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
Finepoint Way
Kidderminster
DY11 7WF

Email: 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

Trading name, if different

Registered office address

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: AP@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 Boswick

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 Boswick

Position MD Date 1/3/23

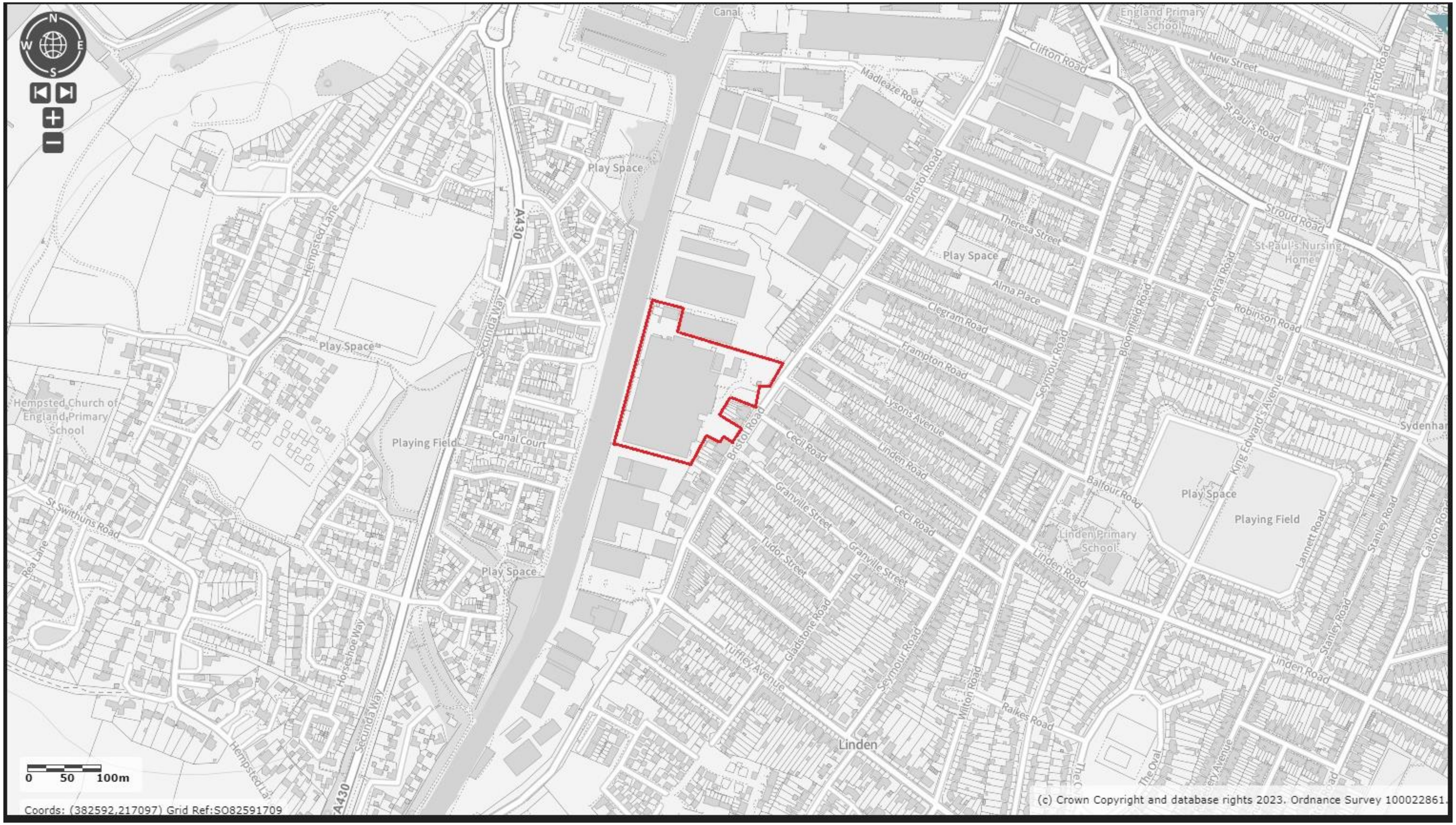
Signature____________________ Name____________________

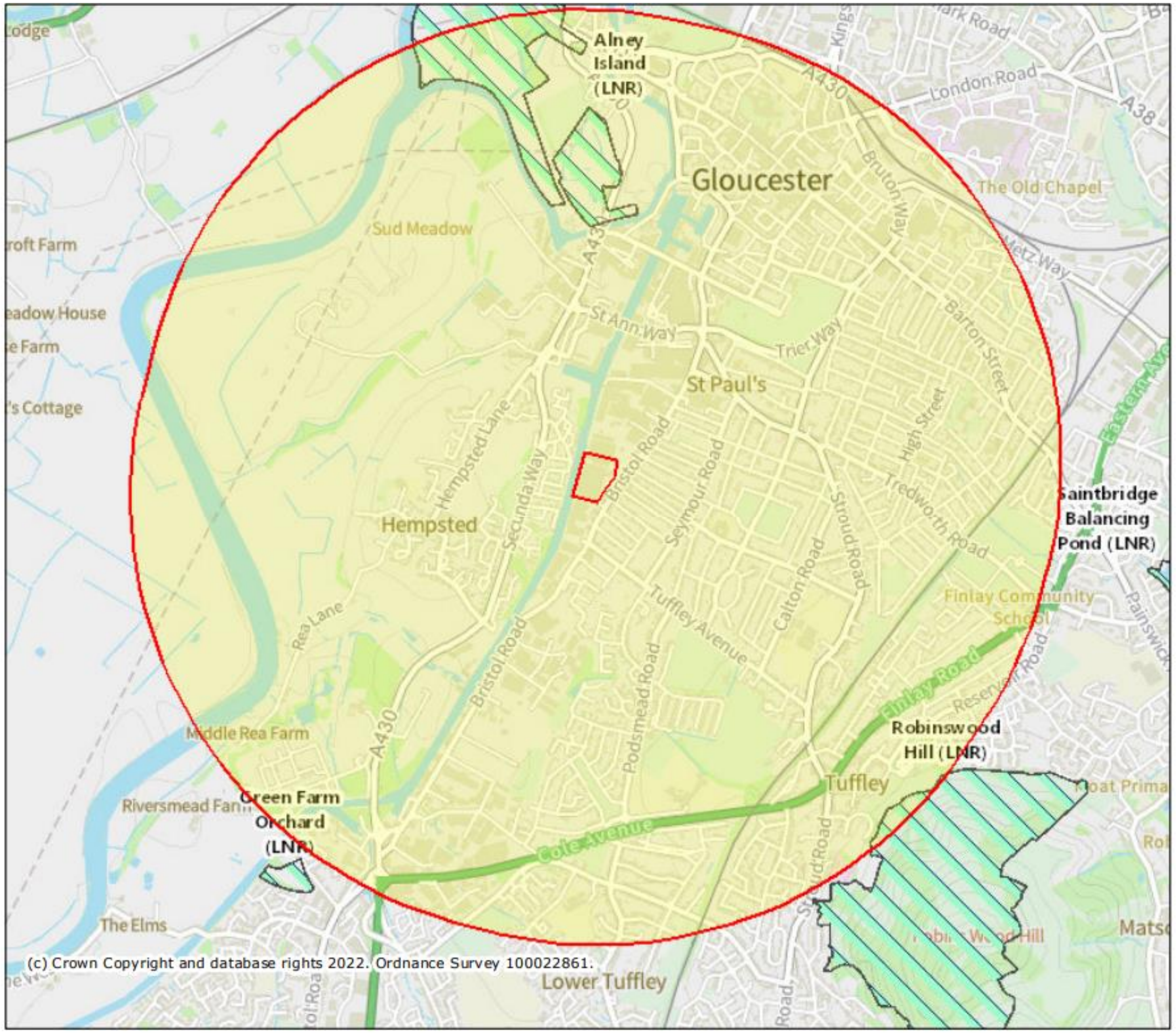
Position____________________ Date____________________

PERMALI LTD PROCESS LOCATIONS AND EMISSION POINTS

Permali Map 004


Towpath Rd
Quayside Way
Top Speed Remapping
Kebab Expres
Mekufa (UK)
Electronics Retail and Repair Shop
am-pm Signature
Sign shop
Permali – Advanced Composite & TPU Film...
Bristol Rd
Linden Rd
Little Rainbow Playgroup
Gloucester
Tyre Shop
Bristol Rd
Cecil Rd
Permali Gloucester Limited
Linden Stores
Convenience Store
Bristol Rd
Gold Coast Tanning Rooms
The Sunny Garden
Chinese Takeaway · ££
Elite Autos
Used car dealer
Bristol Rd
Google


Canal
England Primary School
Clifton Road
New Street
Park End Road
Madleaze Road
St Paul's Road
Bristol Road
Stroud Road
Play Space
Theresa Street
St Paul's Nursing Home
A430
Hempsted Lane
Alma Place
Clegram Road
Robinson Road
Central Road
Bloomfield Road
Seymour Road
Frampton Road
Secunda Way
Play Space
Lysons Avenue
King Edward's Avenue
Sydenham
Hempsted Church of England Primary School
Playing Field
Canal Court
Cecil Road
Linden Road
Balfour Road
Play Space
Playing Field
St Swithuns Road
Granville Street
Cecil Road
Linden Primary School
Lannett Road
Stanley Road
Calton Road
Rea Lane
Tudor Street
Granville Street
Linden Road
Play Space
Gladstone Road
Horseshoe Way
Tuffley Avenue
Seymour Road
Stanley Road
Linden Road
Milton Road
Raikes Road
Secunda Way
Hempsted La
Linden
The Oval
A430
0 50 100m
Coords: (382592,217097) Grid Ref:SO82591709



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

0 0.5 1
km

Map produced by MAGIC on 27 June, 2022.

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 1mpregnation (Mathanol) 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

Permali Gloucester Limited

JER9222
3
1
24 February 2023

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

Approval for issue

Jennifer Stringer	Technical Director	24 February 2023

File Name

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

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Prepared by:

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Prepared for:

Permali Gloucester Ltd

Contents

Appendices

1 INTRODUCTION

1.1 Site Details

1.1.1 Site details are shown in Table 1.1 below:

Table 1.1 Site Details

Name of the applicant	Permali Gloucester Ltd
Activity address	Bristol Road Gloucester Gloucestershire GL1 5TT
National grid reference	SO 82318 17113
Site area (ha)	2.78ha
Document reference and dates for Site Condition Report at permit application and surrender	230214 R JER9222 RN Permali Gloucester Ltd Site Condition Report
Document references for site plans (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

Table 2.1 Condition of the land at permit issue

Environmental setting including: Topography Geology Hydrology Hydrogeology Surrounding land use 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: Location, nature of incidents or direct discharges that may have affected soil or groundwater Historical land uses and associated contaminants 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
Supporting information	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[1]
- Information held by the British Geological Survey relating to geology and hydrogeology[2].

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[3] 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.

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[1] https://environment.data.gov.uk/public-register/view/index

[2] //mapapps.bgs.ac.uk/geologyofbritain/home.html

[3] 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^3 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 of 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: • plan showing activity layout; and • environmental risk assessment.	Appendix A - Site Plans to this SCR. 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[4]:

- 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.

---

[4] https://www.legislation.gov.uk/uksi/2016/1154/contents/made

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 6-1~~ 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 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 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.

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
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

Appendix A
SITE PLANS

Appendix B
GROUND INVESTIGATIONS

Appendix C

RAW MATERIALS INVENTORY

Appendix D
GROUNDSURE REPORT

Appendix E

DISCHARGE CONSENT SURRENDER

PERMALI GLOUCESTER LTD - SITE CONDITION REPORT

2023-02-24

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Permit Variation

Permali, Gloucester

For Permali

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Quality Management

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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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Contents

Tables, Figures and Appendices

Tables

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Appendices

1 Introduction

1.1 This report details the air quality assessment undertaken to accompany the application to vary the Environmental Permit for the Permali, 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_2)

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_{10} and $PM_{2.5}$), nitrogen dioxide (NO_2), sulphur dioxide (SO_2), ozone (O_3), 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 $\mu g.m^{-3}$	18 times pcy

Pollutant	Averaging Period	Limit Values	Not to be Exceeded More Than
Dioxide (NO_2)	Annual	40 µg.m^{-3}	-
Particulate Matter (PM_{10})	24 hour	50 µg.m^{-3}	35 times pcy
	Annual	40 µg.m^{-3}	-
Particulate Matter (PM_{10})	Annual	20 µg.m^{-3}	-
Benzene	Annual	5 µg.m^{-3}	-

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^{-3}	Short-term EAL, µg.m^{-3}
Nitrogen dioxide (NO_2)	40	200
Particulates (PM_{10})	40	50
Particulates ($PM_{2.5}$)	20	-

Pollutant	**Long-term EAL, µg.m^{-3}**	**Short-term EAL, µg.m^{-3}**
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 ($m.s^{-1}$)	12.4	4.6	12.6	12.6	12.6	2.8	2.8
Actual volumetric flow ($Am^3.s^{-1}$)	20	4.4	6.3	6.3	6.3	0.2	0.2
NO_x mass emissions ($g.s^{-1}$)	-	-	-	-	-	0.023	0.023
VOC mass emissions ($g.s^{-1}$)	0.274	0.010	-	-	-	-	-
PM mass emissions ($g.s^{-1}$)	-	-	0.003	0.003	0.003	-	-
Phenol mass emissions ($g.s^{-1}$)	-	0.025	-	-	-	-	-
Formaldehyde mass emissions ($g.s^{-1}$)	-	0.0002	-	-	-	-	-
Data source	Provided by Permali		September 2020 stack emissions monitoring report		Provided by Permali		

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. NOx, 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^{-1})	9.6	9.6	6.0	6.0
Actual volumetric flow (Am^3.s^{-1})	3.1	3.1	0.9	0.9
NO_x mass emissions (g.s^{-1})	-	-	0.01	0.01
VOC mass emissions (g.s^{-1})	0.197	0.197	0.028	0.028
PM mass emissions (g.s^{-1})	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. 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. Hotels, unless people live there as their permanent residence. Gardens of residential properties. 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. 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). 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. 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
Factors affecting the source odour potential include: - the magnitude of the odour release (taking into account odour-control measures) - how inherently odorous the compounds are - the unpleasantness of the odour	Factors affecting the odour flux to the receptor are: - 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) - the effectiveness of any mitigation/control in reducing flux to the receptor - the effectiveness of dispersion/ dilution in reducing the odour flux to the receptor - topography and terrain	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:
Large Source Odour Potential Magnitude - Larger Permitted processes of odorous nature or large STWs; materials usage hundreds of thousands of tonnes/m^3 per year; area sources of thousands of m^2. The compounds involved are very odorous (e.g. mercaptans), having very low Odour Detection Thresholds (ODTs) where known. Unpleasantness - processes classed as " Most offensive" in H4; or (where known) compounds/odours having unpleasant (-2) to very unpleasant (-4) hedonic score. Mitigation/control - open air operation with no containment, reliance solely on good management techniques and best practice.	**Highly Effective Pathway for Odour Flux to Receptor** Distance - receptor is adjacent to the source/site; distance well below any official set-back distances [a]. Direction - high frequency (%) of winds from source to receptor (or, qualitatively, receptors downwind of source with respect to prevailing wind). Effectiveness of dispersion/dilution - open processes with low-level releases, e.g. lagoons, uncovered effluent treatment plant, landfilling of putrescible wastes.	**High Sensitivity Receptor** - surrounding land where: - users` can reasonably expect enjoyment of a high level of amenity; and - 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. Examples may include residential dwellings, hospitals, schools/education and tourist/cultural.
Medium Source Odour Potential Magnitude - smaller Permitted processes or small Sewage Treatment Works (STWs); materials usage thousands of tonnes/m^3 per year; area sources of hundreds of m^2. The compounds involved are moderately odorous. Unpleasantness - processes classed in H4 as "Moderately offensive"; or (where known) odours having neutral (0) to unpleasant (-2) hedonic score.	**Moderately Effective Pathway for Odour Flux to Receptor** Distance - receptor is local to the source. Where mitigation relies on dispersion/dilution - releases are elevated, but compromised by building effects.	**Medium Sensitivity Receptor** - surrounding land where: - 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 - people wouldn't reasonably be expected to be present here continuously or regularly

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. Examples may include places of work, commercial/retail premises and playing/recreation fields.
Small Source Odour Potential Magnitude - falls below Part B threshold; materials usage hundreds of tonnes/m^3 per year; area sources of tens m^2. The compounds involved are only mildly odorous, having relatively high ODTs where known. Unpleasantness - processes classed as "Less offensive" in H4; or (where known) compounds/odours having neutral (0) to very pleasant (+4) hedonic score. Mitigation/control - effective, tangible mitigation measures in place (e.g. BAT, BPM) leading to little or no residual odour.	**Ineffective Pathway for Odour Flux to Receptor** Distance - receptor is remote from the source; distance exceeds any official set-back distances. Direction - low frequency (%) of winds from source to receptor (or, qualitatively, receptors upwind of source with respect to prevailing wind). Where mitigation relies on dispersion/ dilution - releases are from high level (e.g. stacks, or roof vents > 3 m above ridge height) and are not compromised by surrounding buildings	**Low Sensitivity Receptor** - surrounding land where: ▪ the enjoyment of amenity would not reasonably be expected; or ▪ 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. Examples may include industrial, farms, footpaths and roads.

Notes: [a] 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 Processes involving septic effluent or sludge Biological landfill odours
Moderately Offensive	Intensive livestock rearing Fat frying (food processing) Sugar beet processing Well aerated green waste composting
Less Offensive	Brewery Confectionary 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.

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* 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.

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* 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 Permali.

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	$m.s^{-1}$	4.6
Efflux temperature	° C	17
Odour emission rate	$ou_E.s^{-1}$	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 $ou_E.s^{-1}$ 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 ($g.s^{-1}$)**	**Emission Rate ($mg.s^{-1}$)**	**Volumetric Flow ($m^3.s^{-1}$)**	**Emission Concentration ($mg.m^3$)**	**ODT (ppm) at 293k**	**ODT ($mg.m^{-3}$) at 293k**	**Odour Emission Concentration ($Oue.m^{-3}$)**	**Odour emission rate ($Ou.s^{-1}$) 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:	
High sensitivity receptor	Surrounding land where: • Users can reasonably expect enjoyment of a high level of amenity; • 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. Examples may include residential dwellings, hospitals, schools/education and tourist/cultural.
Medium sensitivity receptor	Surrounding land where: • 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 • 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. Examples may include places of work, commercial/retail premises and playing/recreational fields.
Low sensitivity receptor	Surrounding land where: • The enjoyment of amenity would not reasonably be expected; or • 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. Examples may include industrial use, farms, footpaths and roads.

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 C_{98}, ou_E /m^3	**Receptor Sensitivity**		
	Low	**Medium**	**High**
≥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. 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_2 or PM_{10} 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 ($\mu g.m^{-3}$)	Data Source
NO_2	1 hour (99.79th percentile)	35.4(a)	Defra mapped (2018)
	1 hour (annual mean)	17.7	
PM_{10}	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 µg.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 NO_2 and VOC concentrations from proposed stacks. The 2018 meteorological year has been used for the annual-mean 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 ($\mu g.m^{-3}$)	Max PC ($\mu g.m^{-3}$)	Max PC as % of EAL	Criteria (%)	PC is Potentially Significant?	AC including existing stacks ($\mu g.m^{-3}$)	PEC ($\mu g.m^{-3}$)	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 $\mu g.m^{-3}$ from P2.

Table 5.2 Maximum Predicted Contributions at across the grid – P2

Pollutant	Averaging Period	EAL ($\mu g.m^{-3}$)	Max PC ($\mu g.m^{-3}$)	Max PC as % of EAL	Criteria (%)	PC is Potentially Significant?	AC including existing stacks ($\mu g.m^{-3}$)	PEC ($\mu g.m^{-3}$)	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 $\mu g.m^{-3}$ from P1.

Table 5.3 Maximum Predicted Contributions at across the grid – P3

Pollutant	Averaging Period	EAL ($\mu g.m^{-3}$)	Max PC ($\mu g.m^{-3}$)	Max PC as % of EAL	Criteria (%)	PC is Potentially Significant?	AC including existing stacks ($\mu g.m^{-3}$)	PEC ($\mu g.m^{-3}$)	PEC as % of EAL	PEC is Potentially Significant ?
PM_{10}	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 ($\mu g.m^{-3}$)	Max PC ($\mu g.m^{-3}$)	Max PC as % of EAL	Criteria (%)	PC is Potentially Significant?	AC including existing stacks ($\mu g.m^{-3}$)	PEC ($\mu g.m^{-3}$)	PEC as % of EAL	PEC is Potentially Significant ?
PM_{10}	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 ($\mu g.m^{-3}$)	Max PC ($\mu g.m^{-3}$)	Max PC as % of EAL	Criteria (%)	PC is Potentially Significant?	AC including existing stacks ($\mu g.m^{-3}$)	PEC ($\mu g.m^{-3}$)	PEC as % of EAL	PEC is Potentially Significant ?
PM_{10}	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 ($\mu g.m^{-3}$)	Max PC ($\mu g.m^{-3}$)	Max PC as % of EAL	Criteria (%)	PC is Potentially Significant?	AC including existing stacks ($\mu g.m^{-3}$)	PEC ($\mu g.m^{-3}$)	PEC as % of EAL	PEC is Potentially Significant ?
NO_2	1 hour (99.79th percentile)	**200**	73.03	37	10	Yes	111.28*	184.31	92	No
	1 hour (annual mean)	**40**	43.62	109	1	Yes	59.02*	102.64	257	Yes

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

Table 5.7 Maximum Predicted Contributions at across the grid – P7

Pollutant	Averaging Period	EAL ($\mu g.m^{-3}$)	Max PC ($\mu g.m^{-3}$)	Max PC as % of EAL	Criteria (%)	PC is Potentially Significant?	AC including existing stacks ($\mu g.m^{-3}$)	PEC ($\mu g.m^{-3}$)	PEC as % of EAL	PEC is Potentially Significant ?
NO_2	1 hour (99.79th percentile)	**200**	73.03	37	10	Yes	111.28	184.31	92	No
	1 hour (annual mean)	**40**	39.40	98	1	Yes	63.24	102.64	257	Yes

*includes the 73.03 and 43.62 $\mu g.m^{-3}$ 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_2 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_2 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_2. On that basis, the effects are not considered to be significant for short-term NO_2. For VOCs and long-term NO_2, 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

	Annual Mean								30 Minute Mean		
Receptor	**PC Proposed (P1 and P2) (µg.m^{-3})**	**Existing sources (µg.m^{-3})**	**AC (µg.m^{-3})**	**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^{-3})**	**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									0.9	1	
I3									1.1	1	
I4									0.3	0	

	Annual Mean								30 Minute Mean		
Receptor	PC Proposed (P1 and P2) (µg.m^{-3})	Existing sources (µg.m^{-3})	AC (µg.m^{-3})	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^{-3})	Proposed PC as %EAL (assumed to be 100% formaldehyde)	Proposed PC is Potentially Significant?
I5									1.4	1	
I6									0.3	0	
I7									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_2

	Annual Mean							
Receptor	PC Proposed (P6 & P7) (µg.m^{-3})	Existing sources (µg.m^{-3})	AC (µg.m^{-3})	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	Annual Mean							
	PC Proposed (P6 & P7) (µg.m^{-3})	Existing sources (µg.m^{-3})	AC (µg.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_2 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 $ou_E.s^{-1}$, 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 98th percentile hourly-mean odour concentrations predicted at the nearest sensitive receptors.

Table 6.1 98th Percentile of Hourly Odour Concentrations ($ou_E.m^{-3}$)

Receptor ID	Receptor Sensitivity	98th Percentile Hourly-mean Odour Concentration ($ou_E.m^{-3}$)	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	98th Percentile Hourly-mean Odour Concentration ($ou_E.m^{-3}$)	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 98th percentile hourly odour concentrations at the nearest sensitive receptor locations are all well below the 1.5 $ou_E.m^{-3}$ benchmark at residential receptors and the 3 $ou_E.m^{-3}$ 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 Permali, Gloucester site.

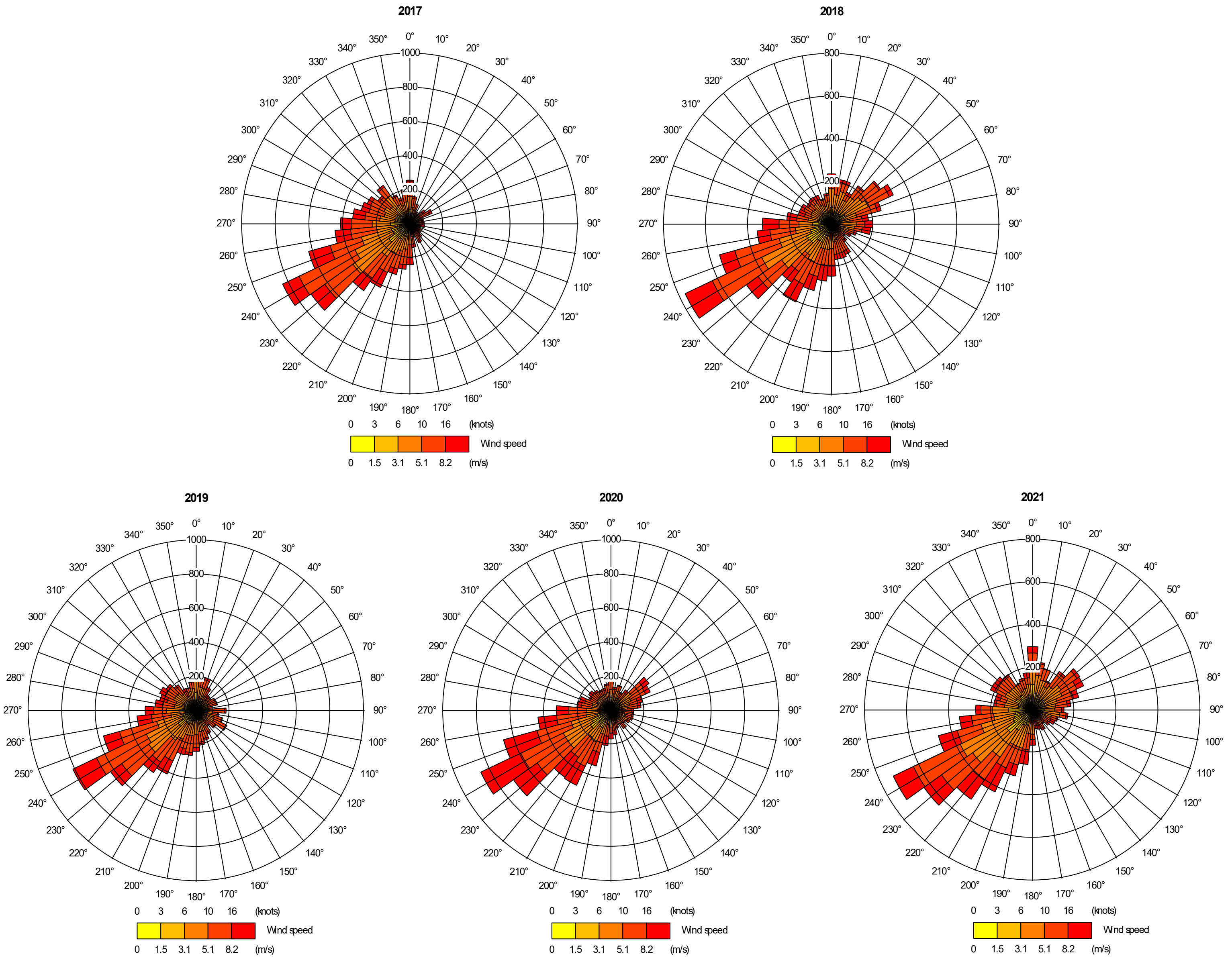
7.2 The assessment covers an evaluation of the impacts on the local area of NO_2, PM_{10}, VOC, formaldehyde, phenol, and odour emissions from the proposed and existing stacks operated on the site.

