICES**

# APPENDIX A GRAMM – POLY SOUNDBLOK

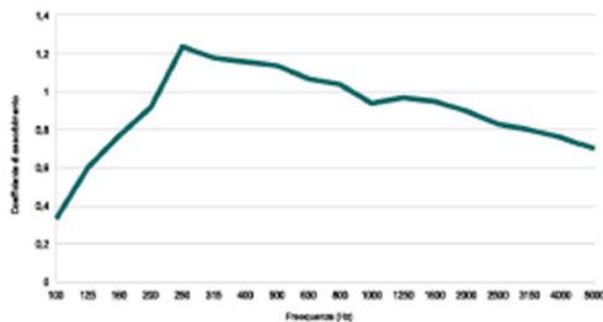
## POLYSoundBlok® ABSORPTIVE

Tried, Tested, Trusted



### Technical Information

- Barrier Rating: A5, B3
- Absorption: 16 Dba
- Reflection: 28 DLR
- Height: From 0.415m - 10m (Bespoke Heights available on request)
- Lengths: 1m - 4.25m (Bespoke Lengths available on request)
- Weight: 23kg/m<sup>2</sup>
- Material: Core up-cycled PVC (3.30mm)
- Finish: 4 Standard Colours, Brown, Green, Grey & Black
- Design Life: 40 years



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GRAMM BARRIER SYSTEMS SOUNDBLOK RANGE

# POLYSoundBlok® ABSORPTIVE

Tried, Tested, Trusted



Cross section detail

Gramm offer a full range of acoustic barriers to safeguard and protect a whole range of property and sites from noise as well as providing the security you need. Whether your requirement is to keep sound in or out of your premises, we have the right noise barriers and acoustic fencing to provide the solution.

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| Class  | Acoustic Performance  | Design Life                           | Replacement Design Life Based on 120 years       |
|--|---|---------------------------------------|--|
| B3<br>A5   | DLR 28 dB<br>D1a 16 dB(A)   | 40 years - Panels<br>60 years - Posts | 2<br>1   |
| Foundation Type  | Fixing Method / Post Type   | Fixings                               | Maintenance                                      |
| 1) Shallow concrete pad footing set at 3.0 or 4.25m centres.<br>2) Augered foundations set at 3.0m or 4.25m centres. | 1) Galvanised steel or PPC posts with baseplates fixed to concrete pad footings using chemfix resin anchors/studs.<br>2) Steel RSJ posts set into augered foundations using ST5 concrete. | Stainless Steel                       | Zero Maintenance.<br>Yearly inspection required. |

Gramm Barrier Systems Ltd noise barrier & fencing specialist.

Images and photos are property of gramm barrier systems and must not be duplicated or disrupted without permission.



## APPENDIX B

# Temporary Noise Barrier



## APPENDIX C

### NPPG Observed Effect Levels

| Perception                     | Examples of outcomes   | Increasing effect level                   | Action                           |
|--------------------------------|--|---|----------------------------------|
| Not noticeable                 | No Effect  | No Observed Effect                        | No specific measures required    |
| Noticeable and not intrusive   | Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.   | No Observed Adverse Effect                | No specific measures required    |
|                                |  | Lowest Observed Adverse Effect Level      |                                  |
| Noticeable and intrusive       | Noise can be heard and causes small changes in behaviour and/or attitude, eg turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.  | Observed Adverse Effect                   | Mitigate and reduce to a minimum |
|                                |  | Significant Observed Adverse Effect Level |                                  |
| Noticeable and disruptive      | The noise causes a material change in behaviour and/or attitude, eg avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area. | Significant Observed Adverse Effect       | Avoid                            |
| Noticeable and very disruptive | Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, eg regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, eg auditory and non-auditory   | Unacceptable Adverse Effect               | Prevent                          |

## APPENDIX D WHISTOP DIFFRACTOR

**Example is on a safety barrier but can be attached to the top of any robust noise barrier system to enhance its performance**



**1. Environmental Aspect:**

Noise being emitted from onsite manufacturing processes including abatement controls (scrubber, RTO and carbon filtration).

**2. Target:**

To maintain compliance to environmental permit conditions and minimise risk of noise being emitted from site to neighbouring communities resulting in statutory nuisance complaints and breach of permit.

**3. Areas under control:**

Whole site – all manufacturing processes plant and equipment, all abatement equipment.

**4. General Company Working Policies with regard to Noise:**

The following controls shall be considered normal operating conditions:

- To include working policies to reduce emissions towards employees (Health & Safety) – Ref Section 4.3
- To include noise control measures to reduce emissions toward residential neighbours – Ref Section 4.1
- **Remote Noise Monitoring** to verify ongoing conformity with permit conditions – Ref Section 4.2
  - **Provide** – (monthly) report statements highlighting any exceedances to permit limits.
  - **Identify** – whether an exceedance originated from the Permalı site or a third-party source.
  - **Interpret** – whether an exceedance constituted a valid breach of permit.
  - **Investigate** – whether further mitigation might be required to control or prevent.
- Program of Routine on-site noise monitoring “at source” as a plant health check – Ref Section 8.

**4.1 Noise Control Measures and Action Plan:**

The following mitigation measures include those described and specified in the Sound Barrier Solutions “Permalı Noise Impact Assessment & Barrier/Mitigation Design” Report: September 2023 (referred to as Phase 1 and Phase 2):

- Temporary Noise Barrier Installation around Primary Sources
- Phase 1: Attenuation of Primary Sources - V9 Cyclo-Filter & Valve. V9 Fan and Dust Plant 5
- Noise Survey (Oct/Nov 23) of the Mitigated Noise Sources with Temp Barrier Removed
- Phase 1: Temporary Noise Barrier Installation : 5m x 44m
- Phase 1: Gramm PolySoundBlok Noise Barrier Installation: 6m x 125m
- Phase 2: Gramm PolySoundBlok Noise Barrier Installation: 4m x 44m (replacing the Temporary)
- Noise Impact Assessment & Mitigation Design for Chiller (Southeast Corner)
- Noise Mitigation Measures for Chiller – Approved and Installed
  
- Remote Noise Monitoring System – Specified, Approved, Thresholds Set, and Installed
- Remote Noise Monitoring System – Proactive – Regular Reports generated to confirm compliance
- Remote Noise Monitoring System – Reactive – Interrogate data in response to future complaints.
  
- Future Measures: Consider the additional noise mitigation benefit of including diffracting tops to the barrier sections as a way of enhancing their acoustic performance in the future.
  
- General: West-Facing Factory Shutter Doors Restrict Opening to half-height or for Vehicular access only. Normally keep closed when not in use or not required for ventilation.
- General: Replacement of Site Vehicle Reversing Sirens with ‘White Noise’ Sirens

[https://gloucester365-my.sharepoint.com/personal/gosig\\_gloucester\\_gov\\_uk/Documents/permalı Download Steve Williams June 2023/Report & Attachments/IP015-021A NMP Noise Management Plan.docx](https://gloucester365-my.sharepoint.com/personal/gosig_gloucester_gov_uk/Documents/permalı Download Steve Williams June 2023/Report & Attachments/IP015-021A NMP Noise Management Plan.docx)

**4.2 Remote Noise Monitoring:** Refer to Example in Section 13

The intention will be to have a permanent/remote noise monitoring station at the site boundary to monitor site noise levels 24/7 to verify ongoing conformity with permit conditions and to manage any potential recorded exceedances (as described above). This will be devised with the approval of the local authority. This will involve:

- Identify a best location for a RNM station.
- Determine permit threshold levels that can be directly related to specific Noise Sensitive Receptors.
- Devise a red/amber/green system for triggering an exceedance.
- Choose an optimum RNM station system and confirm means of installation.
- Set up an ongoing means of remote data collation, management, and reporting.

**4.3 Health & Safety: Control of Noise at Work Regulations 2005.**

Under the Health and Safety at Work, etc Act 1974, employers have a general duty to ensure, so far as is reasonably practicable, the health, safety, and welfare at work of all employees.

Under the Control of Noise at Work Regulations 2005 Permal Gloucester Ltd must:

- Identify noise hazards in the workplace.
- Estimate likely exposures to noise of employees.
- Identify measures required to eliminate or reduce risks, control exposures, and protect employees.
- Make a record of what measures are to be taken in the form of an action plan.
- Protect employees with hearing protection, making its use mandatory in high-risk areas.
- Inform, instruct, and train employees on the risks from noise, control measures, hearing protection and safe working practices.
- Provide health surveillance (including hearing checks) for those at high risk.
- Maintain any noise control equipment and hearing protection in order to control exposure.

The Control of Noise at Work Regulations 2005 also impose limits on exposure which the employer must ensure are not exceeded.

We must eliminate or reduce the risk of employees being harmed by exposure to noise whilst at work.

To do this, we shall regularly assess the noise levels to which our employees are exposed in areas where we identify that exposure reaches or exceeds the action levels. Noise assessments are completed by external competent persons and results from the assessments are reviewed and where necessary controls implemented.

We also provide information, instruction and training for employees about noise risks, safety measures and hearing protection options if there is a risk, they are being exposed to levels between 80 and 85 dB(A) or higher. Several areas within the facility have been identified as hearing protection zones.

We ensure that any hearing protection provided is suitable.

Where noise exposure exceeds the second action level or peak action level, we shall take steps to reduce exposure to the noise source so far as is reasonably practicable, by means other than the provision of hearing protection.

**5. Result of Deviation:**

Breach of permit conditions, Statutory nuisance, complaints from sensitive receptors, possible prosecution, significant environmental noise incident.

| Deviation with respect to Site Noise:  | Potential Result of Deviation:   |
|--|--|
| Breach of Environmental Permit Conditions (EPC) with regard to Noise:                | Issue of Breach of Condition notice with regard to the Permit conditions with a requirement to demonstrate and secure compliance with the stated Permit conditions within a specified time-frame period. Failure to do so may result in prosecution and a financial penalty.   |
| Statutory Nuisance with regard to noise under the Environmental Protection Act 1990: | If the Council confirm that a statutory nuisance is happening or will happen in the future, councils must serve an Abatement Notice. This requires the responsible party to stop or restrict the noise. The notice will usually be served on the owner/occupier of the premises where the nuisance is deemed to originate  |
| Complaints from Noise Sensitive Receptors:   | <p>Any public noise complaints should be assessed against remote noise monitoring records to <b>identify</b> any complaint is due noise generated by Permali or by a third unrelated party.</p> <p>Should the noise be identified as originating from Permali the level should be <b>interpreted</b> to confirm whether it constitutes a breach of the EPC.</p> <p>Should a breach be confirmed, the incident should be <b>investigated</b> to determine practical mitigation measures are put in place to ensure there is no re-occurrence.</p> |

**6. Objectives affected:**

- Failure to prevent pollution.
- Operational controls failure.
- Permit compliance breached.
- Fail to minimise environmental complaints.

**7. Clean-up Controls:**

- Wet scrubber system is located in a bund.

**8. Routine Noise Testing of Operational Plant:**

The (Specific Noise Source) Operating Plant referred to in Table 10: BAT for Noise Control shall be routinely noise surveyed in the near field (suggest every 6 months to a year) to confirm that the specific noise source levels have not deviated adversely.

[https://gloucester365-my.sharepoint.com/personal/gosig\\_gloucester\\_gov\\_uk/Documents/permali Download Steve Williams June 2023/Report & Attachments/IP015-021A NMP Noise Management Plan.docx](https://gloucester365-my.sharepoint.com/personal/gosig_gloucester_gov_uk/Documents/permali%20Download%20Steve%20Williams%20June%202023/Report%20&%20Attachments/IP015-021A%20NMP%20Noise%20Management%20Plan.docx)

**9. Risk Assessment:**

**Table 1: Categorisation of Noise Risk (Noise Effect Levels)**

| <b>Category:</b> | <b>Risk Rating:</b>                                       | <b>Characteristic of source and emissions at Noise Sensitive Receptors:</b>  | <b>Action</b>                    |
|------------------|---|--|----------------------------------|
| <b>1</b>         | <b>NOEL</b><br>No Observed Effect                         | No effect.   | No measures required             |
| <b>2</b>         | <b>NOAEL</b><br>No Observed Adverse Effect                | Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.   | No measures required             |
| <b>3</b>         | <b>LOAEL</b><br>Lowest Observed Adverse Effect Level      | Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.  | No measures required             |
| <b>4</b>         | <b>ADVERSE</b><br>Observed Adverse Effect Level           |  | Mitigate and reduce to a minimum |
| <b>5</b>         | <b>SOAEL</b><br>Significant Observed Adverse Effect Level | The noise causes a material change in behaviour and/or attitude, eg avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area. | Avoid                            |

10. Bat for Noise Control:

| Aspect:  | Who / What is could be affected:                             | Current BAT Control:   | Risk score: (Ref Table 1) | Impact:   | Area Impacted: | Residual Significance:  |
|--|--|--|---------------------------|---|----------------|---|
| Cumulative Site Noise Sources                              | Neighbours on Western Canal Bank downwind of emission points | <ul style="list-style-type: none"> <li>Phase 1 /2 Noise Barriers Installed</li> <li>Primary Noise Sources Mitigated</li> <li>Remote Noise Monitoring – Noise Management Program</li> </ul> | 4 (Day)<br>5 (Night)      | NPSE: ADVERSE (Daytime)<br>Observed Adverse Effect Level<br><br>NPSE: SOAEL (Night-time)<br>Significant Observed Adverse Effect Level<br><br>Without Mitigation measures in place | Offsite        | NPSE: LOAEL Lowest Observed Adverse Level with mitigation measures in place |
| Specific Noise Source: Regenerative Thermal Oxidiser (RTO) | Neighbours on Western Canal Bank downwind of emission points | <ul style="list-style-type: none"> <li>Routine Monitoring of Operating Specific Noise On and Offsite</li> </ul>  | 4 (Day)<br>5 (Night)      | NPSE: ADVERSE (Daytime)<br>Observed Adverse Effect Level<br><br>NPSE: SOAEL (Night-time)<br>Significant Observed Adverse Effect Level<br><br>Without Mitigation measures in place | Offsite        | NPSE: LOAEL Lowest Observed Adverse Level with mitigation measures in place |
| Specific Noise Source: V9 Cyclo-Filter & Valve.            | Neighbours on Western Canal Bank downwind of emission points | <ul style="list-style-type: none"> <li>Routine Monitoring of Operating Specific Noise On and Offsite</li> </ul>  |                           |   | Offsite        | NPSE: LOAEL Lowest Observed Adverse Level with mitigation measures in place |
| Specific Noise Source : V9 Fan                             | Neighbours on Western Canal Bank downwind of emission points | <ul style="list-style-type: none"> <li>Routine Monitoring of Operating Specific Noise On and Offsite</li> </ul>  |                           |   | Offsite        | NPSE: LOAEL Lowest Observed Adverse Level with mitigation measures in place |
| Specific Noise Source: Dust Plant 5                        | Neighbours on Western Canal Bank downwind of emission points | <ul style="list-style-type: none"> <li>Routine Monitoring of Operating Specific Noise On and Offsite</li> </ul>  |                           |   | Offsite        | NPSE: LOAEL Lowest Observed Adverse Level with mitigation measures in place |
| Specific Noise Source: West Facing Shutter Doors           | Neighbours on Western Canal Bank downwind of emission points | <ul style="list-style-type: none"> <li>Restrict Opening to half-height or for Vehicular access only.</li> <li>Normally keep closed when not in use or not</li> </ul>                       |                           |   | 4              | NPSE: ADVERSE Observed Adverse Effect Level                                 |



|  |  |  |   |   |         |                 |
|--|--|--|---|---|---------|-----------------|
|  |  | required for ventilation<br>Dust plant emissions   |   | Without<br>Mitigation<br>measures in place  |         |                 |
| Specific Noise Source :<br>Site Vehicles | Neighbours on<br>Western Canal<br>Bank downwind<br>of emission<br>points | <ul style="list-style-type: none"> <li>Replacement of Site<br/>Vehicle Reversing Sirens<br/>with 'White Noise' Sirens</li> </ul> | 4 | NPSE: ADVERSE<br>Observed Adverse<br>Effect Level<br><br>Without<br>Mitigation<br>measures in place | Offsite | Not Significant |

**11. Management & Responsibilities:**

| <b>Environmental Noise:</b>  | <b>Personnel Responsible:</b>  |
|--|--|
| Adherence to all operational controls implemented to minimise noise emissions being generated from onsite activities, to include:<br>Control of site operational hours.<br>Control of site fork-lift truck operations during evening and night shift.<br>Control of external plant operating times.<br>Controls for closing of roller doors / final exit doors / factory windows during evening and night work.<br>Controlling waste collection times.<br>Control of logistics – deliveries and collection times.<br>Control of maintenance activities.<br>Control of contractor activities. | All Employees<br>Production Managers<br>Supervisors<br>Team Leaders<br>HS&E Manager<br>Facilities Manager<br>Maintenance Manager<br>Operations Director<br>Managing Director |
| Ongoing Remote Noise Management Service: (Monthly) report statement to confirm permit compliance, identify potential exceedance, interpret its validity and if required, investigate the required control measure/mitigation.  | HS&E Team<br>Facilities Management Team<br>Remote Monitoring Service<br>Integration Team   |
| The action and investigations to be carried out in the event of complete process or noise abatement failure. This will include investigating the causes of any noise complaints.   | HS&E Team<br>Facilities Management Team<br>Remote Monitoring Service<br>Integration Team   |
| Employees responsible for dealing with noise management.<br>Employees who are responsible for liaising with local authorities, permit regulators, residents, and who also have the authority to initiate action in the event of significant plant / management control failures.   | HS&E Manager<br>Facilities Manager<br>Maintenance Manager<br>Integration Manager<br>Operations Director<br>Managing Director   |
| Employees responsible for collation of measuring and monitoring records  | Facilities Management Team<br>HS&E Manager   |
| Completion and submission of mandatory annual reporting to permit regulators.  | Facilities Management Team<br>HS&E Manager   |
| Employees responsible for effective root cause and corrective actions post environmental noise complaints.   | HS&E Team + others   |
| Employees responsible for providing training for maintenance engineers on plant and equipment that could generate excessive noise during specific work activities.   | Facilities Manager<br>Maintenance Manager  |

[https://gloucester365-my.sharepoint.com/personal/gosig\\_gloucester\\_gov\\_uk/Documents/permalidownload Steve Williams June 2023/Report & Attachments/IP015-021A NMP Noise Management Plan.docx](https://gloucester365-my.sharepoint.com/personal/gosig_gloucester_gov_uk/Documents/permalidownload%20Steve%20Williams%20June%202023/Report%20&%20Attachments/IP015-021A%20NMP%20Noise%20Management%20Plan.docx)

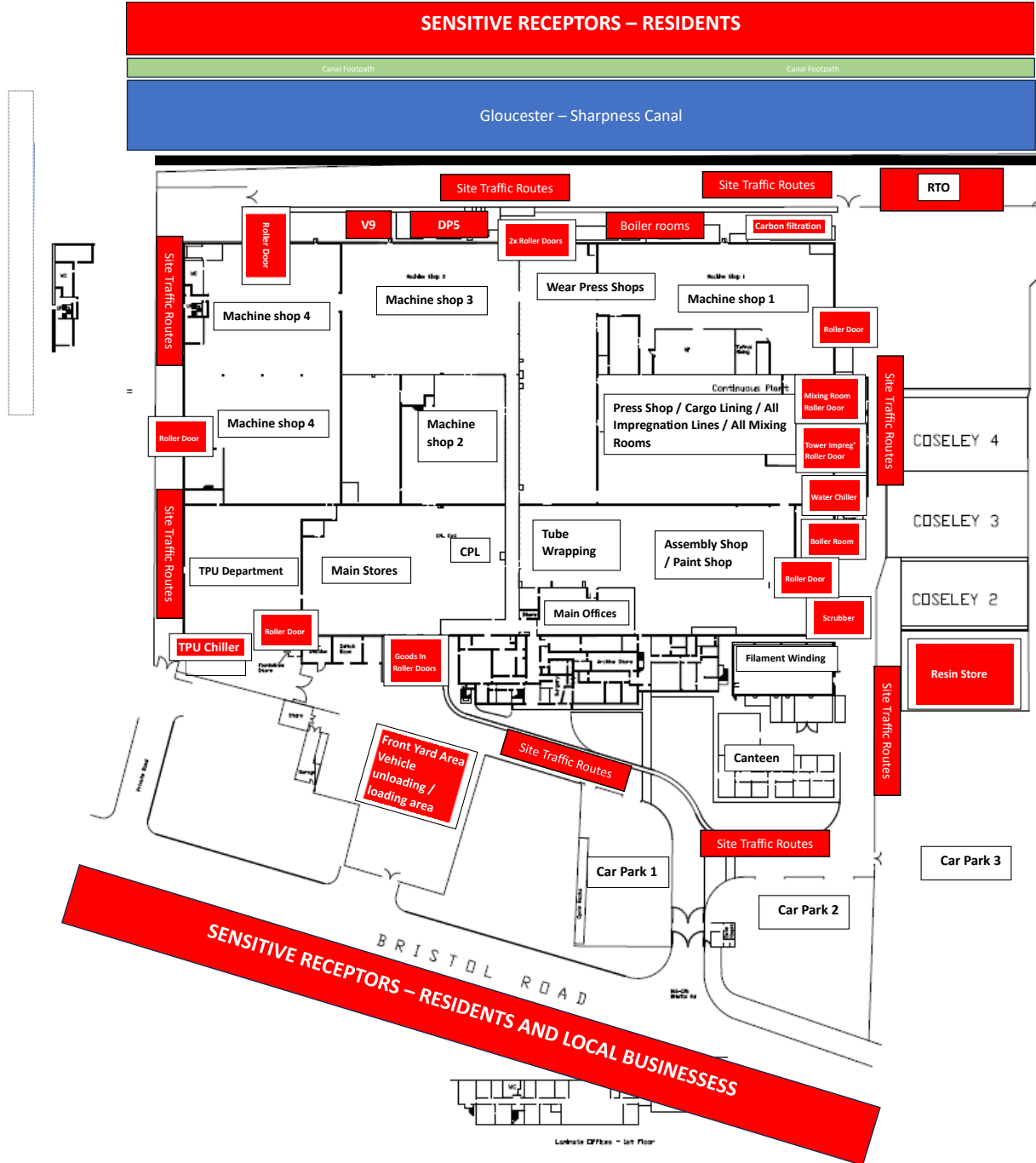
**PERMALI GLOUCESTER LIMITED**  
 OPERATIONAL CONTROLS & EMERGENCY PREPAREDNESS  
 CONTROL DOCUMENT – IP015-021 Rev' A– NOISE MANAGEMENT PLAN (NMP)

|  |   |
|--|---|
| Employees responsible for all external plant and equipment. PPM scheduled at correct frequencies for manufacturing processes and external abatement equipment are established. | Facilities Manager<br>Maintenance Manager<br>Facilities Co-ordinator<br>HS&E Team |
| Effective engagement with residents and local authority  | Operations Director<br>HS&E Manager   |
| Annual Management Review of this document  | Facilities Manager<br>Operations Manager<br>HS&E Manager<br>Managing Director     |

[https://gloucester365-my.sharepoint.com/personal/gosig\\_gloucester\\_gov\\_uk/Documents/permalidownload Steve Williams June 2023/Report & Attachments/IP015-021A NMP Noise Management Plan.docx](https://gloucester365-my.sharepoint.com/personal/gosig_gloucester_gov_uk/Documents/permalidownload%20Steve%20Williams%20June%202023/Report%20&%20Attachments/IP015-021A%20NMP%20Noise%20Management%20Plan.docx)

**12. Noise Emission Points:**

Site noise emission point highlighted on map below from access, egress points, site traffic movements and external plant and equipment:



[https://gloucester365-my.sharepoint.com/personal/gosig\\_gloucester\\_gov\\_uk/Documents/permalidownload Steve Williams June 2023/Report & Attachments/IP015-021A NMP Noise Management Plan.docx](https://gloucester365-my.sharepoint.com/personal/gosig_gloucester_gov_uk/Documents/permalidownload%20Steve%20Williams%20June%202023/Report%20&%20Attachments/IP015-021A%20NMP%20Noise%20Management%20Plan.docx)

**13. REMOTE NOISE MONITORING - NOISE MANAGEMENT :**

- **A REMOTE NOISE MONITORING STATION** will simultaneously record noise and weather data with the facility to filter out wind/rain affected readings. Audio files may also be recorded on a loop system.
- **A SITE BOUNDARY LOCATION** for the remote noise monitor station shall be selected based on exposure to noise, proximity to receptors and also to power supply.
- **THRESHOLD LEVELS** will be determined at the remote monitor location for both day/night conditions that can be directly related to façade noise levels the most exposed noise sensitive receptors.
- **TRAFFIC LIGHT** – Red/Amber/Green levels will then be set for the remote monitor that identify potential exceedance levels against the permit noise criteria (BS4142:2014+A1:2019).
- **REMOTE ASSESSMENTS** will be carried out of the data and MONTHLY REPORTS generated to confirm compliance with the Permit Conditions and highlight any potential exceedance if they occur.
- **PROACTIVE NOISE MANAGEMENT**  
The monthly reports will be used to:
  - **Verify** – compliance with the permit.
  - **Identify** – whether an exceedance originated from Permali or a third-party source.
  - **Interpret** – whether an exceedance constituted a valid breach of permit.
  - **Investigate** – whether further mitigation might be required to control or prevent.
- **REACTIVE NOISE MANAGEMENT**  
When unexpected complaints occur, the monthly report can be used to:
  - **Interrogate** – the complaint with regard to its nature, time and duration, to clarify and confirm the origin of the noise if it indeed originated from site, to demonstrate good management and where appropriate provide constructive feedback.
- **EXAMPLE SYSTEM: (overpage)**  
CIRRUS – QUANTUM OUTDOOR CLOUD-BASED NOISE MONITORING

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The NMP as described above is a living document that will evolve. The NMP shall be reviewed and where necessarily updated to check its continued effectiveness:

- As part of annual review
- Following any changes to the operation of the site
- Following receipt of odour complaints.

|  |
|--|
| Approved by: Jess Haggett Date: 25/09/2023 |
|--|

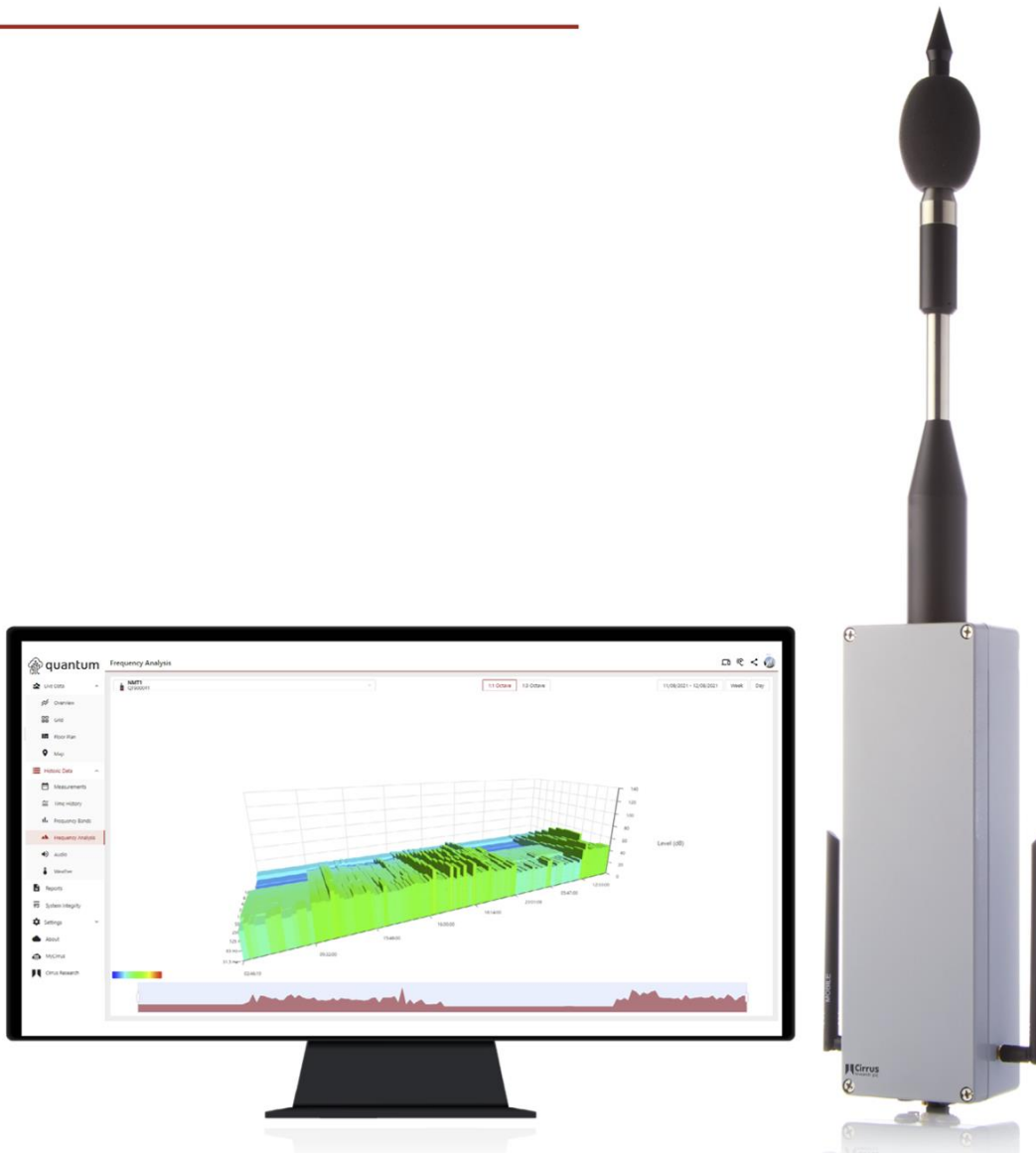
[https://gloucester365-my.sharepoint.com/personal/gosig\\_gloucester\\_gov\\_uk/Documents/permali Download Steve Williams June 2023/Report & Attachments/IP015-021A NMP Noise Management Plan.docx](https://gloucester365-my.sharepoint.com/personal/gosig_gloucester_gov_uk/Documents/permali%20Download%20Steve%20Williams%20June%202023/Report%20&%20Attachments/IP015-021A%20NMP%20Noise%20Management%20Plan.docx)





# Quantum Outdoor Cloud-Based Noise Monitoring

Go beyond noise measurement: unattended monitoring and control of environmental noise with our cloud-based system



[https://gloucester365-my.sharepoint.com/personal/gosig\\_gloucester\\_gov\\_uk/Documents/permalidownload/Steve Williams June 2023/Report & Attachments/IP015-021A NMP Noise Management Plan.docx](https://gloucester365-my.sharepoint.com/personal/gosig_gloucester_gov_uk/Documents/permalidownload/Steve%20Williams%20June%202023/Report%20&%20Attachments/IP015-021A%20NMP%20Noise%20Management%20Plan.docx)

# Report for the Periodic Monitoring of Emissions to Atmosphere

## Permal Ltd (Gloucester)

### Thermal Oxidiser

Permit No: np  
Installation: Gloucester  
Monitoring Dates: 31st August 2023  
Site Address: Permal Gloucester Ltd, 270 Bristol Road, Gloucester, GL1 5TT

Report Number: EM-0042                      Version: 1                      Visit: 3 in 2023  
Date of Report: 14th September 2023  
Report Author: Jonny Guy  
MCERTS No: MM 16 1388                      MCERTS Level: 2 (TE1, TE2, TE4)

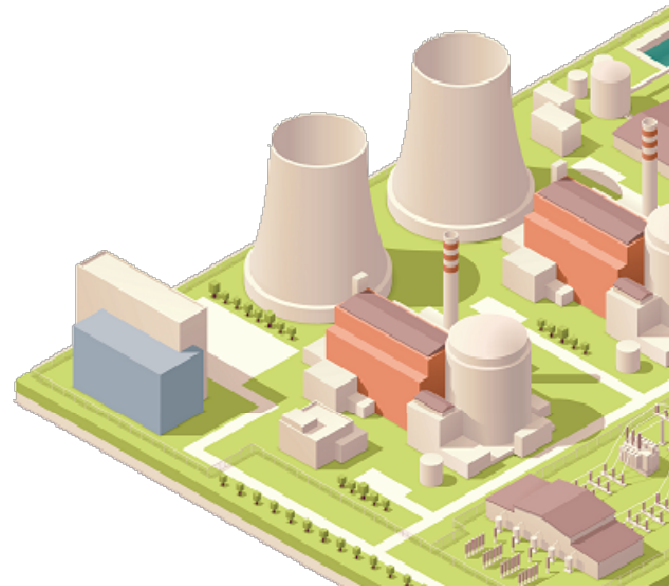
Approved By: Ian Baggley                      Function: Training Manager  
MCERTS No: MM 05 653                      MCERTS Level: 2 (TE1, TE2, TE3, TE4)

Signed:



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### YOUR INDUSTRY EXPERTS



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# Executive Summary

## Monitoring Objectives

Envirocare Technical Consultancy were contracted by Permali Ltd to carry out emissions monitoring, to determine the release of prescribed pollutants at Thermal Oxidiser. There are no emission limits set for any of the pollutants at this time. The methodologies utilised and the results obtained form the basis of this report.

The substances requested for monitoring are listed below.

## Emission Point Identification

| Substances to be Monitored               | Thermal Oxidiser |
|--|------------------|
| Carbon Monoxide                          | ✓                |
| Oxides of Nitrogen (as NO <sub>2</sub> ) | ✓                |
| Total VOC                                | ✓                |
| Oxygen                                   | ✓                |
| Formaldehyde                             | ✓                |
| Phenol                                   | ✓                |
| Ethanol                                  | ✓                |
| Volumetric Flow                          | ✓                |

Special requirements: none

Opinions and interpretations expressed within this report are outside the scope of Envirocare Technical Consultancy's MCERTS and UKAS accreditation. Envirocare accepts no responsibility for information in this report that was provided by the client, the client's representative or employees of the client. Where such information has been provided by external sources this is identified in footnotes of the respective tables.

# Executive Summary

## Monitoring Results

where MU = Measurement Uncertainty associated with the result (95% Confidence)

| Substance                                |     | Concentration              |                             |                                  | Reference Conditions    | Mass Emission |               |                                  | Sampling Date | Sampling Times |
|--|-----|----------------------------|-----------------------------|----------------------------------|-------------------------|---------------|---------------|----------------------------------|---------------|----------------|
|  |     | Limit (mg/m <sup>3</sup> ) | Result (mg/m <sup>3</sup> ) | Measurement Uncertainty (MU) +/- |                         | Limit (g/hr)  | Result (g/hr) | Measurement Uncertainty (MU) +/- |               |                |
| Carbon Monoxide                          | R1  | -                          | 19.3                        | 3.2                              | 273k, 101.3kPa, Wet Gas | -             | 864           | 148                              | 31/08/2023    | 16:04-16:34    |
|  | R2  | -                          | 17.1                        | 3.2                              |                         | -             | 763           | 147                              | 31/08/2023    | 16:35-17:05    |
| Oxides of Nitrogen (as NO <sub>2</sub> ) | R1  | -                          | 11.5                        | 1.4                              |                         | -             | 513           | 67                               | 31/08/2023    | 16:04-16:34    |
|  | R2  | -                          | 13.9                        | 1.4                              |                         | -             | 623           | 68                               | 31/08/2023    | 16:35-17:05    |
| Total VOC                                | R1  | -                          | 94.1                        | 2.5                              |                         | -             | 4209          | 222                              | 31/08/2023    | 16:04-16:34    |
|  | R2  | -                          | 9.9                         | 2.1                              |                         | -             | 441           | 96                               | 31/08/2023    | 16:35-17:05    |
| Formaldehyde                             | R1  | -                          | < 0.01                      | 0.004                            | 273k, 101.3kPa, Wet Gas | -             | 0.64          | 0.2                              | 31/08/2023    | 16:08-17:08    |
| Phenol                                   | R1  | -                          | < 0.04                      | 0.009                            |                         | -             | 1.60          | 0.4                              | 31/08/2023    | 16:08-17:08    |
| Ethanol                                  | R1  | -                          | < 0.29                      | 0.071                            |                         | -             | 12.8          | 3.2                              | 31/08/2023    | 16:08-17:08    |
| Oxygen                                   | Ave | -                          | 20.3%                       | 0.15                             | As Measured, Wet Gas    | -             | -             | -                                | 31/08/2023    | 16:04-17:05    |
| Volumetric Flow (Actual)                 | R1  | -                          | 61,620 m <sup>3</sup> /h    | 2790                             | As Measured             | -             | -             | -                                | 31/08/2023    | 17:00-17:10    |
| Volumetric Flow (REF)                    | R1  | -                          | 44,713 m <sup>3</sup> /h    | 2025                             | 273k, 101.3kPa, Wet Gas | -             | -             | -                                | 31/08/2023    | 17:00-17:10    |

Reference conditions (REF) are: 273k, 101.3kPa, Wet Gas

# Supporting Information

## Appendix 1: General Information

### Operating Information

| Parameter                                    | Process Details   |
|--|---|
| Process Type                                 | Thermal Oxidiser  |
| Continuous or Batch Process                  | Continuous  |
| Operating Status                             | Running   |
| Feedstock                                    | Extraction from Various paint mixing and spraying rooms |
| Normal Load, Throughput or Continuous Rating | Normal  |
| Abatement System                             | Thermal Oxidiser  |
| Abatement System Status                      | Running   |
| Process Fuel                                 | Natural Gas   |
| Plume Appearance                             | Not Visible   |

### Monitoring Deviations

| Parameter      | Run | Deviation  |
|----------------|-----|--|
| Speciated VOCs | All | Sampling rate was conducted above that recommended in the Standard in order that the Limit of Detection could be achieved. |

### Monitoring Organisation Staff Details

| Personnel     | Position    | MCERTS Level           | MCERTS Number |
|---------------|-------------|------------------------|---------------|
| Mr J Guy      | Team Leader | 2 (TE1, TE2, TE4)      | MM 16 1388    |
| Mr S Dwyer    | Technician  | Trainee                | MM 23 1768    |
| Mr T Campbell | Director    | 2 (TE1, TE2, TE3, TE4) | MM 03 155     |

### Monitoring Methods

| Pollutant Species  | Standard          | Technical Procedure | Testing MCERTS | Analysis Laboratory  | Analytical Procedure | Analytical Technique | Analysis MCERTS |
|--------------------|-------------------|---------------------|----------------|--|----------------------|----------------------|-----------------|
| Volumetric Flow    | BS EN ISO 16911-1 | ETC-SE-24a          | Yes            | Pitot Tube and Thermocouple  |                      |                      |                 |
| Formaldehyde       | PD CEN/TS 13649-1 | ETC-SE-06 (a/b)     | Yes            | Marchwood  | WI 3044              | HPLC                 | Yes             |
| Phenol             | PD CEN/TS 13649-1 | ETC-SE-06 (a/b)     | Yes            | Marchwood  | WI3042/48            | GC-MS                | No              |
| Ethanol            | PD CEN/TS 13649-1 | ETC-SE-06 (a/b)     | Yes            | Marchwood  | WI3042/48            | GC-MS                | Yes             |
| Carbon Monoxide    | BS EN 15058       | ETC-SE-10 (a/b)     | Yes            | NDIR by Horiba PG-250 or PG350E  |                      |                      |                 |
| Oxides of Nitrogen | BS EN 14792       | ETC-SE-10 (a/b)     | Yes            | Chemiluminescence by Horiba PG-250 or Horiba PG-350                      |                      |                      |                 |
| Oxygen             | BS EN 14789       | ETC-SE-10 (a/b)     | Yes            | Dry Zirconia Cell by Horiba PG-250 or Dry Paramagnetic by Horiba PG-350E |                      |                      |                 |
| Total VOC          | BS EN 12619       | ETC-SE-04           | Yes            | Flame Ionisation Detector by M&C Thermo FID or Sick 3006 FID             |                      |                      |                 |

Envirocare: 2522 | Marchwood Scientific Services: 1668

## Equipment Checklist

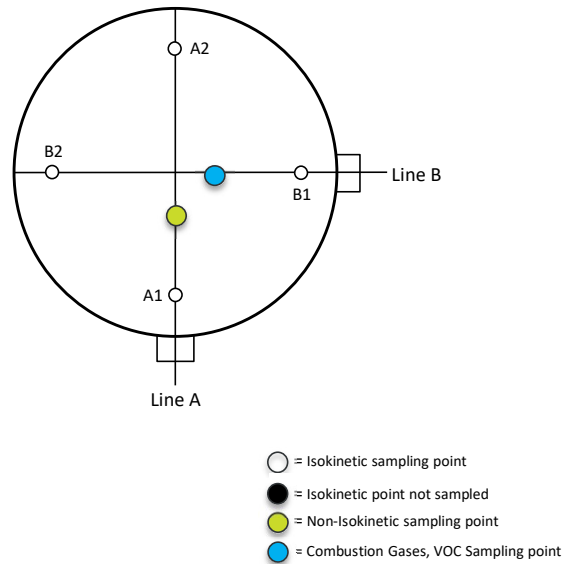
| Extractive Sampling    |                | Instrumental Analysers      |                | Miscellaneous Items           |                |
|------------------------|----------------|-----------------------------|----------------|-------------------------------|----------------|
| Equipment Type         | Equipment I.D. | Equipment Type              | Equipment I.D. | Equipment Type                | Equipment I.D. |
| Control Box DGM        | 8.03           | Horiba PG-250               | -              | Tape Measure                  | 17.09          |
| Box Thermocouples      | 2.13A          | Horiba PG-250 SRM           | -              | Bevel Box                     | -              |
| Box Thermocouple In    | 2.13A          | Horiba PG-350               | 12.13          | Stopwatch                     | 10.22          |
| Box Thermocouple Out   | 2.13A          | JCT JCC Cooler              | -              | Barometer                     | 11.11          |
| Control Box Timer      | 10.21          | MAK10 Cooler                | -              | Digital Manometer             | 24.11          |
| Umbilical              | 2.13B          | Horiba PS200 Cooler         | 3.48B          | Digital Temperature Meter     | -              |
| Oven Box               | 9.1            | M&C PSS Gas Preparation     | -              | Dual Channel Heat Controller  | 6.09           |
| Heated Probe (1)       | 4.31           | Gasmet DX4000 FTIR          | -              | 1m Heated Line                | -              |
| Heated Probe (2)       | 4.3            | Gasmet Sampling System      | -              | 3m Heated Line                | -              |
| Stack Thermocouple (1) | 1.81           | SK-Thermo FID               | 13.07          | 5m Heated Line                | -              |
| Stack Thermocouple (2) | 1.26           | Bernath 3006 FID            | -              | 10m Heated Line               | 5.25           |
| S-Type Pitot (1)       | 20.11S         | Testo 350XL                 | -              | 20m Heated Line               | -              |
| S-Type Pitot (2)       | 20.04S, 20.05S | M&C PSP 4000                | 7.13           | 30m Heated Line               | -              |
| L-Type Pitot           | 20.06L         | Easylogger EN-EL-12 Bit     | -              | Impinger Arm Thermocouple (1) | 3.21A          |
| Site Balance           | 18.12          | Hioki 5043 (V)              | -              | Impinger Arm Thermocouple (2) | 3.22A          |
| 500g Check Weight      | 18.12          | Analyser Temperature Logger | -              | Dioxins Kit Thermocouple      | -              |
| 1KG Check Weight       | 18.12          | -                           | 8.09B          | Sample Temperature Logger     | -              |
| Digital Callipers      | 16.11          | -                           | -              | Laboratory Balance            | -              |

## Appendix 2: Thermal Oxidiser Results and Calculations

Picture of the sampling location



Sampling Points Diagram



### Duct Characteristics

| Parameter                   | Units          | Value    |
|-----------------------------|----------------|----------|
| Type                        | -              | Circular |
| Depth                       | m              | 1.50     |
| Width                       | m              | -        |
| Area                        | m <sup>2</sup> | 1.8      |
| Port Depth                  | cm             | 5.0      |
| Orientation of Stack / Duct | -              | Vertical |
| Sampling Port Size          | -              | 2" BSP   |
| Number of Ports             | -              | 2        |

| Manual Sampling Points       | Used / Required |
|------------------------------|-----------------|
| Number of Sampling Lines     | 1 / 1           |
| Number of Sampling Points    | 1 / 1           |
| Instrumental Sampling Points | Used / Required |
| Number of Sampling Lines     | 1 / 1           |
| Number of Sampling Points    | 1 / 1           |

| Platform Type and Location            |           |
|---------------------------------------|-----------|
| Platform Type - Permanent / Temporary | Permanent |
| Location - Inside / Outside           | Outside   |

| EA Technical Guidance Note M1 Platform Requirements |   |     |
|---|---|-----|
| Load Baring Capacity                                | Load baring capacity of platform sufficient to fulfil the measurement objective | Yes |
| Position & Work Space                               | Sufficient work area to manipulate probe & operate the measurement instruments  | Yes |
|   | Depth of work area > internal diameter of stack and wall thickness plus 1.5m    | Yes |
|   | Ports on vertical ducts 1.2m to 1.5m above platform floor                       | Yes |
|   | Platform has chains / self closing gates at top of ladders                      | Yes |
| Fall Prevention                                     | Platform has adequate drainage to prevent accumulation of free-standing water   | Yes |
|   | Platform has 2 levels of handrails (approx. 0.5m & 1.0m high)                   | Yes |
| Access  | Gaps between handrails not >0,5m  | Yes |
|   | Platform has vertical base boards (approx. 0.25m high)                          | Yes |
|   | Access to sampling ports unhindered by obstructions                             | Yes |
|   | Easy & safe access and egress available   | Yes |

### Sampling Location / Platform Recommendations

The Sampling location meets all the requirements specified in Environment Agency Guidance Note M1 and BS EN 15259, and no improvement actions are required.