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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Job Ref: JAR02788

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Date: 16/01/2023	**Rev: 0**
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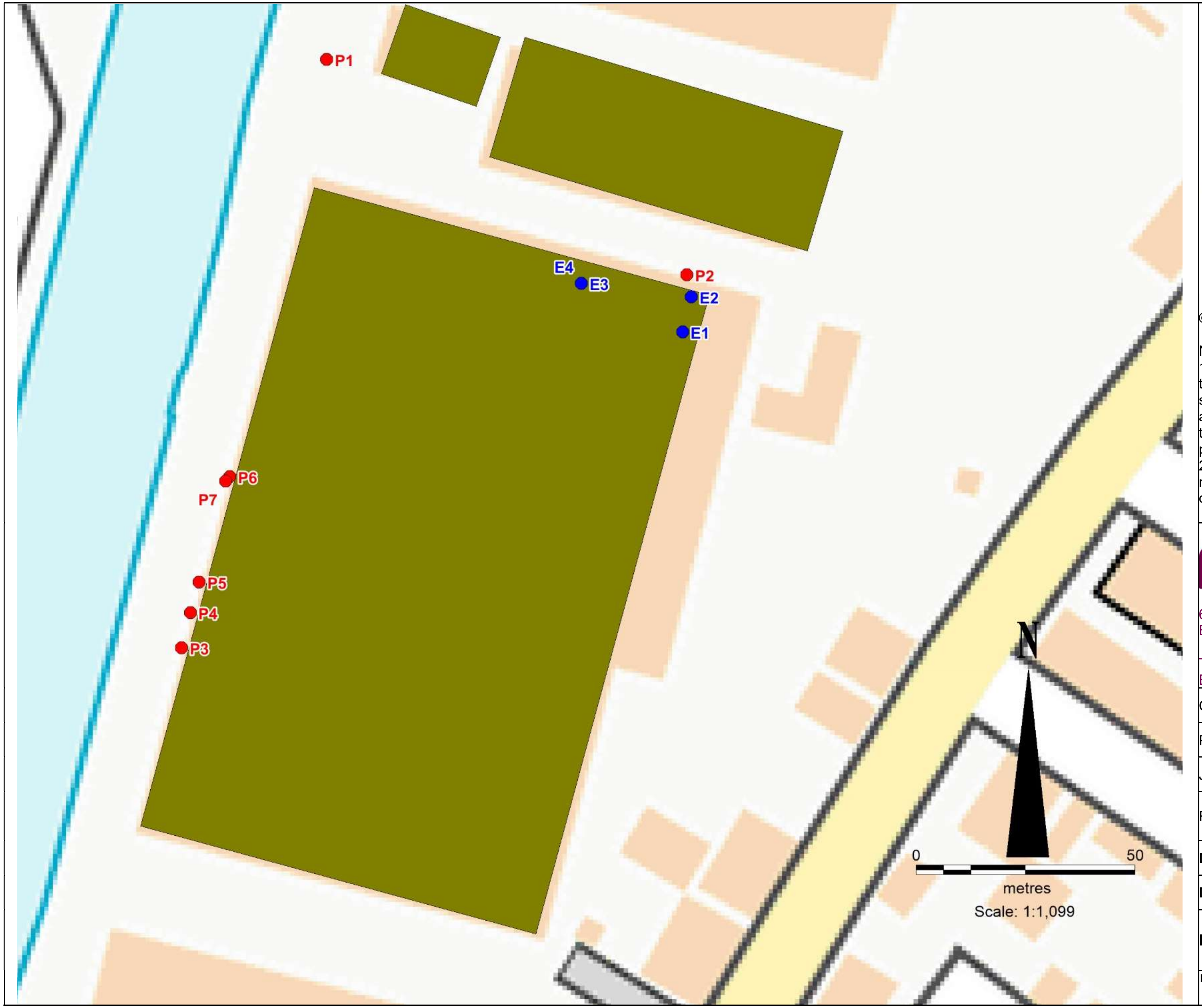
Figure 1: Wind Roses – NWP Data centred on 382376, 217160 (2017 – 2022)



Legend

🟩 Buildings Modelled

🔴 Proposed Sources

🔵 Existing Sources

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Figure 2: Stacks and Buildings Modelled

Legend

🟫 Buildings Modelled

🔴 Proposed Sources

🔵 Existing Sources

◆ Residential Sensitive Receptors

◆ Industrial Sensitive Receptors

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Figure 3: Modelled Sensitive Receptors

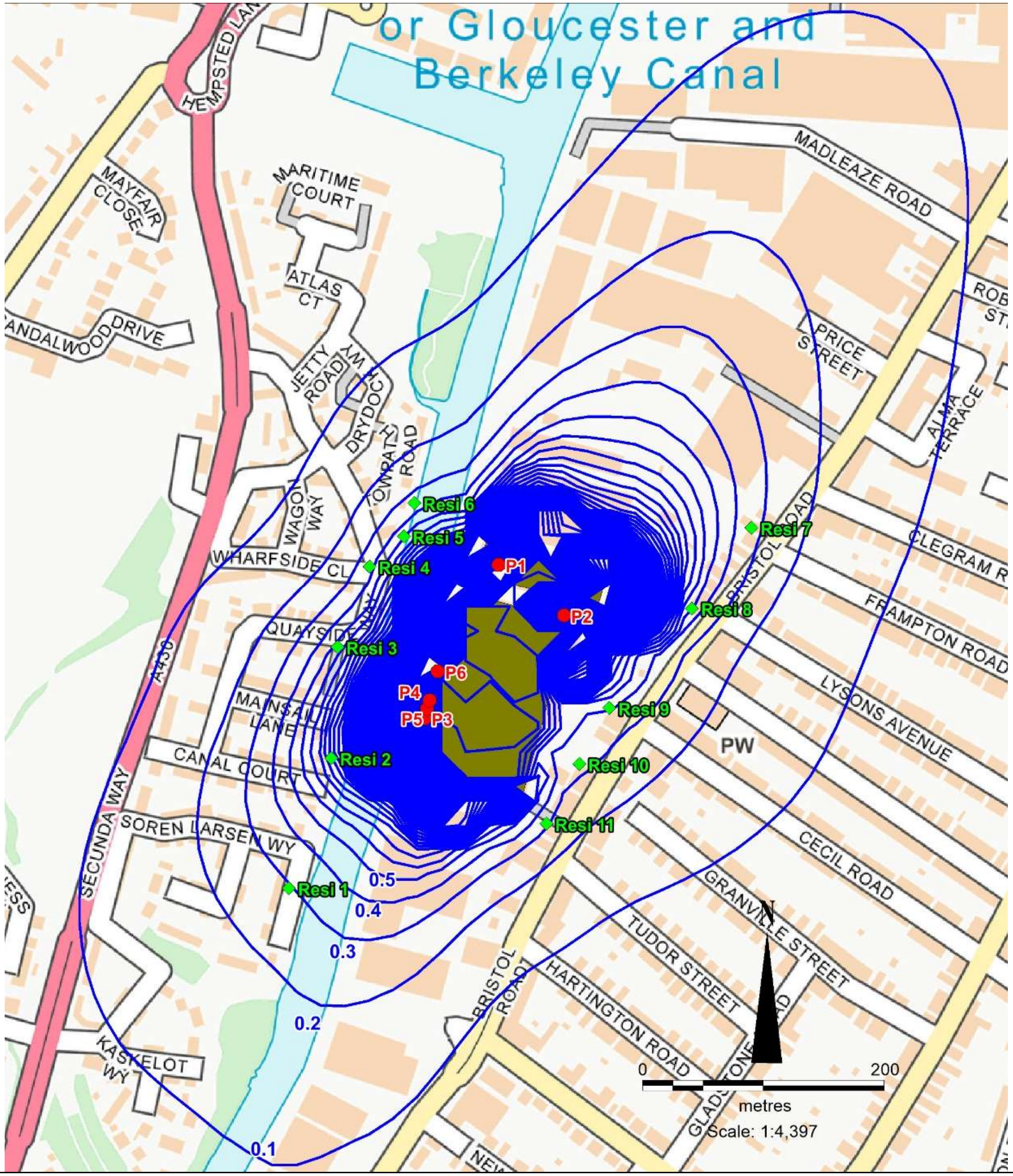

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Figure 4: Annual Mean NO_2 PCs (ug/m^3)

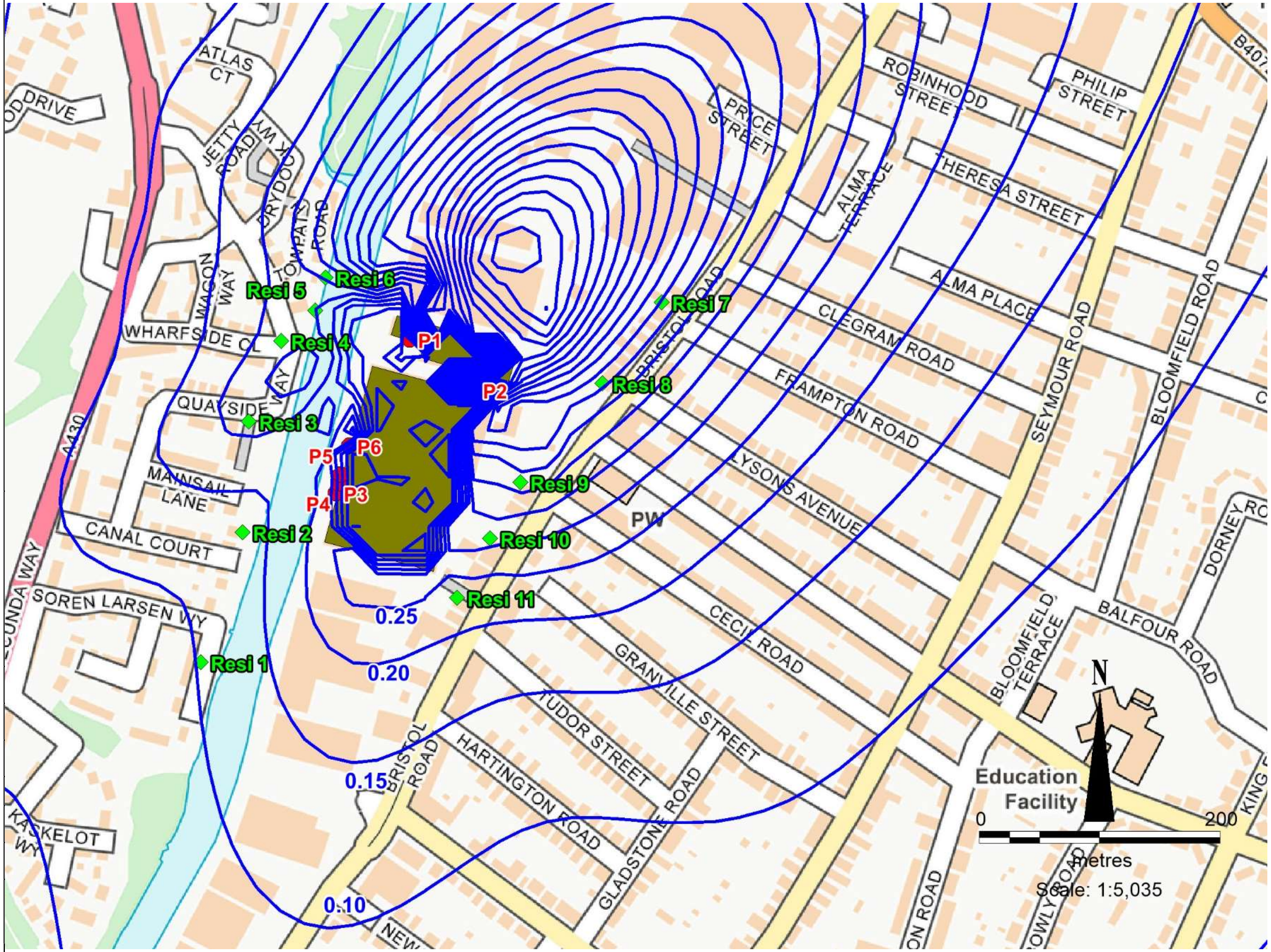

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Figure 5: Annual Mean VOC PCs (ug/m^3)

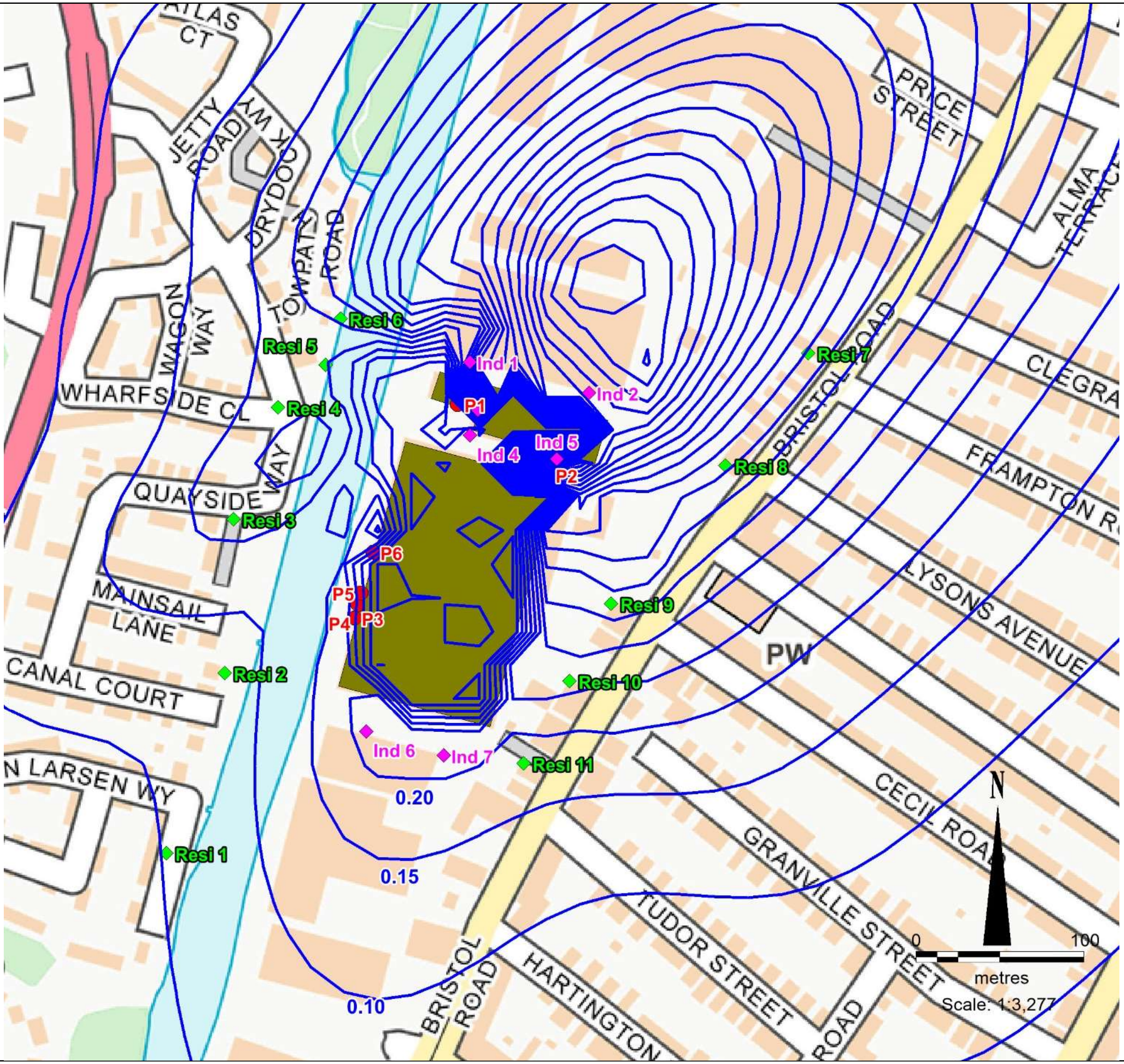

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Figure 6: 30 Minute Mean VOCs (Formaldehyde) PCs (ug/m^3)

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.”*

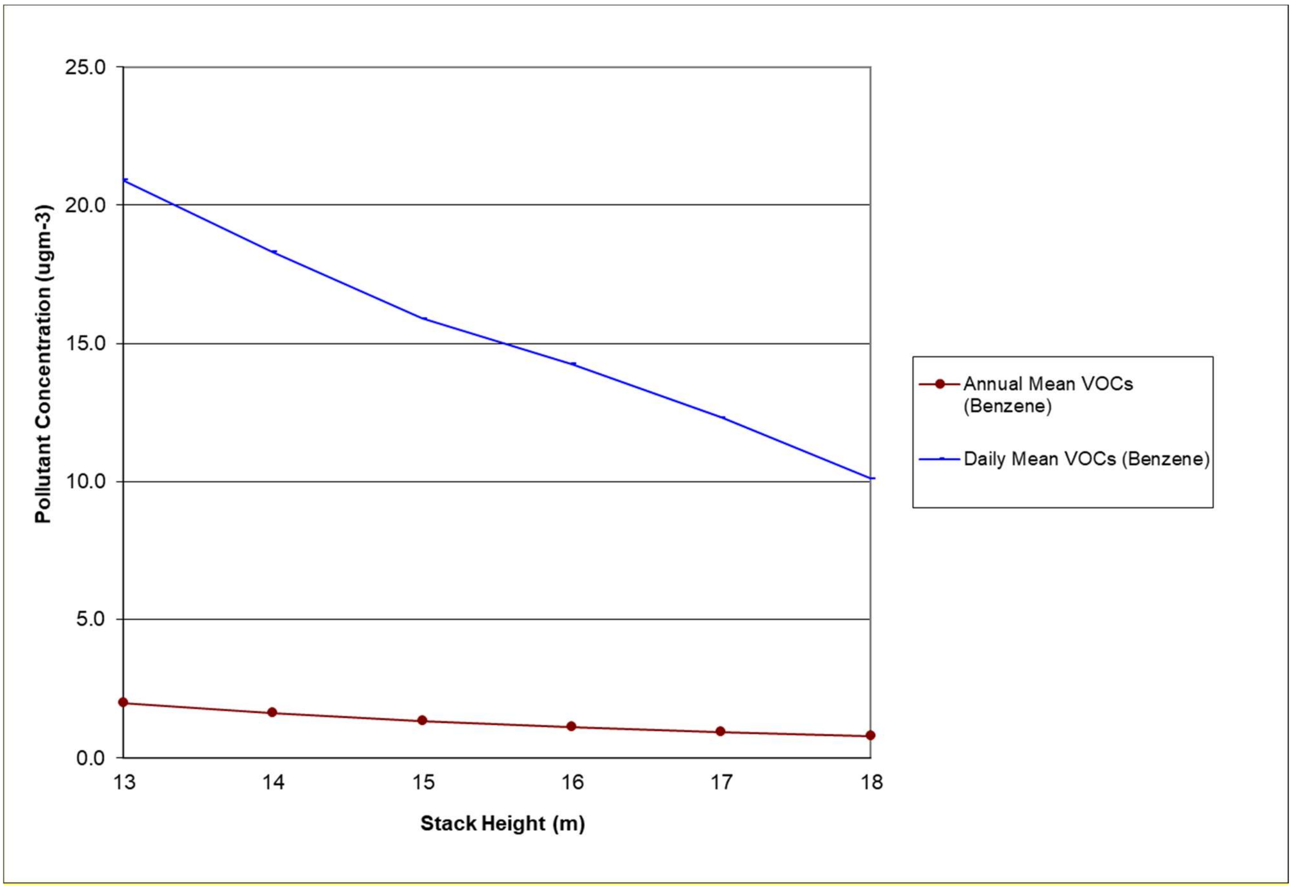
The emissions data used in the stack height determination are summarised in Section 3 of the report. Simulations have been run using ADMS 5 to determine what stack height is required to provide adequate dispersion/dilution and to overcome local building wake effects.

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.

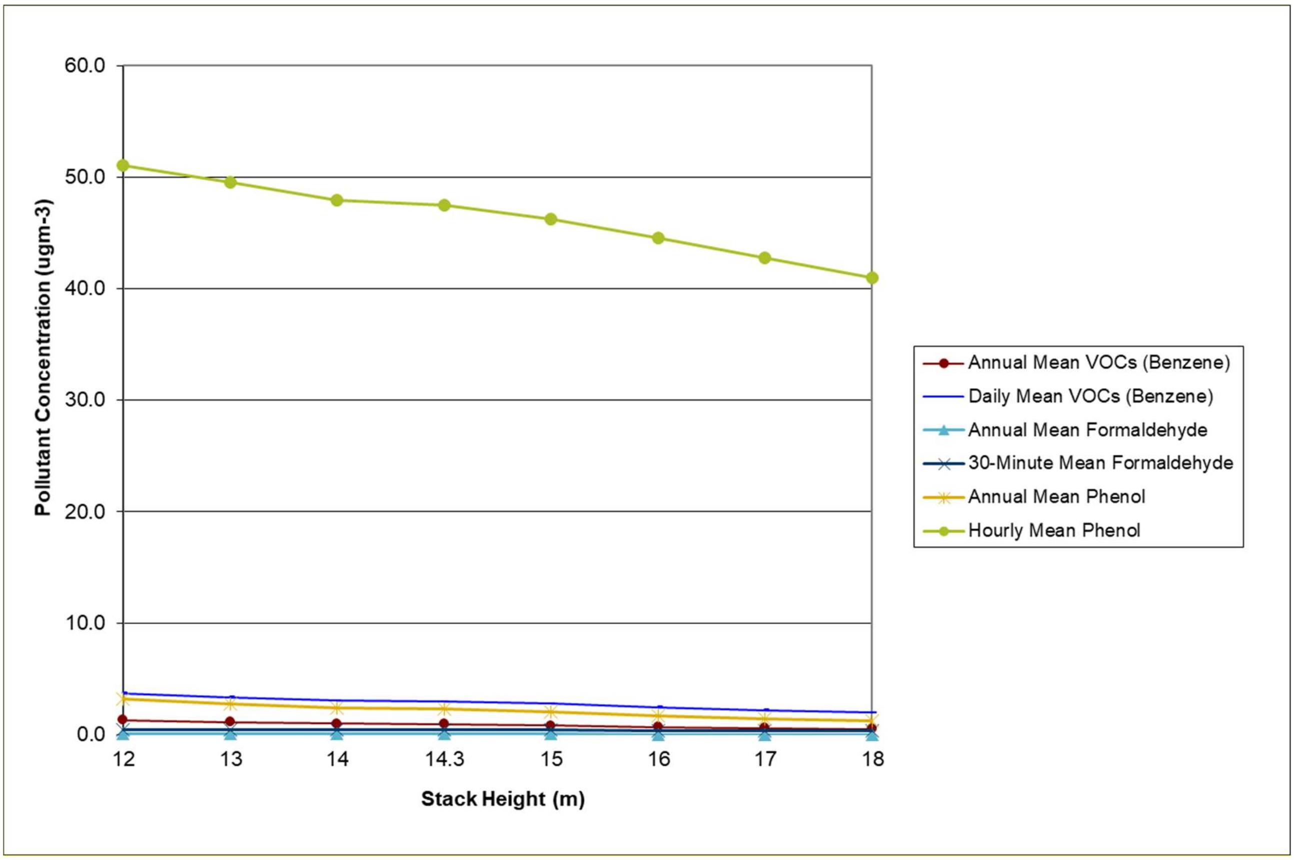
The dispersion modelling for the purposes of stack height determination assumed a domain of 3 km by 3 km centred on the proposed development and with a grid spacing of 30 m.

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.

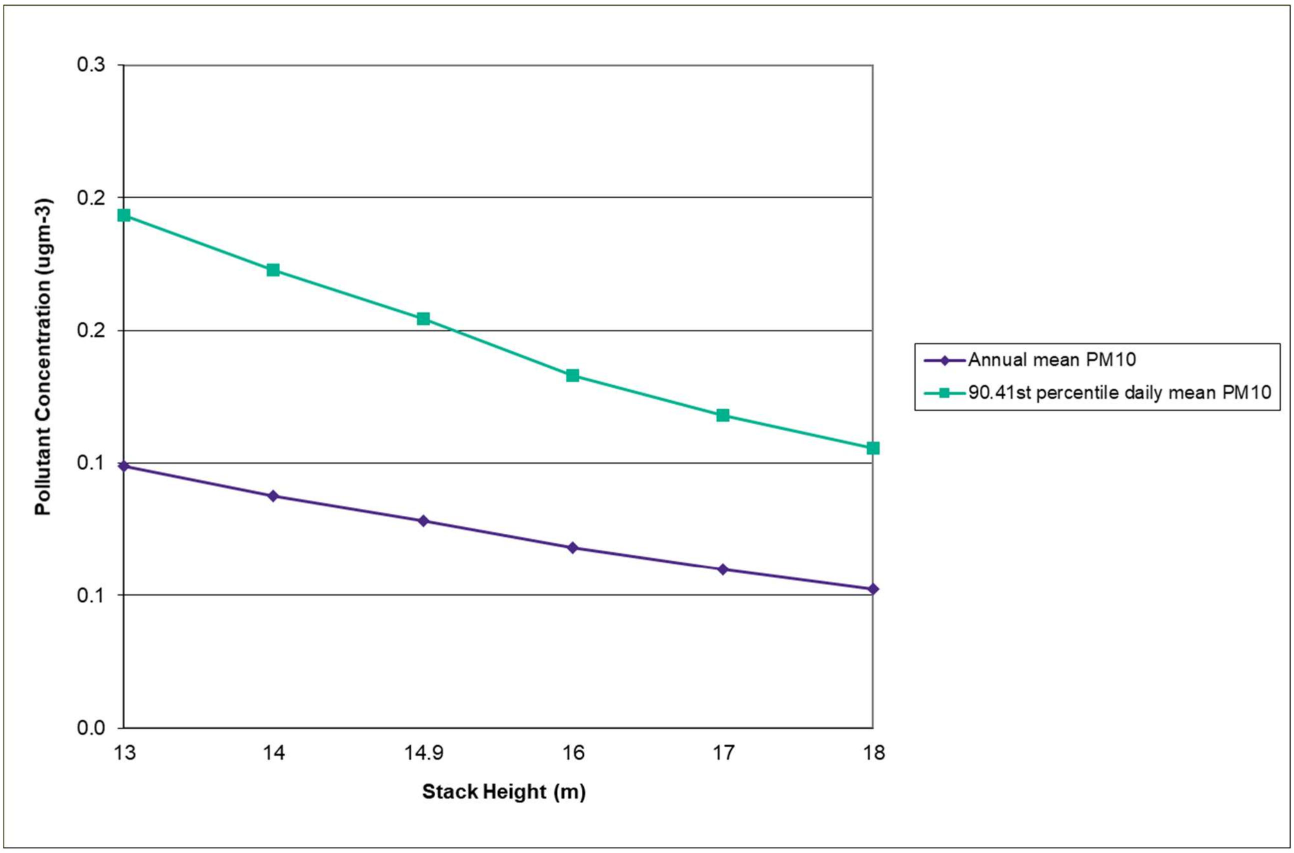
Graph A.1 Variation in Concentration (as µg.m^{-3}) with Stack Height (m) – Stack P1



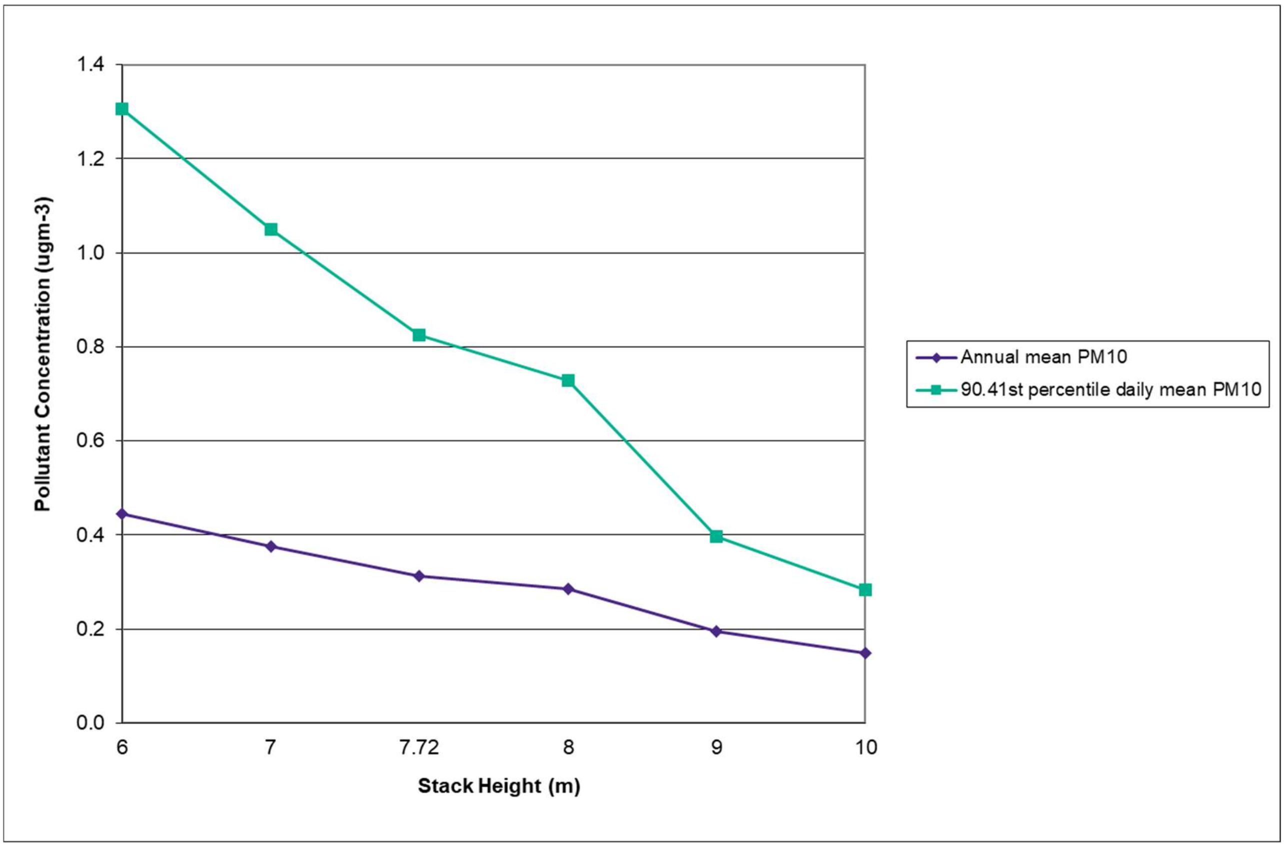
Graph A.2 Variation in Concentration (as µg.m^{-3}) with Stack Height (m) – Stack P2



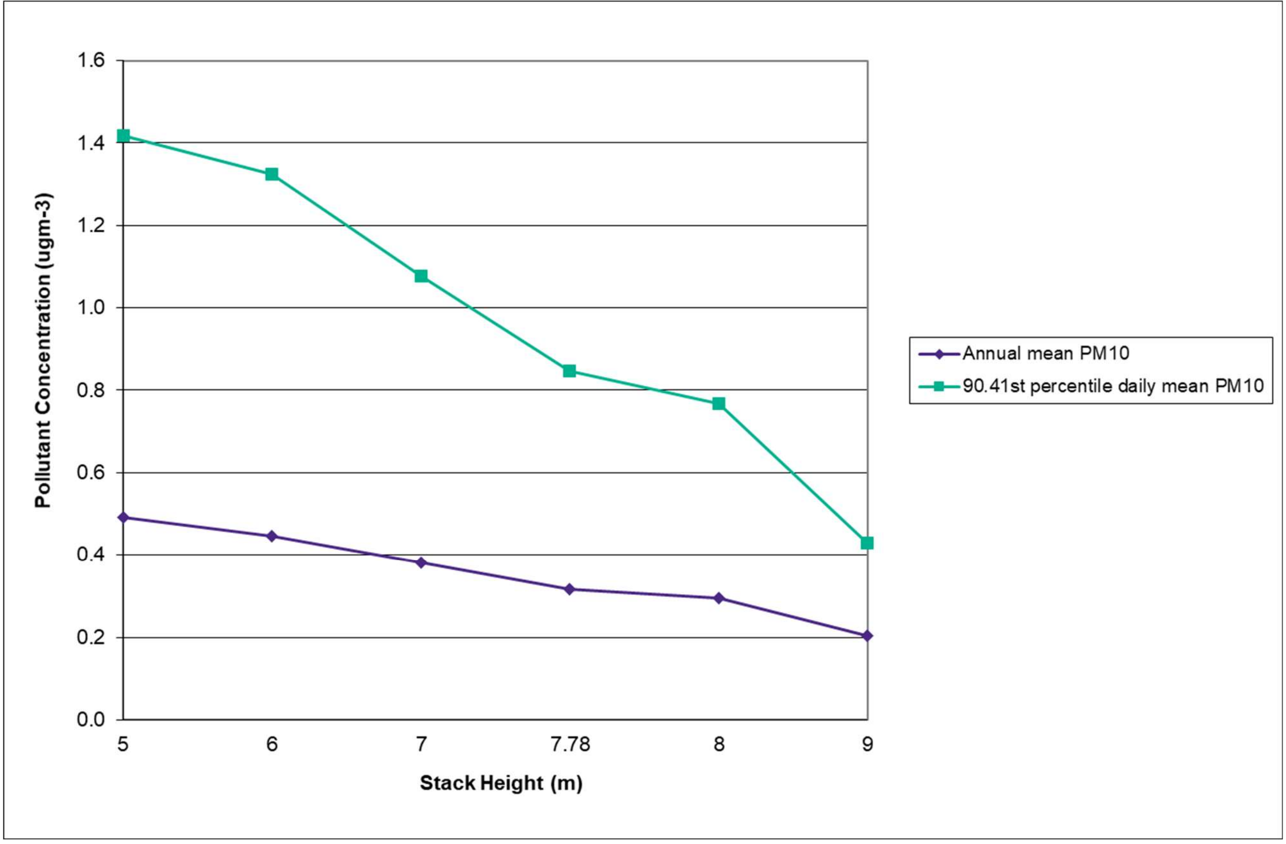
Graph A.3 Variation in Concentration (as µg.m^{-3}) with Stack Height (m) – Stack P3



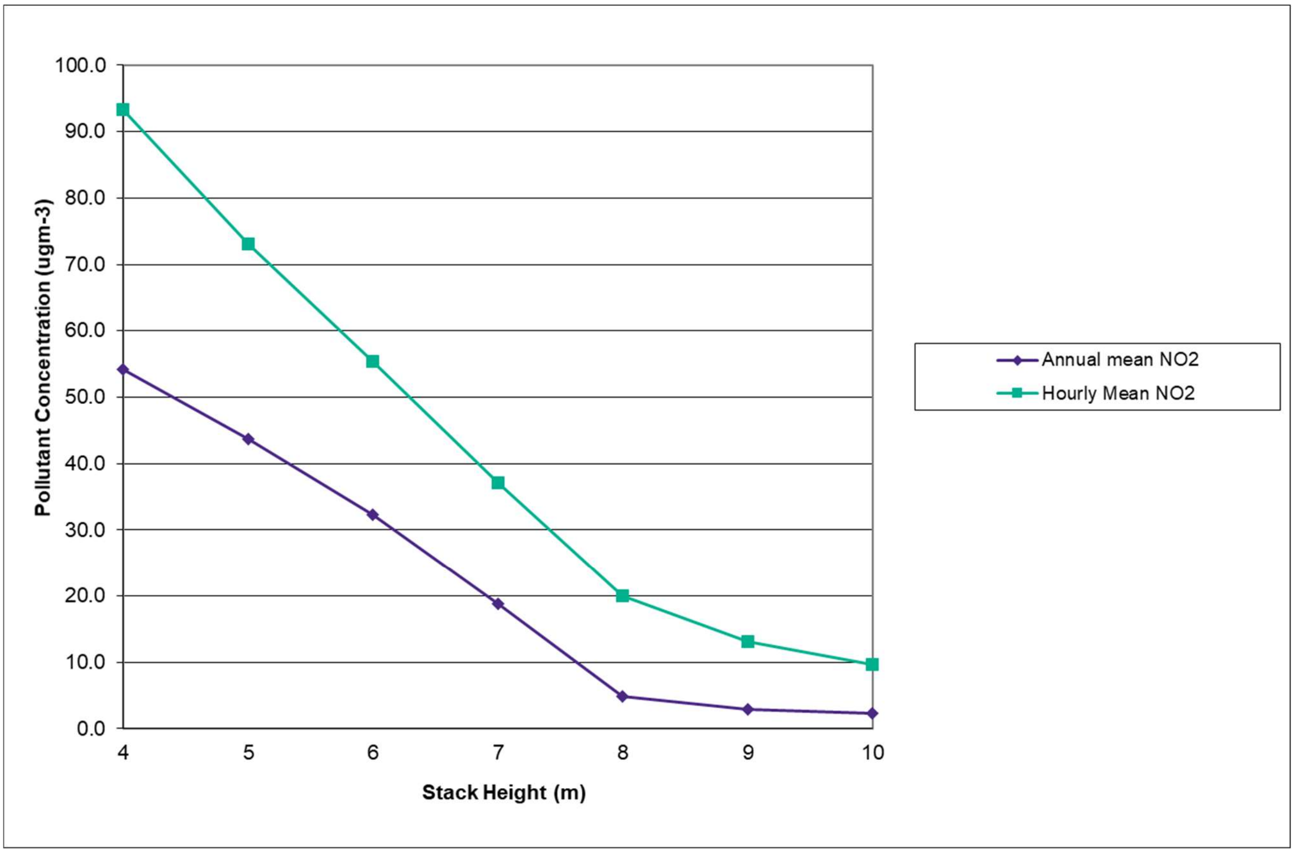
Graph A.4 Variation in Concentration (as µg.m^{-3}) with Stack Height (m) – Stack P4



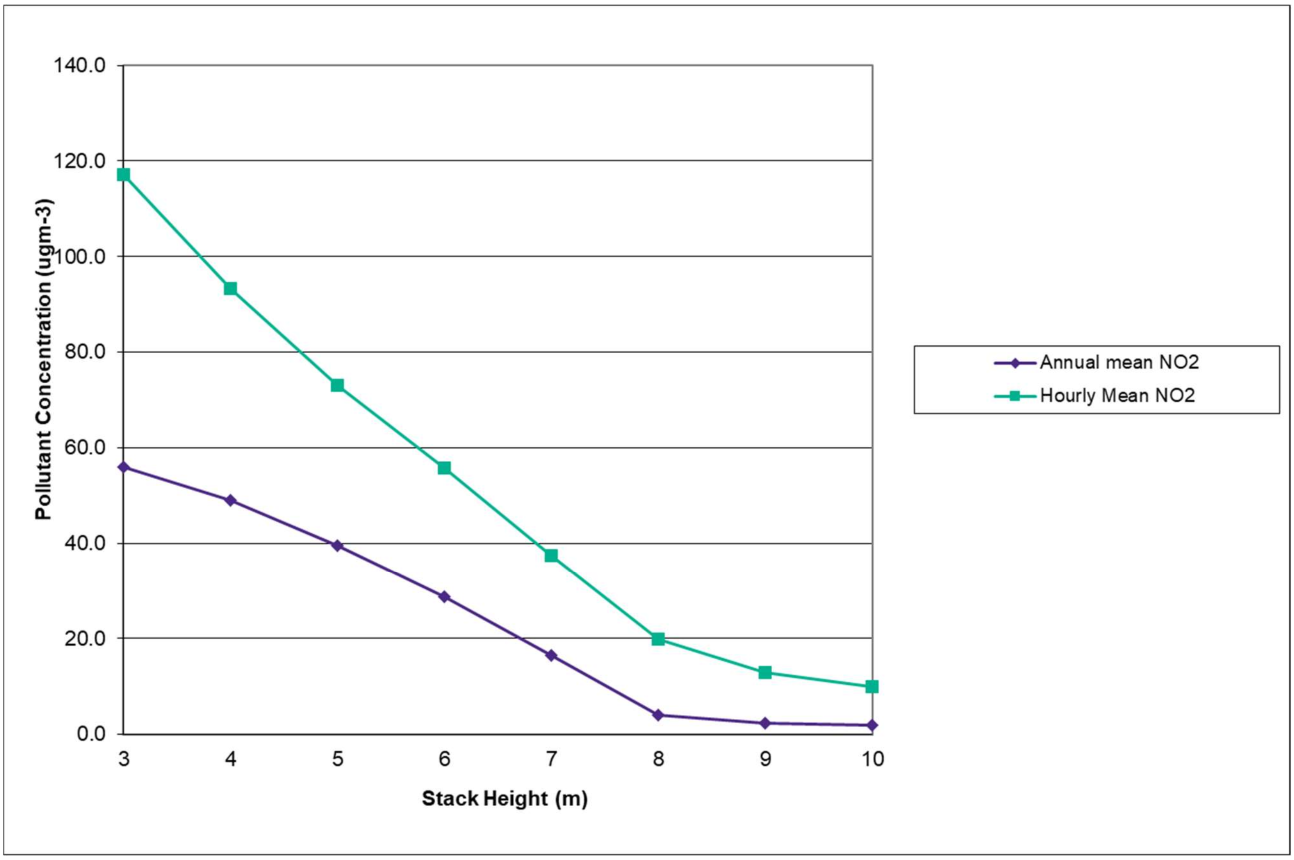
Graph A.5 Variation in Concentration (as µg.m^{-3}) with Stack Height (m) – Stack P5



Graph A.6 Variation in Concentration (as µg.m^{-3}) with Stack Height (m) – Stack P6



Graph A.7 Variation in Concentration (as µg.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_2 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)

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
Enviromental
Permitting
R0
01 December 2022

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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Contents

Tables

Figures

Appendices

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'[1].

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.

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[1] 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[2] 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'[3] 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

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[2] 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

[3] 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[4] 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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[4] 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_{Aeq} 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_{Aeq}. 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_{max}, inside and L_{night}, outside. The L_{night} 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 $L_{night,\ outside}$ 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 $L_{night,\ outside}$, 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 $L_{Amax,\ inside}$. Lower thresholds are given that may change sleep structure.

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

Noise Level, $L_{night,outside}$	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.

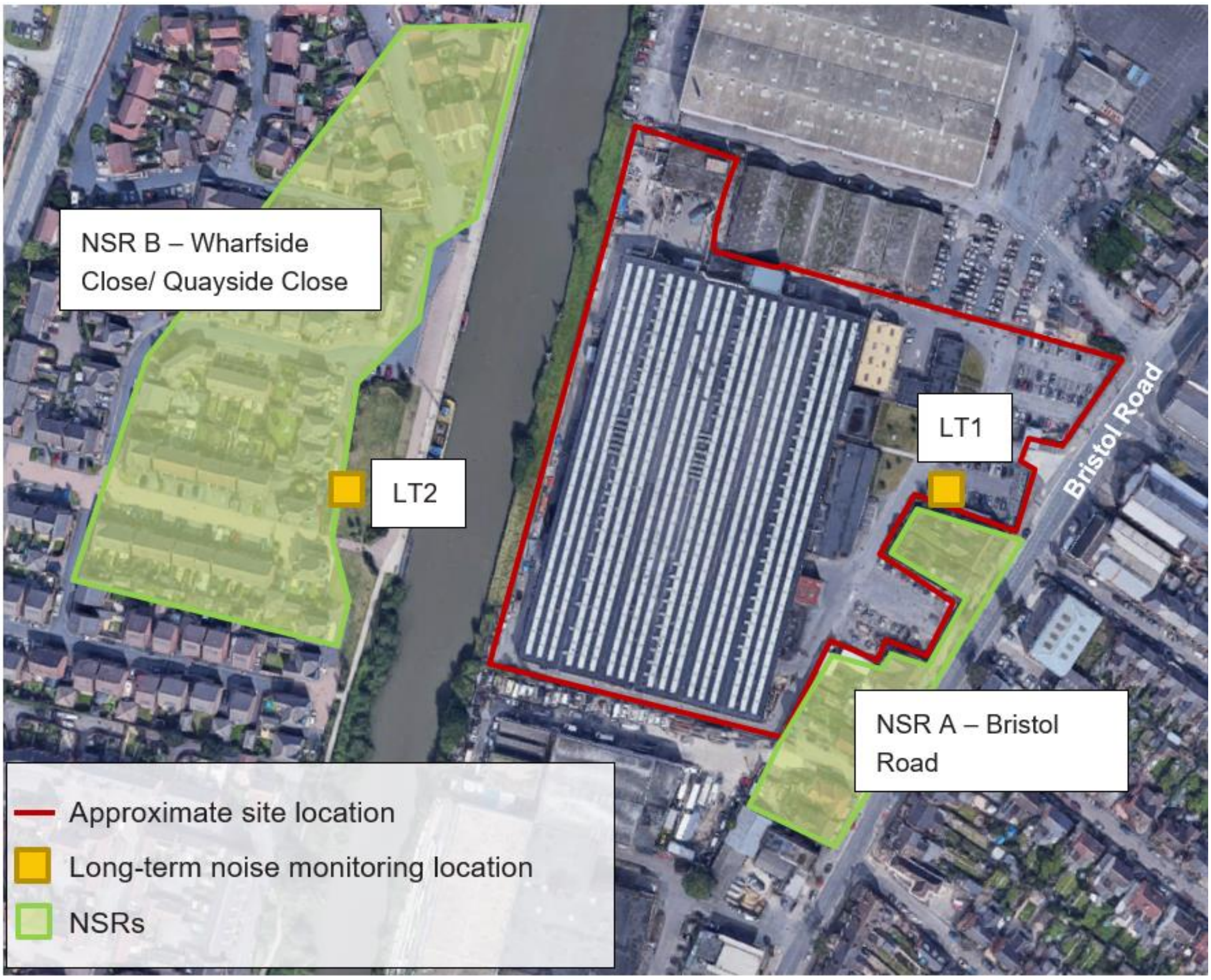

Figure 3.1 Site Location

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 Quaydise 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.

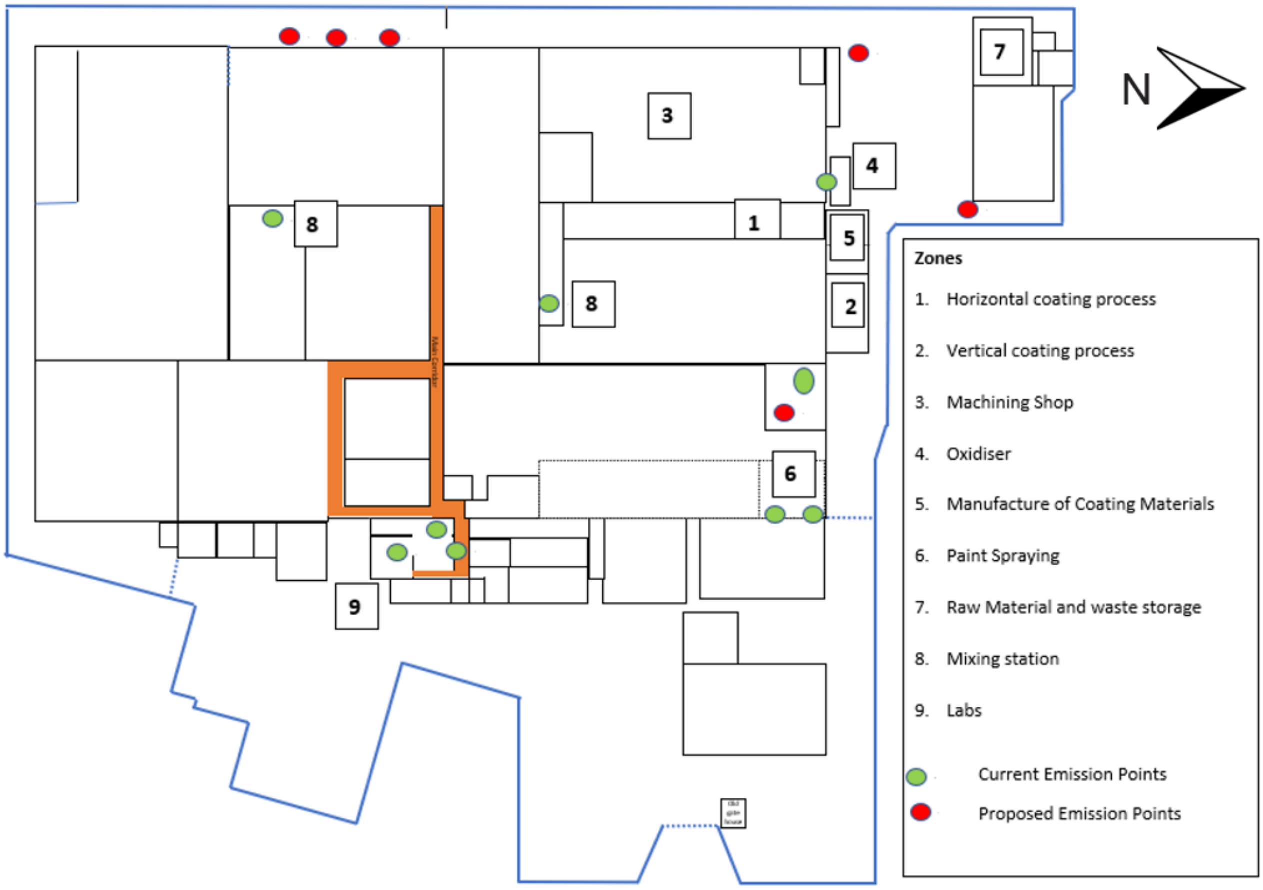

Figure 3.2 Permali Process Locations and Emission Points

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 (< ± 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/ Calibration Start /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 / 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 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^{-1} wind from the west, 2 oktas of cloud.

3.1.17 At LT2 on deployment it was 20°C, 35% relative humidity, 1.9ms^{-1} 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 $L_{Aeq,16hr}$ (dB)*	50th percentile $L_{A90,15min}$ (dB)**	Average $L_{Aeq,8hr}$ (dB)*	50th percentile $L_{A90,15min}$ (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 $L_{Aeq,16hour}$ periods.

** 50th percentile $L_{A90,15min}$ (dB): A-weighted L_{90} 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, $L_{Aeq,T}$ dB	Background Sound Level, $L_{A90,T}$ dB	Residual Sound Level, $L_{Aeq,T}$ dB	Background Sound Level, $L_{A90,T}$ dB

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

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'[5].

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[6] or have an impulsive character.

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[5] ISO. International Standard ISO 9613-2:1996. Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation.

[6] 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.

Table 4.1: Modelled Plant

Modelled Plant	Quantity	Sound Power Level (dB L_{WA})	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.