## Flow Criteria Measurements

| Duct Diameter (m) | Cross Sectional Area (m <sup>2</sup> ) | Barometric Pressure (mbar) | Ambient Temperature (°C) | Mean Oxygen (%) | Mean Carbon Dioxide (%) | Mean Water Vapour (%) | Stack Gas Molecular mass (g/mol) | Pitot Coefficient |
|-------------------|--|----------------------------|--------------------------|-----------------|-------------------------|-----------------------|----------------------------------|-------------------|
| 1.50              | 1.8                                    | 1007                       | 14.0                     | 20.3            | 0.5                     | 1.0                   | 28.8                             | 0.844             |

| Sample Line | Traverse Point | Position (cm) | Differential Pressure Reading (cmH2O) |      |      |         | Stack Velocity (m/s) | Stack Temp (°C) | Angle of Swirl |
|-------------|----------------|---------------|---------------------------------------|------|------|---------|----------------------|-----------------|----------------|
|             |                |               | 1                                     | 2    | 3    | Average |                      |                 |                |
| A           | A1             | 10.1          | 50.0                                  | 50.0 | 50.0 | 0.5     | 8.7                  | 101             | 5              |
|             | A2             | 37.5          | 62.0                                  | 62.0 | 62.0 | 0.6     | 9.7                  | 101             | 7              |
|             | A3             | 112.5         | 68.0                                  | 68.0 | 68.0 | 0.7     | 10.2                 | 101             | 4              |
|             | A4             | 140.0         | 64.0                                  | 64.0 | 64.0 | 0.7     | 9.9                  | 101             | 5              |

| Sample Line | Traverse Point | Position (cm) | Differential Pressure Reading (cmH2O) |      |      |         | Stack Velocity (m/s) | Stack Temp (°C) | Angle of Swirl |
|-------------|----------------|---------------|---------------------------------------|------|------|---------|----------------------|-----------------|----------------|
|             |                |               | 1                                     | 2    | 3    | Average |                      |                 |                |
| B           | B1             | 10.1          | 66.0                                  | 66.0 | 66.0 | 0.7     | 10.0                 | 101             | 8              |
|             | B2             | 37.5          | 64.0                                  | 64.0 | 64.0 | 0.7     | 9.9                  | 101             | 5              |
|             | B3             | 112.5         | 58.0                                  | 58.0 | 58.0 | 0.6     | 9.4                  | 101             | 4              |
|             | B4             | 140.0         | 60.0                                  | 60.0 | 60.0 | 0.6     | 9.6                  | 101             | 5              |

| Parameter | Mean Duct Velocity | Velocity Ratio (Max:Min) | Mean Stack Temperature | Mean Stack Temperature | Stack Gas Volume Flow | Stack Gas Volume Flow (STP Wet) | Stack Gas Volume Flow (REF) |
|-----------|--------------------|--------------------------|------------------------|------------------------|-----------------------|---------------------------------|-----------------------------|
| Value     | 9.7                | 1.2:1                    | 101                    | 374                    | 61620                 | 44713                           | 44713                       |
| Units     | m/s                | -                        | °C                     | K                      | m <sup>3</sup> /hr    | Nm <sup>3</sup> /hr             | Nm <sup>3</sup> /hr         |

## Formaldehyde - Run 1 Calculations

| Sampling Details        |         |        |
|-------------------------|---------|--------|
| Collection Media        | 226-119 |        |
| Sampling Rate           | 1000    | mL/min |
| Test Duration           | 60.0    | min    |
| Sample Volume           | 60.00   | L      |
| Corrected Sample Volume | 56.05   | NL     |

| Analysis Details            |       |                    |
|-----------------------------|-------|--------------------|
| 1st Collector Reference     | RTOFF |                    |
| 1st Collector Concentration | <0.2  | µg                 |
| 2nd Collector Reference     | RTOFB |                    |
| 2nd Collector Concentration | <0.6  | µg                 |
| Blank Concentration         | <0.00 | mg/Nm <sup>3</sup> |
| Has breakthrough occurred?  | No    | -                  |

| Date       | Operators |
|------------|-----------|
| 31/08/2023 | JG SD TC  |

| Parameter             | Before | After | Unit |
|-----------------------|--------|-------|------|
| Barometric Pressure   | 1007   | 1007  | mbar |
| Operating Temperature | 17     | 18    | °C   |
| Leak Check            | Pass   | Pass  | -    |
| Time                  | 16:08  | 17:08 | -    |

| Emissions Calculations |       |                    |
|------------------------|-------|--------------------|
| Emission Limit Value   | -     | mg/Nm <sup>3</sup> |
| Corrected Emission     | <0.01 | mg/Nm <sup>3</sup> |

## Phenol - Run 1 Calculations

| Sampling Details        |        |        |
|-------------------------|--------|--------|
| Collection Media        | 226-73 |        |
| Sampling Rate           | 1000   | mL/min |
| Test Duration           | 60.0   | min    |
| Sample Volume           | 60.00  | L      |
| Corrected Sample Volume | 56.05  | NL     |

| Analysis Details            |       |                    |
|-----------------------------|-------|--------------------|
| 1st Collector Reference     | RTOFF |                    |
| 1st Collector Concentration | <1    | µg                 |
| 2nd Collector Reference     | RTOFB |                    |
| 2nd Collector Concentration | <1    | µg                 |
| Blank Concentration         | <0.02 | mg/Nm <sup>3</sup> |
| Has breakthrough occurred?  | No    | -                  |

| Date       | Operators |
|------------|-----------|
| 31/08/2023 | JG SD TC  |

| Parameter             | Before | After | Unit |
|-----------------------|--------|-------|------|
| Barometric Pressure   | 1007   | 1007  | mbar |
| Operating Temperature | 17     | 18    | °C   |
| Leak Check            | Pass   | Pass  | -    |
| Time                  | 16:08  | 17:08 | -    |

| Emissions Calculations |       |                    |
|------------------------|-------|--------------------|
| Emission Limit Value   | -     | mg/Nm <sup>3</sup> |
| Corrected Emission     | <0.04 | mg/Nm <sup>3</sup> |

## Ethanol - Run 1 Calculations

| Sampling Details        |        |        |
|-------------------------|--------|--------|
| Collection Media        | 226-09 |        |
| Sampling Rate           | 1000   | mL/min |
| Test Duration           | 60.0   | min    |
| Sample Volume           | 60.00  | L      |
| Corrected Sample Volume | 55.96  | NL     |

| Analysis Details            |         |                    |
|-----------------------------|---------|--------------------|
| 1st Collector Reference     | RTOMEKF |                    |
| 1st Collector Concentration | <8      | µg                 |
| 2nd Collector Reference     | RTOMEKB |                    |
| 2nd Collector Concentration | <8      | µg                 |
| Blank Concentration         | <0.14   | mg/Nm <sup>3</sup> |
| Has breakthrough occurred?  | No      | -                  |

| Date       | Operators |
|------------|-----------|
| 31/08/2023 | JG SD TC  |

| Parameter             | Before | After | Unit |
|-----------------------|--------|-------|------|
| Barometric Pressure   | 1007   | 1007  | mbar |
| Operating Temperature | 17     | 19    | °C   |
| Leak Check            | Pass   | Pass  | -    |
| Time                  | 16:08  | 17:08 | -    |

| Emissions Calculations |       |                    |
|------------------------|-------|--------------------|
| Emission Limit Value   | -     | mg/Nm <sup>3</sup> |
| Corrected Emission     | <0.29 | mg/Nm <sup>3</sup> |



## Instrumental Gas Analyser Calibrations

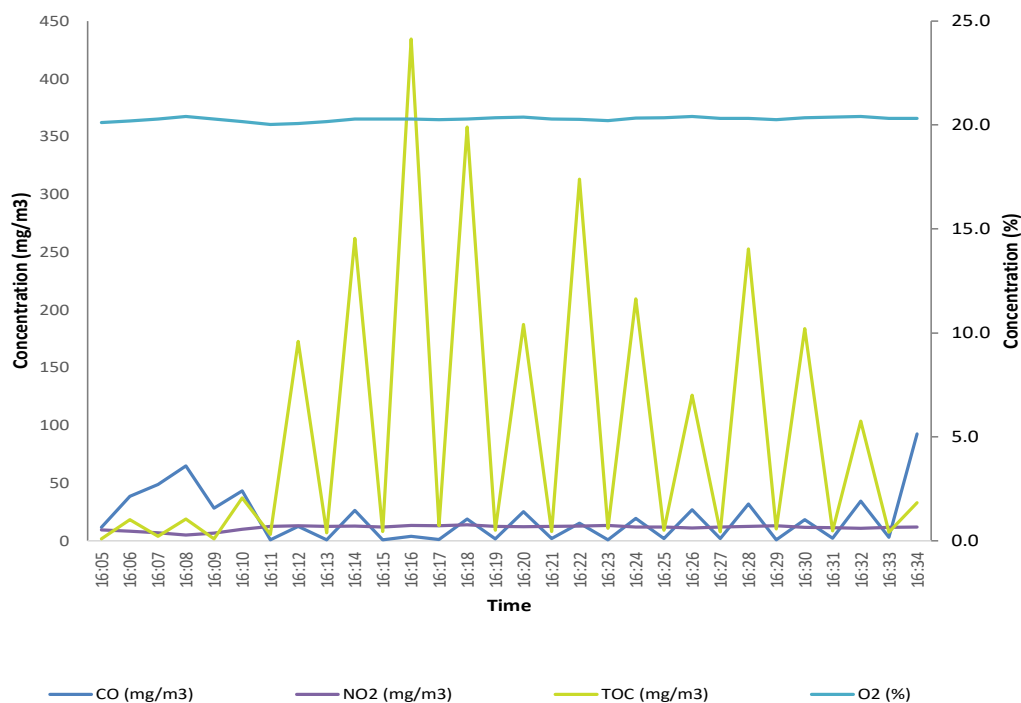
| Date       | Operators | Combustion Gas Analyser | Flame Ionisation Detector |
|------------|-----------|-------------------------|---------------------------|
| 31/08/2023 | JG SD TC  | 12.1                    | 13.1                      |

| Calibration Gas   | Certified Concentration | Analyser Range | T90 Time | Analyser Span | Pre-sample Cal |      | Post-sample Cal |      | Zero Drift (%) | Span Drift (%) | Drift Acceptable |
|-------------------|-------------------------|----------------|----------|---------------|----------------|------|-----------------|------|----------------|----------------|------------------|
|                   |                         |                |          |               | Zero           | Span | Zero            | Span |                |                |                  |
| Carbon Monoxide   | 161ppm                  | 200ppm         | 29       | 161           | 0.10           | 161  | -0.10           | 159  | -0.06          | -1.25          | Yes              |
| Nitrogen Monoxide | 201.9ppm                | 250ppm         | 29       | 203           | 0.00           | 203  | 0.10            | 203  | 0.05           | -0.10          | Yes              |
| Propane           | 79.83ppm                | 100ppm         | 22       | 79.8          | -0.44          | 79.8 | -0.06           | 78.8 | -0.08          | -1.24          | Yes              |
| Oxygen            | 21.08%                  | 25%            | 20       | 21.1          | 0              | 21.1 | -0.01           | 21.1 | -0.05          | -0.09          | Yes              |

## Instrumental Gas Analyser Results

| Substance                                | Run | Corrected Concentration |       |      | Units             | Basis                              | O <sub>2</sub> Correction |
|--|-----|-------------------------|-------|------|-------------------|------------------------------------|---------------------------|
|  |     | Average                 | Max   | Min  |                   |                                    |                           |
| Carbon Monoxide                          | 1   | 19.3                    | 92.7  | 0.70 | mg/m <sup>3</sup> | -                                  | -                         |
| Oxides of Nitrogen (as NO <sub>2</sub> ) | 1   | 11                      | 14    | 5.0  | mg/m <sup>3</sup> | NO <sub>x</sub> as NO <sub>2</sub> | -                         |
| Total VOC                                | 1   | 94.1                    | 434.4 | 1.84 | mg/m <sup>3</sup> | VOC as C                           | -                         |
| Oxygen                                   | 1   | 20.3                    | 20.4  | 20.0 | %                 | -                                  | -                         |

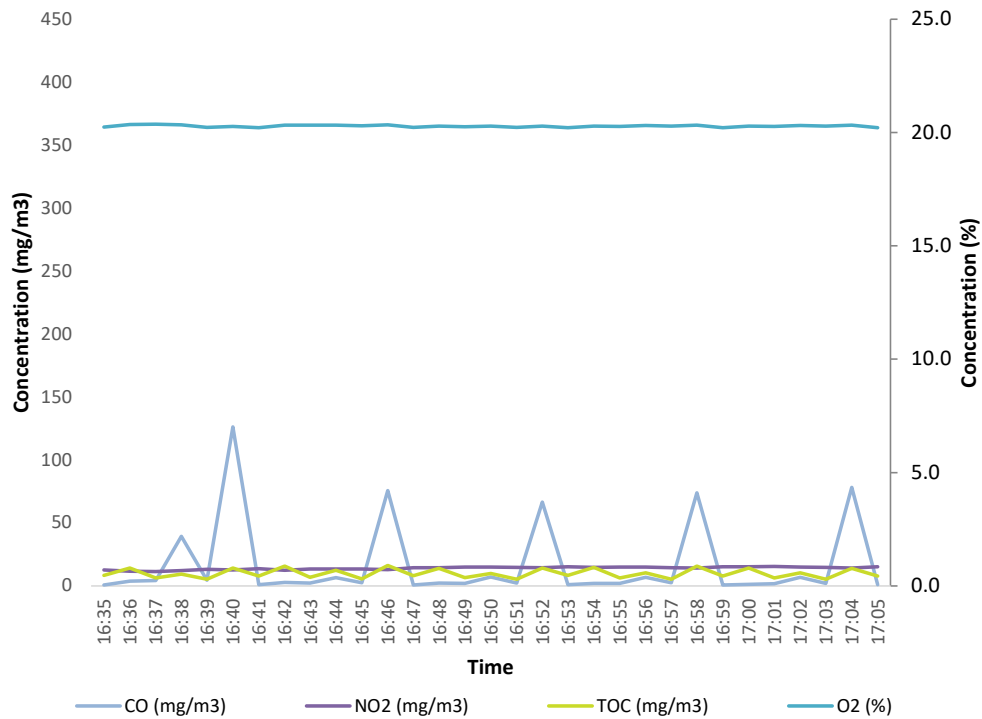
## Instrumental Gas Analyser Chart - Run 1



### Instrumental Gas Analyser Results (continued)

| Substance                                   | Run | Corrected Concentration |       |      | Units             | Basis                              | O <sub>2</sub> Correction |
|---|-----|-------------------------|-------|------|-------------------|------------------------------------|---------------------------|
|   |     | Average                 | Max   | Min  |                   |                                    |                           |
| Carbon Monoxide                             | 2   | 17.06                   | 126.3 | 0.70 | mg/m <sup>3</sup> | -                                  | -                         |
| Oxides of Nitrogen<br>(as NO <sub>2</sub> ) | 2   | 14                      | 15    | 11.5 | mg/m <sup>3</sup> | NO <sub>x</sub> as NO <sub>2</sub> | -                         |
| Total VOC                                   | 2   | 9.87                    | 16.14 | 5.19 | mg/m <sup>3</sup> | VOC as C                           | -                         |
| Oxygen                                      | 2   | 20.3                    | 20.4  | 20.2 | %                 | -                                  | -                         |

### Instrumental Gas Analyser Chart - Run 2



## Uncertainty

### Uncertainty of Formaldehyde by Pump - Run 1

| Parameter                  | Value | Unit              |
|----------------------------|-------|-------------------|
| Emission Limit Value (ELV) | -     | mg/m <sup>3</sup> |
| Mean Sampling Rate         | 1.0   | L/min             |
| Barometric Pressure        | 1007  | mbar              |

| Parameter                 | Value | Unit              |
|---------------------------|-------|-------------------|
| Emission Concentration    | 0.01  | mg/m <sup>3</sup> |
| Monitoring Duration       | 60    | min               |
| Average Stack Temperature | 101   | °C                |

| Source of Uncertainty   | Uncertainty Criteria           | Actual Source Value | Units | % Actual Value | Source Uncertainty u | Combined Uncertainty u <sup>2</sup> |
|---|--------------------------------|---------------------|-------|----------------|----------------------|-------------------------------------|
| Analysis  | 25% of result (95% confidence) | 0.00                | mg    | 12.5           | 0.0018               | 0.0000032                           |
| Leak Rate   | <2% of sampling rate           | 0.01                | L/min | 1.00           | 0.00029              | 0.0000001                           |
| Time  | 1 minute                       | 0.50                | min   | 0.01           | 0.000002             | 0.000000000004                      |
| Sampling Flow Rate  | 2% of value                    | 0.01                | L/min | 1.00           | 0.00014              | 0.00000002                          |
| Temperature   | 1% of value                    | 0.50                | °C    | 0.13           | 0.000019             | 0.0000000004                        |
| Pressure  | 1% of value                    | 5.0                 | mbar  | 0.50           | 0.000071             | 0.00000001                          |
| <b>Total</b>  |                                |                     |       |                |                      | 0.000                               |
| <b>Combined Standard Uncertainty [(sum u<sup>2</sup>)<sup>0.5</sup>]</b>          |                                |                     |       |                |                      | 0.002                               |
| <b>Expanded Total Uncertainty as a % of emission conc. (95% confidence)</b>       |                                |                     |       |                |                      | 24.91                               |
| <b>Expanded Total Uncertainty (mg/m<sup>3</sup>) (95% confidence)</b>             |                                |                     |       |                |                      | 0.004                               |
| <b>Expanded Total Uncertainty as a % of emission limit value (95% confidence)</b> |                                |                     |       |                |                      | -                                   |

### Uncertainty of Phenol by Pump - Run 1

| Parameter                  | Value | Unit              |
|----------------------------|-------|-------------------|
| Emission Limit Value (ELV) | -     | mg/m <sup>3</sup> |
| Mean Sampling Rate         | 1.0   | L/min             |
| Barometric Pressure        | 1007  | mbar              |

| Parameter                 | Value | Unit              |
|---------------------------|-------|-------------------|
| Emission Concentration    | 0.04  | mg/m <sup>3</sup> |
| Monitoring Duration       | 60    | min               |
| Average Stack Temperature | 101   | °C                |

| Source of Uncertainty   | Uncertainty Criteria           | Actual Source Value | Units | % Actual Value | Source Uncertainty u | Combined Uncertainty u <sup>2</sup> |
|---|--------------------------------|---------------------|-------|----------------|----------------------|-------------------------------------|
| Analysis  | 25% of result (95% confidence) | 0.00                | mg    | 12.5           | 0.0045               | 0.00002                             |
| Leak Rate   | <2% of sampling rate           | 0.01                | L/min | 1.00           | 0.00071              | 0.000001                            |
| Time  | 1 minute                       | 0.50                | min   | 0.01           | 0.000005             | 0.000000000002                      |
| Sampling Flow Rate  | 2% of value                    | 0.01                | L/min | 1.00           | 0.00036              | 0.0000001                           |
| Temperature   | 1% of value                    | 0.50                | °C    | 0.13           | 0.000048             | 0.000000002                         |
| Pressure  | 1% of value                    | 5.0                 | mbar  | 0.50           | 0.00018              | 0.00000003                          |
| <b>Total</b>  |                                |                     |       |                |                      | 0.000                               |
| <b>Combined Standard Uncertainty [(sum u<sup>2</sup>)<sup>0.5</sup>]</b>          |                                |                     |       |                |                      | 0.005                               |
| <b>Expanded Total Uncertainty as a % of emission conc. (95% confidence)</b>       |                                |                     |       |                |                      | 24.91                               |
| <b>Expanded Total Uncertainty (mg/m<sup>3</sup>) (95% confidence)</b>             |                                |                     |       |                |                      | 0.009                               |
| <b>Expanded Total Uncertainty as a % of emission limit value (95% confidence)</b> |                                |                     |       |                |                      | -                                   |

Uncertainty of Ethanol by Pump - Run 1

| Parameter                  | Value | Unit              |
|----------------------------|-------|-------------------|
| Emission Limit Value (ELV) | -     | mg/m <sup>3</sup> |
| Mean Sampling Rate         | 1.0   | L/min             |
| Barometric Pressure        | 1007  | mbar              |

| Parameter                 | Value | Unit              |
|---------------------------|-------|-------------------|
| Emission Concentration    | 0.29  | mg/m <sup>3</sup> |
| Monitoring Duration       | 60    | min               |
| Average Stack Temperature | 101   | °C                |

| Source of Uncertainty   | Uncertainty Criteria           | Actual Source Value | Units | % Actual Value | Source Uncertainty u | Combined Uncertainty u <sup>2</sup> |
|---|--------------------------------|---------------------|-------|----------------|----------------------|-------------------------------------|
| Analysis  | 25% of result (95% confidence) | 0.04                | mg    | 12.5           | 0.036                | 0.0013                              |
| Leak Rate   | <2% of sampling rate           | 0.01                | L/min | 1.00           | 0.0057               | 0.00003                             |
| Time  | 1 minute                       | 0.50                | min   | 0.01           | 0.00004              | 0.00000002                          |
| Sampling Flow Rate  | 2% of value                    | 0.01                | L/min | 1.00           | 0.00286              | 0.00001                             |
| Temperature   | 1% of value                    | 0.50                | °C    | 0.13           | 0.00038              | 0.0000001                           |
| Pressure  | 1% of value                    | 5.0                 | mbar  | 0.50           | 0.00142              | 0.000002                            |
| <b>Total</b>  |                                |                     |       |                |                      | 0.001                               |
| <b>Combined Standard Uncertainty <math>[(\sum u^2)^{0.5}]</math></b>              |                                |                     |       |                |                      | 0.036                               |
| <b>Expanded Total Uncertainty as a % of emission conc. (95% confidence)</b>       |                                |                     |       |                |                      | 24.91                               |
| <b>Expanded Total Uncertainty (mg/m<sup>3</sup>) (95% confidence)</b>             |                                |                     |       |                |                      | 0.071                               |
| <b>Expanded Total Uncertainty as a % of emission limit value (95% confidence)</b> |                                |                     |       |                |                      | -                                   |

Uncertainty of Carbon Monoxide by Horiba Gas Analyser - Run 1

| Parameter                  | Value | Unit              |
|----------------------------|-------|-------------------|
| Emission Limit Value (ELV) | -     | mg/m <sup>3</sup> |
| Reading                    | 15.4  | ppm               |
| Span Gas Certified Value   | 161   | ppm               |
| Range                      | 200   | ppm               |

| Cal Gas |
|---------|
| CO      |

| Source of Uncertainty   | Uncertainty Criteria | Probability Distribution | Divisor | Source Uncertainty u | Combined Uncertainty u <sup>2</sup> |
|---|----------------------|--------------------------|---------|----------------------|-------------------------------------|
| Zero Drift/Lower limit of detection (ppm)   | 0.20                 | Rectangular              | 1.73    | 0.12                 | 0.013                               |
| Span Drift (ppm)  | 2.1                  | Rectangular              | 1.73    | 1.22                 | 1.48                                |
| Linearity (% of value)  | 0.54                 | Rectangular              | 1.73    | 0.0482               | 0.0023                              |
| Setting Gas Divider (% of value)  | 0.35                 | Normal                   | 1.00    | 0.054                | 0.0029                              |
| Interference (% of value)   | -0.48                | Rectangular              | 1.73    | -0.043               | 0.0018                              |
| Standard deviation of repeatability at zero point (% of range)                    | 0.10                 | Rectangular              | -       | 0.20                 | 0.04                                |
| Standard deviation of repeatability at span point (% of range)                    | 0.20                 | Rectangular              | -       | 0.40                 | 0.16                                |
| <b>Total</b>  |                      |                          |         |                      | 1.70                                |
| <b>Combined Standard Uncertainty [(sum u<sup>2</sup>)<sup>0.5</sup>]</b>          |                      |                          |         |                      | 1.31                                |
| <b>Expanded Total Uncertainty (ppm) (95% confidence)</b>                          |                      |                          |         |                      | 2.6                                 |
| <b>Expanded Total Uncertainty as a % of emission conc. (95% confidence)</b>       |                      |                          |         |                      | 17                                  |
| <b>Expanded Total Uncertainty (mg/m<sup>3</sup>) (95% confidence)</b>             |                      |                          |         |                      | 3.2                                 |
| <b>Expanded Total Uncertainty as a % of emission limit value (95% confidence)</b> |                      |                          |         |                      | -                                   |