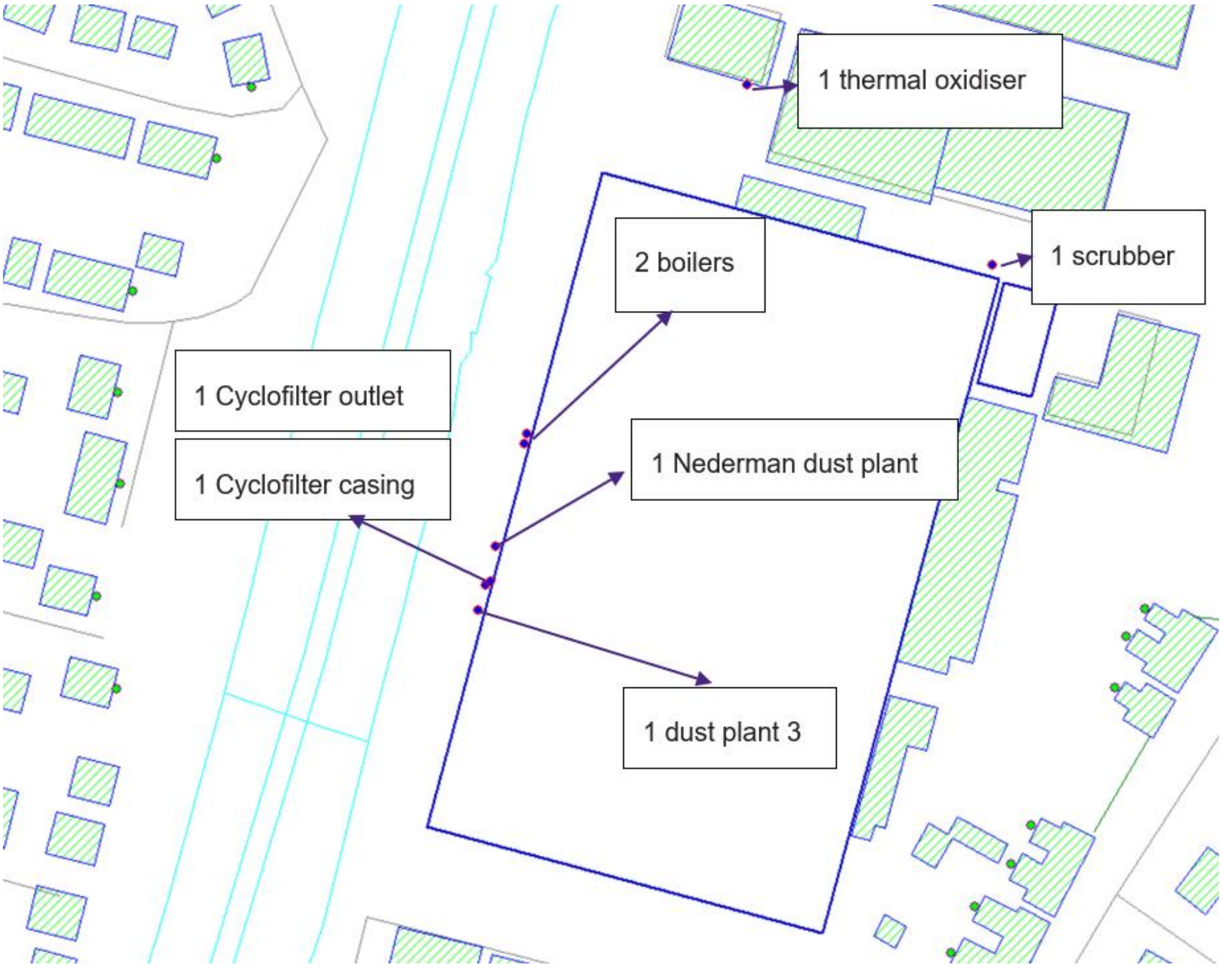


Figure 4.1 Location of plant on site

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 $L_{Aeq,Tr}$)	
	Daytime	Night-time
NSR A - Bristol Rd	42	42
NSR B - Wharfside Close/ 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 $L_{Aeq,Tr}$)
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 L_S	Rating Penalty, dB	Rating Level, dB $L_{Ar,Tr}$	Rating - Background Level Difference, dB
	Background, dB $L_{A90,T}$	Residual, dB $L_{Aeq,T}$				
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 L_S	Rating Penalty, dB	Rating Level, dB $L_{Ar,Tr}$	Rating - Background Level Difference, dB
	Background, dB $L_{A90,T}$	Residual, dB $L_{Aeq,T}$				
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

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)

Location	Baseline residual noise level, dB $L_{Aeq,T}$	Specific sound level, dB $L_{Aeq,T}$	Ambient noise level with site, dB $LA_{eq,T}$	Noise change, dB
NSR A - Bristol Rd	51	42	52	**+1**
NSR B - Wharfside Close/ Quayside Close	49	64	64	**+15**

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

Location	Baseline residual noise level, dB $L_{Aeq,T}$	Specific sound level, dB $L_{Aeq,T}$	Ambient noise level with site, dB $LA_{eq,T}$	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 L_S	Rating Penalty, dB	Rating Level, dB $L_{Ar,Tr}$	Rating - Background Level Difference, dB
	Background, dB $L_{A90,T}$	Residual, dB $L_{Aeq,T}$				
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 L_S	Rating Penalty, dB	Rating Level, dB $L_{Ar,Tr}$	Rating - Background Level Difference, dB
	Background, dB $L_{A90,T}$	Residual, dB $L_{Aeq,T}$				
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 $L_{Aeq,T}$	Specific sound level, dB $L_{Aeq,T}$	Ambient noise level with site, dB $LA_{eq,T}$	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 $L_{Aeq,T}$	Specific sound level, dB $L_{Aeq,T}$	Ambient noise level with site, dB $LA_{eq,T}$	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 $L_{Aeq,T}$, 9 dB and 14 dB below the GCN guideline levels for the onset of moderate (50 dB $L_{Aeq,T}$) and serious annoyance (55 dB $L_{Aeq,T}$) 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 $L_{Aeq,T}$ during the night-time period, 1 dB below the level above which adverse effects are noted for the night-time periods (30 dB $L_{Aeq,T}$).

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. Tjellesen – 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.

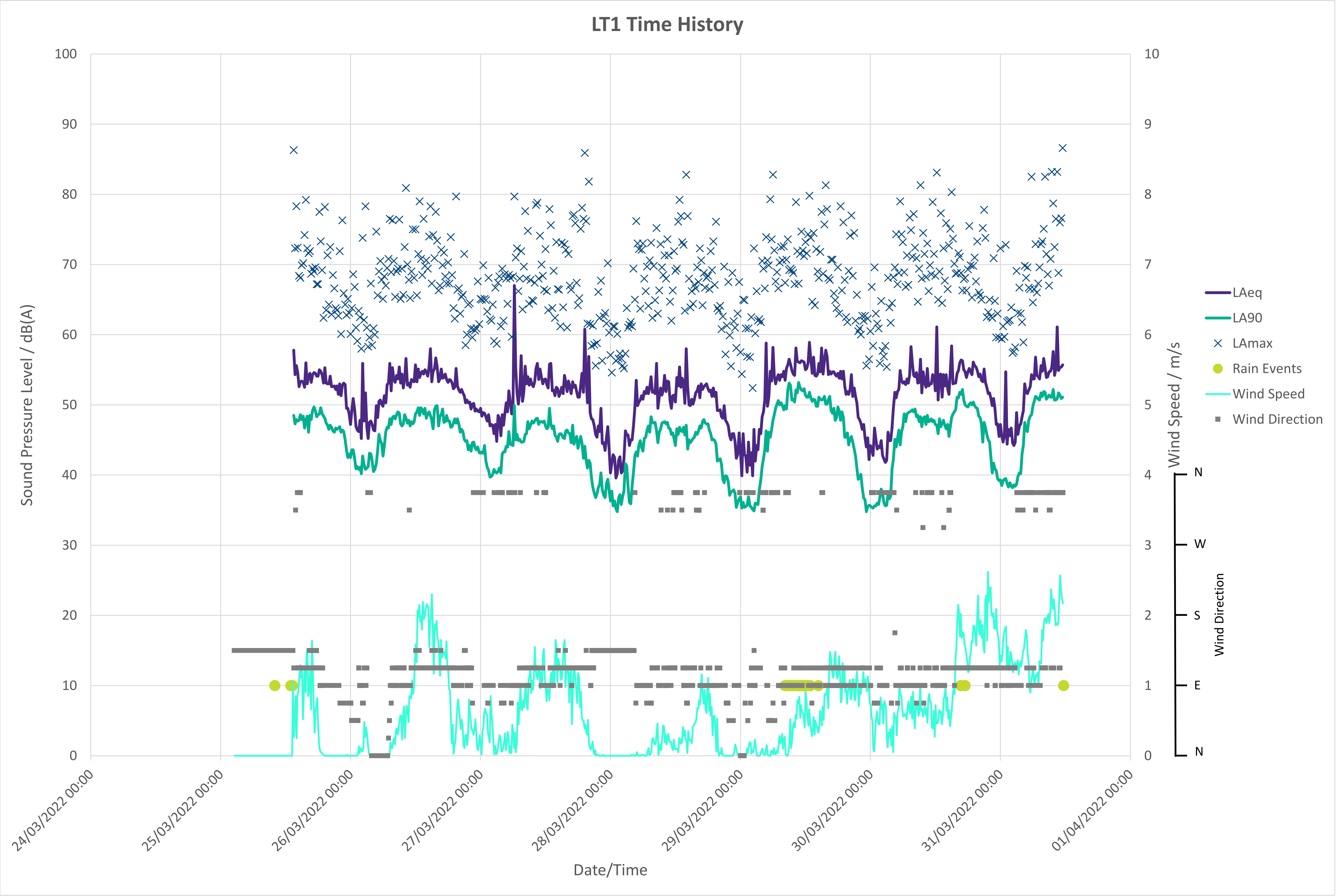
A.16 Ben was also responsible for … (delete as appropriate) …

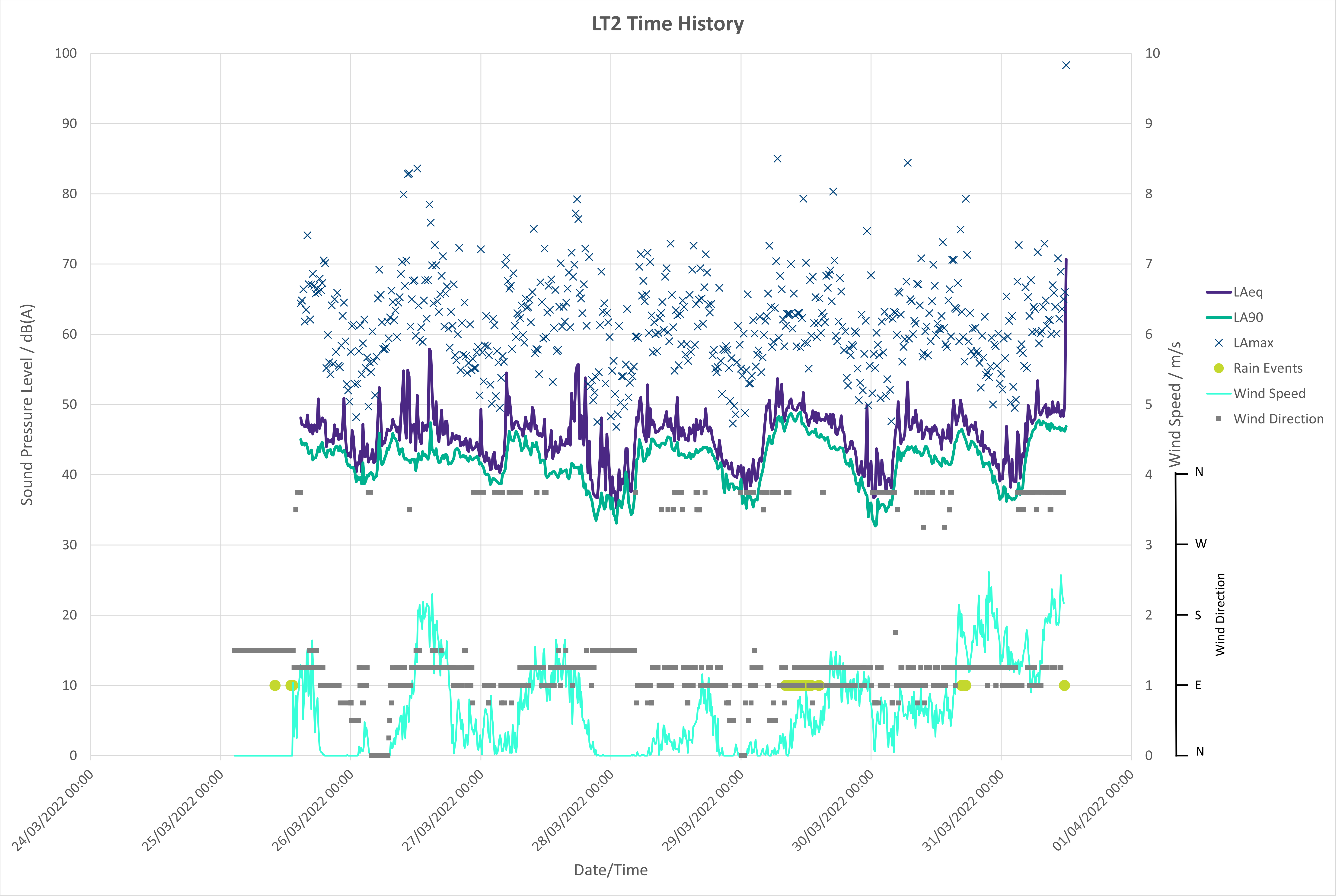
- undertaking the site visit;
- carrying out sound monitoring;

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

Appendix B

Time History Graphs


LT1 Time History
Sound Pressure Level / dB(A)
100
90
80
70
60
50
40
30
20
10
0
Wind Speed / m/s
10
9
8
7
6
5
4
3
2
1
0
Wind Direction
N
W
S
E
N
24/03/2022 00:00
25/03/2022 00:00
26/03/2022 00:00
27/03/2022 00:00
28/03/2022 00:00
29/03/2022 00:00
30/03/2022 00:00
31/03/2022 00:00
01/04/2022 00:00
Date/Time
LAeq
LA90
LAmax
Rain Events
Wind Speed
Wind Direction


LT2 Time History
Sound Pressure Level / dB(A)
100
90
80
70
60
50
40
30
20
10
0
Wind Speed / m/s
10
9
8
7
6
5
4
3
2
1
0
24/03/2022 00:00
25/03/2022 00:00
26/03/2022 00:00
27/03/2022 00:00
28/03/2022 00:00
29/03/2022 00:00
30/03/2022 00:00
31/03/2022 00:00
01/04/2022 00:00
Date/Time
LAeq
LA90
LAmax
Rain Events
Wind Speed
Wind Direction
N
W
S
E
N
Wind Direction

Appendix C

Environmental Sound Survey Sheets

Location	LT1, Permali site, Bristol Road, Gloucester
Purpose of Monitoring	Permali / Tenmat, Bristol Road
Relevant Guidance / Standard	

Sound Measurement System

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	

		START		END	
	Personnel	BG		SDH	
	Date / time	25/03/2022 13:15		31/03/2022 1200	
Calibrator	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%	

	START TI	START P	START F	START S	END TI	END P	END F	END S
Likely temp. inversion / Precipitation / Fog / Wet ground / Frozen ground / Snow cover? (tick boxes)					×	×	×	×

	START	END
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))

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.

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)

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.

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)

On collection the sounds were the same, again dominated by road traffic, more wind noise though.

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	

Sound Measurement System

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	

		START	**END**
Personnel		BG	SDH
Date / time		25/03/2022 14:30	31/03/2022 1200
Calibrator	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

	START		END	
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%	

	TI	P	F	S	TI	P	F	S
Likely temp. inversion / Precipitation / Fog / Wet ground / Frozen ground / Snow cover? (tick boxes)					×	×	×	×

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))

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.

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)

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.

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)

On collection the sounds were similar, dominated by distant traffic noise and construction sounds. Again, more wind noise than before

Location	LT2, off Quayside Way, Gloucester

Photographs of measurement location

Appendix D

Technical Datasheets/ Measurement Data

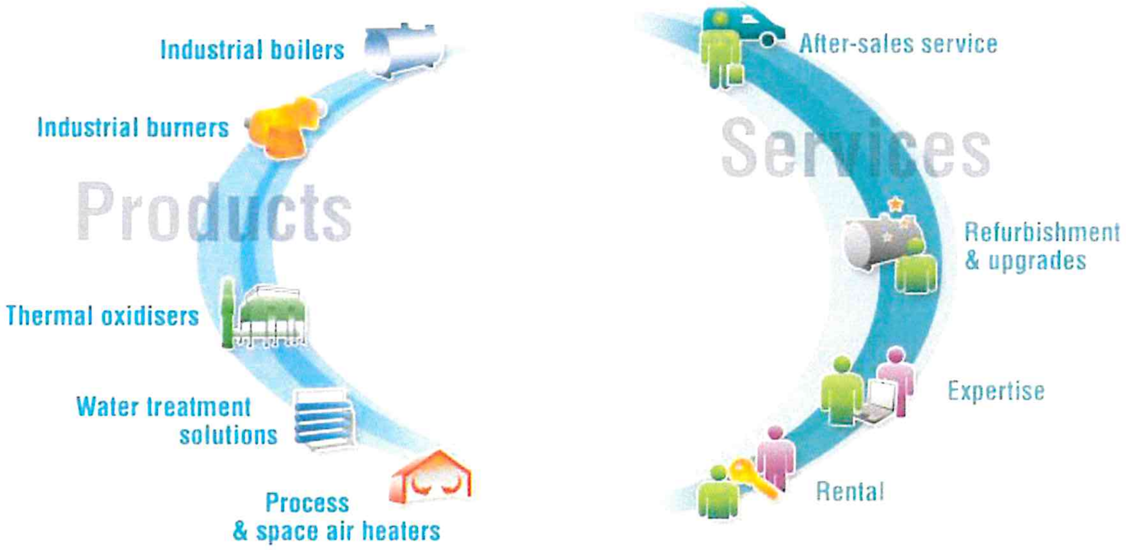
Client
Permali

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.



www.babcock-wanson.co.uk

Babcock
Wanson

Babcock Wanson UK Limited
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Hertfordshire WD6 1SA UK

Tel: +44 (0) 20 8953 7111
Fax: +44 (0) 20 8207 5177
Email: info@babcock-wanson.co.uk
www.babcock-wanson.co.uk

Permali
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 NOx 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 NOx Natural Gas burners guarantee NOx emissions of <100 mg/Nm^3, this ensures compliance with the MCPD well into the future. This figure is based on dry flue gas and 3% O_2 as defined in the MCPD.

Babcock Wanson Low NOx 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 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 20141/68/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.

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

Your sales engineer is:

Tim Marchant
Sales Engineer
PROCESS ENGINEERING DIVISION
+44 (0) 796 7340 224
TMarchant@babcock-wanson.com

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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/Nm³)	
Nominal Gas Consumption at MCR	Nm³/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/Nm³	
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.

CHIMNEY

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 workings 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 4th 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
Applications Engineer
PROCESS ENGINEERING DIVISION
DSolaru@babcock-wanson.com

Your sales engineer is:

Tim Marchant
Sales Engineer
PROCESS ENGINEERING DIVISION
+44 (0) 796 7340 224
TMarchant@babcock-wanson.com

Measurement Summary Report

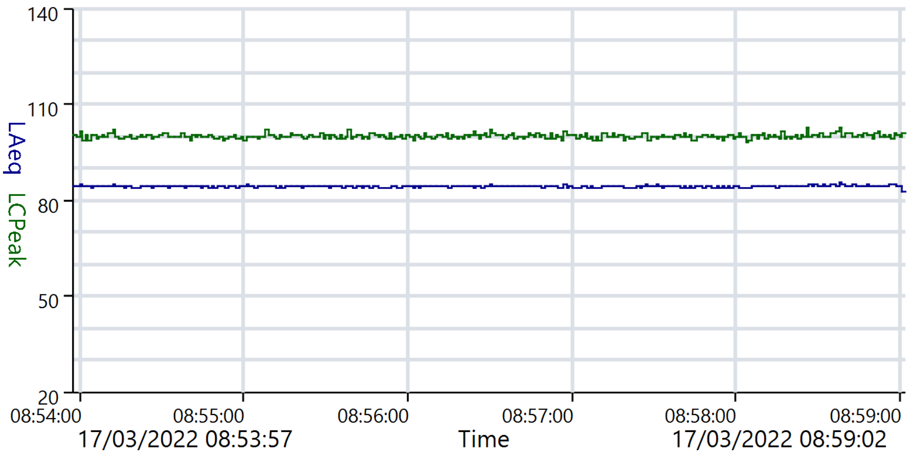
Name	Thermal Oxidiser at 1m from fan			
Time	17/03/2022 08:53:57	**Person**	**Place**	**Project**
Duration	00:05:05	Stephen Crewe	Tenmat Ltd	Site Move Project
Instrument	PN1218, Model 45	HSSE		

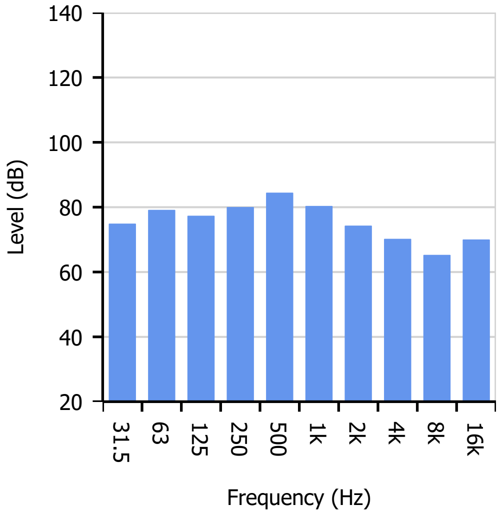
Calibration

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

Basic Values	
LAeq	84.2 dB
LCPeak	102.5 dB
C-A	3.7 dB
LEPd	64.5 dB
LAFMax	86.0 dB

Projected Exposure	
30 Minutes	72.2 dB
1 Hour	75.2 dB
2 Hours	78.2 dB
4 Hours	81.2 dB
6 Hours	83.0 dB
8 Hours	84.2 dB
10 Hours	85.2 dB
12 Hours	86.0 dB





Measurement Summary Report

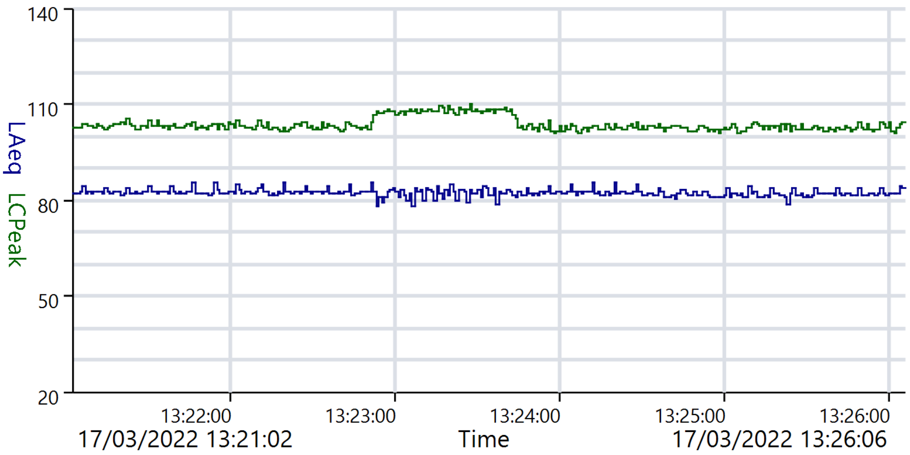
Name	Dust plant 3 1m from fan			
Time	17/03/2022 13:21:02	**Person**	**Place**	**Project**
Duration	00:05:04	Stephen Crewe	Tenmat Ltd	Site Move Project
Instrument	PN1218, Model 45	HSSE		

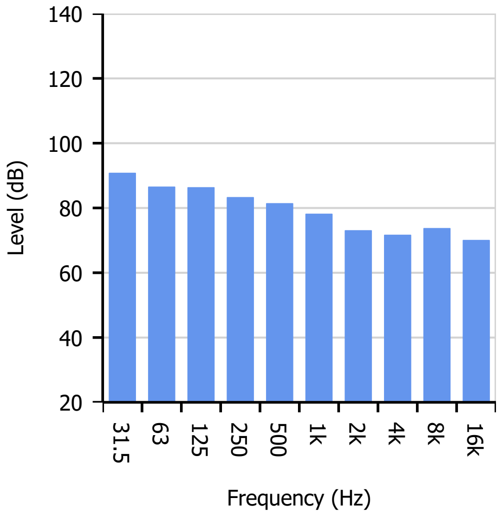
Calibration

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

Basic Values	
LAeq	82.4 dB
LCPeak	110.0 dB
C-A	10.4 dB
LEPd	62.6 dB
LAFMax	88.8 dB

Projected Exposure	
30 Minutes	70.4 dB
1 Hour	73.4 dB
2 Hours	76.4 dB
4 Hours	79.4 dB
6 Hours	81.2 dB
8 Hours	82.4 dB
10 Hours	83.4 dB
12 Hours	84.2 dB





Measurement Summary Report

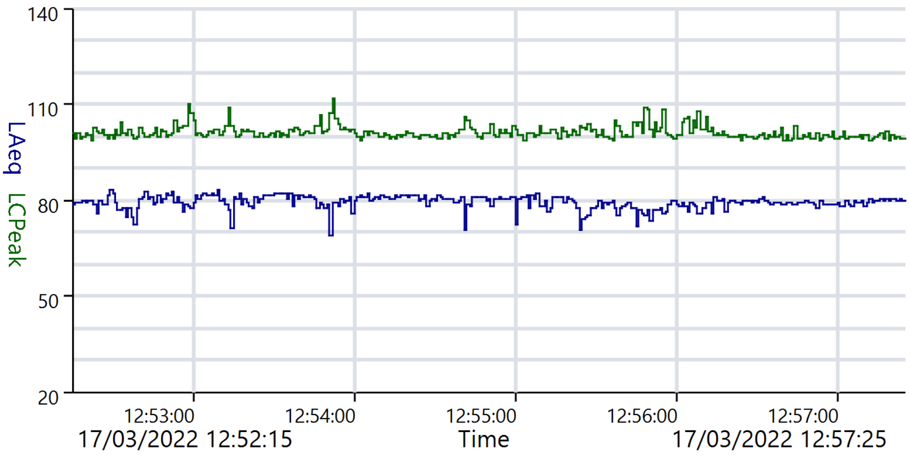
Name	Nederman dust plant 1m from fan			
Time	17/03/2022 12:52:15	**Person**	**Place**	**Project**
Duration	00:05:10	Stephen Crewe	Tenmat Ltd	Site Move Project
Instrument	PN1218, Model 45	HSSE		

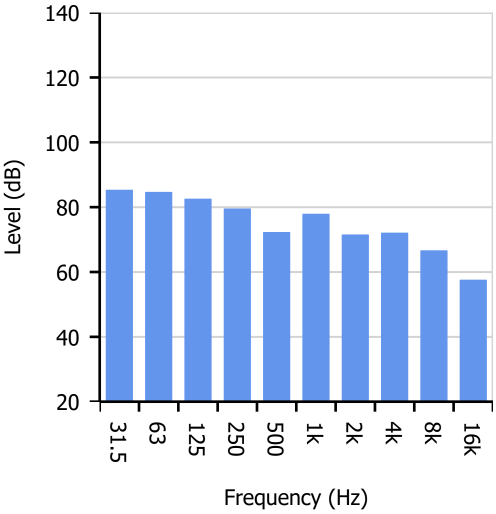
Calibration

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

Basic Values	
LAeq	79.6 dB
LCPeak	111.6 dB
C-A	9.7 dB
LEPd	59.9 dB
LAFMax	84.2 dB

Projected Exposure	
30 Minutes	67.6 dB
1 Hour	70.6 dB
2 Hours	73.6 dB
4 Hours	76.6 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

Permali Gloucester Limited

JER9222
1
3
24 February 2023

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

Approval for issue

Jennifer Stringer	Technical Director	24 February 2023

File Name

230224_JER9222_R_RN_Permali Environmental Risk Assessment_V1R3

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Prepared by:

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Prepared for:

Permali Gloucester

Tables

Appendices

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[1] 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.