Uncertainty of Carbon Monoxide by Horiba Gas Analyser - Run 2

| Parameter                  | Value | Unit              |
|----------------------------|-------|-------------------|
| Emission Limit Value (ELV) | -     | mg/m <sup>3</sup> |
| Reading                    | 13.6  | ppm               |
| Span Gas Certified Value   | 161.0 | ppm               |
| Range                      | 200   | ppm               |

| Cal Gas |
|---------|
| CO      |

| Source of Uncertainty   | Uncertainty Criteria | Probability Distribution | Divisor | Source Uncertainty u | Combined Uncertainty u <sup>2</sup> |
|---|----------------------|--------------------------|---------|----------------------|-------------------------------------|
| Zero Drift/Lower limit of detection (ppm)   | 0.20                 | Rectangular              | 1.73    | 0.115                | 0.013                               |
| Span Drift (ppm)  | 2.11                 | Rectangular              | 1.73    | 1.218                | 1.484                               |
| Linearity (% of value)  | 0.54                 | Rectangular              | 1.73    | 0.043                | 0.002                               |
| Setting Gas Divider (% of value)  | 0.35                 | Normal                   | 1.00    | 0.048                | 0.002                               |
| Interference (% of value)   | -0.48                | Rectangular              | 1.73    | -0.038               | 0.001                               |
| Standard deviation of repeatability at zero point (% of range)                    | 0.10                 | Rectangular              | -       | 0.20                 | 0.04                                |
| Standard deviation of repeatability at span point (% of range)                    | 0.20                 | Rectangular              | -       | 0.40                 | 0.16                                |
| <b>Total</b>  |                      |                          |         |                      | 1.703                               |
| <b>Combined Standard Uncertainty [(sum u<sup>2</sup>)<sup>0.5</sup>]</b>          |                      |                          |         |                      | 1.30                                |
| <b>Expanded Total Uncertainty (ppm) (95% confidence)</b>                          |                      |                          |         |                      | 2.56                                |
| <b>Expanded Total Uncertainty as a % of emission conc. (95% confidence)</b>       |                      |                          |         |                      | 18.74                               |
| <b>Expanded Total Uncertainty (mg/m<sup>3</sup>) (95% confidence)</b>             |                      |                          |         |                      | 3.20                                |
| <b>Expanded Total Uncertainty as a % of emission limit value (95% confidence)</b> |                      |                          |         |                      | -                                   |

Uncertainty of Oxides of Nitrogen by Horiba Gas Analyser - Run 1

| Parameter                  | Value | Unit              |
|----------------------------|-------|-------------------|
| Emission Limit Value (ELV) | -     | mg/m <sup>3</sup> |
| Reading                    | 5.6   | ppm               |
| Span Gas Certified Value   | 202   | ppm               |
| Range                      | 250   | ppm               |

| Cal Gas |
|---------|
| NO      |

| Source of Uncertainty   | Uncertainty Criteria | Probability Distribution | Divisor | Source Uncertainty u | Combined Uncertainty u <sup>2</sup> |
|---|----------------------|--------------------------|---------|----------------------|-------------------------------------|
| Zero Drift/Lower limit of detection (ppm)   | -0.20                | Rectangular              | 1.73    | -0.12                | 0.013                               |
| Span Drift (ppm)  | 0.10                 | Rectangular              | 1.73    | 0.06                 | 0.0033                              |
| Linearity (% of value)  | 0.2                  | Rectangular              | 1.73    | 0.01                 | 0.00004                             |
| Setting Gas Divider (% of value)  | 0.35                 | Normal                   | 1.00    | 0.02                 | 0.0004                              |
| Interference (% of value)   | 0.63                 | Rectangular              | 1.73    | 0.02                 | 0.0004                              |
| Standard deviation of repeatability at zero point (% of range)                    | 0.00                 | Rectangular              | -       | 0.20                 | 0.04                                |
| Standard deviation of repeatability at span point (% of range)                    | 0.10                 | Rectangular              | -       | 0.25                 | 0.06                                |
| <b>Total</b>  |                      |                          |         |                      | 0.12                                |
| <b>Combined Standard Uncertainty [(sum u<sup>2</sup>)<sup>0.5</sup>]</b>          |                      |                          |         |                      | 0.35                                |
| <b>Expanded Total Uncertainty (ppm) (95% confidence)</b>                          |                      |                          |         |                      | 0.7                                 |
| <b>Expanded Total Uncertainty as a % of emission conc. (95% confidence)</b>       |                      |                          |         |                      | 12.1                                |
| <b>Expanded Total Uncertainty (mg/m<sup>3</sup>) (95% confidence)</b>             |                      |                          |         |                      | 1.4                                 |
| <b>Expanded Total Uncertainty as a % of emission limit value (95% confidence)</b> |                      |                          |         |                      | -                                   |

Uncertainty of Oxides of Nitrogen by Horiba Gas Analyser - Run 2

| Parameter                  | Value | Unit              |
|----------------------------|-------|-------------------|
| Emission Limit Value (ELV) | -     | mg/m <sup>3</sup> |
| Reading                    | 6.8   | ppm               |
| Span Gas Certified Value   | 201.9 | ppm               |
| Range                      | 250   | ppm               |

| Cal Gas |
|---------|
| NO      |

| Source of Uncertainty   | Uncertainty Criteria | Probability Distribution | Divisor | Source Uncertainty u | Combined Uncertainty u <sup>2</sup> |
|---|----------------------|--------------------------|---------|----------------------|-------------------------------------|
| Zero Drift/Lower limit of detection (ppm)   | -0.20                | Rectangular              | 1.73    | -0.115               | 0.013                               |
| Span Drift (ppm)  | 0.10                 | Rectangular              | 1.73    | 0.058                | 0.003                               |
| Linearity (% of value)  | 0.2                  | Rectangular              | 1.73    | 0.008                | 0.000                               |
| Setting Gas Divider (% of value)  | 0.35                 | Normal                   | 1.00    | 0.024                | 0.001                               |
| Interference (% of value)   | 0.63                 | Rectangular              | 1.73    | 0.025                | 0.001                               |
| Standard deviation of repeatability at zero point (% of range)                    | 0.00                 | Rectangular              | -       | 0.20                 | 0.04                                |
| Standard deviation of repeatability at span point (% of range)                    | 0.10                 | Rectangular              | -       | 0.250                | 0.063                               |
| <b>Total</b>  |                      |                          |         |                      | 0.12                                |
| <b>Combined Standard Uncertainty [(sum u<sup>2</sup>)<sup>0.5</sup>]</b>          |                      |                          |         |                      | 0.35                                |
| <b>Expanded Total Uncertainty (ppm) (95% confidence)</b>                          |                      |                          |         |                      | 0.68                                |
| <b>Expanded Total Uncertainty as a % of emission conc. (95% confidence)</b>       |                      |                          |         |                      | 10.0                                |
| <b>Expanded Total Uncertainty (mg/m<sup>3</sup>) (95% confidence)</b>             |                      |                          |         |                      | 1.4                                 |
| <b>Expanded Total Uncertainty as a % of emission limit value (95% confidence)</b> |                      |                          |         |                      | -                                   |

Uncertainty of Total VOC by FID - Run1

| Parameter                  | Value | Unit              |
|----------------------------|-------|-------------------|
| Emission Limit Value (ELV) | -     | mg/m <sup>3</sup> |
| Reading                    | 58.55 | ppm               |
| Span Gas Certified Value   | 79.8  | ppm               |
| Range                      | 100   | ppm               |

| Cal Gas                       |
|-------------------------------|
| C <sub>3</sub> H <sub>8</sub> |

| Source of Uncertainty   | Uncertainty Criteria | Probability Distribution | Divisor | Source Uncertainty u | Combined Uncertainty u <sup>2</sup> |
|---|----------------------|--------------------------|---------|----------------------|-------------------------------------|
| Zero Drift/Lower limit of detection (ppm)   | -0.38                | Rectangular              | 1.73    | -0.22                | 0.047                               |
| Span Drift (ppm)  | 0.97                 | Rectangular              | 1.73    | 0.56                 | 0.314                               |
| Linearity (% of value)  | 0.68                 | Rectangular              | 1.73    | 0.230                | 0.053                               |
| Setting Gas Divider (% of value)  | 0.35                 | Normal                   | 1.00    | 0.205                | 0.042                               |
| Noise (ppm)   | 0.10                 | Rectangular              | 1.73    | 0.06                 | 0.003                               |
| Temperature Drift (% of value)  | 1.0                  | Rectangular              | 1.73    | 0.338                | 0.114                               |
| Standard deviation of repeatability at zero point (% of range)                    | 0.20                 | Rectangular              | -       | 0.20                 | 0.04                                |
| Standard deviation of repeatability at span point (% of range)                    | 0.20                 | Rectangular              | -       | 0.20                 | 0.04                                |
| <b>Total</b>  |                      |                          |         |                      | 0.65                                |
| <b>Combined Standard Uncertainty [(sum u<sup>2</sup>)<sup>0.5</sup>]</b>          |                      |                          |         |                      | 0.81                                |
| <b>Expanded Total Uncertainty (ppm) (95% confidence)</b>                          |                      |                          |         |                      | 1.58                                |
| <b>Expanded Total Uncertainty as a % of emission conc. (95% confidence)</b>       |                      |                          |         |                      | 2.7                                 |
| <b>Expanded Total Uncertainty (mg/m<sup>3</sup>) (95% confidence)</b>             |                      |                          |         |                      | 2.5                                 |
| <b>Expanded Total Uncertainty as a % of emission limit value (95% confidence)</b> |                      |                          |         |                      | -                                   |

Uncertainty of Total VOC by FID - Run 2

| Parameter                  | Value | Unit              |
|----------------------------|-------|-------------------|
| Emission Limit Value (ELV) | -     | mg/m <sup>3</sup> |
| Reading                    | 6.1   | ppm               |
| Span Gas Certified Value   | 79.8  | ppm               |
| Range                      | 100   | ppm               |

| Cal Gas                       |
|-------------------------------|
| C <sub>3</sub> H <sub>8</sub> |

| Source of Uncertainty   | Uncertainty Criteria | Probability Distribution | Divisor | Source Uncertainty u | Combined Uncertainty u <sup>2</sup> |
|---|----------------------|--------------------------|---------|----------------------|-------------------------------------|
| Zero Drift/Lower limit of detection (ppm)   | -0.38                | Rectangular              | 1.73    | -0.218               | 0.047                               |
| Span Drift (ppm)  | 0.97                 | Rectangular              | 1.73    | 0.560                | 0.314                               |
| Linearity (% of value)  | 0.68                 | Rectangular              | 1.73    | 0.024                | 0.001                               |
| Setting Gas Divider (% of value)  | 0.35                 | Normal                   | 1.00    | 0.021                | 0.0005                              |
| Noise (ppm)   | 0.10                 | Rectangular              | 1.73    | 0.058                | 0.003                               |
| Temperature Drift (% of value)  | 1.0                  | Rectangular              | 1.73    | 0.035                | 0.001                               |
| Standard deviation of repeatability at zero point (% of range)                    | 0.20                 | Rectangular              | -       | 0.20                 | 0.04                                |
| Standard deviation of repeatability at span point (% of range)                    | 0.20                 | Rectangular              | -       | 0.20                 | 0.04                                |
| <b>Total</b>  |                      |                          |         |                      | 0.447                               |
| <b>Combined Standard Uncertainty [(sum u<sup>2</sup>)<sup>0.5</sup>]</b>          |                      |                          |         |                      | 0.668                               |
| <b>Expanded Total Uncertainty (ppm) (95% confidence)</b>                          |                      |                          |         |                      | 1.310                               |
| <b>Expanded Total Uncertainty as a % of emission conc. (95% confidence)</b>       |                      |                          |         |                      | 21.3                                |
| <b>Expanded Total Uncertainty (mg/m<sup>3</sup>) (95% confidence)</b>             |                      |                          |         |                      | 2.1                                 |
| <b>Expanded Total Uncertainty as a % of emission limit value (95% confidence)</b> |                      |                          |         |                      | -                                   |

Uncertainty of Oxygen by Horiba Gas Analyser - Run 1

| Parameter                | Value | Unit |
|--------------------------|-------|------|
| Reading                  | 20.3  | %    |
| Span Gas Certified Value | 21.1  | %    |
| Range                    | 25.0  | %    |

| Cal Gas        |
|----------------|
| O <sub>2</sub> |

| Source of Uncertainty   | Uncertainty Criteria | Probability Distribution | Divisor | Source Uncertainty u | Combined Uncertainty u <sup>2</sup> |
|---|----------------------|--------------------------|---------|----------------------|-------------------------------------|
| Zero Drift/Lower limit of detection (%vol)                                  | 0.02                 | Rectangular              | 1.73    | 0.01                 | 0.0001                              |
| Span Drift (%vol)   | 0.03                 | Rectangular              | 1.73    | 0.02                 | 0.0003                              |
| Linearity (% of value)  | 0.20                 | Rectangular              | 1.73    | 0.02                 | 0.00055                             |
| Setting Gas Divider (% of value)  | 0.35                 | Normal                   | 1.00    | 0.07                 | 0.0050                              |
| Interference (% of value)   | 0.00                 | Rectangular              | 1.73    | 0.0000               | 0.0000                              |
| Standard deviation of repeatability at zero point (% of range)              | 0.02                 | Rectangular              | -       | 0.005                | 0.00003                             |
| Standard deviation of repeatability at span point (% of range)              | 0.02                 | Rectangular              | -       | 0.005                | 0.00003                             |
| <b>Total</b>  |                      |                          |         |                      | 0.006                               |
| <b>Combined Standard Uncertainty [(sum u<sup>2</sup>)<sup>0.5</sup>]</b>    |                      |                          |         |                      | 0.08                                |
| <b>Expanded Total Uncertainty (%) (95% confidence)</b>                      |                      |                          |         |                      | 0.15                                |
| <b>Expanded Total Uncertainty as a % of emission conc. (95% confidence)</b> |                      |                          |         |                      | 0.8                                 |

Uncertainty of Oxygen by Horiba Gas Analyser - Run 2

| Parameter                | Value | Unit |
|--------------------------|-------|------|
| Reading                  | 20.28 | %    |
| Span Gas Certified Value | 21.08 | %    |
| Range                    | 25    | %    |

| Cal Gas        |
|----------------|
| O <sub>2</sub> |

| Source of Uncertainty   | Uncertainty Criteria | Probability Distribution | Divisor | Source Uncertainty u | Combined Uncertainty u <sup>2</sup> |
|---|----------------------|--------------------------|---------|----------------------|-------------------------------------|
| Zero Drift/Lower limit of detection (%vol)                                  | 0.02                 | Rectangular              | 1.73    | 0.0115               | 0.00013                             |
| Span Drift (%vol)   | 0.03                 | Rectangular              | 1.73    | 0.0173               | 0.00030                             |
| Linearity (% of value)  | 0.20                 | Rectangular              | 1.73    | 0.0234               | 0.00055                             |
| Setting Gas Divider (% of value)  | 0.35                 | Normal                   | 1.00    | 0.0710               | 0.00504                             |
| Interference (% of value)   | 0.00                 | Rectangular              | 1.73    | 0.0000               | 0.00000                             |
| Standard deviation of repeatability at zero point (% of range)              | 0.02                 | Rectangular              | -       | 0.0050               | 0.00003                             |
| Standard deviation of repeatability at span point (% of range)              | 0.02                 | Rectangular              | -       | 0.0050               | 0.00003                             |
| <b>Total</b>  |                      |                          |         |                      | 0.006                               |
| <b>Combined Standard Uncertainty [(sum u<sup>2</sup>)<sup>0.5</sup>]</b>    |                      |                          |         |                      | 0.078                               |
| <b>Expanded Total Uncertainty (%) (95% confidence)</b>                      |                      |                          |         |                      | 0.15                                |
| <b>Expanded Total Uncertainty as a % of emission conc. (95% confidence)</b> |                      |                          |         |                      | 0.75                                |



Uncertainty of Volumetric Flow - Run 1

| Parameter   | Value  | Unit               |
|---|--------|--------------------|
| Measured Volumetric Flow Rate Actual  | 61620  | m <sup>3</sup> /hr |
| Performance Characteristics & Source Value                                    |        |                    |
|   | Value  | Units              |
| Standard Uncertainty - Pitot tube Coefficient                                 | 0.005  | -                  |
| Standard Uncertainty - Mean Local Dynamic Pressure                            | 34.5   | Pa                 |
| Standard Uncertainty - Molar Mass of Stack Gas                                | 0.0000 | -                  |
| Standard Uncertainty - Stack Gas Temperature                                  | 0.50   | K                  |
| Standard Uncertainty - Absolute Pressure in Duct                              | 176    | Pa                 |
| Standard Uncertainty - Density of Stack Gas                                   | 0.005  | -                  |
| Standard Uncertainty - Mean Velocity  | 0.06   | m/s                |
| <b>Expanded Uncertainty Mean Velocity (95% confidence)</b>                    | 0.13   | m/s                |
| <b>Expanded Uncertainty Mean Velocity (95% Confidence), Relative</b>          | 1.3    | %                  |
| <b>Standard Uncertainty - Volumetric Flow Rate</b>                            | 1424   | -                  |
| <b>Standard Uncertainty - Volumetric Flow Rate (95% Confidence)</b>           | 2790   | m <sup>3</sup> /hr |
| <b>Standard Uncertainty - Volumetric Flow Rate (95% Confidence), Relative</b> | 4.5    | %                  |
| 95% confidence interval factor - 1.96   |        |                    |

| Document Version Number | Record of change within different version numbers  |
|-------------------------|--|
| V1                      | Original version of the document issued to client. |

# Report for the Periodic Monitoring of Emissions to Atmosphere

## Permal Ltd (Gloucester)

### Carbon Filter

Permit No: np  
Installation: Gloucester  
Monitoring Dates: 31st August 2023  
Site Address: Permal Gloucester Ltd, 270 Bristol Road, Gloucester, GL1 5TT

Report Number: EM-0042      Version: 1      Visit: 1 in 2023  
Date of Report: 14th September 2023  
Report Author: Jonny Guy  
MCERTS No: MM 16 1388      MCERTS Level: 2 (TE1, TE2, TE4)

Approved By: Ian Baggley      Function: Training Manager  
MCERTS No: MM 05 653      MCERTS Level: 2 (TE1, TE2, TE3, TE4)

Signed:



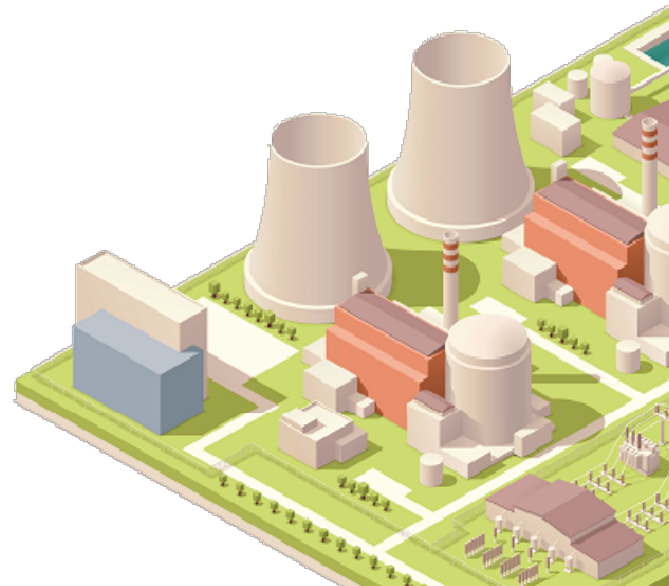
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### YOUR INDUSTRY EXPERTS



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# Executive Summary

## Monitoring Objectives

Envirocare Technical Consultancy were contracted by Permali to carry out emissions monitoring, to determine the release of prescribed pollutants at Carbon Filter. There are no emission limits set for any of the pollutants at this time. The methodologies utilised and the results obtained form the basis of this report.

The substances requested for monitoring are listed below.

## Emission Point Identification

| Substances to be Monitored | Carbon Filter |
|----------------------------|---------------|
| Total VOC                  | ✓             |
| Acetone & MEK              | ✓             |
| Formaldehyde               | ✓             |
| Ethanol & 2-methoxyethanol | ✓             |
| Total Phenol & Cresol      | ✓             |
| Volumetric Flow            | ✓             |

Special requirements: none

Opinions and interpretations expressed within this report are outside the scope of Envirocare Technical Consultancy's MCERTS and UKAS accreditation. Envirocare accepts no responsibility for information in this report that was provided by the client, the client's representative or employees of the client. Where such information has been provided by external sources this is identified in footnotes of the respective tables.

# Executive Summary

## Monitoring Results

where MU = Measurement Uncertainty associated with the result (95% Confidence)

| Substance                  | Limit (mg/m <sup>3</sup> ) | Concentration               |                                  |              | Reference Conditions    | Mass Emission |                                  |      | Sampling Date | Sampling Times |
|----------------------------|----------------------------|-----------------------------|----------------------------------|--------------|-------------------------|---------------|----------------------------------|------|---------------|----------------|
|                            |                            | Result (mg/m <sup>3</sup> ) | Measurement Uncertainty (MU) +/- | Limit (g/hr) |                         | Result (g/hr) | Measurement Uncertainty (MU) +/- |      |               |                |
| Total VOC                  | R1                         | -                           | 1.63                             | 3.2          | 273k, 101.3kPa, Wet Gas | -             | 17.9                             | 35   | 31/08/2023    | 11:30-12:40    |
| Total Phenol & Cresol      | R1                         | -                           | < 0.12                           | 0.031        |                         | -             | 1.4                              | 0.3  | 31/08/2023    | 11:30-12:40    |
| Acetone & MEK              | R1                         | -                           | < 0.12                           | 0.031        |                         | -             | 1.4                              | 0.3  | 31/08/2023    | 11:30-12:40    |
| Formaldehyde               | R1                         | -                           | < 0.01                           | 0.003        |                         | -             | 0.14                             | 0.03 | 31/08/2023    | 11:30-12:40    |
| Ethanol & 2-methoxyethanol | R1                         | -                           | < 0.77                           | 0.19         |                         | -             | 8.5                              | 2.2  | 31/08/2023    | 11:30-12:40    |
| Volumetric Flow (Actual)   | R1                         | -                           | 12,002 m <sup>3</sup> /h         | 544          | As Measured             | -             | -                                | -    | 31/08/2023    | 14:53-14:59    |
| Volumetric Flow (REF)      | R1                         | -                           | 11,004 m <sup>3</sup> /h         | 499          | 273k, 101.3kPa, Wet Gas | -             | -                                | -    | 31/08/2023    | 14:53-14:59    |

Reference conditions (REF) are: 273k, 101.3kPa, Wet Gas

# Supporting Information

## Appendix 1: General Information

### Operating Information

| Parameter                                    | Process Details  |
|--|------------------|
| Process Type                                 | Carbon filter    |
| Continuous or Batch Process                  | Batch            |
| Operating Status                             | Running          |
| Feedstock                                    | Coating material |
| Normal Load, Throughput or Continuous Rating | Normal           |
| Abatement System                             | Carbon Filter    |
| Abatement System Status                      | Running          |
| Process Fuel                                 | -                |
| Plume Appearance                             | N/A              |

### Monitoring Deviations

| Parameter      | Run | Deviation  |
|----------------|-----|--|
| Speciated VOCs | All | Sampling rate was conducted above that recommended in the Standard in order that the Limit of Detection could be achieved. |

### Monitoring Organisation Staff Details

| Personnel     | Position    | MCERTS Level           | MCERTS Number |
|---------------|-------------|------------------------|---------------|
| Mr J Guy      | Team Leader | 2 (TE1, TE2, TE4)      | MM 16 1388    |
| Mr S Dwyer    | Technician  | Trainee                | MM 23 1768    |
| Mr T Campbell | Director    | 2 (TE1, TE2, TE3, TE4) | MM 03 155     |

### Monitoring Methods

| Pollutant Species          | Standard          | Technical Procedure | Testing MCERTS | Analysis Laboratory  | Analytical Procedure | Analytical Technique | Analysis MCERTS |
|----------------------------|-------------------|---------------------|----------------|--|----------------------|----------------------|-----------------|
| Volumetric Flow            | BS EN ISO 16911-1 | ETC-SE-24a          | Yes            | Pitot Tube and Thermocouple                                  |                      |                      |                 |
| Acetone & MEK              | PD CEN/TS 13649-1 | ETC-SE-06 (a/b)     | Yes            | Marchwood  | WI3042/48            | GC-MS                | Yes             |
| Formaldehyde               | PD CEN/TS 13649-1 | ETC-SE-06 (a/b)     | Yes            | Marchwood  | WI 3044              | HPLC                 | Yes             |
| Ethanol & 2-methoxyethanol | PD CEN/TS 13649-1 | ETC-SE-06 (a/b)     | Yes            | Marchwood  | WI3042/48            | GC-MS                | Yes             |
| Total Phenol & Cresol      | PD CEN/TS 13649-1 | ETC-SE-06 (a/b)     | Yes            | Marchwood  | WI3042/48            | GC-MS                | No              |
| Total VOC                  | BS EN 12619       | ETC-SE-04           | Yes            | Flame Ionisation Detector by M&C Thermo FID or Sick 3006 FID |                      |                      |                 |

Envirocare: 2522 | Marchwood Scientific Services: 1668

## Equipment Checklist

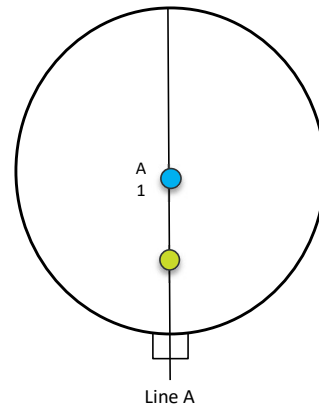
| Extractive Sampling    |                | Instrumental Analysers      |                | Miscellaneous Items           |                |
|------------------------|----------------|-----------------------------|----------------|-------------------------------|----------------|
| Equipment Type         | Equipment I.D. | Equipment Type              | Equipment I.D. | Equipment Type                | Equipment I.D. |
| Control Box DGM        | 8.03           | Horiba PG-250               | -              | Tape Measure                  | 17.09          |
| Box Thermocouples      | 2.13A          | Horiba PG-250 SRM           | -              | Bevel Box                     | -              |
| Box Thermocouple In    | 2.13A          | Horiba PG-350               | -              | Stopwatch                     | 10.22          |
| Box Thermocouple Out   | 2.13A          | JCT JCC Cooler              | -              | Barometer                     | 11.11          |
| Control Box Timer      | 10.21          | MAK10 Cooler                | -              | Digital Manometer             | 24.11          |
| Umbilical              |                | Horiba PS200 Cooler         |                | Digital Temperature Meter     | -              |
| Oven Box               |                | M&C PSS Gas Preparation     | -              | Dual Channel Heat Controller  | 6.09           |
| Heated Probe (1)       |                | Gasmet DX4000 FTIR          | -              | 1m Heated Line                | -              |
| Heated Probe (2)       |                | Gasmet Sampling System      | -              | 3m Heated Line                | -              |
| Stack Thermocouple (1) | 1.81           | SK-Thermo FID               | 13.07          | 5m Heated Line                | -              |
| Stack Thermocouple (2) |                | Bernath 3006 FID            | -              | 10m Heated Line               | 5.25           |
| S-Type Pitot (1)       | 20.11S         | Testo 350XL                 | -              | 20m Heated Line               | -              |
| S-Type Pitot (2)       |                | M&C PSP 4000                | 7.13           | 30m Heated Line               | -              |
| L-Type Pitot           | 20.06L         | Easylogger EN-EL-12 Bit     | -              | Impinger Arm Thermocouple (1) | 3.21A          |
| Site Balance           | 18.12          | Hioki 5043 (V)              | -              | Impinger Arm Thermocouple (2) | 3.22A          |
| 500g Check Weight      | 18.12          | Analyser Temperature Logger | -              | Dioxins Kit Thermocouple      | -              |
| 1KG Check Weight       | 18.12          | -                           | 8.09B          | Sample Temperature Logger     | -              |
| Digital Callipers      | 16.11          | -                           | -              | Laboratory Balance            | -              |

## Appendix 2: Carbon Filter Results and Calculations

Picture of the sampling location



Sampling Points Diagram



- = Isokinetic sampling point
- = Isokinetic point not sampled
- = Non-Isokinetic sampling point
- = Combustion Gases, VOC Sampling point

### Duct Characteristics

| Parameter                   | Units          | Value      |
|-----------------------------|----------------|------------|
| Type                        | -              | Circular   |
| Depth                       | m              | 0.95       |
| Width                       | m              | -          |
| Area                        | m <sup>2</sup> | 0.7        |
| Port Depth                  | cm             | 0.0        |
| Orientation of Stack / Duct | -              | Horizontal |
| Sampling Port Size          | -              | 2" BSP     |
| Number of Ports             | -              | 1          |

| Manual Sampling Points       | Used / Required |
|------------------------------|-----------------|
| Number of Sampling Lines     | 1 / 1           |
| Number of Sampling Points    | 1 / 1           |
| Instrumental Sampling Points | Used / Required |
| Number of Sampling Lines     | 1 / 1           |
| Number of Sampling Points    | 1 / 1           |

| Platform Type and Location            |              |
|---------------------------------------|--------------|
| Platform Type - Permanent / Temporary | Ground Level |
| Location - Inside / Outside           | Outside      |

| EA Technical Guidance Note M1 Platform Requirements |   |     |
|---|---|-----|
| Load Baring Capacity                                | Load baring capacity of platform sufficient to fulfil the measurement objective | N/A |
| Position & Work Space                               | Sufficient work area to manipulate probe & operate the measurement instruments  | Yes |
|   | Depth of work area > internal diameter of stack and wall thickness plus 1.5m    | Yes |
|   | Ports on vertical ducts 1.2m to 1.5m above platform floor                       | Yes |
|   | Platform has chains / self closing gates at top of ladders                      | N/A |
| Fall Prevention                                     | Platform has adequate drainage to prevent accumulation of free-standing water   | N/A |
|   | Platform has 2 levels of handrails (approx. 0.5m & 1.0m high)                   | N/A |
|   | Gaps between handrails not >0,5m  | N/A |
| Access  | Platform has vertical base boards (approx. 0.25m high)                          | N/A |
|   | Access to sampling ports unhindered by obstructions                             | Yes |
|   | Easy & safe access and egress available   | Yes |

### Sampling Location / Platform Recommendations

All sampling platforms should be designed in accordance with the requirements specified in Environment Agency Guidance Note M1 and BS EN 15259.



## Flow Criteria Measurements

| Duct Diameter (m) | Cross Sectional Area (m <sup>2</sup> ) | Barometric Pressure (mbar) | Ambient Temperature (°C) | Estimated Oxygen (%) | Estimated Carbon Dioxide (%) | Estimated Water Vapour (%) | Stack Gas Molecular mass (g/mol) | Pitot Coefficient |
|-------------------|--|----------------------------|--------------------------|----------------------|------------------------------|----------------------------|----------------------------------|-------------------|
| 0.95              | 0.7                                    | 1007                       | 15.0                     | 20.8                 | 0.1                          | 1.0                        | 28.7                             | 0.844             |

| Sample Line | Traverse Point | Position (cm) | Differential Pressure Reading (cmH <sub>2</sub> O) |      |      |         | Stack Velocity (m/s) | Stack Temp (°C) | Angle of Swirl |
|-------------|----------------|---------------|--|------|------|---------|----------------------|-----------------|----------------|
|             |                |               | 1  | 2    | 3    | Average |                      |                 |                |
| A           | A1             | 6.4           | 12.0   | 12.0 | 12.0 | 0.1     | 3.8                  | 23              | 9              |
|             | A2             | 23.8          | 22.0   | 22.0 | 22.0 | 0.2     | 5.2                  | 23              | 10             |
|             | A3             | 71.3          | 21.0   | 21.0 | 21.0 | 0.2     | 5.0                  | 23              | 10             |
|             | A4             | 88.6          | 19.0   | 19.0 | 19.0 | 0.2     | 4.8                  | 23              | 11             |

| Parameter | Mean Duct Velocity | Velocity Ratio (Max:Min) | Mean Stack Temperature | Mean Stack Temperature | Stack Gas Volume Flow | Stack Gas Volume Flow (STP Wet) | Stack Gas Volume Flow (REF) |
|-----------|--------------------|--------------------------|------------------------|------------------------|-----------------------|---------------------------------|-----------------------------|
| Value     | 4.7                | 1.4:1                    | 23                     | 296                    | 12002                 | 11004                           | 11004                       |
| Units     | m/s                | -                        | °C                     | K                      | m <sup>3</sup> /hr    | Nm <sup>3</sup> /hr             | Nm <sup>3</sup> /hr         |

### Acetone & MEK - Run 1 Calculations

| Sampling Details        |        |        |
|-------------------------|--------|--------|
| Collection Media        | 226-09 |        |
| Sampling Rate           | 1000   | mL/min |
| Test Duration           | 70.0   | min    |
| Sample Volume           | 70.00  | L      |
| Corrected Sample Volume | 65.17  | NL     |

| Analysis Details            |       |                    |
|-----------------------------|-------|--------------------|
| 1st Collector Reference     | CFACF |                    |
| 1st Collector Concentration | <4    | µg                 |
| 2nd Collector Reference     | CFPCB |                    |
| 2nd Collector Concentration | <4    | µg                 |
| Blank Concentration         | <0.06 | mg/Nm <sup>3</sup> |
| Has breakthrough occurred?  | No    | -                  |

| Date       | Operators |
|------------|-----------|
| 31/08/2023 | JG SD TC  |

| Parameter             | Before | After | Unit |
|-----------------------|--------|-------|------|
| Barometric Pressure   | 1007   | 1007  | mbar |
| Operating Temperature | 18     | 19    | °C   |
| Leak Check            | Pass   | Pass  | -    |
| Time                  | 11:30  | 12:40 | -    |

| Emissions Calculations |       |                    |
|------------------------|-------|--------------------|
| Emission Limit Value   | -     | mg/Nm <sup>3</sup> |
| Corrected Emission     | <0.12 | mg/Nm <sup>3</sup> |

### Formaldehyde - Run 1 Calculations

| Sampling Details        |         |        |
|-------------------------|---------|--------|
| Collection Media        | 226-119 |        |
| Sampling Rate           | 1000    | mL/min |
| Test Duration           | 70.0    | min    |
| Sample Volume           | 70.00   | L      |
| Corrected Sample Volume | 65.17   | NL     |

| Analysis Details            |       |                    |
|-----------------------------|-------|--------------------|
| 1st Collector Reference     | CFF   |                    |
| 1st Collector Concentration | <0.7  | µg                 |
| 2nd Collector Reference     | CFB   |                    |
| 2nd Collector Concentration | <0.1  | µg                 |
| Blank Concentration         | <0.00 | mg/Nm <sup>3</sup> |
| Has breakthrough occurred?  | No    | -                  |

| Date       | Operators |
|------------|-----------|
| 31/08/2023 | JG SD TC  |

| Parameter             | Before | After | Unit |
|-----------------------|--------|-------|------|
| Barometric Pressure   | 1007   | 1007  | mbar |
| Operating Temperature | 18     | 19    | °C   |
| Leak Check            | Pass   | Pass  | -    |
| Time                  | 11:30  | 12:40 | -    |

| Emissions Calculations |       |                    |
|------------------------|-------|--------------------|
| Emission Limit Value   | -     | mg/Nm <sup>3</sup> |
| Corrected Emission     | <0.01 | mg/Nm <sup>3</sup> |

## Ethanol & 2-methoxyethanol - Run 1 Calculations

| Sampling Details        |        |        |
|-------------------------|--------|--------|
| Collection Media        | 226-09 |        |
| Sampling Rate           | 517    | mL/min |
| Test Duration           | 70.0   | min    |
| Sample Volume           | 36.17  | L      |
| Corrected Sample Volume | 33.67  | NL     |

| Analysis Details            |        |                    |
|-----------------------------|--------|--------------------|
| 1st Collector Reference     | CFMEKF |                    |
| 1st Collector Concentration | <13    | µg                 |
| 2nd Collector Reference     | CFMEKB |                    |
| 2nd Collector Concentration | <13    | µg                 |
| Blank Concentration         | <0.39  | mg/Nm <sup>3</sup> |
| Has breakthrough occurred?  | No     | -                  |

| Date       | Operators |
|------------|-----------|
| 31/08/2023 | JG SD TC  |

| Parameter             | Before | After | Unit |
|-----------------------|--------|-------|------|
| Barometric Pressure   | 1007   | 1007  | mbar |
| Operating Temperature | 18     | 19    | °C   |
| Leak Check            | Pass   | Pass  | -    |
| Time                  | 11:30  | 12:40 | -    |

| Emissions Calculations |       |                    |
|------------------------|-------|--------------------|
| Emission Limit Value   | -     | mg/Nm <sup>3</sup> |
| Corrected Emission     | <0.77 | mg/Nm <sup>3</sup> |

## Total Phenol & Cresol - Run 1 Calculations

| Sampling Details        |        |        |
|-------------------------|--------|--------|
| Collection Media        | 226-73 |        |
| Sampling Rate           | 1000   | mL/min |
| Test Duration           | 70.0   | min    |
| Sample Volume           | 70.00  | L      |
| Corrected Sample Volume | 65.17  | NL     |

| Analysis Details            |       |                    |
|-----------------------------|-------|--------------------|
| 1st Collector Reference     | CFPF  |                    |
| 1st Collector Concentration | <4    | µg                 |
| 2nd Collector Reference     | CFPB  |                    |
| 2nd Collector Concentration | <4    | µg                 |
| Blank Concentration         | <0.06 | mg/Nm <sup>3</sup> |
| Has breakthrough occurred?  | No    | -                  |

| Date       | Operators |
|------------|-----------|
| 31/08/2023 | JG SD TC  |

| Parameter             | Before | After | Unit |
|-----------------------|--------|-------|------|
| Barometric Pressure   | 1007   | 1007  | mbar |
| Operating Temperature | 18     | 19    | °C   |
| Leak Check            | Pass   | Pass  | -    |
| Time                  | 11:30  | 12:40 | -    |

| Emissions Calculations |       |                    |
|------------------------|-------|--------------------|
| Emission Limit Value   | -     | mg/Nm <sup>3</sup> |
| Corrected Emission     | <0.12 | mg/Nm <sup>3</sup> |

## Instrumental Gas Analyser Calibrations

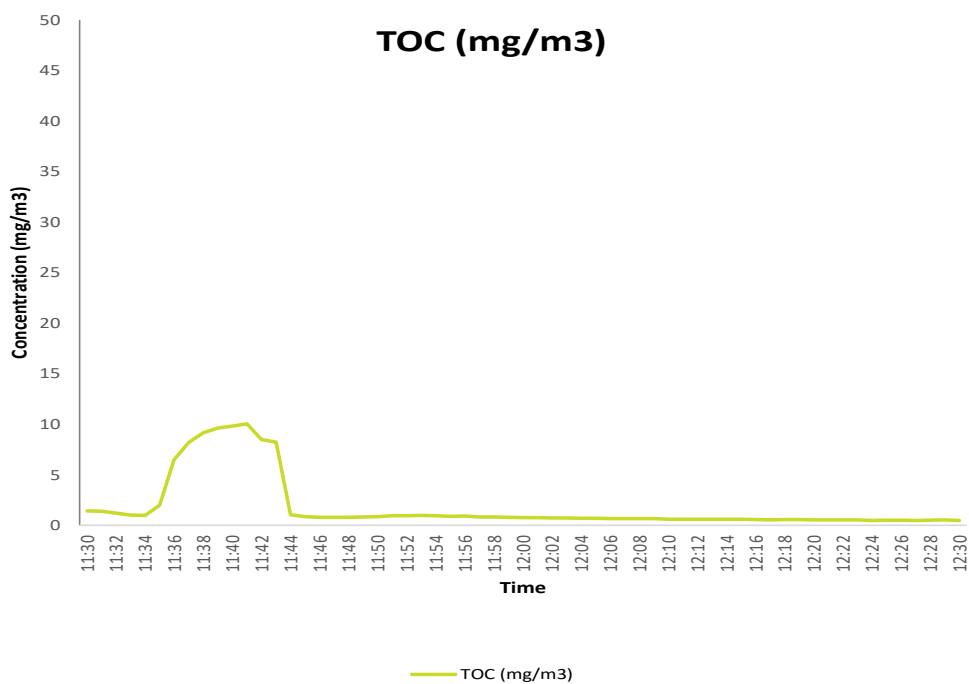
| Date       | Operators | Combustion Gas Analyser | Flame Ionisation Detector |
|------------|-----------|-------------------------|---------------------------|
| 31/08/2023 | JG SD TC  | -                       | 13.1                      |

| Calibration Gas | Certified Concentration | Analyser Range | T90 Time | Analyser Span | Pre-sample Cal |      | Post-sample Cal |      | Zero Drift (%) | Span Drift (%) | Drift Acceptable |
|-----------------|-------------------------|----------------|----------|---------------|----------------|------|-----------------|------|----------------|----------------|------------------|
|                 |                         |                |          |               | Zero           | Span | Zero            | Span |                |                |                  |
| Propane         | 79.83ppm                | 100ppm         | 28       | 79.8          | 0.40           | 80.4 | -0.06           | 78.8 | -0.08          | -1.22          | Yes              |

## Instrumental Gas Analyser Results

| Substance | Run | Corrected Concentration |       |      | Units             | Basis    | O <sub>2</sub> Correction |
|-----------|-----|-------------------------|-------|------|-------------------|----------|---------------------------|
|           |     | Average                 | Max   | Min  |                   |          |                           |
| Total VOC | 1   | 1.63                    | 10.04 | 0.46 | mg/m <sup>3</sup> | VOC as C | -                         |

## Instrumental Gas Analyser Chart - Run 1



## Uncertainty

### Uncertainty of Acetone & MEK by Pump - Run 1

| Parameter                  | Value | Unit              |
|----------------------------|-------|-------------------|
| Emission Limit Value (ELV) | -     | mg/m <sup>3</sup> |
| Mean Sampling Rate         | 1.0   | L/min             |
| Barometric Pressure        | 1007  | mbar              |

| Parameter                 | Value | Unit              |
|---------------------------|-------|-------------------|
| Emission Concentration    | 0.12  | mg/m <sup>3</sup> |
| Monitoring Duration       | 70    | min               |
| Average Stack Temperature | 23    | °C                |

| Source of Uncertainty   | Uncertainty Criteria           | Actual Source Value | Units | % Actual Value | Source Uncertainty u | Combined Uncertainty u <sup>2</sup> |
|---|--------------------------------|---------------------|-------|----------------|----------------------|-------------------------------------|
| Analysis  | 25% of result (95% confidence) | 0.02                | mg    | 12.5           | 0.0153               | 0.00024                             |
| Leak Rate   | <2% of sampling rate           | 0.01                | L/min | 1.00           | 0.0025               | 0.00001                             |
| Time  | 1 minute                       | 0.50                | min   | 0.01           | 0.000015             | 0.0000000002                        |
| Sampling Flow Rate  | 2% of value                    | 0.01                | L/min | 1.00           | 0.00123              | 0.0000015                           |
| Temperature   | 1% of value                    | 0.50                | °C    | 0.17           | 0.00021              | 0.000000043                         |
| Pressure  | 1% of value                    | 5.0                 | mbar  | 0.50           | 0.00061              | 0.0000004                           |
| <b>Total</b>  |                                |                     |       |                |                      | 0.00024                             |
| <b>Combined Standard Uncertainty [(sum u<sup>2</sup>)<sup>0.5</sup>]</b>          |                                |                     |       |                |                      | 0.02                                |
| <b>Expanded Total Uncertainty as a % of emission conc. (95% confidence)</b>       |                                |                     |       |                |                      | 24.91                               |
| <b>Expanded Total Uncertainty (mg/m<sup>3</sup>) (95% confidence)</b>             |                                |                     |       |                |                      | 0.03                                |
| <b>Expanded Total Uncertainty as a % of emission limit value (95% confidence)</b> |                                |                     |       |                |                      | -                                   |

### Uncertainty of Formaldehyde by Pump - Run 1

| Parameter                  | Value | Unit              |
|----------------------------|-------|-------------------|
| Emission Limit Value (ELV) | -     | mg/m <sup>3</sup> |
| Mean Sampling Rate         | 1.0   | L/min             |
| Barometric Pressure        | 1007  | mbar              |

| Parameter                 | Value | Unit              |
|---------------------------|-------|-------------------|
| Emission Concentration    | 0.01  | mg/m <sup>3</sup> |
| Monitoring Duration       | 70    | min               |
| Average Stack Temperature | 23    | °C                |

| Source of Uncertainty   | Uncertainty Criteria           | Actual Source Value | Units | % Actual Value | Source Uncertainty u | Combined Uncertainty u <sup>2</sup> |
|---|--------------------------------|---------------------|-------|----------------|----------------------|-------------------------------------|
| Analysis  | 25% of result (95% confidence) | 0.00                | mg    | 12.5           | 0.00153              | 0.0000024                           |
| Leak Rate   | <2% of sampling rate           | 0.01                | L/min | 1.00           | 0.00025              | 0.0000001                           |
| Time  | 1 minute                       | 0.50                | min   | 0.01           | 0.0000015            | 0.000000000002                      |
| Sampling Flow Rate  | 2% of value                    | 0.01                | L/min | 1.00           | 0.000123             | 0.00000002                          |
| Temperature   | 1% of value                    | 0.50                | °C    | 0.17           | 0.000021             | 0.0000000004                        |
| Pressure  | 1% of value                    | 5.0                 | mbar  | 0.50           | 0.000061             | 0.000000004                         |
| <b>Total</b>  |                                |                     |       |                |                      | 0.000002                            |
| <b>Combined Standard Uncertainty [(sum u<sup>2</sup>)<sup>0.5</sup>]</b>          |                                |                     |       |                |                      | 0.002                               |
| <b>Expanded Total Uncertainty as a % of emission conc. (95% confidence)</b>       |                                |                     |       |                |                      | 24.91                               |
| <b>Expanded Total Uncertainty (mg/m<sup>3</sup>) (95% confidence)</b>             |                                |                     |       |                |                      | 0.003                               |
| <b>Expanded Total Uncertainty as a % of emission limit value (95% confidence)</b> |                                |                     |       |                |                      | -                                   |

Uncertainty of Ethanol & 2-methoxyethanol by Pump - Run 1

| Parameter                  | Value | Unit              |
|----------------------------|-------|-------------------|
| Emission Limit Value (ELV) | -     | mg/m <sup>3</sup> |
| Mean Sampling Rate         | 0.5   | L/min             |
| Barometric Pressure        | 1007  | mbar              |

| Parameter                 | Value | Unit              |
|---------------------------|-------|-------------------|
| Emission Concentration    | 0.77  | mg/m <sup>3</sup> |
| Monitoring Duration       | 70    | min               |
| Average Stack Temperature | 23    | °C                |

| Source of Uncertainty   | Uncertainty Criteria           | Actual Source Value | Units | % Actual Value | Source Uncertainty u | Combined Uncertainty u <sup>2</sup> |
|---|--------------------------------|---------------------|-------|----------------|----------------------|-------------------------------------|
| Analysis  | 25% of result (95% confidence) | 0.10                | mg    | 12.5           | 0.097                | 0.00932                             |
| Leak Rate   | <2% of sampling rate           | 0.01                | L/min | 1.94           | 0.015                | 0.00024                             |
| Time  | 1 minute                       | 0.50                | min   | 0.01           | 0.00009              | 0.00000001                          |
| Sampling Flow Rate  | 2% of value                    | 0.01                | L/min | 1.94           | 0.0149               | 0.00022                             |
| Temperature   | 1% of value                    | 0.50                | °C    | 0.17           | 0.0013               | 0.000002                            |
| Pressure  | 1% of value                    | 5.0                 | mbar  | 0.50           | 0.0038               | 0.00001                             |
| <b>Total</b>  |                                |                     |       |                |                      | 0.010                               |
| <b>Combined Standard Uncertainty <math>[(\sum u^2)^{0.5}]</math></b>              |                                |                     |       |                |                      | 0.10                                |
| <b>Expanded Total Uncertainty as a % of emission conc. (95% confidence)</b>       |                                |                     |       |                |                      | 25.12                               |
| <b>Expanded Total Uncertainty (mg/m<sup>3</sup>) (95% confidence)</b>             |                                |                     |       |                |                      | 0.19                                |
| <b>Expanded Total Uncertainty as a % of emission limit value (95% confidence)</b> |                                |                     |       |                |                      | -                                   |