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[1] 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)[2].

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[3] 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.

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[2] https://uk-air.defra.gov.uk/aqma/maps/

[3] http://mapapps.bgs.ac.uk/geologyofbritain/home.html

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.

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	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. Thermal oxidiser/scrubber abatement systems are used to minimise risk of odour from the process. The following procedures are incorporated into the site management system to manage the risk from the facility: Inspection, pre-planned maintenance and management procedures reduce the likelihood of leaks and incidents from handling and internal transport of raw materials. Emergency response and shutdown procedures minimise the impact of incidents and ensure that emergencies are dealt with swiftly and safely, Complaints procedure will log any contact with the site from local residents, businesses or the regulator and ensure that an immediate investigation is undertaken. A review of raw materials will be routinely undertaken to identify alternative materials with a lower pollution / odour potential.	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	A Noise Management Plan will be developed as part of the EMS to ensure: 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. All new items of plant are subject to a noise assessment All items of plant and equipment are serviced and maintained following manufacturers recommendations. The complaints procedure is followed in the event that noise or vibration complaints are received. 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.	Low (with noise mitigation measures)	High for some residents without noise mitigation measures 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. Externally there are IBCs of waste oil/water stored. As part of the site management systems, emergency response procedures are in place with staff being trained in spillage response. Storage and delivery areas are located on impermeable surfacing with sealed drainage systems. 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. Resin mixing area is internally bunded with impermeable surfacing and sealed drainage. 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. 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	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). 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.	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	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. As part of the site management systems, emergency response procedures will be in place with staff being trained in spillage response.	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)	All hazardous substances are kept in dedicated internally bunded storage areas. All internal surfaces are impermeable. 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. Internal areas (resin mixing area) are bunded and have impermeable surfaces and sealed drain. 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
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	Emergency response and shutdown procedures will be in place should an issue be detected. Thermal oxidiser and Scrubber systems will be subject to regular	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 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. All chemicals/solvents are stored in dedicated bunded storage areas internally and externally with sealed drainage / impermeable surfaces. 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. 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

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.

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_x, CO
- scrubber – odour
- dust abatement (x3) – Particulates
- spray booths (x2) – VOCs and Particulates
- gas boilers (x4) – NOx 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.

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.

REFERENCES

1. Environment Agency's (EA's) Risk Assessments for your environmental permit - https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit

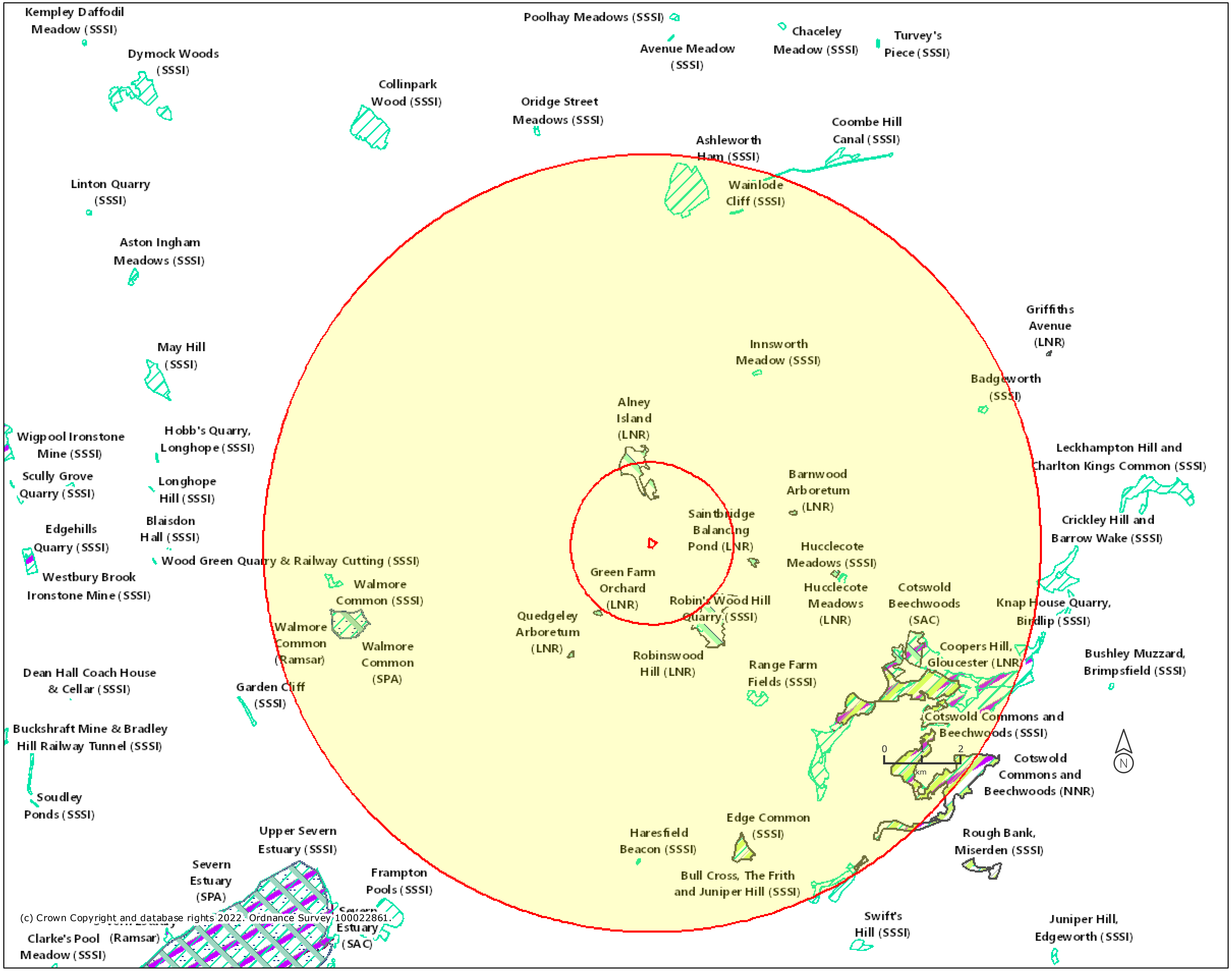
1. DEFRA Air Quality Management Area Maps - https://uk-air.defra.gov.uk/aqma/maps/

2. British Geological Survey Geology of Britain Viewer - http://mapapps.bgs.ac.uk/geologyofbritain/home.html

Appendix A

MAPS

Permali 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

0 2 4
km

Map produced by MAGIC on 20 September, 2022.

Environment Agency

Flood map for planning

Your reference	Location (easting/northing)	Created
Permali Flood Map	**382328/217128**	**12 Sep 2022 17:18**

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

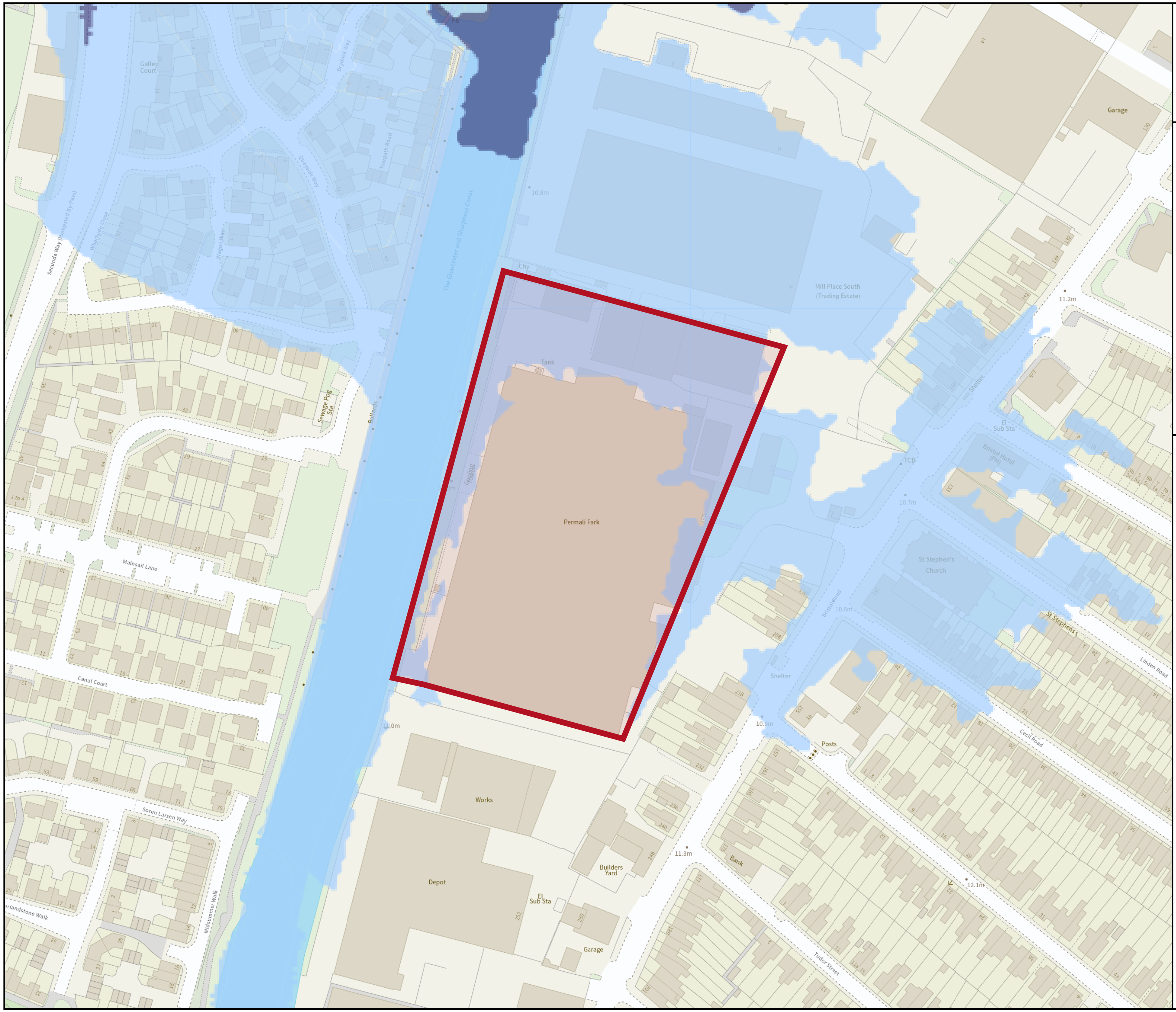
This means:

- 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)

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.



Environment Agency

Flood map for planning

Your reference
Permali 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 benefitting from flood defences
- ■ Flood zone 2
- ☐ Flood zone 1
- — Flood defence
- — Main river
- ▦ Water storage area

0 20 40 60m

APPLICATION FOR AN ENVIRONMENTAL PERMIT

Permali Gloucester

Environmental Risk Assessment (ERA)

2023-02-24

JER9222

1

3

Contact

Platform
New Station Street
Leeds
LS1 4JB

+44 1132 206 190

forward
Reducing waste in every way

Forward Waste Management Activity Report

Period From: 01/01/2021 - 31/12/2021

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

Customer	Customer Site Address	Date	Ticket	Quantity	Container	Material	EWC Code	Weight (KG)	Sale Value	Rebate Unit	Rebate Value
Permali 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
Permali 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
Permali 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
Permali 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
		Material Totals:		*4*				*10260*	*£880.00*		*£531.14*

Customer	Customer Site Address	Date	Ticket	Quantity	Container	Material	EWC Code	Weight (KG)	Sale Value
Permali 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
Permali 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
Permali Gloucester Limited	Bristol Road	15/02/2021	089093	1	FWM 40 cu yd comp container	General Dry Waste	20 03 01	3180	£659.28
Permali 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
Permali Gloucester Limited	Bristol Road	15/03/2021	090140	1	FWM 40 cu yd comp container	General Dry Waste	20 03 01	5000	£925.00
Permali 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
Permali Gloucester Limited	Bristol Road	19/04/2021	091491	1	FWM 40 cu yd comp container	General Dry Waste	20 03 01	3760	£743.96
Permali 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
Permali Gloucester Limited	Bristol Road	19/05/2021	092907	1	FWM 40 cu yd comp container	General Dry Waste	20 03 01	5180	£951.28
Permali 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
Permali Gloucester Limited	Bristol Road	21/06/2021	094200	1	FWM 40 cu yd comp container	General Dry Waste	20 03 01	4460	£884.07
Permali 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
Permali 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
Permali 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
Permali 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
Permali Gloucester Limited	Bristol Road	06/09/2021	097315	1	FWM 40 cu yd comp container	General Dry Waste	20 03 01	4960	£961.32
Permali 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
Permali Gloucester Limited	Bristol Road	25/11/2021	100968	1	FWM 40 cu yd comp container	General Dry Waste	20 03 01	3980	£809.91
		Material Totals:		*18*				*101060*	*£18,682.28*

Customer	Customer Site Address	Date	Ticket	Quantity	Container	Material	EWC Code	Weight (KG)	Sale Value
Permali Gloucester Limited	Bristol Road	04/01/2021	087484	1	(FWM) 40 cu yd open container	General Dry Waste	20 03 01	3620	£723.52
Permali Gloucester Limited	Bristol Road	26/01/2021	088439	1	(FWM) 40 cu yd open container	General Dry Waste	20 03 01	5460	£992.16
Permali Gloucester Limited	Bristol Road	10/02/2021	089037	1	(FWM) 40 cu yd open container	General Dry Waste	20 03 01	5200	£954.20
Permali 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
Permali Gloucester Limited	Bristol Road	09/03/2021	090053	1	(FWM) 40 cu yd open container	General Dry Waste	20 03 01	480	£296.00
Permali Gloucester Limited	Bristol Road	10/03/2021	090072	1	(FWM) 40 cu yd open container	General Dry Waste	20 03 01	3980	£776.08
Permali Gloucester Limited	Bristol Road	29/03/2021	090678	1	(FWM) 40 cu yd open container	General Dry Waste	20 03 01	3960	£773.16
Permali Gloucester Limited	Bristol Road	19/04/2021	091492	1	(FWM) 40 cu yd open container	General Dry Waste	20 03 01	4940	£916.24
Permali 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
Permali 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
Permali Gloucester Limited	Bristol Road	10/08/2021	096067	1	(FWM) 40 cu yd open container	General Dry Waste	20 03 01	4340	£865.53
Permali Gloucester Limited	Bristol Road	20/08/2021	096632	1	(FWM) 40 cu yd open container	General Dry Waste	20 03 01	5060	£976.77
Permali Gloucester Limited	Bristol Road	02/09/2021	097262	1	(FWM) 40 cu yd open container	General Dry Waste	20 03 01	4340	£865.53
Permali Gloucester Limited	Bristol Road	24/09/2021	098187	1	(FWM) 40 cu yd open container	General Dry Waste	20 03 01	4620	£908.79
Permali Gloucester Limited	Bristol Road	30/09/2021	098507	1	(FWM) 40 cu yd open container	General Dry Waste	20 03 01	0	£235.00
Permali Gloucester Limited	Bristol Road	12/10/2021	099030	1	(FWM) 40 cu yd open container	General Dry Waste	20 03 01	4600	£905.70
Permali Gloucester Limited	Bristol Road	20/10/2021	099324	1	(FWM) 40 cu yd open container	General Dry Waste	20 03 01	4620	£908.79
Permali Gloucester Limited	Bristol Road	27/10/2021	099546	1	(FWM) 40 cu yd open container	General Dry Waste	20 03 01	2920	£646.14
Permali Gloucester Limited	Bristol Road	03/11/2021	099864	1	(FWM) 40 cu yd open container	General Dry Waste	20 03 01	2700	£612.15
Permali Gloucester Limited	Bristol Road	10/11/2021	100152	1	(FWM) 40 cu yd open container	General Dry Waste	20 03 01	3600	£751.20
Permali Gloucester Limited	Bristol Road	17/11/2021	100446	1	(FWM) 40 cu yd open container	General Dry Waste	20 03 01	4280	£856.26
Permali Gloucester Limited	Bristol Road	24/11/2021	100824	1	(FWM) 40 cu yd open container	General Dry Waste	20 03 01	2960	£652.32
Permali Gloucester Limited	Bristol Road	01/12/2021	101097	1	(FWM) 40 cu yd open container	General Dry Waste	20 03 01	4600	£905.70
Permali Gloucester Limited	Bristol Road	08/12/2021	101427	1	(FWM) 40 cu yd open container	General Dry Waste	20 03 01	4380	£871.71
Permali 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***
Permali Gloucester Limited	Bristol Road	10/02/2021	088784	1	(FWM) Artic Curtain Sided	Garnet Sand	12 01 17	12420	£1,561.20
Permali Gloucester Limited	Bristol Road	12/03/2021	090097	1	(FWM) Rigid Curtainsider	Garnet Sand	12 01 17	15120	£1,858.20
Permali Gloucester Limited	Bristol Road	12/05/2021	092332	1	(FWM) Artic Curtain Sided	Garnet Sand	12 01 17	23400	£2,769.00
Permali Gloucester Limited	Bristol Road	06/07/2021	094542	1	(FWM) Artic Curtain Sided	Garnet Sand	12 01 17	13240	£1,651.40
Permali Gloucester Limited	Bristol Road	16/09/2021	097438	1	(FWM) Artic Curtain Sided	Garnet Sand	12 01 17	16320	£1,990.20
Permali Gloucester Limited	Bristol Road	15/10/2021	098750	1	(FWM) Artic Curtain Sided	Garnet Sand	12 01 17	8060	£1,081.60
		Material Totals:		***6***				***88560***	***£10,911.60***

Customer	***Customer Site Address***	***Date***	***Ticket***	***Quantity***	***Container***	***Material***	***EWC Code***	***Weight (KG)***	***Sale Value***	
Permali 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	
Permali 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	
Permali 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	
Permali 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	
Permali 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	
Permali 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	
Permali 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	
Permali 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	
Permali 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	
Permali 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	
Permali Gloucester Limited	Bristol Road	13/07/2021	095051	1	(FWM) 40 cu yd open container	Wood - Dirty Grade C	17 02 01	2400	£370.00	
Permali 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	
Permali 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	
Permali 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	
Permali 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	
Permali 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	
Permali 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	
Permali 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	
		Material Totals:		***18***				***35620***	***£6,048.75***	
		Site Totals:		***78***				***350540***	***£61,208.71***	***£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 3rd 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

Signed on behalf of Gloucester City Council

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

EP Permit ref: 23/00006/A2
Information Request ref: Permali1

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.	5th 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.	5th 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.	5th 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.	5th October 2023
An emissions test report for the new thermal oxidiser to demonstrate compliance with the 20mg/m^3 VOC emission limit.	In writing or electronic format.	5th 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.	5th October 2023

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

Signed on behalf of Gloucester City Council

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

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

Project Title	**Permali Gloucester Ltd**
Document Title	**Noise Impact Assessment & Barrier / Mitigation Design**
Issue Version	**04**
Status	**Final**
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Record of Issue

Issue	Status	Author	Date	Check	Date	Authorised	Date
~~**01**~~	~~**Replaced**~~	~~**GFHP**~~	~~**28/06/23**~~	~~**BDS**~~	~~**29/06/23**~~		
~~**02**~~	~~**Replaced**~~	~~**GFHP**~~	~~**20/07/23**~~	~~**BDS**~~	~~**20/07/23**~~		
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04	**Final**	**GFHP**	**29/09/23**	**BDS**	**29/09/23**		

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CONTENTS

1. INTRODUCTION

Aim of the Study

1.1. Sound Barrier Solutions Ltd have been instructed by Permali 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 $LAeq_{1hour}$ 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 $LAeq_{15min}$ 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 Permali 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 LAeq,T. This is equivalent to a free field level of 47dBA LAeq 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 $LAeq_{8hr}$. Assuming a partially open window this is equivalent to an external level of 45 dBA $LAeq_{8hr}$ or a free field external level of 42 dBA $LAeq_{8hr}$ 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 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 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 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 8th 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 12th 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 7th 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 though 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: 26th Oct 2021
Microphones:	01-dB type 40CD half inch	Calibrated: 26th Oct 2021
Calibrator:	01-dB type CAL31 (class 1)	Calibrated: 26th 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 $LAeq_{16hr}$** for daytime conditions and of **45 dBA $LAeq_{8hr}$** 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 23rd 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 (operating plant)	INVC Measured Level LAeq dBA	SBS Predicted Level LAeq dBA
V9 CYCLO-FILTER FAN,V9 CYCLO-FILTER ROTARY VALVE, DUST PLANT-5 (INLET & OUTLET), SCRUBBER, BOILERS	**56**	**56**
V9 CYCLO-FILTER ROTARY VALVE, DUST PLANT-5 (INLET & OUTLET), SCRUBBER, BOILERS	**53**	**54**
DUST PLANT-5 (INLET & OUTLET), SCRUBBER, BOILERS	**50**	**51**

Description (operating plant)	INVC Derived Level LAeq dBA	SBS Predicted Level 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.

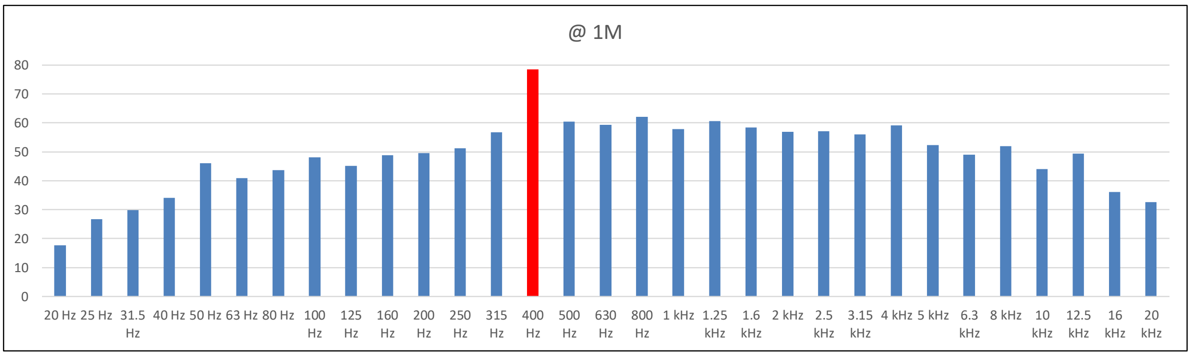
Noise Sensitive Receptors (NSRs)

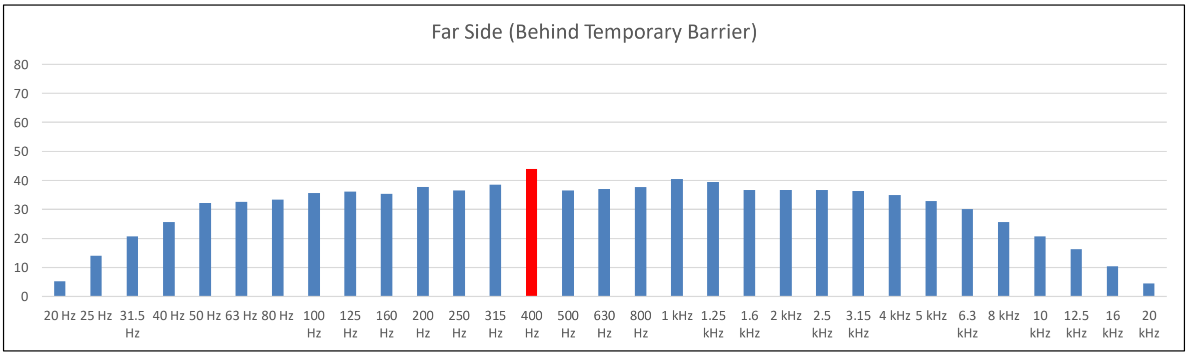
6.8. Tables 2 to 7 list the 26 residential Noise Sensitive Receptors included in the noise model and assessment. These are also illustrated by their ID reference in Figure 2. Each NSR is assessed at their most exposed ground, first and (where relevant) second floor façade. All 26 are spread like a ribbon adjacent to the canal and opposite the Permali 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$_R$** 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 DLα** 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 avoid as durability and high performance and a prerequisite for the 6 metre high Permali barrier.