Uncertainty of Total Phenol & Cresol by Pump - Run 1

| Parameter                  | Value | Unit              |
|----------------------------|-------|-------------------|
| Emission Limit Value (ELV) | -     | mg/m <sup>3</sup> |
| Mean Sampling Rate         | 1.0   | L/min             |
| Barometric Pressure        | 1007  | mbar              |

| Parameter                 | Value | Unit              |
|---------------------------|-------|-------------------|
| Emission Concentration    | 0.12  | mg/m <sup>3</sup> |
| Monitoring Duration       | 70    | min               |
| Average Stack Temperature | 23    | °C                |

| Source of Uncertainty   | Uncertainty Criteria           | Actual Source Value | Units | % Actual Value | Source Uncertainty u | Combined Uncertainty u <sup>2</sup> |
|---|--------------------------------|---------------------|-------|----------------|----------------------|-------------------------------------|
| Analysis  | 25% of result (95% confidence) | 0.02                | mg    | 12.5           | 0.0153               | 0.00024                             |
| Leak Rate   | <2% of sampling rate           | 0.01                | L/min | 1.00           | 0.0025               | 0.00001                             |
| Time  | 1 minute                       | 0.50                | min   | 0.01           | 0.000015             | 0.0000000002                        |
| Sampling Flow Rate  | 2% of value                    | 0.01                | L/min | 1.00           | 0.00123              | 0.000002                            |
| Temperature   | 1% of value                    | 0.50                | °C    | 0.17           | 0.00021              | 0.00000004                          |
| Pressure  | 1% of value                    | 5.0                 | mbar  | 0.50           | 0.00061              | 0.00000037                          |
| <b>Total</b>  |                                |                     |       |                |                      | 0.0002                              |
| <b>Combined Standard Uncertainty <math>[(\sum u^2)^{0.5}]</math></b>              |                                |                     |       |                |                      | 0.02                                |
| <b>Expanded Total Uncertainty as a % of emission conc. (95% confidence)</b>       |                                |                     |       |                |                      | 24.91                               |
| <b>Expanded Total Uncertainty (mg/m<sup>3</sup>) (95% confidence)</b>             |                                |                     |       |                |                      | 0.03                                |
| <b>Expanded Total Uncertainty as a % of emission limit value (95% confidence)</b> |                                |                     |       |                |                      | -                                   |

Uncertainty of Total VOC by FID - Run1

| Parameter                  | Value | Unit              |
|----------------------------|-------|-------------------|
| Emission Limit Value (ELV) | -     | mg/m <sup>3</sup> |
| Reading                    | 1.01  | ppm               |
| Span Gas Certified Value   | 79.8  | ppm               |
| Range                      | 100   | ppm               |

| Cal Gas                       |
|-------------------------------|
| C <sub>3</sub> H <sub>8</sub> |

| Source of Uncertainty   | Uncertainty Criteria | Probability Distribution | Divisor | Source Uncertainty u | Combined Uncertainty u <sup>2</sup> |
|---|----------------------|--------------------------|---------|----------------------|-------------------------------------|
| Zero Drift/Lower limit of detection (ppm)   | 0.46                 | Rectangular              | 1.73    | 0.27                 | 0.071                               |
| Span Drift (ppm)  | 1.63                 | Rectangular              | 1.73    | 0.94                 | 0.886                               |
| Linearity (% of value)  | 0.68                 | Rectangular              | 1.73    | 0.0040               | 0.000016                            |
| Setting Gas Divider (% of value)  | 0.35                 | Normal                   | 1.00    | 0.0035               | 0.000013                            |
| Noise (ppm)   | 0.10                 | Rectangular              | 1.73    | 0.06                 | 0.003                               |
| Temperature Drift (% of value)  | 1.0                  | Rectangular              | 1.73    | 0.006                | 0.0000                              |
| Standard deviation of repeatability at zero point (% of range)                    | 0.20                 | Rectangular              | -       | 0.20                 | 0.04                                |
| Standard deviation of repeatability at span point (% of range)                    | 0.20                 | Rectangular              | -       | 0.20                 | 0.04                                |
| <b>Total</b>  |                      |                          |         |                      | 1.04                                |
| <b>Combined Standard Uncertainty [(sum u<sup>2</sup>)<sup>0.5</sup>]</b>          |                      |                          |         |                      | 1.02                                |
| <b>Expanded Total Uncertainty (ppm) (95% confidence)</b>                          |                      |                          |         |                      | 2.00                                |
| <b>Expanded Total Uncertainty as a % of emission conc. (95% confidence)</b>       |                      |                          |         |                      | 198                                 |
| <b>Expanded Total Uncertainty (mg/m<sup>3</sup>) (95% confidence)</b>             |                      |                          |         |                      | 3.2                                 |
| <b>Expanded Total Uncertainty as a % of emission limit value (95% confidence)</b> |                      |                          |         |                      | -                                   |

Uncertainty of Volumetric Flow - Run 1

| Parameter                            | Value | Unit               |
|--------------------------------------|-------|--------------------|
| Measured Volumetric Flow Rate Actual | 12002 | m <sup>3</sup> /hr |

| Performance Characteristics & Source Value                                    | Value  | Units              |
|---|--------|--------------------|
| Standard Uncertainty - Pitot tube Coefficient                                 | 0.005  | -                  |
| Standard Uncertainty - Mean Local Dynamic Pressure                            | 34.5   | Pa                 |
| Standard Uncertainty - Molar Mass of Stack Gas                                | 0.0000 | -                  |
| Standard Uncertainty - Stack Gas Temperature                                  | 0.50   | K                  |
| Standard Uncertainty - Absolute Pressure in Duct                              | 176    | Pa                 |
| Standard Uncertainty - Density of Stack Gas                                   | 0.026  | -                  |
| Standard Uncertainty - Mean Velocity  | 0.06   | m/s                |
| <b>Expanded Uncertainty Mean Velocity (95% confidence)</b>                    | 0.12   | m/s                |
| <b>Expanded Uncertainty Mean Velocity (95% Confidence), Relative</b>          | 2.4    | %                  |
| <b>Standard Uncertainty - Volumetric Flow Rate</b>                            | 278    | -                  |
| <b>Standard Uncertainty - Volumetric Flow Rate (95% Confidence)</b>           | 544    | m <sup>3</sup> /hr |
| <b>Standard Uncertainty - Volumetric Flow Rate (95% Confidence), Relative</b> | 4.5    | %                  |

95% confidence interval factor - 1.96

| Document Version Number | Record of change within different version numbers  |
|-------------------------|--|
| V1                      | Original version of the document issued to client. |



# Report for the Periodic Monitoring of Emissions to Atmosphere

## Permal Ltd (Gloucester)

### Layup Table

Permit No: np  
Installation: Gloucester  
Monitoring Dates: 31st August 2023  
Site Address: Permal Gloucester Ltd, 270 Bristol Road, Gloucester, GL1 5TT

Report Number: EM-0042      Version: 1      Visit: 3 in 2023  
Date of Report: 14th September 2023  
Report Author: Jonny Guy  
MCERTS No: MM 16 1388      MCERTS Level: 2 (TE1, TE2, TE4)

Approved By: Ian Baggley      Function: Training Manager  
MCERTS No: MM 05 653      MCERTS Level: 2 (TE1, TE2, TE3, TE4)

Signed:



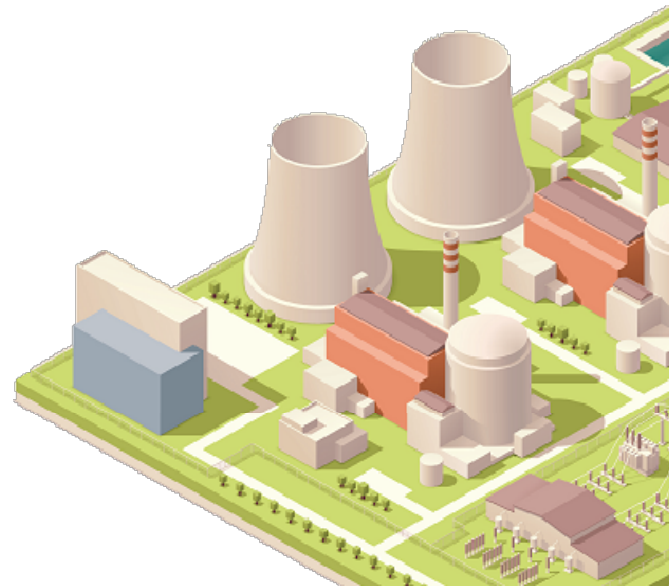
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### YOUR INDUSTRY EXPERTS



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# Executive Summary

## Monitoring Objectives

Envirocare Technical Consultancy were contracted by Permali Ltd to carry out emissions monitoring, to determine the release of prescribed pollutants at Layup Table. There are no emission limits set for any of the pollutants at this time. The methodologies utilised and the results obtained form the basis of this report.

The substances requested for monitoring are listed below.

## Emission Point Identification

| Substances to be Monitored | Layup Table |
|----------------------------|-------------|
| Total VOCs                 | ✓           |
| Styrene                    | ✓           |
| Volumetric Flow            | ✓           |

Special requirements: none

Opinions and interpretations expressed within this report are outside the scope of Envirocare Technical Consultancy's MCERTS and UKAS accreditation. Envirocare accepts no responsibility for information in this report that was provided by the client, the client's representative or employees of the client. Where such information has been provided by external sources this is identified in footnotes of the respective tables.

# Executive Summary

## Monitoring Results

where MU = Measurement Uncertainty associated with the result (95% Confidence)

| Substance                | Limit (mg/m <sup>3</sup> ) | Concentration               |                                  | Reference Conditions | Mass Emission           |               |                                  | Sampling Date | Sampling Times |             |
|--------------------------|----------------------------|-----------------------------|----------------------------------|----------------------|-------------------------|---------------|----------------------------------|---------------|----------------|-------------|
|                          |                            | Result (mg/m <sup>3</sup> ) | Measurement Uncertainty (MU) +/- |                      | Limit (g/hr)            | Result (g/hr) | Measurement Uncertainty (MU) +/- |               |                |             |
| Total VOCs               | R1                         | -                           | 1.02                             | 0.25                 | 273k, 101.3kPa, Wet Gas | -             | 3.2                              | 0.8           | 31/08/2023     | 14:03-14:33 |
| Styrene                  | R1                         | -                           | < 0.44                           | 0.11                 |                         | -             | 1.4                              | 0.4           | 31/08/2023     | 14:03-14:33 |
| Volumetric Flow (Actual) | R1                         | -                           | 3,450 m <sup>3</sup> /h          | 156                  | As Measured             | -             | -                                | -             | 31/08/2023     | 14:45-14:50 |
| Volumetric Flow (REF)    | R1                         | -                           | 3,174 m <sup>3</sup> /h          | 144                  | 273k, 101.3kPa, Wet Gas | -             | -                                | -             | 31/08/2023     | 14:45-14:50 |

Reference conditions (REF) are: 273k, 101.3kPa, Wet Gas

# Supporting Information

## Appendix 1: General Information

### Operating Information

| Parameter                                    | Process Details |
|--|-----------------|
| Process Type                                 | Wrapping Table  |
| Continuous or Batch Process                  | Batch           |
| Operating Status                             | Running         |
| Feedstock                                    | Components      |
| Normal Load, Throughput or Continuous Rating | Normal          |
| Abatement System                             | None            |
| Abatement System Status                      | N/A             |
| Process Fuel                                 | N/A             |
| Plume Appearance                             | Not visible     |

### Monitoring Deviations

| Parameter      | Run | Deviation  |
|----------------|-----|--|
| Speciated VOCs | All | Sampling rate was conducted above that recommended in the Standard in order that the Limit of Detection could be achieved. |

### Monitoring Organisation Staff Details

| Personnel     | Position    | MCERTS Level           | MCERTS Number |
|---------------|-------------|------------------------|---------------|
| Mr J Guy      | Team Leader | 2 (TE1, TE2, TE4)      | MM 16 1388    |
| Mr S Dwyer    | Technician  | Trainee                | MM 23 1768    |
| Mr T Campbell | Director    | 2 (TE1, TE2, TE3, TE4) | MM 03 155     |

### Monitoring Methods

| Pollutant Species | Standard          | Technical Procedure | Testing MCERTS | Analysis Laboratory         | Analytical Procedure | Analytical Technique | Analysis MCERTS |
|-------------------|-------------------|---------------------|----------------|-----------------------------|----------------------|----------------------|-----------------|
| Volumetric Flow   | BS EN ISO 16911-1 | ETC-SE-24a          | Yes            | Pitot Tube and Thermocouple |                      |                      |                 |
| Total VOCs        | PD CEN/TS 13649-1 | ETC-SE-06 (a/b)     | Yes            | Marchwood                   | WI3042/48            | GC-MS                | No              |
| Styrene           | PD CEN/TS 13649-1 | ETC-SE-06 (a/b)     | Yes            | Marchwood                   | WI3042/48            | GC-MS                | No              |

Envirocare: 2522 | Marchwood Scientific Services: 1668

## Equipment Checklist

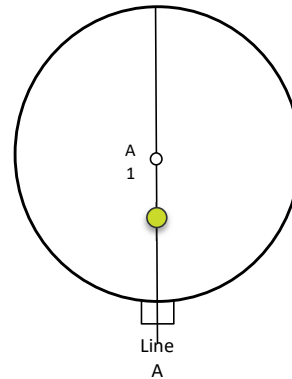
| Extractive Sampling    |                | Instrumental Analysers      |                | Miscellaneous Items           |                |
|------------------------|----------------|-----------------------------|----------------|-------------------------------|----------------|
| Equipment Type         | Equipment I.D. | Equipment Type              | Equipment I.D. | Equipment Type                | Equipment I.D. |
| Control Box DGM        | 8.03           | Horiba PG-250               | -              | Tape Measure                  | 17.09          |
| Box Thermocouples      | 2.13A          | Horiba PG-250 SRM           | -              | Bevel Box                     | -              |
| Box Thermocouple In    | 2.13A          | Horiba PG-350               | -              | Stopwatch                     | 10.22          |
| Box Thermocouple Out   | 2.13A          | JCT JCC Cooler              | -              | Barometer                     | 11.11          |
| Control Box Timer      | 10.21          | MAK10 Cooler                | -              | Digital Manometer             | 24.11          |
| Umbilical              |                | Horiba PS200 Cooler         |                | Digital Temperature Meter     | -              |
| Oven Box               |                | M&C PSS Gas Preparation     | -              | Dual Channel Heat Controller  | 6.09           |
| Heated Probe (1)       |                | Gasmet DX4000 FTIR          | -              | 1m Heated Line                | -              |
| Heated Probe (2)       |                | Gasmet Sampling System      | -              | 3m Heated Line                | -              |
| Stack Thermocouple (1) | 1.81           | SK-Thermo FID               |                | 5m Heated Line                | -              |
| Stack Thermocouple (2) |                | Bernath 3006 FID            | -              | 10m Heated Line               |                |
| S-Type Pitot (1)       | 20.11S         | Testo 350XL                 | -              | 20m Heated Line               | -              |
| S-Type Pitot (2)       |                | M&C PSP 4000                | 7.13           | 30m Heated Line               | -              |
| L-Type Pitot           | 20.06L         | Easylogger EN-EL-12 Bit     | -              | Impinger Arm Thermocouple (1) | 3.21A          |
| Site Balance           | 18.12          | Hioki 5043 (V)              | -              | Impinger Arm Thermocouple (2) | 3.22A          |
| 500g Check Weight      | 18.12          | Analyser Temperature Logger | -              | Dioxins Kit Thermocouple      | -              |
| 1KG Check Weight       | 18.12          | -                           | 8.09B          | Sample Temperature Logger     | -              |
| Digital Callipers      | 16.11          | -                           | -              | Laboratory Balance            | -              |

## Appendix 2: Layup Table Results and Calculations

Picture of the sampling location



Sampling Points Diagram



- = Isokinetic sampling point
- = Isokinetic point not sampled
- = Non-Isokinetic sampling point
- = Combustion Gases, VOC Sampling point

### Duct Characteristics

| Parameter                   | Units          | Value    |
|-----------------------------|----------------|----------|
| Type                        | -              | Circular |
| Depth                       | m              | 0.35     |
| Width                       | m              | -        |
| Area                        | m <sup>2</sup> | 0.1      |
| Port Depth                  | cm             | 0.0      |
| Orientation of Stack / Duct | -              | Angled   |
| Sampling Port Size          | -              | Hole     |
| Number of Ports             | -              | 1        |

| Manual Sampling Points       | Used / Required |
|------------------------------|-----------------|
| Number of Sampling Lines     | 1 / 1           |
| Number of Sampling Points    | 1 / 1           |
| Instrumental Sampling Points | Used / Required |
| Number of Sampling Lines     | -               |
| Number of Sampling Points    | -               |

| Platform Type and Location            |        |
|---------------------------------------|--------|
| Platform Type - Permanent / Temporary | MEWP   |
| Location - Inside / Outside           | Inside |

| EA Technical Guidance Note M1 Platform Requirements |   |     |
|---|---|-----|
| Load Baring Capacity                                | Load baring capacity of platform sufficient to fulfil the measurement objective | Yes |
| Position & Work Space                               | Sufficient work area to manipulate probe & operate the measurement instruments  | Yes |
|   | Depth of work area > internal diameter of stack and wall thickness plus 1.5m    | N/A |
|   | Ports on vertical ducts 1.2m to 1.5m above platform floor                       | Yes |
|   | Platform has chains / self closing gates at top of ladders                      | N/A |
| Fall Prevention                                     | Platform has adequate drainage to prevent accumulation of free-standing water   | N/A |
|   | Platform has 2 levels of handrails (approx. 0.5m & 1.0m high)                   | N/A |
|   | Gaps between handrails not >0,5m  | N/A |
| Access  | Platform has vertical base boards (approx. 0.25m high)                          | N/A |
|   | Access to sampling ports unhindered by obstructions                             | No  |
|   | Easy & safe access and egress available   | Yes |

### Sampling Location / Platform Recommendations

All sampling platforms should be designed in accordance with the requirements specified in Environment Agency Guidance Note M1 and BS EN 15259.

## Flow Criteria Measurements

| Duct Diameter (m) | Cross Sectional Area (m <sup>2</sup> ) | Barometric Pressure (mbar) | Ambient Temperature (°C) | Mean Oxygen (%) | Estimated Carbon Dioxide (%) | Estimated Water Vapour (%) | Stack Gas Molecular mass (g/mol) | Pitot Coefficient |
|-------------------|--|----------------------------|--------------------------|-----------------|------------------------------|----------------------------|----------------------------------|-------------------|
| 0.35              | 0.1                                    | 1007                       | 15.0                     | 20.8            | 0.1                          | 1.0                        | 28.7                             | 0.844             |

| Sample Line | Traverse Point | Position (cm) | Differential Pressure Reading (cmH2O) |      |      |         | Stack Velocity (m/s) | Stack Temp (°C) | Angle of Swirl |
|-------------|----------------|---------------|---------------------------------------|------|------|---------|----------------------|-----------------|----------------|
|             |                |               | 1                                     | 2    | 3    | Average |                      |                 |                |
| A           | A1             | 2.3           | 78.0                                  | 78.0 | 78.0 | 0.80    | 9.7                  | 22              | 4              |
|             | A2             | 8.8           | 83.0                                  | 83.0 | 83.0 | 0.85    | 10.0                 | 22              | 6              |
|             | A3             | 26.3          | 81.0                                  | 81.0 | 81.0 | 0.83    | 9.9                  | 22              | 6              |
|             | A4             | 32.7          | 87.0                                  | 87.0 | 87.0 | 0.89    | 10.2                 | 22              | 5              |

| Parameter | Mean Duct Velocity | Velocity Ratio (Max:Min) | Mean Stack Temperature | Mean Stack Temperature | Stack Gas Volume Flow | Stack Gas Volume Flow (STP Wet) | Stack Gas Volume Flow (REF) |
|-----------|--------------------|--------------------------|------------------------|------------------------|-----------------------|---------------------------------|-----------------------------|
| Value     | 10.0               | 1.1:1                    | 22                     | 295                    | 3450                  | 3174                            | 3174                        |
| Units     | m/s                | -                        | °C                     | K                      | m <sup>3</sup> /hr    | Nm <sup>3</sup> /hr             | Nm <sup>3</sup> /hr         |



### Total VOCs - Run 1 Calculations

| Sampling Details        |        |        |
|-------------------------|--------|--------|
| Collection Media        | 226-09 |        |
| Sampling Rate           | 800    | mL/min |
| Test Duration           | 30.0   | min    |
| Sample Volume           | 24.00  | L      |
| Corrected Sample Volume | 22.54  | NL     |

| Analysis Details            |         |                    |
|-----------------------------|---------|--------------------|
| 1st Collector Reference     | LTTVOCF |                    |
| 1st Collector Concentration | 19      | µg                 |
| 2nd Collector Reference     | LTTVOCB |                    |
| 2nd Collector Concentration | <4      | µg                 |
| Blank Concentration         | <0.18   | mg/Nm <sup>3</sup> |
| Has breakthrough occurred?  | No      | -                  |

| Date       | Operators |
|------------|-----------|
| 31/08/2023 | SD TC     |

| Parameter             | Before | After | Unit |
|-----------------------|--------|-------|------|
| Barometric Pressure   | 1007   | 1007  | mbar |
| Operating Temperature | 16     | 16    | °C   |
| Leak Check            | Pass   | Pass  | -    |
| Time                  | 14:03  | 14:33 | -    |

| Emissions Calculations |      |                    |
|------------------------|------|--------------------|
| Emission Limit Value   | -    | mg/Nm <sup>3</sup> |
| Corrected Emission     | 1.02 | mg/Nm <sup>3</sup> |

### Styrene - Run 1 Calculations

| Sampling Details        |        |        |
|-------------------------|--------|--------|
| Collection Media        | 226-09 |        |
| Sampling Rate           | 800    | mL/min |
| Test Duration           | 30.0   | min    |
| Sample Volume           | 24.00  | L      |
| Corrected Sample Volume | 22.54  | NL     |

| Analysis Details            |       |                    |
|-----------------------------|-------|--------------------|
| 1st Collector Reference     | STF   |                    |
| 1st Collector Concentration | <5    | µg                 |
| 2nd Collector Reference     | STB   |                    |
| 2nd Collector Concentration | <5    | µg                 |
| Blank Concentration         | <0.22 | mg/Nm <sup>3</sup> |
| Has breakthrough occurred?  | No    | -                  |

| Date       | Operators |
|------------|-----------|
| 01/09/2023 | SD TC     |

| Parameter             | Before | After | Unit |
|-----------------------|--------|-------|------|
| Barometric Pressure   | 1007   | 1007  | mbar |
| Operating Temperature | 16     | 16    | °C   |
| Leak Check            | Pass   | Pass  | -    |
| Time                  | 14:03  | 14:33 | -    |

| Emissions Calculations |       |                    |
|------------------------|-------|--------------------|
| Emission Limit Value   | -     | mg/Nm <sup>3</sup> |
| Corrected Emission     | <0.44 | mg/Nm <sup>3</sup> |