7.21. Appendix B give a photograph of the temporary noise barrier system being used at Permali 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$_{r.}$** 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$_{r.}$** 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 Permali 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 is added to SNL so the Rating Level is also **45dBA LA$_{r.}$**

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$_{r.}$** 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$_{r.}$** 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$_{r.}$** 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
0	**0**	**-**	53	49	54	5
6m Poly	**Temp**	**-2**	45	49	50	1
6m Poly	**4m Poly**	**-2**	43	49	50	1

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
0	**0**	**-**	54	45	54	9
6m Poly	**Temp**	**-2**	43	45	47	2
6m Poly	**4m Poly**	**-2**	43	45	47	2

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 $LAeq_{8hr}$. Assuming a partially open window this is equivalent to an external level of 45 dBA $LAeq_{8hr}$ or a free field external level of 42 dBA $LAeq_{8hr}$ 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 Permali 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$_R$** 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 DLα** thus preventing the build-up of reflected noise in open factory space. The temporary barrier being utilised at Permali 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. The 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. Once 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 in 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**)
<u>Night-time Residual Noise Level : **45dB**</u>

13. FIGURES

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

Fig 2 – NSRs and Proposed Noise Barrier Sections

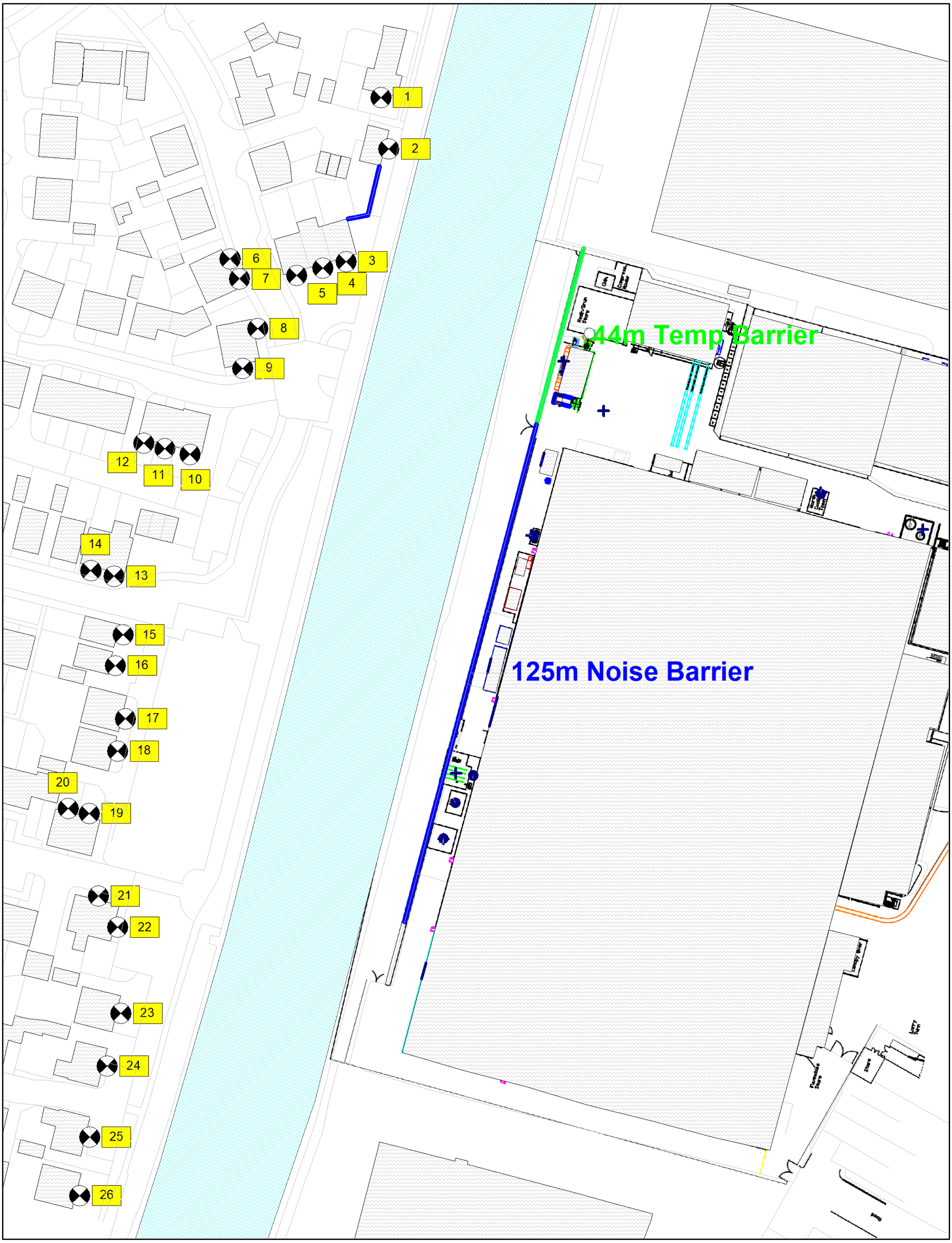
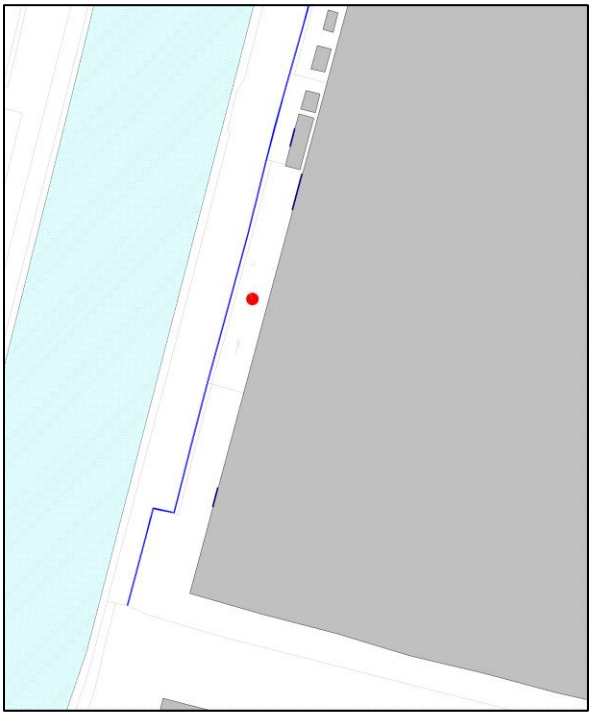
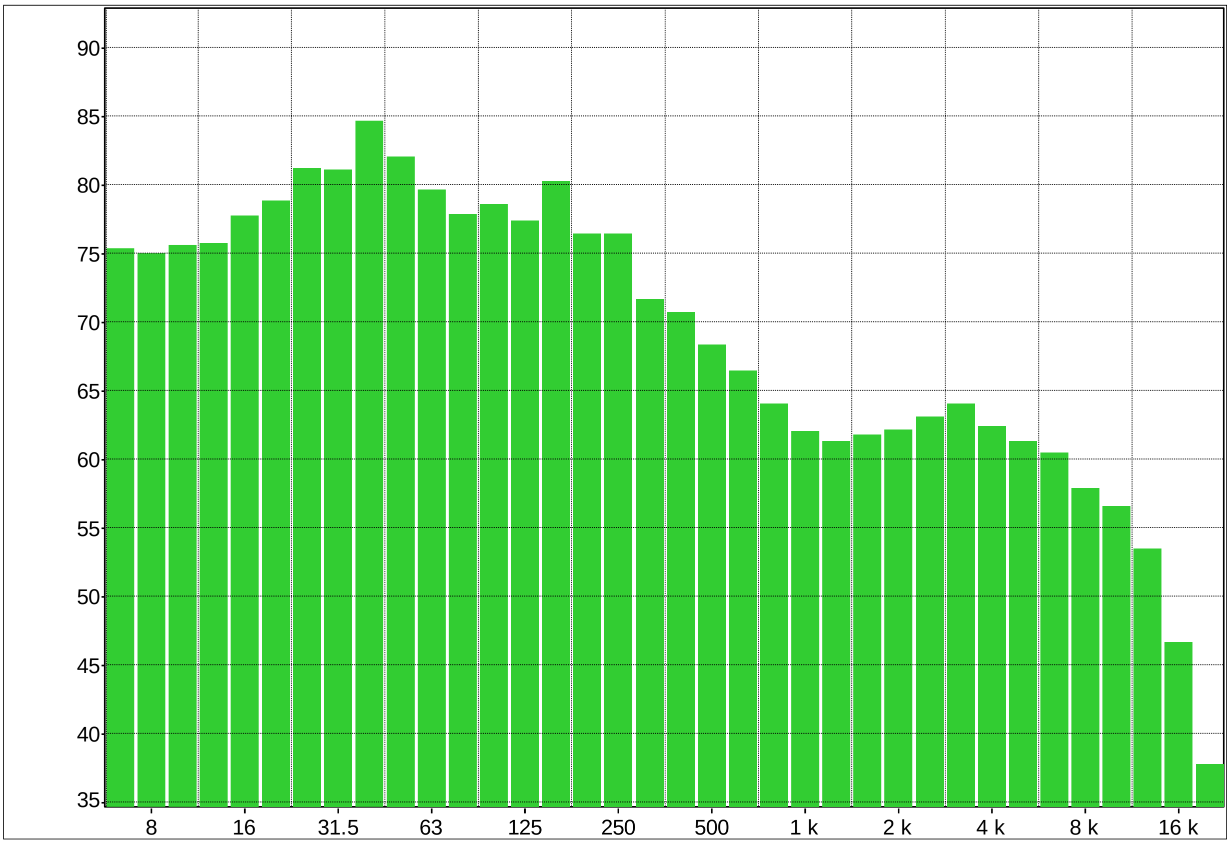


Fig 3 – V9 Cyclo-Filter Fan-Housing

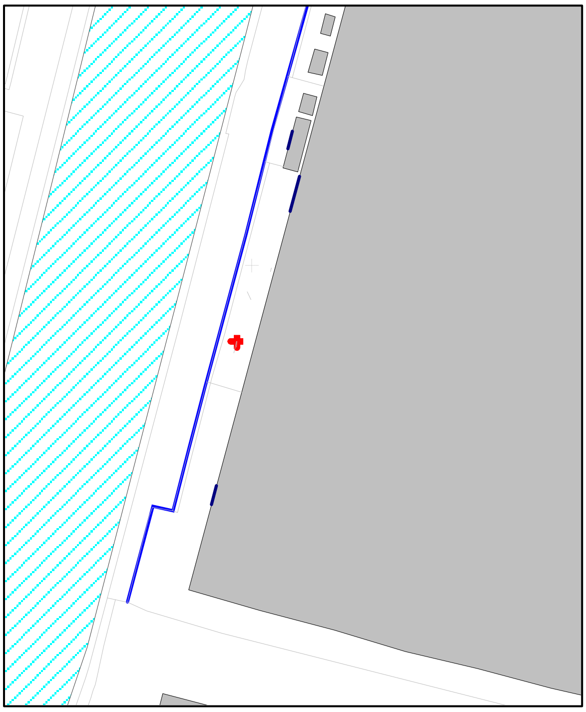


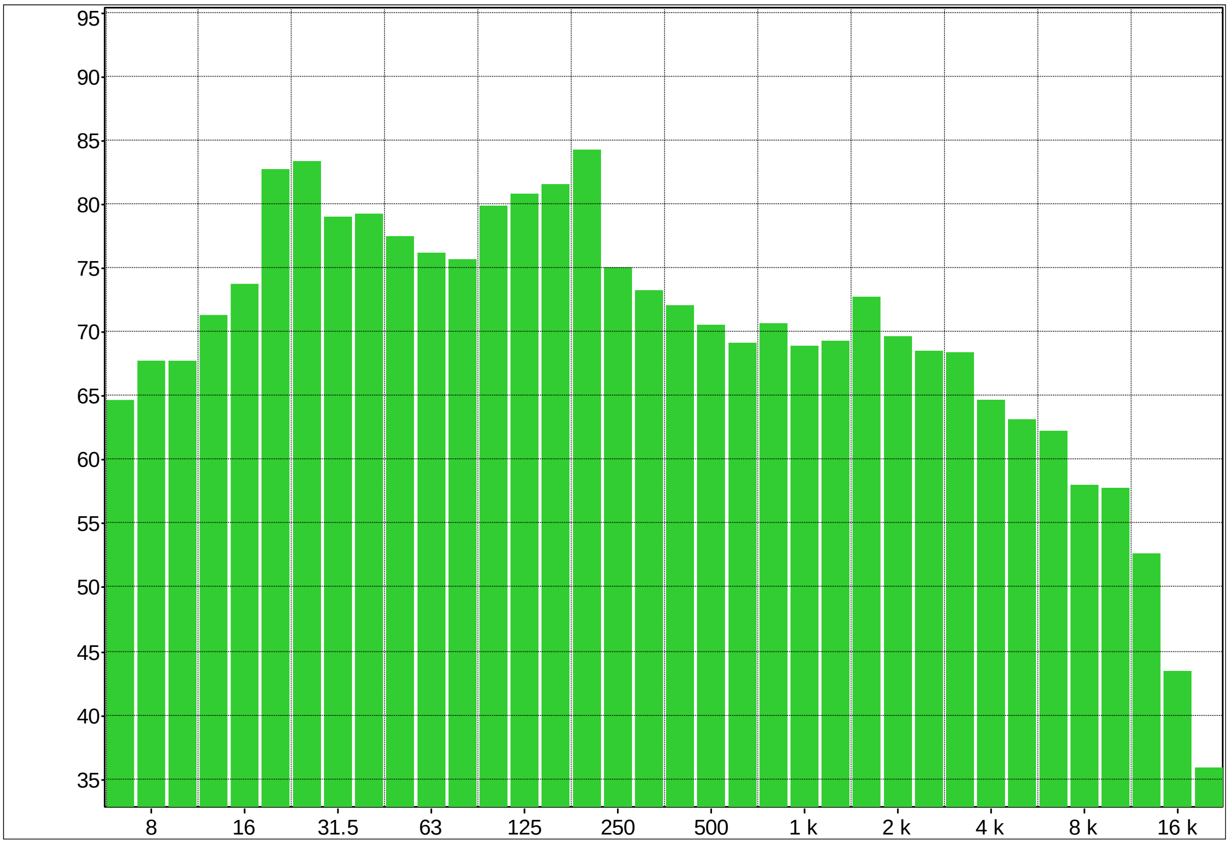


1/3 Octave LLeq Spectrum at 1.80m distance and 5.62m height

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

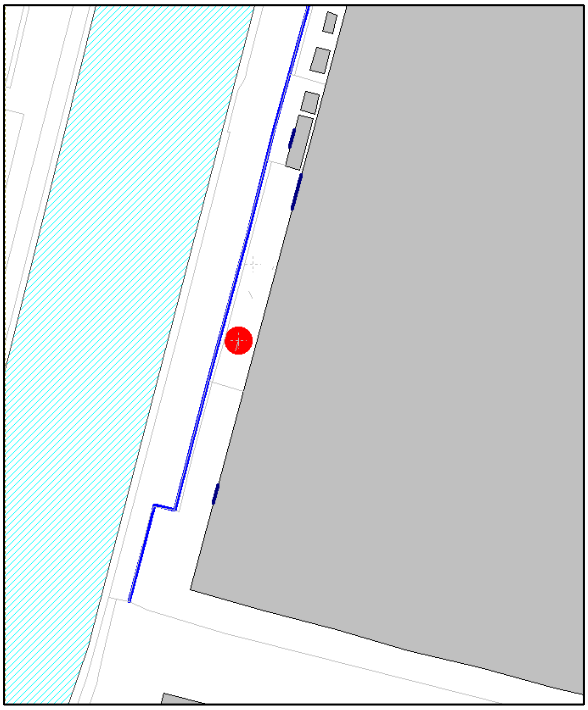


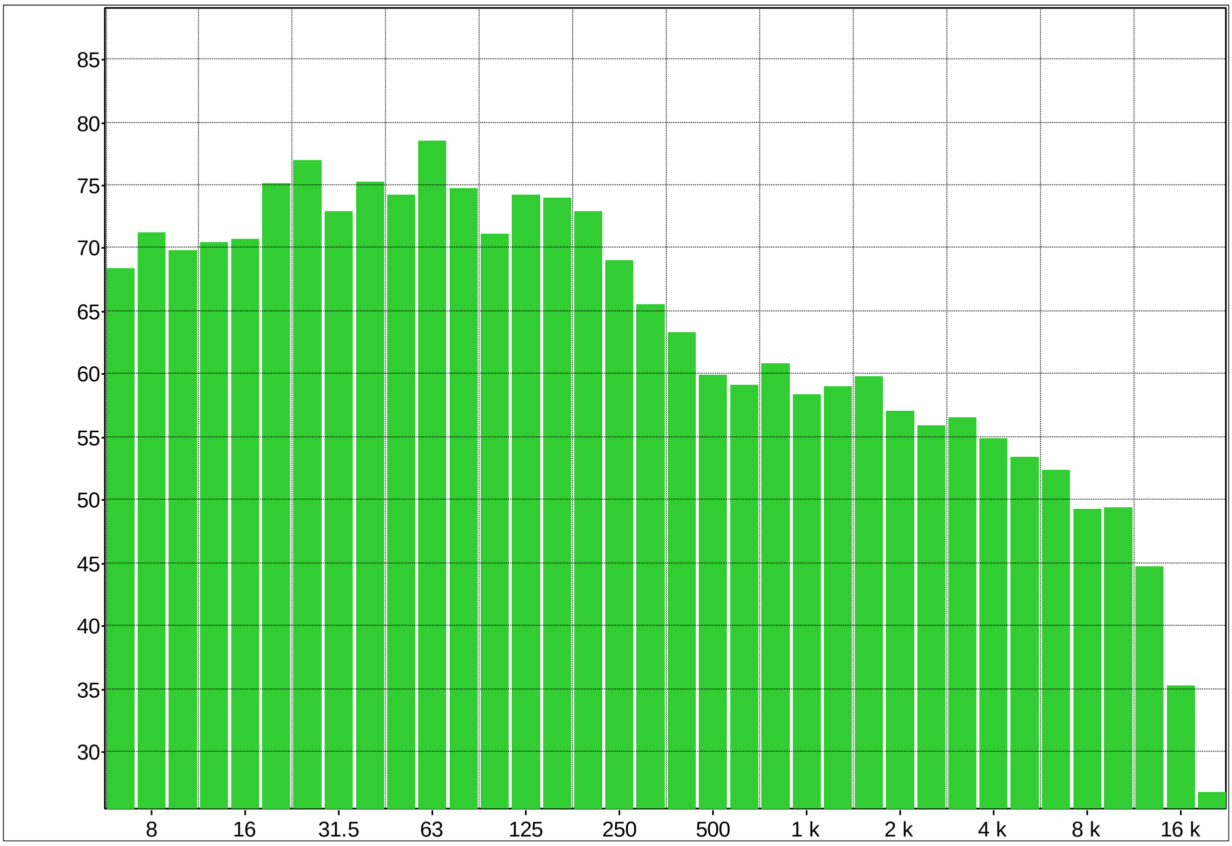


1/3 Octave LLeq Spectrum at 1.80m distance and 2.22m height

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

Fig 5 – V9 Cyclo-Filter

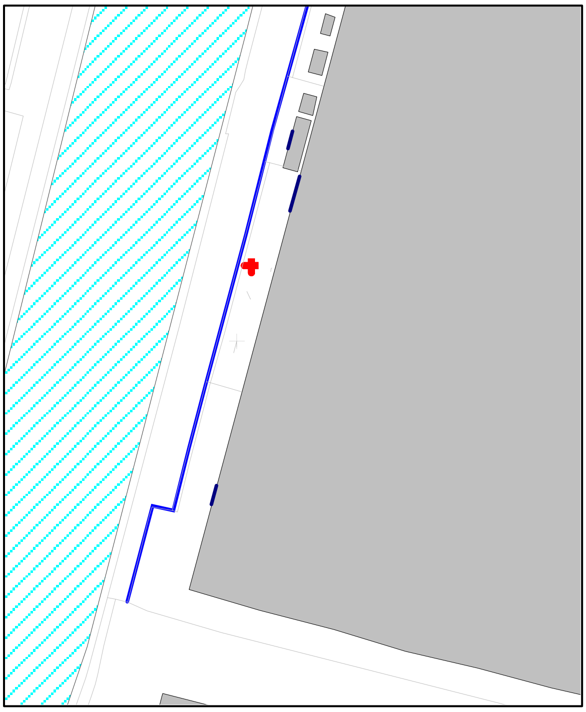


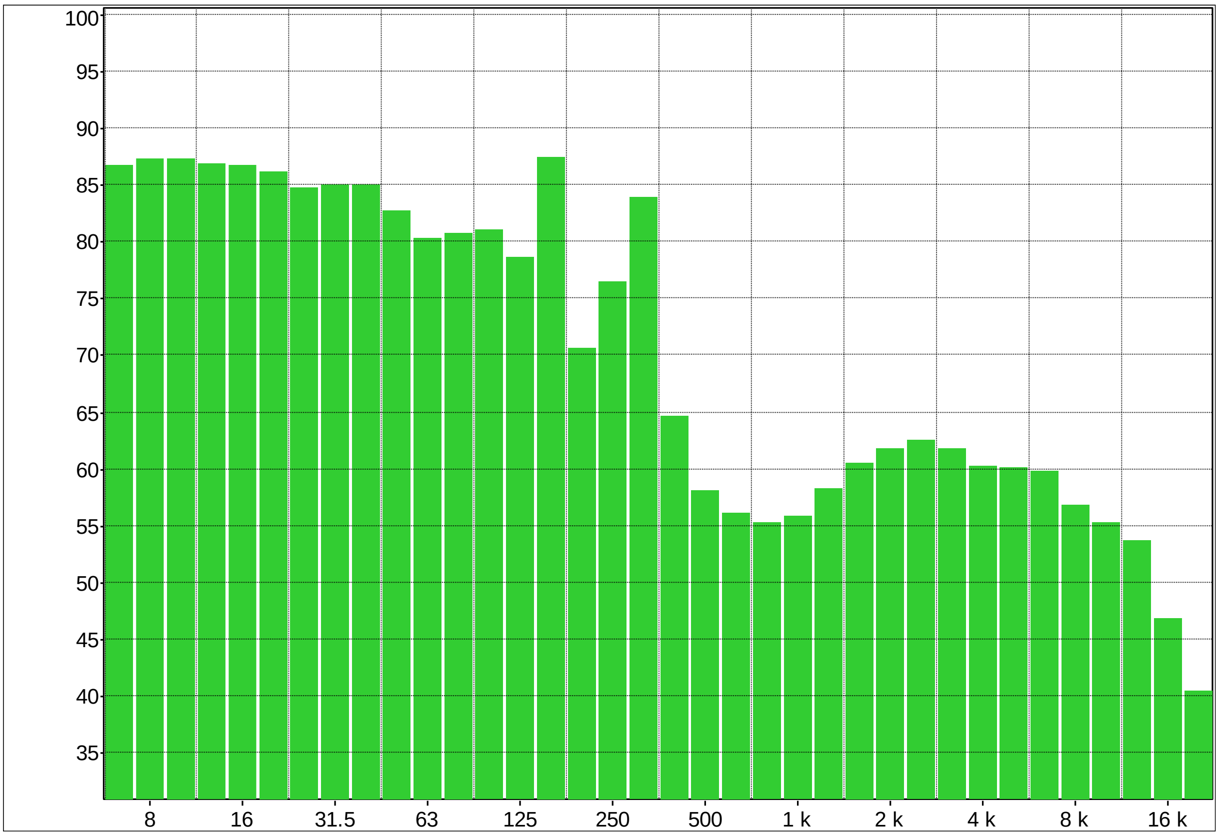


1/3 Octave LLeq Spectrum at 2.00m distance and 8.56m height

SOURCE DESCRIPTION	D (m)	H (m)	LAeq	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)

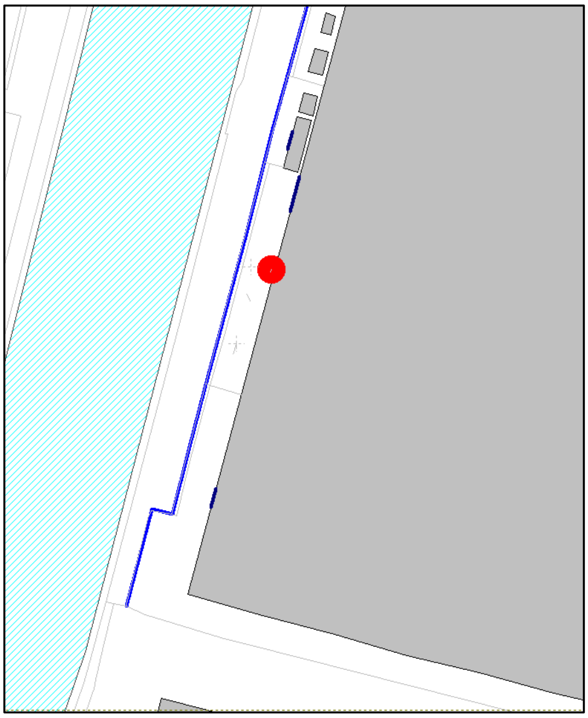


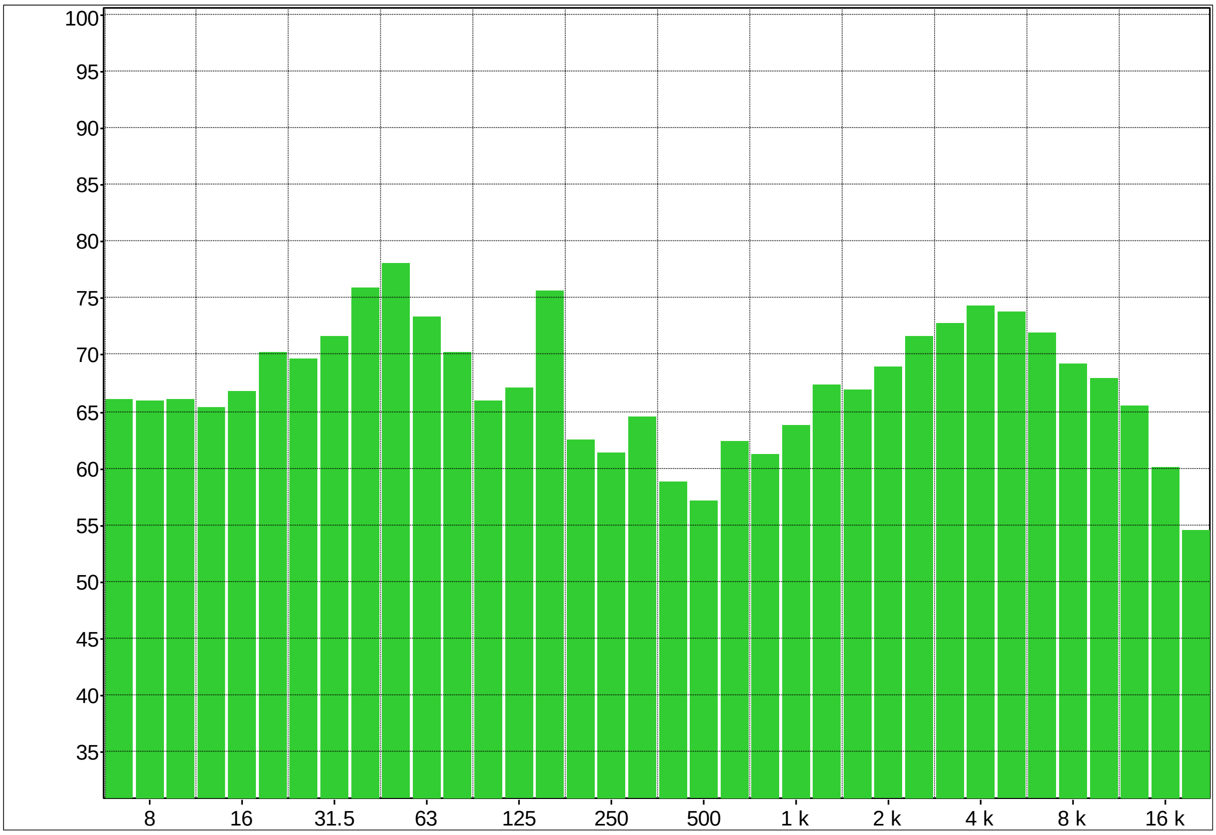


1/3 Octave LLeq Spectrum at 1.60m distance and 5.62m height

SOURCE DESCRIPTION	D (m)	H (m)	LAeq	31.5	63	125	250	500	1000	2000	4000	8000
DUST PLANT-5 (OUTLET)	1.60	5.62	**79**	**50**	**60**	**73**	**76**	**63**	**61**	**68**	**66**	**61**