## Uncertainty

### Uncertainty of Total VOCs by Pump - Run 1

| Parameter                  | Value | Unit              |
|----------------------------|-------|-------------------|
| Emission Limit Value (ELV) | -     | mg/m <sup>3</sup> |
| Mean Sampling Rate         | 0.8   | L/min             |
| Barometric Pressure        | 1007  | mbar              |

| Parameter                 | Value | Unit              |
|---------------------------|-------|-------------------|
| Emission Concentration    | 1.02  | mg/m <sup>3</sup> |
| Monitoring Duration       | 30    | min               |
| Average Stack Temperature | 24    | °C                |

| Source of Uncertainty   | Uncertainty Criteria           | Actual Source Value | Units | % Actual Value | Source Uncertainty u | Combined Uncertainty u <sup>2</sup> |
|---|--------------------------------|---------------------|-------|----------------|----------------------|-------------------------------------|
| Analysis  | 25% of result (95% confidence) | 0.13                | mg    | 12.5           | 0.128                | 0.0163                              |
| Leak Rate   | <2% of sampling rate           | 0.01                | L/min | 1.25           | 0.0204               | 0.00042                             |
| Time  | 1 minute                       | 0.50                | min   | 0.03           | 0.0003               | 0.000001                            |
| Sampling Flow Rate  | 2% of value                    | 0.01                | L/min | 1.25           | 0.0128               | 0.00016                             |
| Temperature   | 1% of value                    | 0.50                | °C    | 0.17           | 0.0017               | 0.000003                            |
| Pressure  | 1% of value                    | 5.0                 | mbar  | 0.50           | 0.0051               | 0.00003                             |
| <b>Total</b>  |                                |                     |       |                |                      | 0.017                               |
| <b>Combined Standard Uncertainty [(sum u<sup>2</sup>)<sup>0.5</sup>]</b>          |                                |                     |       |                |                      | 0.13                                |
| <b>Expanded Total Uncertainty as a % of emission conc. (95% confidence)</b>       |                                |                     |       |                |                      | 24.95                               |
| <b>Expanded Total Uncertainty (mg/m<sup>3</sup>) (95% confidence)</b>             |                                |                     |       |                |                      | 0.25                                |
| <b>Expanded Total Uncertainty as a % of emission limit value (95% confidence)</b> |                                |                     |       |                |                      | -                                   |

### Uncertainty of Styrene by Pump - Run 1

| Parameter                  | Value | Unit              |
|----------------------------|-------|-------------------|
| Emission Limit Value (ELV) | -     | mg/m <sup>3</sup> |
| Mean Sampling Rate         | 0.8   | L/min             |
| Barometric Pressure        | 1007  | mbar              |

| Parameter                 | Value | Unit              |
|---------------------------|-------|-------------------|
| Emission Concentration    | 0.44  | mg/m <sup>3</sup> |
| Monitoring Duration       | 30    | min               |
| Average Stack Temperature | 24    | °C                |

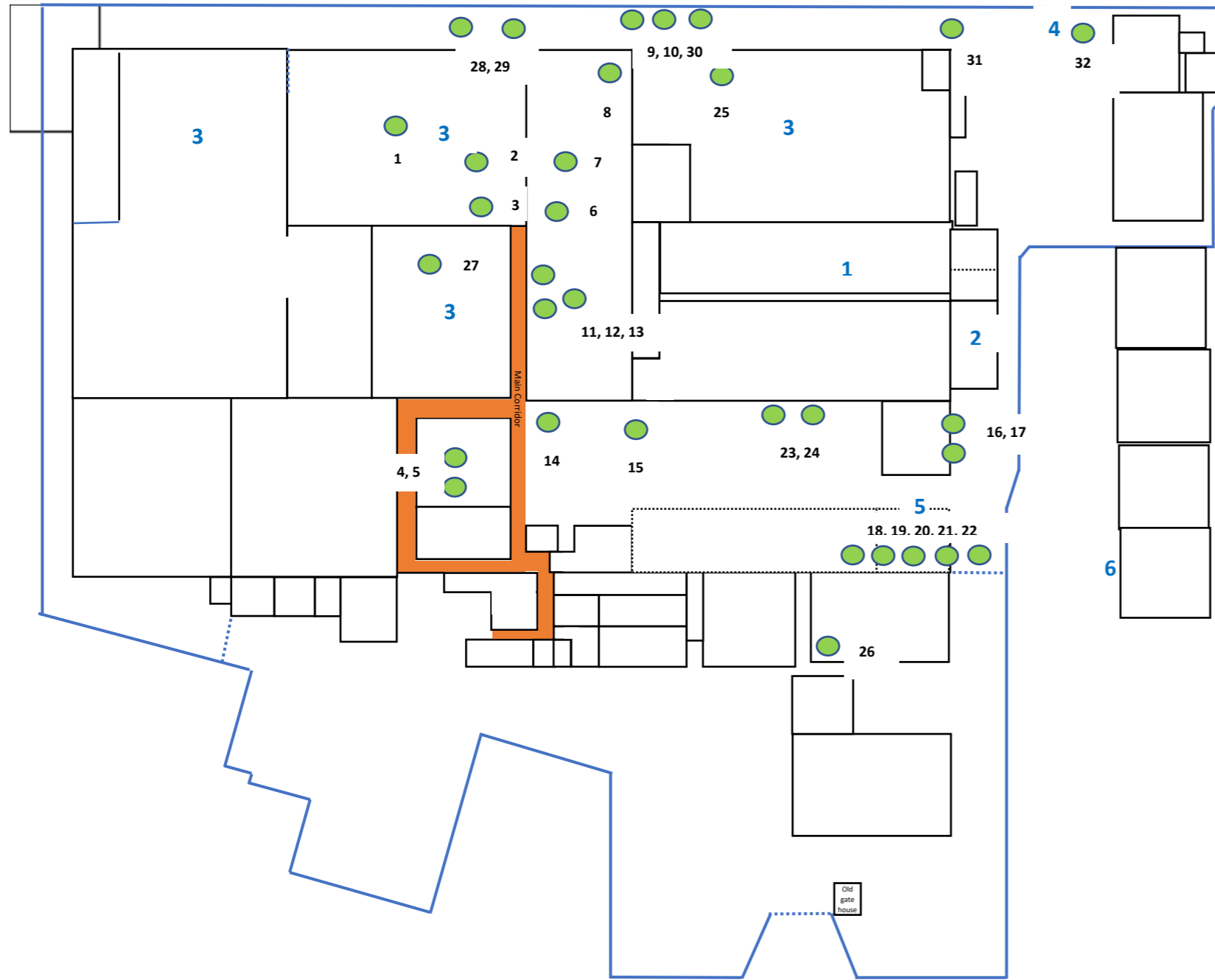
| Source of Uncertainty   | Uncertainty Criteria           | Actual Source Value | Units | % Actual Value | Source Uncertainty u | Combined Uncertainty u <sup>2</sup> |
|---|--------------------------------|---------------------|-------|----------------|----------------------|-------------------------------------|
| Analysis  | 25% of result (95% confidence) | 0.06                | mg    | 12.5           | 0.055                | 0.00308                             |
| Leak Rate   | <2% of sampling rate           | 0.01                | L/min | 1.25           | 0.009                | 0.00008                             |
| Time  | 1 minute                       | 0.50                | min   | 0.03           | 0.00012              | 0.0000002                           |
| Sampling Flow Rate  | 2% of value                    | 0.01                | L/min | 1.25           | 0.0055               | 0.00003                             |
| Temperature   | 1% of value                    | 0.50                | °C    | 0.17           | 0.0007               | 0.000001                            |
| Pressure  | 1% of value                    | 5.0                 | mbar  | 0.50           | 0.0022               | 0.000005                            |
| <b>Total</b>  |                                |                     |       |                |                      | 0.003                               |
| <b>Combined Standard Uncertainty [(sum u<sup>2</sup>)<sup>0.5</sup>]</b>          |                                |                     |       |                |                      | 0.06                                |
| <b>Expanded Total Uncertainty as a % of emission conc. (95% confidence)</b>       |                                |                     |       |                |                      | 24.95                               |
| <b>Expanded Total Uncertainty (mg/m<sup>3</sup>) (95% confidence)</b>             |                                |                     |       |                |                      | 0.11                                |
| <b>Expanded Total Uncertainty as a % of emission limit value (95% confidence)</b> |                                |                     |       |                |                      | -                                   |

Uncertainty of Volumetric Flow - Run 1

| Parameter   | Value  | Unit               |
|---|--------|--------------------|
| Measured Volumetric Flow Rate Actual  | 3450   | m <sup>3</sup> /hr |
| Performance Characteristics & Source Value                                    |        |                    |
|   | Value  | Units              |
| Standard Uncertainty - Pitot tube Coefficient                                 | 0.005  | -                  |
| Standard Uncertainty - Mean Local Dynamic Pressure                            | 34.5   | Pa                 |
| Standard Uncertainty - Molar Mass of Stack Gas                                | 0.0000 | -                  |
| Standard Uncertainty - Stack Gas Temperature                                  | 0.50   | K                  |
| Standard Uncertainty - Absolute Pressure in Duct                              | 176    | Pa                 |
| Standard Uncertainty - Density of Stack Gas                                   | 0.027  | -                  |
| Standard Uncertainty - Mean Velocity  | 0.13   | m/s                |
| <b>Expanded Uncertainty Mean Velocity (95% confidence)</b>                    | 0.25   | m/s                |
| <b>Expanded Uncertainty Mean Velocity (95% Confidence), Relative</b>          | 2.5    | %                  |
| <b>Standard Uncertainty - Volumetric Flow Rate</b>                            | 80     | -                  |
| <b>Standard Uncertainty - Volumetric Flow Rate (95% Confidence)</b>           | 156    | m <sup>3</sup> /hr |
| <b>Standard Uncertainty - Volumetric Flow Rate (95% Confidence), Relative</b> | 4.5    | %                  |
| 95% confidence interval factor - 1.96   |        |                    |

| Document Version Number | Record of change within different version numbers  |
|-------------------------|--|
| V1                      | Original version of the document issued to client. |

PERMALI LTD PROCESS LOCATIONS  
AND EMISSION POINTS



- Emission Point - Zones**
1. Horizontal coating processes x 2
  2. Vertical coating process x 1
  3. Machining Shops x 4
  4. Oxidiser
  5. Paint Spraying
  6. Raw Material and waste storage

# Gloucester City Council

## Permit with introductory note

The Environmental Permitting (England & Wales) Regulations 2016

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Permali Gloucester Limited  
170 Bristol Road  
Gloucester  
GL1 5TT

**Permit Reference Number**  
**23/00006/A2**

# PERMALI GLOUCESTER LIMITED

## Permit Reference number 23/00006/A2

### Introductory note

#### **This introductory note does not form a part of the permit**

This permit is granted by Gloucester City Council (The Council) under Regulation 13 of the Environmental Permitting (England & Wales) Regulations 2016 to operate an installation involving the surface treating of substances, objects or products using organic solvents with a consumption capacity of more than 200 tonnes per year of solvents.

#### **Brief description of the process**

- Section 6.4 Part A (2) and Schedule 14 Solvent Emission Activities
- The process involves impregnation with preformulated resins of wide-web woven glass fibre cloths and tissue and subsequent conversion to a composite laminate material. Subsequent stages of cutting, pressing and curing followed by machining to shape produce the products which are either packed for shipping or subject to a final spray-coating in proprietary spray booths.
- VOC emissions from the preformulated resin mixing, impregnation and curing activity and cleaning processes are extracted to a gas fired regenerative thermal oxidiser (RTO) and activated carbon filter. Particulate matter emissions from cutting and machining activities are extracted to filtration systems. The principal releases from the installation comprise VOC, NOx and CO emissions from the RTO, VOC emission from the carbon filter unit, abated particulate emissions from cutting and machining activities, and noise from external plant / equipment. Waste streams associated with the installation include Solvent, Oil / Water mix, wood, Garnett sand (used as a cutting abrasive, cardboard, filter system particulate matter and waste product from the machining / pressing activities. There are Four on-site gas fired boilers, (2 classed as Medium Combustion Plant and regulated by the EA) supplying heat and steam for running the presses, emitting products of combustion.
- The site is located adjacent to the Gloucester and Sharpness Canal. To the East and West of the site are residential properties, there are no SSSI's within 2km of the facility.
- Schedule 7 details the site location and boundary, the site layout and emission points to air.

The Installation is operated by Permal Gloucester Limited and is located at 170 Bristol Road, Gloucester, Gloucestershire, GL1 5TT, England.

The status log of a permit sets out the permitting history, including any changes to the permit reference number.

| <b>Status log of the permit</b>      |                         |   |
|--------------------------------------|-------------------------|---|
| <b>Description</b>                   | <b>Date</b>             | <b>Comments</b>   |
| Application received 03/03/23        | Duly made<br>03/05/2023 | Application for an A2 solvent coating activity namely the impregnation of textiles in a plant with a consumption capacity of more than 200 tonnes per year.                               |
| Additional Information notice served | 27/7/2023               | Further information in respect of noise and odour management plans, Update site plan including carbon filtration unit, emission results from RTO and unabated emission sources.           |
| Additional information received      | 4/10/2023               | Updated site plan showing all emission to air points, emission results from RTO, Carbon filter and unabated emission sources. Noise action and management plan and odour management plan. |
| Permit determined<br>23/00006/A2     | DD/MM/YYYY              |   |

End of introductory note

DRAFT

# Permit to Operate

## The Environmental Permitting (England and Wales) Regulations 2016

### Permit number

23/00006/A2

### Operator Name: **Permali Gloucester Limited**

whose registered office is 170 Bristol Road, Gloucester, GL1 5TT

company registration number 03546214

to operate an installation at

170 Bristol Road, Gloucester, GL1 5TT

to the extent authorised by and subject to the conditions of this permit.

**Name**

**Gupti Gosine**

**Date**

**XXXXXXXXXX**

An Authorised Officer of The Council



# Conditions

## 1 Management

### 1.1 General management

- 1.1.1 The operator shall manage and operate the activities:
- (a) in accordance with a written environmental management system (EMS) that identifies and minimises risks of pollution, including those arising from operations, maintenance, accidents, incidents, non-conformances, closure and those drawn to the attention of the operator as a result of complaints; and
  - (b) using sufficient competent persons and resources.
- 1.1.2 Records demonstrating compliance with condition 1.1.1 shall be maintained.
- 1.1.3 Any person having duties that are or may be affected by the matters set out in this permit shall have convenient access to a copy of it kept at or near the place where those duties are carried out

### 1.2 Energy efficiency

- 1.2.1 The operator shall:
- (a) take appropriate measures to ensure that energy is used efficiently in the activities;
  - (b) review and record at least every four years whether there are suitable opportunities to improve the energy efficiency of the activities; and
  - (c) take any further appropriate measures identified by a review.

### 1.3 Efficient use of raw materials

- 1.3.1 The operator shall:
- (a) take appropriate measures to ensure that raw materials and water are used efficiently in the activities;
  - (b) maintain records of raw materials and water used in the activities;
  - (c) review and record at least every four years whether there are suitable alternative materials that could reduce environmental impact or opportunities to improve the efficiency of raw material and water use; and
  - (d) take any further appropriate measures identified by a review.

### 1.4 Avoidance, recovery and disposal of wastes produced by the activities

- 1.4.1 The operator shall take appropriate measures to ensure that:
- (a) the waste hierarchy referred to in Article 4 of the Waste Framework Directive is applied to the generation of waste by the activities; and
  - (b) any waste generated by the activities is treated in accordance with the waste hierarchy referred to in Article 4 of the Waste Framework Directive; and

- (c) where disposal is necessary, this is undertaken in a manner which minimises its impact on the environment.
- 1.4.2 The operator shall review and record at least every four years whether changes to those measures should be made and take any further appropriate measures identified by a review.

## 2 Operations

### 2.1 Permitted activities

- 2.1.1 The operator is only authorised to carry out the activities specified in Schedule 1 table S1.1 (the “activities”).

### 2.2 The site

- 2.2.1 The activities shall not extend beyond the site, being the land shown edged in red on the site plan at schedule 7 to this permit.

### 2.3 Operating techniques

- 2.3.1 For the activities referenced in schedule 1, table S1.1 the activities shall, subject to the conditions of this permit, be operated using the techniques and in the manner described in the documentation specified in schedule 1, table S1.2, unless otherwise agreed in writing by the Regulator.
- 2.3.2 If notified by the Regulator that the activities are giving rise to pollution, the operator shall submit to the Regulator, for approval within the period specified, a revision of any plan or other documentation (“plan”) specified in schedule 1, table S1.2 or otherwise required under this permit which identifies and minimises the risks of pollution relevant to that plan and shall implement the approved revised plan in place of the original from the date of approval, unless otherwise agreed in writing by the Regulator.
- 2.3.3 The operator shall
- (a) identify the process areas, sections or steps that make the greatest contribution to VOC emissions and energy consumption, which have the greatest potential for improvement;
  - (b) identify and implement actions to minimise VOC emissions and energy consumption;
  - (c) review progress and update actions on an annual basis.
- 2.3.4 Any raw materials or fuels listed in schedule 2 table S2.1 shall conform to the specifications set out in that table.
- 2.3.5 The operator shall ensure that where waste produced by the activities is sent to a relevant waste operation, that operation is provided with the following information, prior to the receipt of the waste:
- (a) the nature of the process producing the waste;
  - (b) the composition of the waste;
  - (c) the handling requirements of the waste;
  - (d) the hazardous property associated with the waste, if applicable; and
  - (e) the waste code of the waste.
- 2.3.6 The operator shall ensure that where waste produced by the activities is sent to a landfill site, it meets the waste acceptance criteria for that landfill.

## 2.4 Improvement programme

- 2.4.1 The operator shall complete the improvements specified in schedule 1 table S1.3 by the date specified in that table unless otherwise agreed in writing by the Regulator.
- 2.4.2 Except in the case of an improvement which consists only of a submission to the Regulator, the operator shall notify the Regulator within 14 days of completion of each improvement.

## 3 Emissions and monitoring

### 3.1 Emissions to water, air or land

- 3.1.1 There shall be no point source emissions to water, air or land except from the sources and emission points listed in Schedule 3 tables S3.1, The limits given in Schedule 3 shall not be exceeded.
- 3.1.2 Periodic monitoring shall be carried out at least once every 5 years for groundwater and 10 years for soil, unless such monitoring is based on a systematic appraisal of the risk of contamination.
- 3.1.3 The operator shall
- maximise the availability and performance of equipment critical to the protection of the environment;
  - record all periods of other than normal operation conditions (OTNOC), their cause and duration and where possible their effect on emissions.

### 3.2 Emissions of substances not controlled by emission limits

- 3.2.1 Emissions of substances not controlled by emission limits (excluding odour) shall not cause pollution. The operator shall not be taken to have breached this condition if appropriate measures, including, but not limited to, those specified in any approved emissions management plan, have been taken to prevent or where that is not practicable, to minimise those emissions.
- 3.2.2 The operator shall:
- if notified by the Regulator that the activities are giving rise to pollution, submit to the Regulator for approval within the period specified, an emissions management plan which identifies and minimises the risks of pollution from emissions of substances not controlled by emission limits;
  - implement the approved emissions management plan, from the date of approval, unless otherwise agreed in writing by the Regulator.
- 3.2.3 All liquids in containers, whose emission to water or land could cause pollution, shall be provided with secondary containment, unless the operator has used other appropriate measures to prevent or where that is not practicable, to minimise, leakage and spillage from the primary container.

### 3.3 Monitoring

- 3.3.1 The operator shall, unless otherwise agreed in writing by the Regulator, monitor total and fugitive VOC emissions by compiling, at least on an annual basis, a solvent mass balance of the solvent inputs and outputs of the plant, as defined in Part 7(2) of Annex VII to Directive 2010/75/EU.

The solvent mass balance shall include:

- identification and documentation of solvent inputs and outputs, (e.g. emissions in waste gases, emissions from each fugitive emission source, solvent output in waste);

- substantiated quantification of each relevant solvent input and output and recording of the methodology used (e.g. measurement, calculation using emission factors, estimation based on operational parameters);
- identification of the main sources of uncertainty of the aforementioned quantification, and implementation of corrective actions to reduce the uncertainty;
- regular update of solvent input and output data.

The solvent mass balance calculation methodology shall be agreed in writing by the Regulator.

3.3.2 The operator shall, unless otherwise agreed in writing by the Regulator, undertake the monitoring specified in the following tables in schedule 3 to this permit:

- point source emissions specified in tables S3.1,
- process monitoring specified in table S3.3;

3.3.3 The operator shall maintain records of all monitoring required by this permit including records of the taking and analysis of samples, instrument measurements (periodic and continual), calibrations, examinations, tests and surveys and any assessment or evaluation made on the basis of such data.

3.3.4 Monitoring equipment, techniques, personnel and organisations employed for the emissions monitoring programme and the environmental or other monitoring specified in condition 3.3.2 shall have either MCERTS certification or MCERTS accreditation (as appropriate), where available, unless otherwise agreed in writing by the Regulator.

3.3.5 Permanent means of access shall be provided to enable sampling / monitoring to be carried out in relation to the emission points specified in schedule 3 tables S3.1, unless otherwise agreed in writing by the Regulator.

### **3.4 Odour**

3.4.1 Emissions from the activities shall be free from odour at levels likely to cause pollution outside the site, as perceived by an authorised officer of the Regulator. The operator shall implement the approved and incorporated Odour Management Plan as detailed in S1.2.

### **3.5 Noise and vibration**

3.5.1 Emissions from the activities shall be free from noise and vibration at levels likely to cause pollution outside the site, as perceived by an authorised officer of the Regulator. The operator shall implement the approved and incorporated Noise Management Plan as detailed in S1.2.

## **4 Information**

### **4.1 Records**

4.1.1 All records required to be made by this permit shall:

- be legible;
- be made as soon as reasonably practicable;
- if amended, be amended in such a way that the original and any subsequent amendments remain legible, or are capable of retrieval; and
- be retained, unless otherwise agreed in writing by the Regulator, for at least 6 years from the date when the records were made, or in the case of the following records until permit surrender:

- (i) off-site environmental effects; and
  - (ii) matters which affect the condition of the land and groundwater.
- 4.1.2 The operator shall keep on site all records, plans and the management system required to be maintained by this permit, unless otherwise agreed in writing by the Regulator.

## 4.2 Reporting

- 4.2.1 The operator shall send all reports and notifications required by the permit to the Regulator using the contact details supplied in writing by the Regulator.
- 4.2.2 Within 28 days of the end of the reporting period the operator shall, unless otherwise agreed in writing by the Regulator, submit reports of the monitoring and assessment carried out in accordance with the conditions of this permit, as follows:
- (a) in respect of the parameters and emission points specified in schedule 4 table S4.1;
  - (b) for the reporting periods specified in schedule 4 table S4.1 and using the forms specified in schedule 4 table S4.4 ; and
  - (c) giving the information from such results and assessments as may be required by the forms specified in those tables.
- 4.2.3 A report or reports on the performance of the activities over the previous year shall be submitted to the Regulator by 31 January (or other date agreed in writing by the Regulator) each year. The report(s) shall include as a minimum:
- (a) a review of the results of the monitoring and assessment carried out in accordance with the permit including an interpretive review of that data;
  - (b) the annual production / treatment data set out in schedule 4 table S4.2; and
  - (c) the performance parameters set out in schedule 4 table S4.3 using the forms specified in table S4.4 of that schedule.
- 4.2.4 The operator shall, unless notice under this condition has been served within the preceding four years, submit to the Regulator, within six months of receipt of a written notice, a report assessing whether there are other appropriate measures that could be taken to prevent, or where that is not practicable, to minimise pollution.
- 4.2.5 The operator shall submit an annual solvent management plan in order to demonstrate compliance with the requirements of the Industrial Emissions Directive, by 31 January each year in respect of the previous year.