Fig 7 – Dust Plant-5 (Inlet)

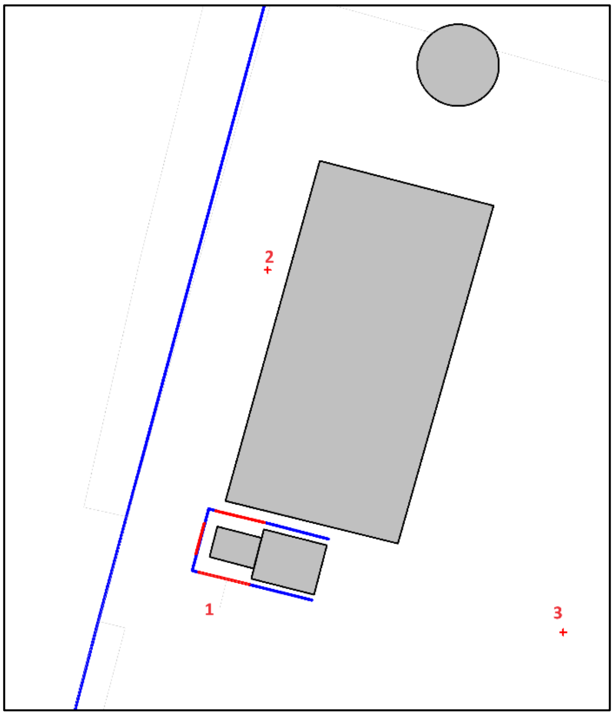


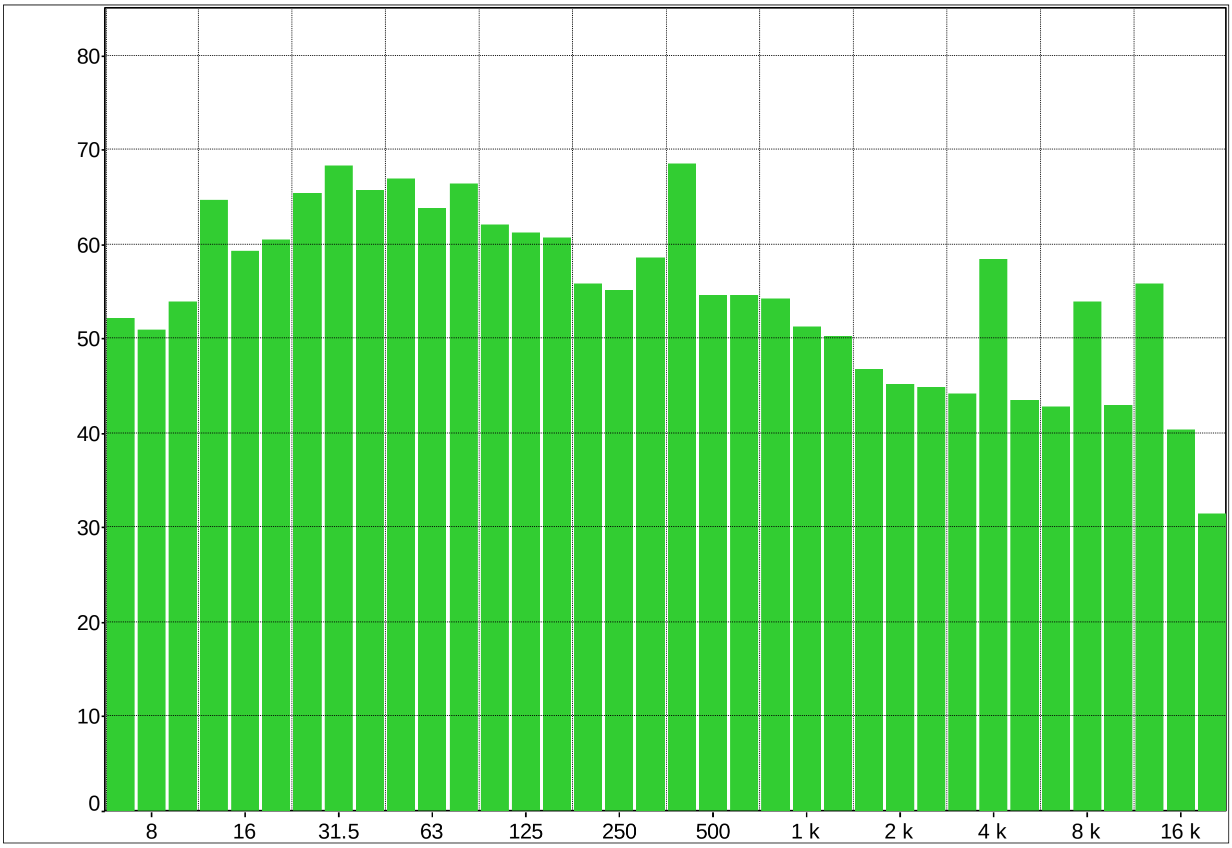


1/3 Octave LLeq Spectrum at 0.80m distance and 5.82 height

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

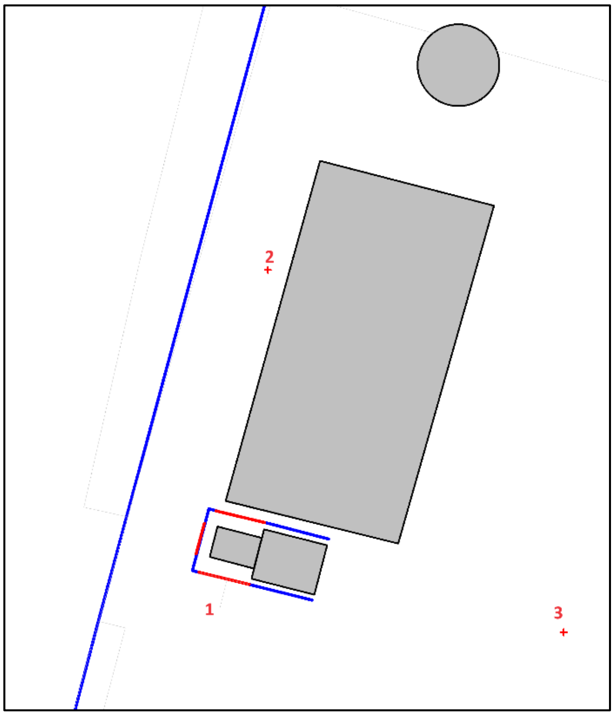


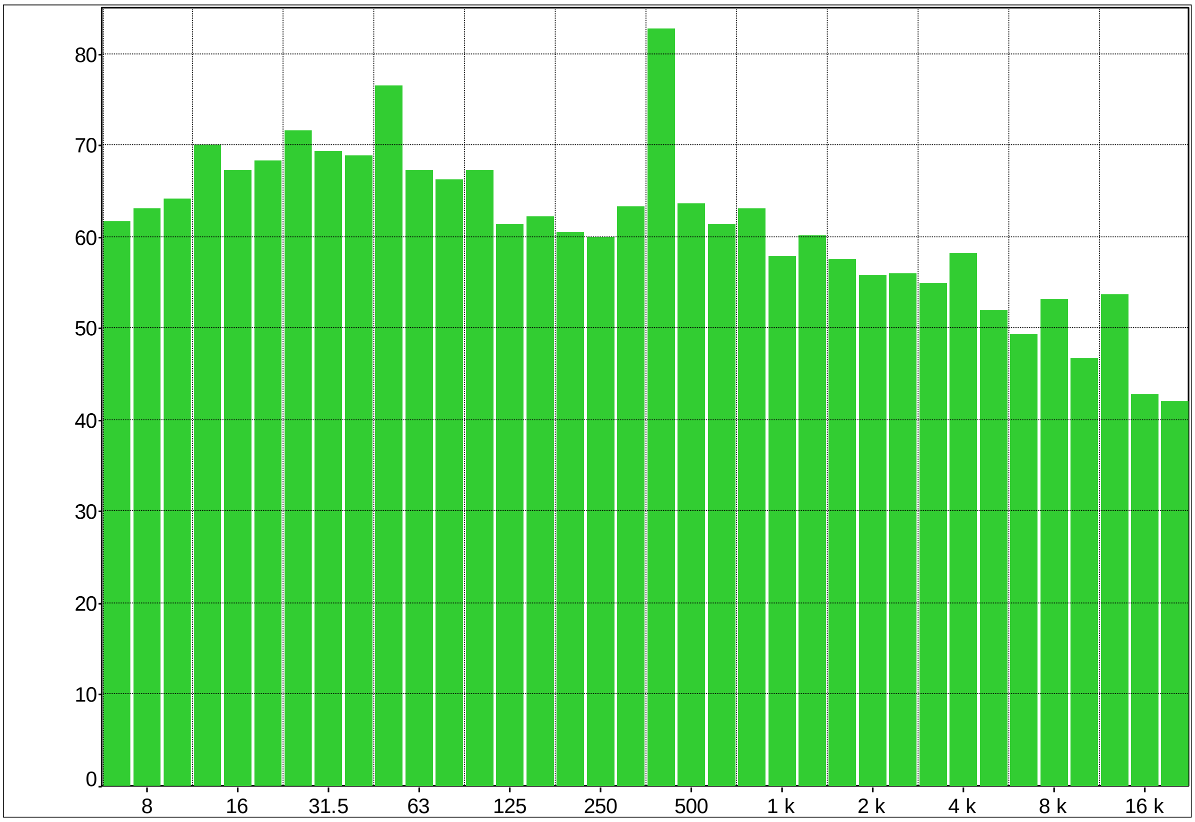


1/3 Octave LLeq Spectrum at 1.00m distance from Opening and 1.5 m height

SOURCE DESCRIPTION	D (m)	H (m)	LAeq	31.5	63	125	250	500	1000	2000	4000	8000
RTO OPENING	1.00	1.50	**68**	**32**	**44**	**50**	**53**	**66**	**57**	**52**	**60**	**53**

Fig 8b – Regenerative Thermal Oxidiser (RTO) Burner Motor (2) & Outlet Pipe (3)

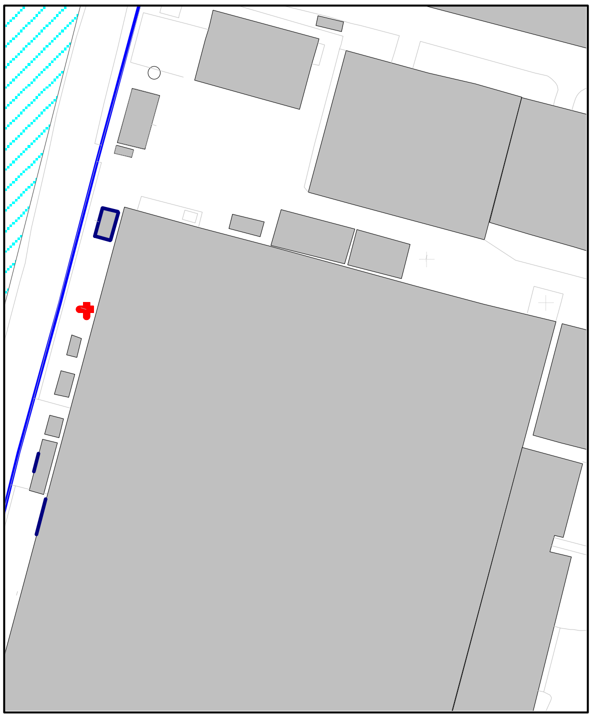


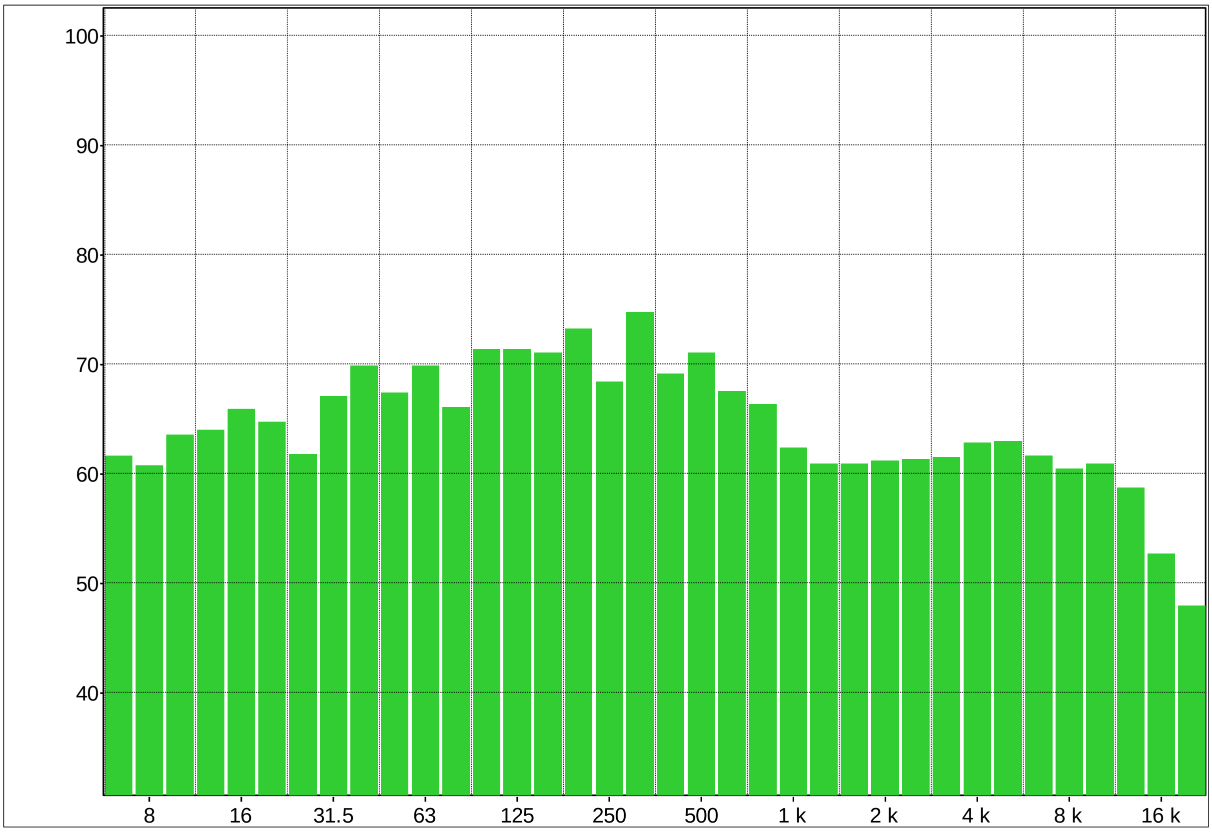


1/3 Octave LLeq Spectrum at 1.00m distance from the Burner Motor and 1.00 m height

SOURCE DESCRIPTION	D (m)	H (m)	LAeq	31.5	63	125	250	500	1000	2000	4000	8000
BURNER MOTOR	1.00	1.00	**80**	**35**	**51**	**53**	**58**	**79**	**66**	**62**	**61**	**54**
RTO PIPE	1.00	2.00	**67**	**32**	**41**	**53**	**56**	**62**	**64**	**55**	**51**	**42**

Fig 9 – Water Cooling Tower (Canal-Facing)

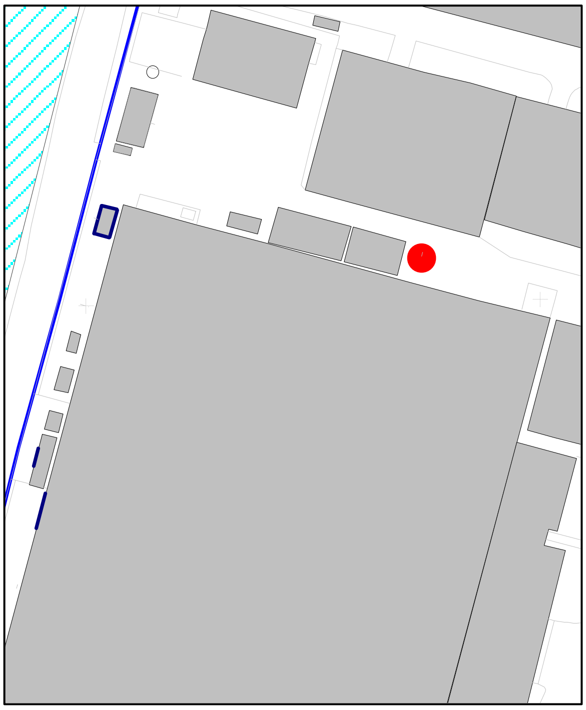


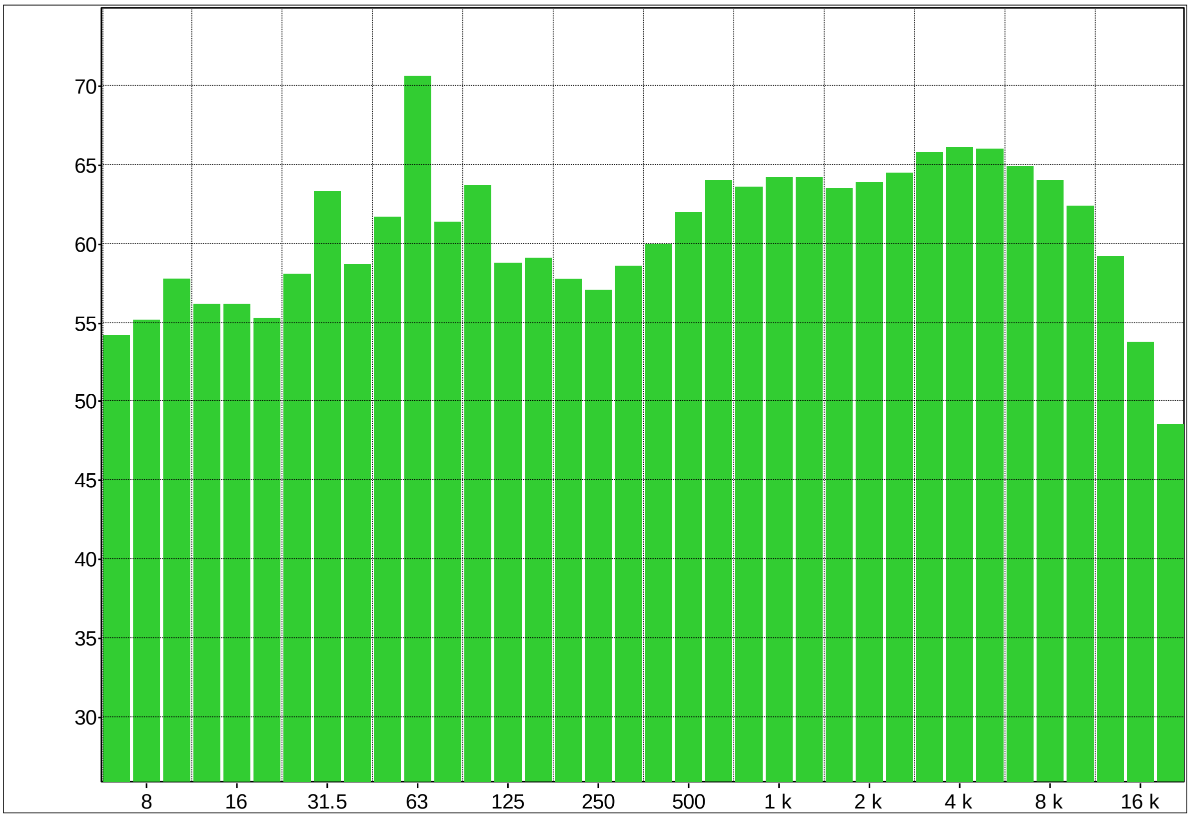


1/3 Octave LLeq Spectrum at 1.20m distance and 1.82m height

SOURCE DESCRIPTION	D (m)	H (m)	LAeq	31.5	63	125	250	500	1000	2000	4000	8000
WATER COOLING (CANAL)	1.20	1.82	**76**	**33**	**47**	**60**	**69**	**71**	**69**	**67**	**68**	**65**
WATER COOLING (CANAL)	1.80	7.68	**70**	**28**	**45**	**59**	**62**	**65**	**63**	**61**	**59**	**55**

Fig 10 – Water Cooling Tower (Side)

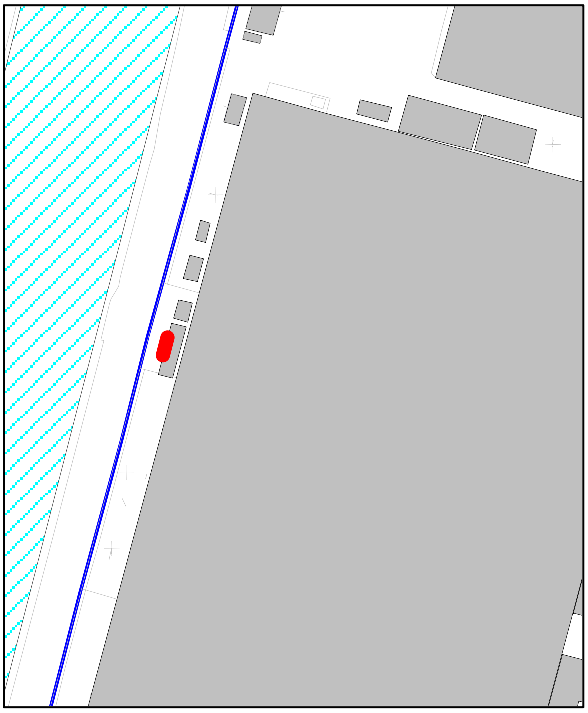


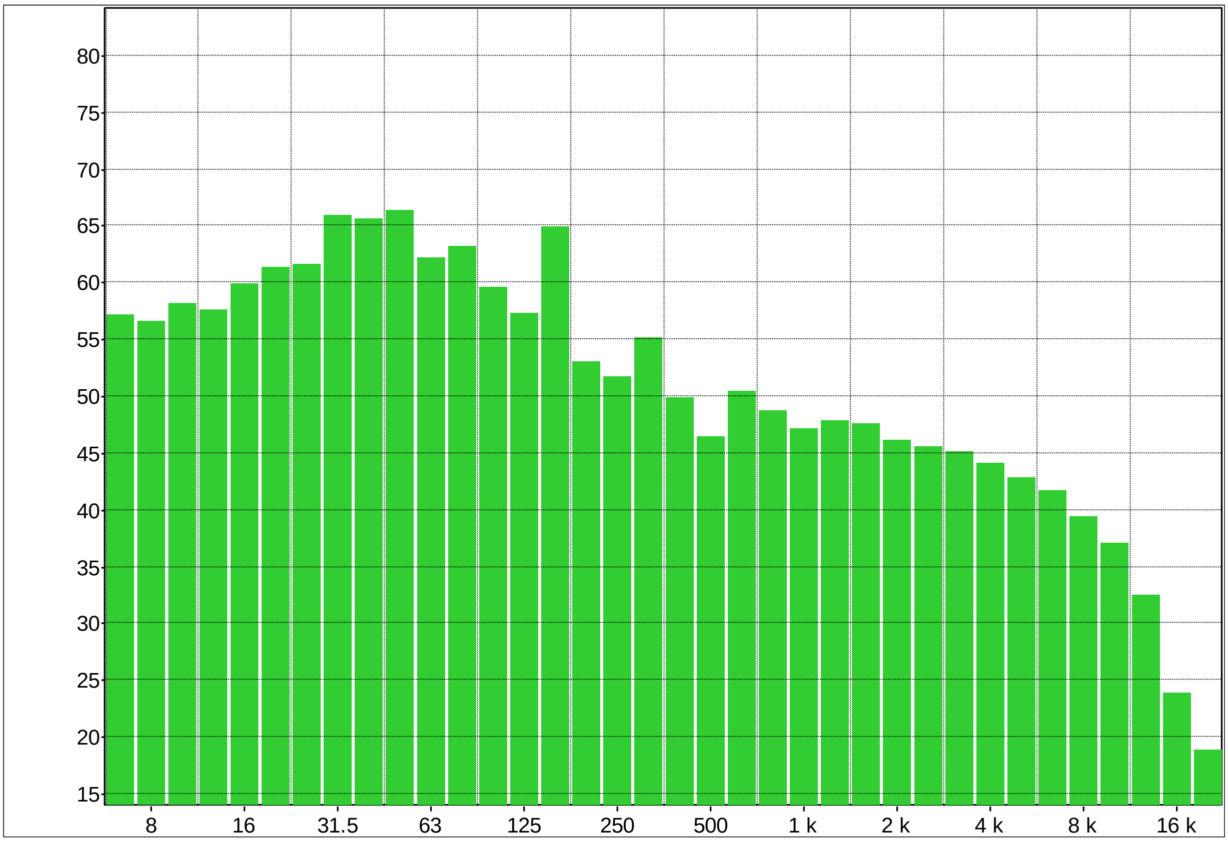


1/3 Octave LLeq Spectrum at 0.90m distance and 1.82m height

SOURCE DESCRIPTION	D (m)	H (m)	LAeq	31.5	63	125	250	500	1000	2000	4000	8000
WATER COOLING (SIDE)	0.90	1.82	**76**	**26**	**45**	**50**	**54**	**64**	**69**	**70**	**72**	**67**
WATER COOLING (SIDE)	0.90	6.70	**69**	**26**	**41**	**49**	**53**	**59**	**62**	**62**	**65**	**56**