## 4.3 Notifications

- 4.3.1 In the event:
- (a) that the operation of the activities gives rise to an incident or accident which significantly affects or may significantly affect the environment, the operator must immediately—
    - (i) inform the Regulator,
    - (ii) take the measures necessary to limit the environmental consequences of such an incident or accident, and
    - (iii) take the measures necessary to prevent further possible incidents or accidents;
  - (b) of a breach of any permit condition the operator must immediately—
    - (i) inform the Regulator, and
    - (ii) take the measures necessary to ensure that compliance is restored within the shortest possible time;

- (c) of a breach of permit condition which poses an immediate danger to human health or threatens to cause an immediate significant adverse effect on the environment, the operator must immediately suspend the operation of the activities or the relevant part of it until compliance with the permit conditions has been restored.
- 4.3.2 Any information provided under condition 4.3.1 shall be confirmed by sending the information listed in schedule 5 to this permit within the time period specified in that schedule.
- 4.3.3 Where the Regulator has requested in writing that it shall be notified when the operator is to undertake monitoring and/or spot sampling, the operator shall inform the Regulator when the relevant monitoring and/or spot sampling is to take place. The operator shall provide this information to the Regulator at least 14 days before the date the monitoring is to be undertaken.
- 4.3.4 The Regulator shall be notified within 14 days of the occurrence of the following matters, except where such disclosure is prohibited by Stock Exchange rules:
- Where the operator is a registered company:
- (a) any change in the operator's trading name, registered name or registered office address; and
  - (b) any steps taken with a view to the operator going into administration, entering into a company voluntary arrangement or being wound up.
- Where the operator is a corporate body other than a registered company:
- (c) any change in the operator's name or address; and
  - (d) any steps taken with a view to the dissolution of the operator.
- 4.3.5 Where the operator proposes to make a change in the nature or functioning, or an extension of the activities, which may have consequences for the environment and the change is not otherwise the subject of an application for approval under the Regulations or this permit:
- (a) the Regulator shall be notified at least 14 days before making the change; and
  - (b) the notification shall contain a description of the proposed change in operation.
- 4.3.6 The Regulator shall be given at least 14 days' notice before implementation of any part of the site closure plan.

## 4.4 Interpretation

- 4.4.1 In this permit the expressions listed in schedule 6 shall have the meaning given in that schedule.
- 4.4.2 In this permit references to reports and notifications mean written reports and notifications, except where reference is made to notification being made "immediately" in which case it may be provided by telephone.

## Schedule 1 – Operations

| Table S1.1 activities  |  |  |
|--|--|--|
| Activity listed in Schedule 1 of the EP Regulations                          | Description of specified activity  | Limits of specified activity and waste types   |
| S6.4 A(2) (a) and Schedule 14  | Impregnation with preformulated resins of wide-web woven glass fibre cloths and tissue and subsequent conversion to a composite laminate material., in plant with a consumption capacity of more than 150kg or more per hour or 200 tonnes per year. | Application of resins onto substrates to produce composite product.  |
| Directly Associated Activities   |  |  |
| Storage and handling of raw materials  | Storage of solid and liquid materials in drums and IBCs, bags and other containers   | Receipt and storage of raw materials to transfer to process areas  |
| Storage, handling and dispatch of finished products, waste & other materials | Storage of finished products. Process waste segregation and storage  | Internal storage of finished products, storage of waste in designated areas and loading for transit off site |
| Machining of products arising from impregnation process                      | Machining of products  | Extraction and collection of particulate matter in filtration systems  |
| Spray coating of product   | Final spray coating of specific product with solvent containing substrate  | Storage of solvent containing coatings, their application and disposal of solvent containing wastes          |

| Table S1.2 Operating techniques           |  |               |
|---|--|---------------|
| Description                               | Parts <b>C=Compliant NC=Non Compliant</b>  | Date Received |
| Review of Environmental Management System | Summary of BAT review ( BAT 1,2, and 13) Assessment of BAT conclusion requirements doc 1,2 <b>NC EMS systems under development</b> IP008-001-009 13 C  | 13/6/2023     |
|   | Summary of the BAT review (BAT 3) Selection of raw materials Assessment of BAT conclusion requirements doc <b>NC EMS to include procedures</b>   | 13/6/2023     |
| BAT Reviews                               | Summary of the BAT review (BAT 4 and 5) Assessment of BAT conclusion requirements doc 4. <b>C</b> Working with suppliers and customers to reduce VOCs where feasible. 5 <b>NC</b> – Storage/mixing area proposals being implemented 2023 | 13/6/2023     |
|   | Summary of the BAT review (BAT 6 to 9) Assessment of BAT conclusion requirements   | 13/6/2023     |

| Table S1.2 Operating techniques |  |               |
|---------------------------------|--|---------------|
| Description                     | Parts <b>C=Compliant NC=Non Compliant</b>  | Date Received |
|                                 | <i>doc 6</i> <b>NC</b> New dedicated solvent mixing area being installed. <i>7</i> <b>C</b> Coating techniques <i>8</i> . <b>NC</b> <b>Drying system to be upgraded</b> . <i>9</i> . <b>C</b><br>Techniques to minimise solvent based cleaning agents            |               |
|                                 | Summary of the BAT review (BAT 14 to 17)<br>Assessment of BAT conclusion requirements<br><i>doc 14</i> . <b>C</b> Techniques used. <i>15</i> . <b>C</b> RTO<br>Techniques <i>16</i> . <b>C</b> RTO Process controls <i>17</i> . <b>C</b><br>RTO Process controls | 13/6/2023     |
|                                 | Summary of the BAT review (Bat 18)<br>Assessment of BAT conclusion requirements<br><i>doc 14</i> <b>C</b>  | 13/6/2023     |
| Energy Efficiency               | Energy Efficiency Plan (BAT 19) <b>NC</b> <b>EEP to be developed</b>   | 13/6/2023     |
| Odour management plan           | Odour management plan (BAT 23) <b>C</b>  | 4/10/2023     |
| Noise management plan           | Noise management plan <b>C</b>   | 4/10/2023     |



| <b>Table S1.3 Improvement programme requirements</b> |  |   |
|--|--|---|
| <b>Reference</b>                                     | <b>Requirement</b>   | <b>Date</b>                                 |
| IP1  | The operator will submit their Environmental Management System (EMS) against the requirements of BAT 1 of the STS BAT Conclusions for approval.  | 6 Months from the issue date of this permit |
| IP2  | The operator shall submit for approval a management plan for the prevention and control of leaks and spillages, which meets the requirements of BAT 3 of the STS BAT conclusions.  | 6 Months from the issue date of this permit |
| IP3  | The operator will carry out a review as to whether there are suitable alternative materials that could reduce environmental impact or opportunities to improve the efficiency of raw material and water use (as described in condition 1.3.1 (c)), taking account of BAT 5 and 20 of the STS BAT conclusions.  | 6 Months from the issue date of this permit |
| IP4  | The operator will carry out a review for the drying and curing operations, against the requirements of BAT 8 of the STS BAT conclusions. The operator will produce a report describing how the installation is BAT, in particular where techniques other than those described in BAT 8 are used, how these achieve an equivalent level of performance. | 6 Months from the issue date of this permit |
| IP5  | The operator will carry out a review of energy efficiency (as described in condition 1.2.1 (b)), taking account of BAT 19 and Table 18.3 of the STS BAT conclusions.   | 6 Months from the issue date of this permit |

## Schedule 2 – Waste types, raw materials and fuels

| Table S2.1 Raw materials and fuels |               |
|------------------------------------|---------------|
| Raw materials and fuel description | Specification |
| Natural gas fuel for RTO           | Natural gas   |

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## Schedule 3 – Emissions and monitoring

| <b>Emission point ref. &amp; location</b>             | <b>Source</b>                       | <b>Parameter</b>  | <b>Limit (including unit)</b> | <b>Reference period</b>          | <b>Monitoring frequency</b>                                       | <b>Monitoring standard or method</b> |
|---|-------------------------------------|---|-------------------------------|----------------------------------|---|--------------------------------------|
| Point 32 on site plan in Schedule 7.2                 | Thermal Oxidiser                    | Oxides of Nitrogen (NO and NO <sub>2</sub> expressed as NO <sub>2</sub> ) | 130 mg/Nm <sup>3</sup>        | Average over the sampling period | Minimum of once per year  | BS EN 14792                          |
| Point 32 on site plan in Schedule 7.2                 | Thermal Oxidiser                    | TVOC  | 20 mg/Nm <sup>3</sup>         | Average over the sampling period | Minimum of once per year  | BS EN 12619                          |
| Point 31 on site plan in Schedule 7.2                 | Carbon Filtration Unit              | TVOC  | 20 mg/Nm <sup>3</sup>         | Average over the sampling period | Minimum of once per 6 month period                                | BS EN 12619                          |
| Points 28 and 29 on site plan in Schedule 7.2         | Machine Shop Dust Abatement Systems | Particulate matter (Dust)   | 20 mg/Nm <sup>3</sup>         | Average over the sampling period | Continuous Indicative monitoring and Minimum of once per year     | BS EN 13284-1                        |
| SPRAYBOOTHS Points 18-22 on site plan in Schedule 7.2 | Coating of product                  | TVOC  | 50 mg/Nm <sup>3</sup>         | Average over the sampling period | Minimum of once per year  | BS EN 12619                          |
| SPRAYBOOTHS Points 18-22 on site plan in Schedule 7.2 | Coating of product                  | Particulate matter (Dust)   | 50 mg/Nm <sup>3</sup>         | Average over the sampling period | By guarantee from manufacturer or by annual extractive monitoring | BS EN 13284-1                        |

Note 1: Certification to the MCERTS performance standards indicates compliance with BS EN 15267-3

| <b>Substance</b> | <b>Medium</b> | <b>Limit (including unit)</b> |
|------------------|---------------|-------------------------------|
| TVOC             | Fugitive      | < 5% of the solvent input     |

| <b>Table S3.3 Process monitoring requirements</b>                                |                                |                             |                                      |   |
|--|--------------------------------|-----------------------------|--------------------------------------|---|
| <b>Emission point reference or source or description of point of measurement</b> | <b>Parameter</b>               | <b>Monitoring frequency</b> | <b>Monitoring standard or method</b> | <b>Other specifications</b>                               |
| Thermal oxidiser Emission Point 32   | Combustion Temperature         | Continuous                  |                                      | Audible and visual alarm if temperature drops below 800°C |
| Thermal oxidiser Emission Point 32   | Carbon Monoxide                | Continuous                  |                                      | Audible & Visual Alarms >150mg/Nm <sup>3</sup>            |
| Particulate Filtration Systems 28 and 29   | System Pressure Drop indicator | Continuous                  |                                      | Audible & Visual Alarms                                   |

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## Schedule 4 – Reporting

Parameters, for which reports shall be made, in accordance with conditions of this permit, are listed below.

| <b>Table S4.1 Reporting of monitoring data</b>                |  |                         |                      |
|---|--|-------------------------|----------------------|
| <b>Parameter</b>  | <b>Emission or monitoring point/reference</b>              | <b>Reporting period</b> | <b>Period begins</b> |
| Emissions to air<br>Parameters as required by condition 3.1.1 | (Dust plants 28,29),<br>(Carbon Filter 31) and<br>(RTO 32) | Every 12 months         | 1 January            |

| <b>Table S4.2: Annual production/treatment</b> |                                  |
|--|----------------------------------|
| <b>Parameter</b>                               | <b>Units</b>                     |
| Area of coated surface                         | m <sup>2</sup> of coated surface |
| Mass of Solvent Consumed                       | kg                               |

| <b>Table S4.3 Performance parameters</b> |                                |                                      |
|--|--------------------------------|--------------------------------------|
| <b>Parameter</b>                         | <b>Frequency of assessment</b> | <b>Units</b>                         |
| Specific energy consumption              | Annually                       | kWh/m <sup>2</sup> of coated surface |

| <b>Table S4.4 Reporting forms</b> |  |                     |
|-----------------------------------|--|---------------------|
| <b>Media/parameter</b>            | <b>Reporting format</b>                      | <b>Date of form</b> |
| Emission to Air                   | Format as agreed in writing by the Regulator |                     |
| Performance parameters            | Format as agreed in writing by the Regulator |                     |
| Ground water                      | Format as agreed in writing by the Regulator |                     |
| Soil                              | Format as agreed in writing by the Regulator |                     |

## Schedule 5 – Notification

These pages outline the information that the operator must provide.

Units of measurement used in information supplied under Part A and B requirements shall be appropriate to the circumstances of the emission. Where appropriate, a comparison should be made of actual emissions and authorised emission limits.

If any information is considered commercially confidential, it should be separated from non-confidential information, supplied on a separate sheet and accompanied by an application for commercial confidentiality under the provisions of the EP Regulations.

### Part A

|                                |  |
|--------------------------------|--|
| <b>Permit Number</b>           |  |
| Name of operator               |  |
| Location of Facility           |  |
| Time and date of the detection |  |

|   |  |
|---|--|
| <b>(a) Notification requirements for any malfunction, breakdown or failure of equipment or techniques, accident, or emission of a substance not controlled by an emission limit which has caused, is causing or may cause significant pollution</b> |  |
| <b>To be notified within 24 hours of detection</b>  |  |
| Date and time of the event  |  |
| Reference or description of the location of the event   |  |
| Description of where any release into the environment took place  |  |
| Substances(s) potentially released  |  |
| Best estimate of the quantity or rate of release of substances  |  |
| Measures taken, or intended to be taken, to stop any emission   |  |
| Description of the failure or accident.   |  |

|   |  |
|---|--|
| <b>(b) Notification requirements for the breach of a limit</b>                      |  |
| <b>To be notified within 24 hours of detection unless otherwise specified below</b> |  |
| Emission point reference/ source  |  |
| Parameter(s)  |  |
| Limit   |  |
| Measured value and uncertainty  |  |
| Date and time of monitoring   |  |

|   |  |
|---|--|
| <b>(b) Notification requirements for the breach of a limit</b>                      |  |
| <b>To be notified within 24 hours of detection unless otherwise specified below</b> |  |
| Measures taken, or intended to be taken, to stop the emission                       |  |

|  |  |
|--|--|
| <b>(c) Notification requirements for the breach of permit conditions not related to limits</b> |  |
| To be notified within 24 hours of detection  |  |
| Condition breached   |  |
| Date, time and duration of breach  |  |
| Details of the permit breach i.e. what happened including impacts observed.                    |  |
| Measures taken, or intended to be taken, to restore permit compliance.                         |  |

|  |  |
|--|--|
| <b>(d) Notification requirements for the detection of any significant adverse environmental effect</b> |  |
| <b>To be notified within 24 hours of detection</b>   |  |
| Description of where the effect on the environment was detected  |  |
| Substances(s) detected   |  |
| Concentrations of substances detected  |  |
| Date of monitoring/sampling  |  |

## Part B – to be submitted as soon as practicable

|  |  |
|--|--|
| Any more accurate information on the matters for notification under Part A.  |  |
| Measures taken, or intended to be taken, to prevent a recurrence of the incident   |  |
| Measures taken, or intended to be taken, to rectify, limit or prevent any pollution of the environment which has been or may be caused by the emission |  |
| The dates of any unauthorised emissions from the facility in the preceding 24 months.  |  |
| <b>Name*</b>   |  |
| <b>Post</b>  |  |
| <b>Signature</b>   |  |
| <b>Date</b>  |  |

\* authorised to sign on behalf of the operator

## Schedule 6 – Interpretation

“abatement equipment” means that equipment dedicated to the removal of polluting substances from releases from the installation to air or water media.

“accident” means an accident that may result in pollution.

“application” means the application for this permit, together with any additional information supplied by the operator as part of the application and any response to a notice served under Schedule 5 to the EP Regulations.

“authorised officer” means any person authorised by the Regulator under section 108(1) of The Environment Act 1995 to exercise, in accordance with the terms of any such authorisation, any power specified in section 108(4) of that Act.

“background concentration” means such concentration of that substance as is present in:

- for emissions to surface water, the surface water quality up-gradient of the site; or
- for emissions to sewer, the surface water quality up-gradient of the sewage treatment works discharge.

“calendar monthly mean” means the value across a calendar month of all validated hourly means.

“CEM” Continuous emission monitor

“EP Regulations” means The Environmental Permitting (England and Wales) Regulations SI 2016 No.1154 and words and expressions used in this permit which are also used in the Regulations have the same meanings as in those Regulations.

“emissions of substances not controlled by emission limits” means emissions of substances to air, water or land from the activities, either from the emission points specified in schedule 3 or from other localised or diffuse sources, which are not controlled by an emission limit.

“emissions to land” includes emissions to groundwater.

“groundwater” means all water, which is below the surface of the ground in the saturation zone and in direct contact with the ground or subsoil.

“hazardous waste” has the meaning given in the Hazardous Waste (England and Wales) Regulations 2005 No.894, the Hazardous Waste (Wales) Regulations 2005 No. 1806 (W.138), the List of Wastes (England) Regulations 2005 No.895 and the List of Wastes (Wales) Regulations 2005 No. 1820 (W.148).

“Industrial Emissions Directive” means DIRECTIVE 2010/75/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 24 November 2010 on industrial emissions as read in accordance with Schedule 1 to the Environmental Permitting (England and Wales) Regulations 2016.

“ISO” means International Standards Organisation.

“MCERTS” means the Environment Agency’s Monitoring Certification Scheme.

“quarter” means a calendar year quarter commencing on 1 January, 1 April, 1 July or 1 October.

“quarterly” for reporting/sampling means after/during each 3 month period, January to March; April to June; July to September and October to December and, when sampling, with at least 2 months between each sampling date.

“SI” means site inspector.

“Volatile Organic Compound” (VOC) means any organic compound means any organic compound as well as the fraction of creosote, having at 293.15 K, a vapour pressure of 0.01 kPa or more, or having a corresponding volatility under the particular conditions of use.

“Waste code” means the six digit code referable to a type of waste in accordance with the List of Wastes (England) Regulations 2005, or List of Wastes (Wales) Regulations 2005, as appropriate, and in relation to hazardous waste, includes the asterisk.



“Waste Framework Directive” or “WFD” means Waste Framework Directive 2008/98/EC of the European Parliament and of the Council on waste.

“year” means calendar year ending 31 December.

Where a minimum limit is set for any emission parameter, for example pH, reference to exceeding the limit shall mean that the parameter shall not be less than that limit.

Unless otherwise stated, any references in this permit to concentrations of substances in emissions into air means:

- (a) in relation to emissions from combustion processes, the concentration in dry air at a temperature of 273K, at a pressure of 101.3 kPa and with an oxygen content of 3% dry for liquid and gaseous fuels, 6% dry for solid fuels; and/or
- (b) in relation to emissions from non-combustion sources, the concentration at a temperature of 273K and at a pressure of 101.3 kPa, with no correction for water vapour content.

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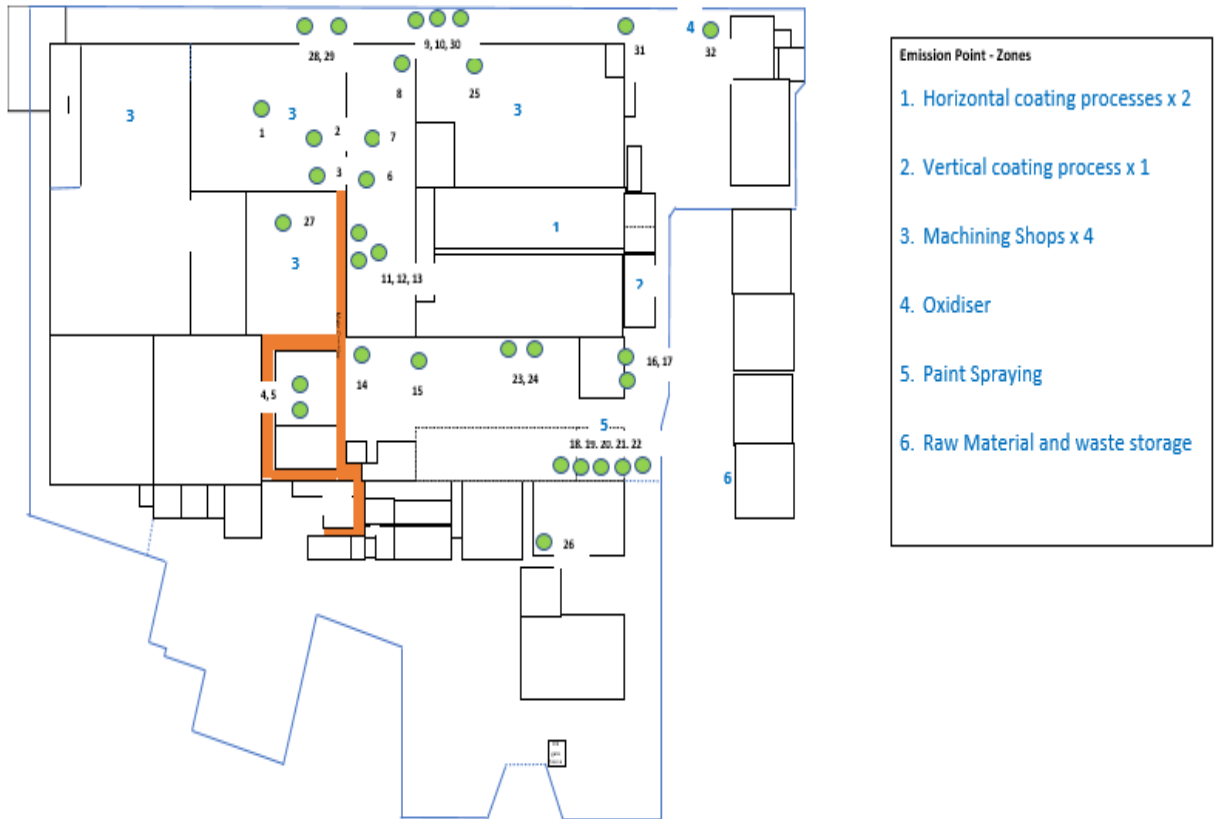
# Schedule 7 – Site Location, Plan and Emission Points



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## 7.1 Emission Points

PERMALI LTD PROCESS LOCATIONS  
AND EMISSION POINTS



Permall Map 005  
25092023

### Emission Extract Points (Manufacturing)

| Extraction Point | Equipment           | Process                     |
|------------------|---------------------|-----------------------------|
| 1                | Large RDM Oven      | Post cure                   |
| 2                | RDM Oven            | Post cure                   |
| 3                | Rostron Oven        | Post cure                   |
| 4                | CPL Presses         | NF                          |
| 5                | CPL Presses         | NF                          |
| 6                | 48" spary booth     | Spray Coating Release Agent |
| 7                | 48" press           | Press                       |
| 8                | Op near 700te Press | Layup                       |
| 9                | New Boilers         | Press                       |
| 10               | New Boilers         | Press                       |
| 11               | Bipel Press         | NF                          |
| 12               | Bipel Press         | NF                          |

|    |   |  |
|----|---|--|
| 13 | Bipel Press   | NF   |
| 14 | Large Tube Wrapper  | Conversion                                 |
| 15 | Small Tube Wrapper  | Conversion                                 |
| 16 | Boiler  | Press                                      |
| 17 | Boiler  | Press                                      |
| 18 | Paint Booth   | Spraying                                   |
| 19 | Paint Booth   | Spraying                                   |
| 20 | Paint Booth   | Spraying                                   |
| 21 | Paint Booth   | Spraying                                   |
| 22 | Paint Booth   | Spraying                                   |
| 23 | STL   | Drying sealed edges Alonso                 |
| 24 | Curing Oven   | Ceramic post cure and plank bonding        |
| 25 | German  | Press                                      |
| 26 | Autoclave   | Pressure Relief valve to atmosphere no VOC |
| 27 | Machine shop 2 Ovens x 3                                    | Post curing                                |
| 28 | V9  | LEV extraction                             |
| 29 | Dust Plant 5  | LEV extraction                             |
| 30 | Hotwell   | Water Treatment for Steam Boiler           |
| 31 | Pre-impregnation plant and mixing - Carbon Filter Abatement | NF Impregnation                            |
| 32 | Regenerative Thermal Oxidiser                               | Vertical and horizontal impregnation       |

END OF PERMIT