Fig 11 – Boiler Doors

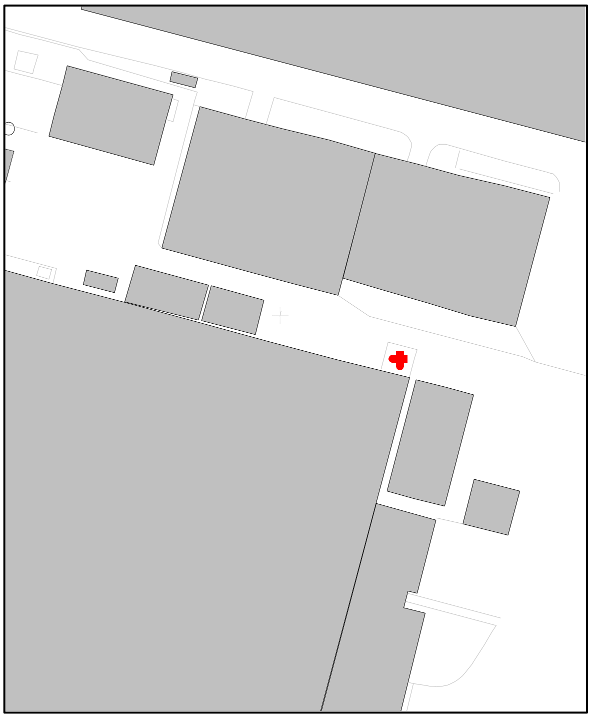


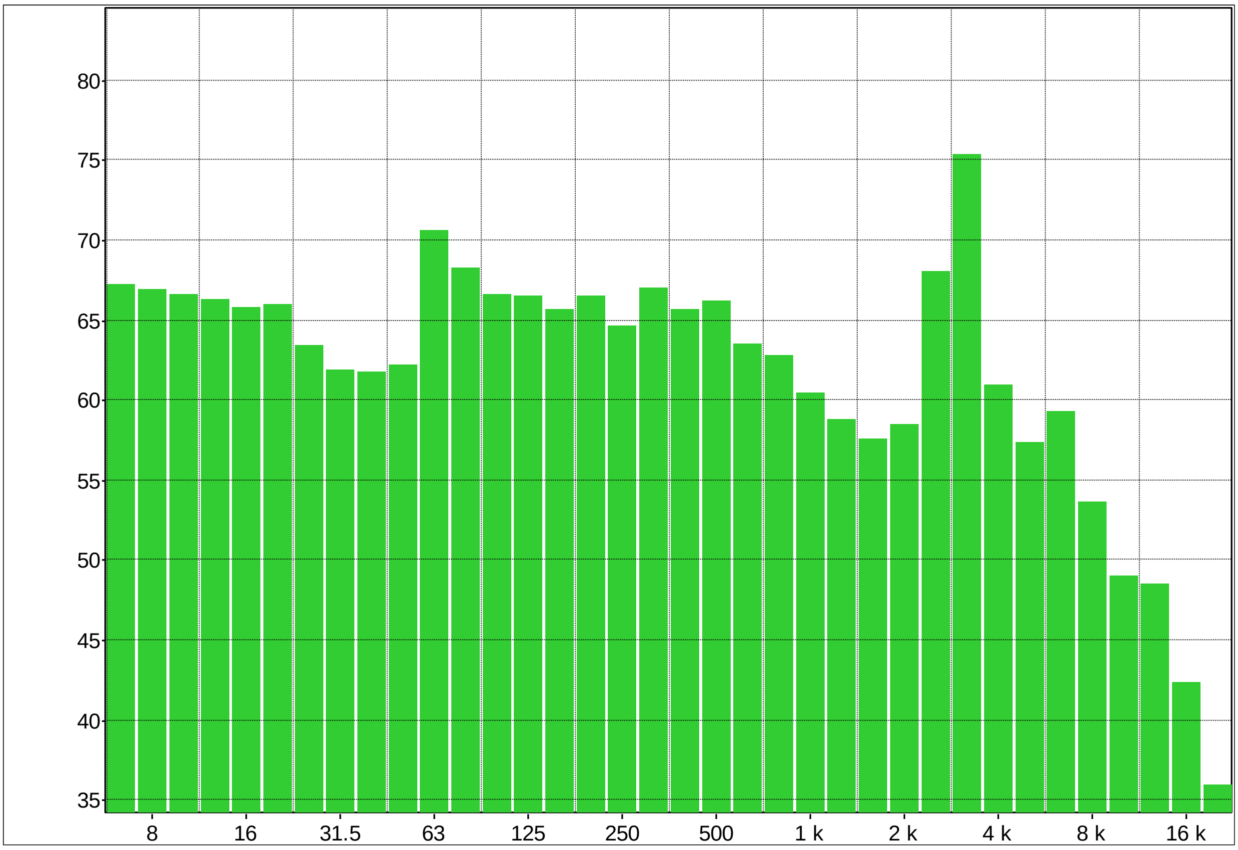


1/3 Octave LLeq Spectrum at 0.80m distance and 1.82m height

SOURCE DESCRIPTION	D (m)	H (m)	LAeq	31.5	63	125	250	500	1000	2000	4000	8000
BOILER DOORS	0.80	1.82	**59**	**30**	**43**	**50**	**50**	**51**	**53**	**52**	**50**	**43**

Fig 12 – Scrubbers

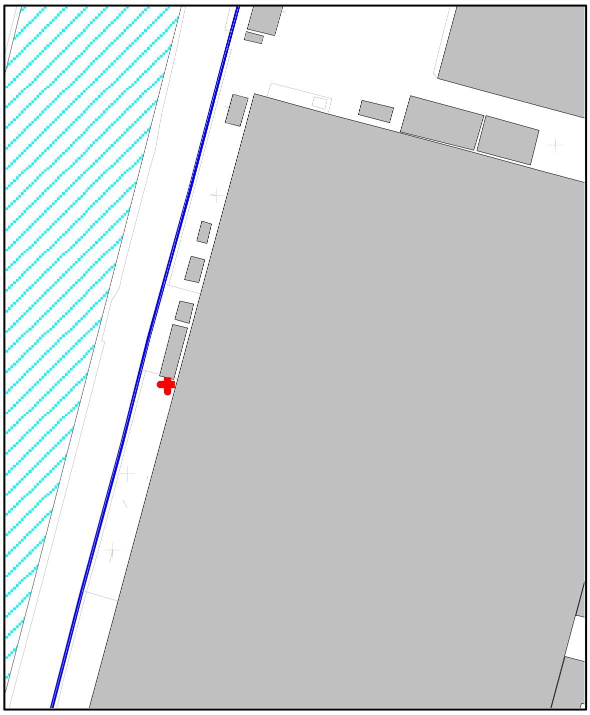


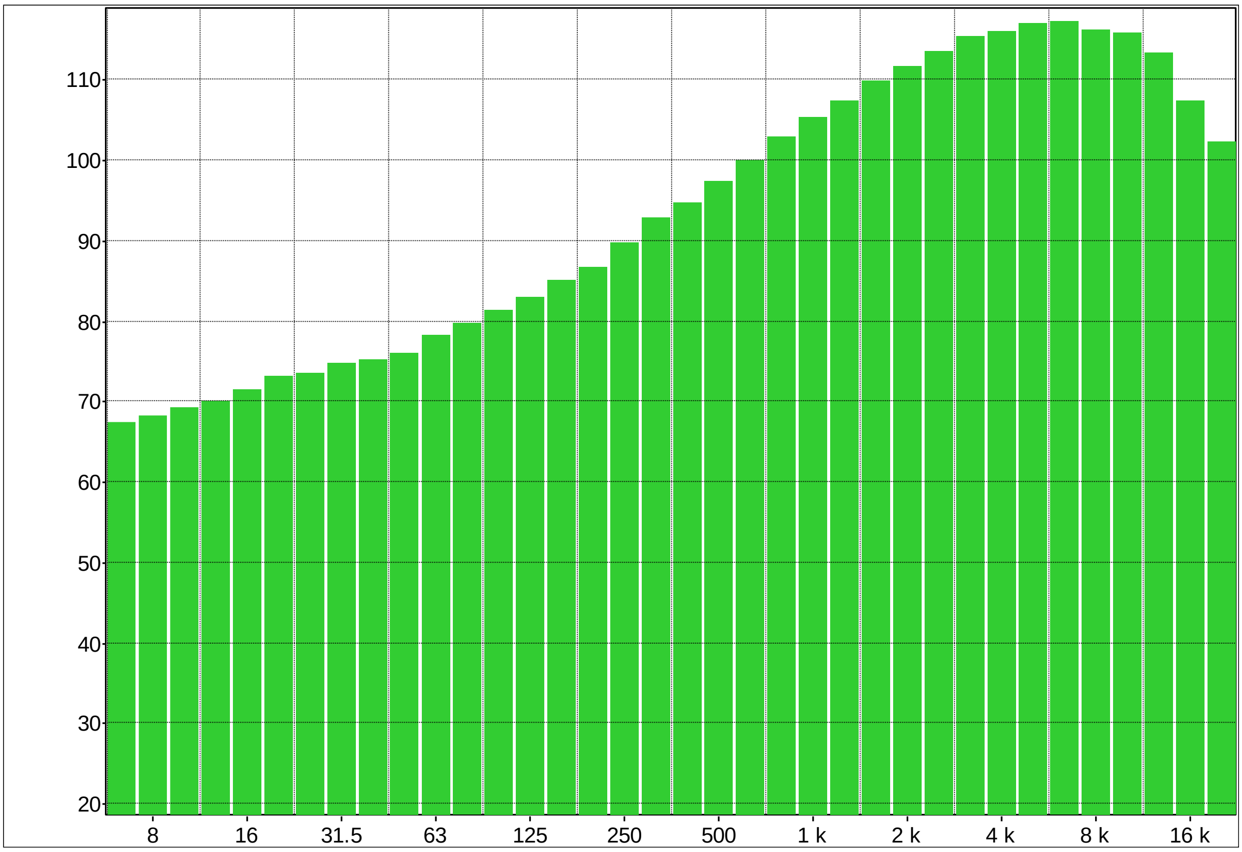


1/3 Octave LLeq Spectrum at 2.00m distance and 1.82m height

SOURCE DESCRIPTION	D (m)	H (m)	LAeq	31.5	63	125	250	500	1000	2000	4000	8000
SCRUBBERS	2.00	1.82	**78**	**27**	**47**	**55**	**62**	**67**	**66**	**70**	**77**	**60**

Fig 13 – Boiler Vent

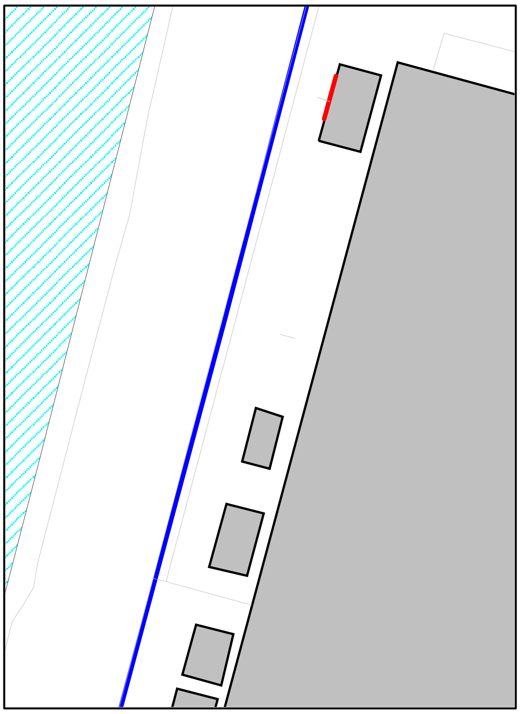


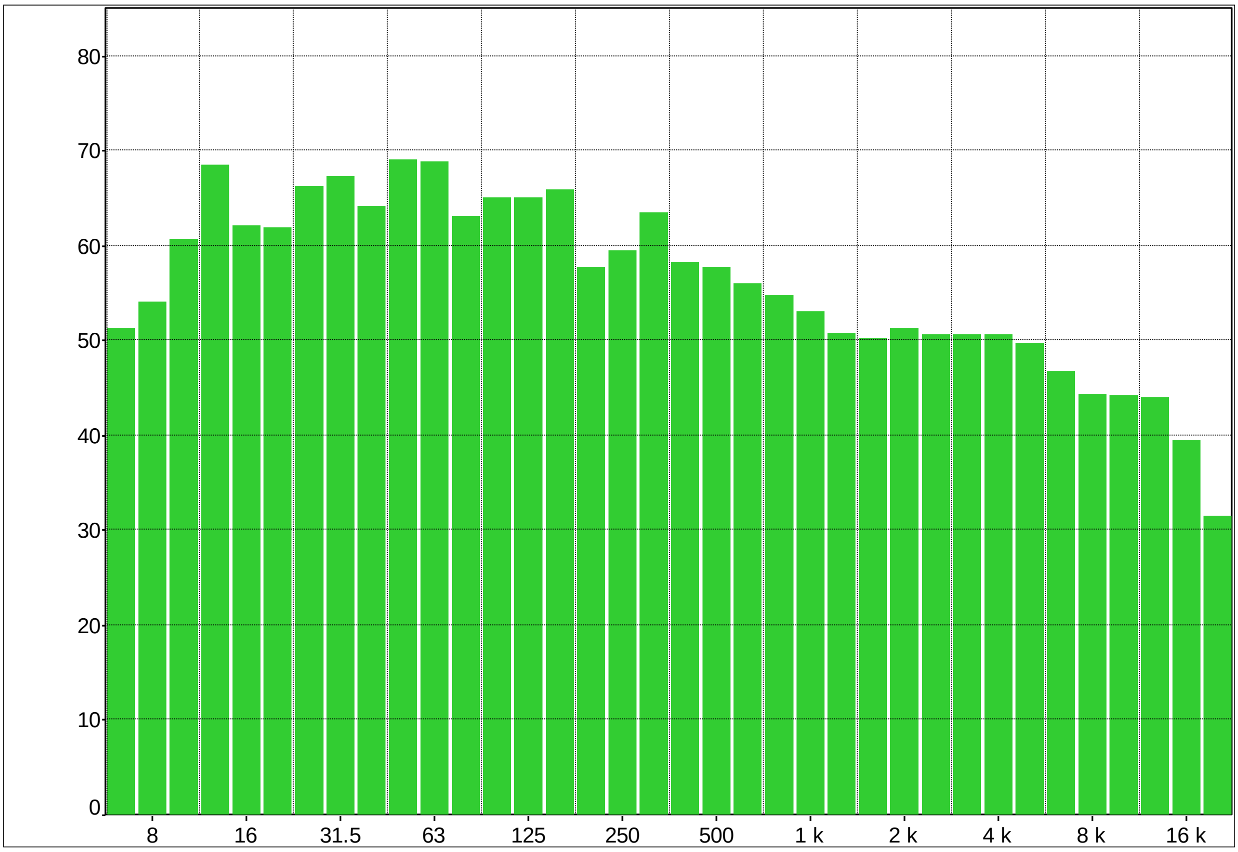


1/3 Octave LLeq Spectrum at 2.40m distance and 6.70m height

SOURCE DESCRIPTION	D (m)	H (m)	LAeq	31.5	63	125	250	500	1000	2000	4000	8000
BOILER VENT	2.40	6.70	**125**	**40**	**57**	**72**	**87**	**99**	**110**	**118**	**122**	**120**

Fig 14 – Carbon Filter





1/3 Octave LLeq Spectrum at 1.0m distance and 1.5m height with the door Open

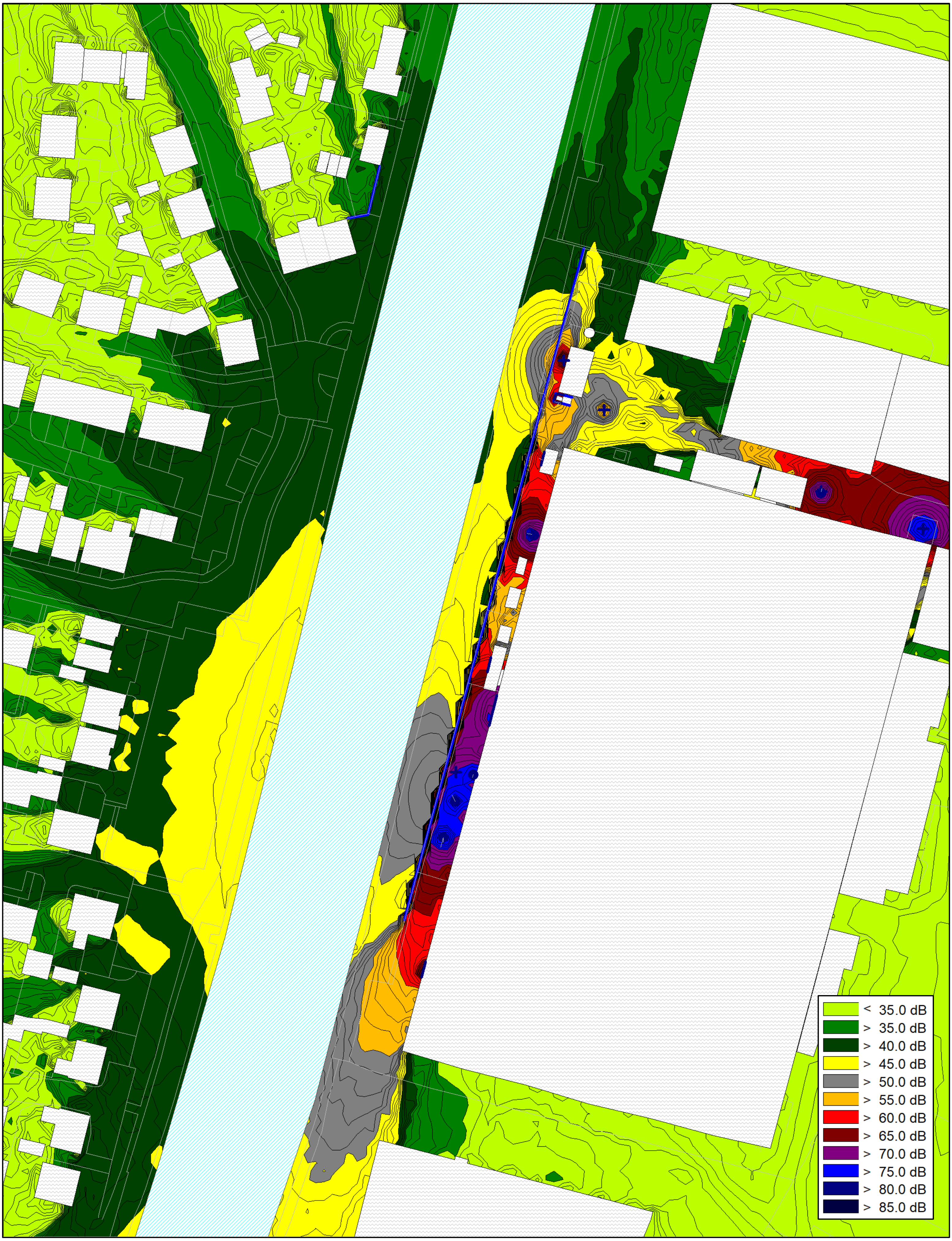
SOURCE DESCRIPTION	D (m)	H (m)	LAeq	31.5	63	125	250	500	1000	2000	4000	8000
CARBON FILTER (CLOSED)	1.00	1.50	**63**	**30**	**45**	**52**	**55**	**57**	**56**	**55**	**54**	**47**

Octave LAeq Spectrum contribution form Carbon Filter at 1.0m distance and 1.5m height with the door Closed

14. NOISE MAPS

MAP 1: Permali: Day SNL Grnd Flr No Mitigation LAeq (dBA)

SOUND BARRIER SOLUTIONS



MAP 2: Permali: Day SNL Grnd Flr 6x125m Bar/Temp/Added LAeq (dBA)

SOUND BARRIER SOLUTIONS

MAP 3: Permali: Day SNL Grnd Flr (6x125+4x44)m Bar/Added LAeq (dBA)

SBS
SOUND BARRIER SOLUTIONS

MAP 4: Permali : Night SNL First Flr No Mitigation LAeq (dBA)

SBS
SOUND BARRIER SOLUTIONS

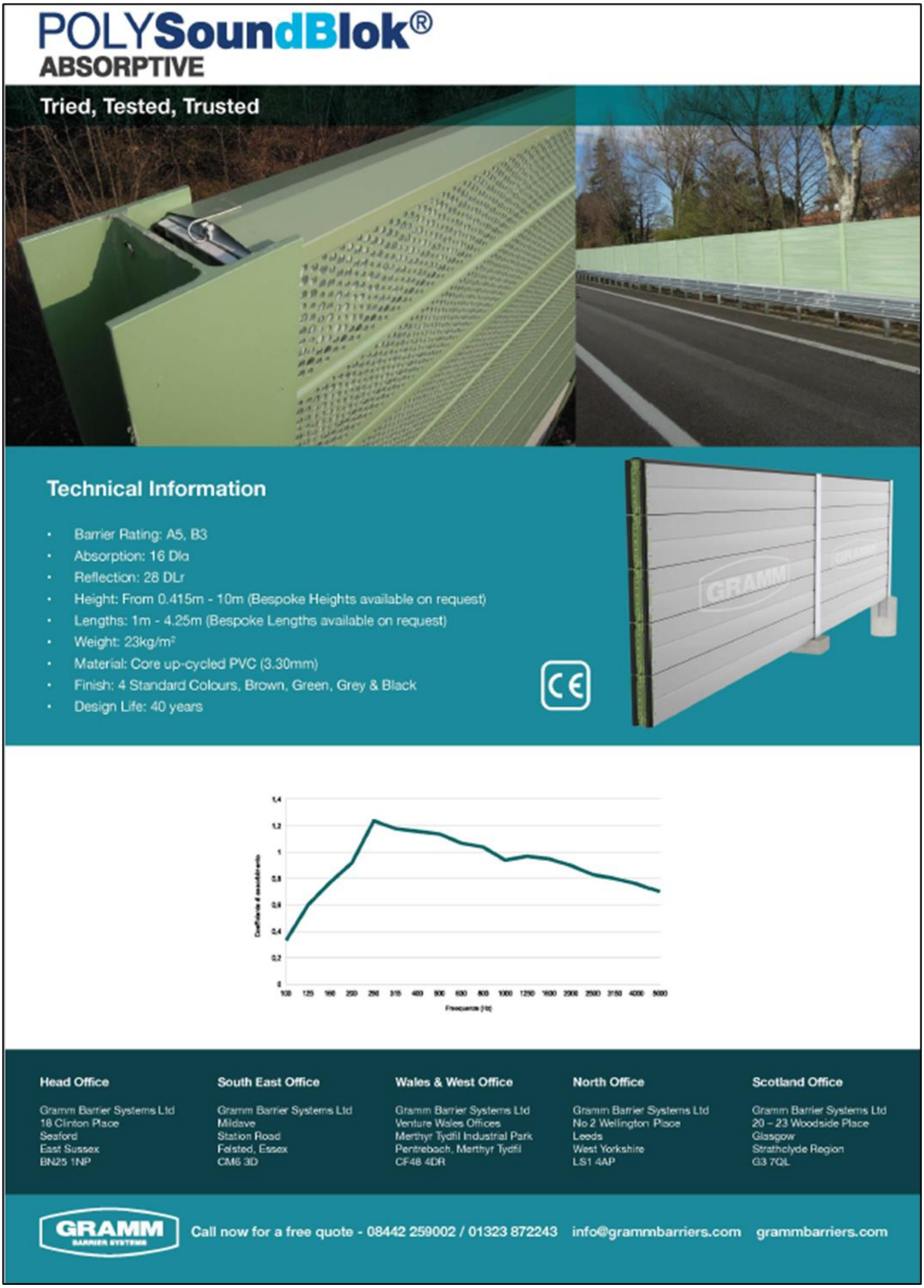
MAP 5: Permali : Night SNL First Flr 6x125m Bar/Temp/Added LAeq (dBA)

MAP 6: Permali: Night SNL First Flr (6x125+4x44)m Bar/Added LAeq (dBA)

SOUND BARRIER SOLUTIONS

15: APPENDICES

APPENDIX A
GRAMM – POLY SOUNDBLOK



POLYSoundBlok®
ABSORPTIVE

Tried, Tested, Trusted

Technical Information

- Barrier Rating: A5, B3
- Absorption: 16 Dlα
- Reflection: 28 DLr
- Height: From 0.415m - 10m (Bespoke Heights available on request)
- Lengths: 1m - 4.25m (Bespoke Lengths available on request)
- Weight: 23kg/m²
- Material: Core up-cycled PVC (3.30mm)
- Finish: 4 Standard Colours, Brown, Green, Grey & Black
- Design Life: 40 years

Head Office

Gramm Barrier Systems Ltd
18 Clinton Place
Seaford
East Sussex
BN25 1NP

South East Office

Gramm Barrier Systems Ltd
Mildave
Station Road
Felsted, Essex
CM6 3D

Wales & West Office

Gramm Barrier Systems Ltd
Venture Wales Offices
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North Office

Gramm Barrier Systems Ltd
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Gramm Barrier Systems Ltd
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GRAMM BARRIER SYSTEMS SOUNDBLOK RANGE

POLYSoundBlok®

ABSORPTIVE

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 A5	DLR 28 dB Dla 16 dB(A)	40 years - Panels 60 years - Posts	2 1

Foundation Type	Fixing Method / Post Type	Fixings	Maintenance
1) Shallow concrete pad footing set a 3.0 or 4.25m centres. 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. 2) Steel RSJ posts set into augered foundations using ST5 concrete.	Stainless Steel	Zero Maintenance. Yearly inspection required.

Gramm Barrier Systems ltd noise barrier & fencing specialist.

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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 Permali 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 “Permali 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

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 Permali 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 Action 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:	Any public noise complaints should be assessed against remote noise monitoring records to **identify** any complaint is due noise generated by Permali or by a third unrelated party. Should the noise be identified as originating from Permali the level should be **interpreted** to confirm whether it constitutes a breach of the EPC. Should a breach be confirmed, the incident should be **investigated** to determine practical mitigation measures are put in place to ensure there is no re-occurrence.

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.

9. Risk Assessment:

Table 1: Categorisation of Noise Risk (Noise Effect Levels)

Category:	Risk Rating:	Characteristic of source and emissions at Noise Sensitive Receptors:	Action
1	**NOEL** No Observed Effect	No effect.	No measures required
2	**NOAEL** 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
3	**LOAEL** 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
4	**ADVERSE** Observed Adverse Effect Level		Mitigate and reduce to a minimum
5	**SOAEL** 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	• Phase 1 /2 Noise Barriers Installed • Primary Noise Sources Mitigated • Remote Noise Monitoring – Noise Management Program	4 (Day) 5 (Night)	NPSE: ADVERSE (Daytime) Observed Adverse Effect Level NPSE: SOAEL (Night-time) Significant Observed Adverse Effect Level 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	• Routine Monitoring of Operating Specific Noise On and Offsite	4 (Day) 5 (Night)	NPSE: ADVERSE (Daytime) Observed Adverse Effect Level NPSE: SOAEL (Night-time) Significant Observed Adverse Effect Level 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	• Routine Monitoring of Operating Specific Noise On and Offsite			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	• Routine Monitoring of Operating Specific Noise On and Offsite			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	• Routine Monitoring of Operating Specific Noise On and Offsite			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	• Restrict Opening to half-height or for Vehicular access only. • Normally keep closed when not in use or not	4	NPSE: ADVERSE Observed Adverse Effect Level	Offsite	Not Significant

		required for ventilation Dust plant emissions		Without Mitigation measures in place		
Specific Noise Source : Site Vehicles	Neighbours on Western Canal Bank downwind of emission points	• Replacement of Site Vehicle Reversing Sirens with 'White Noise' Sirens	4	NPSE: ADVERSE Observed Adverse Effect Level Without Mitigation measures in place	Offsite	Not Significant

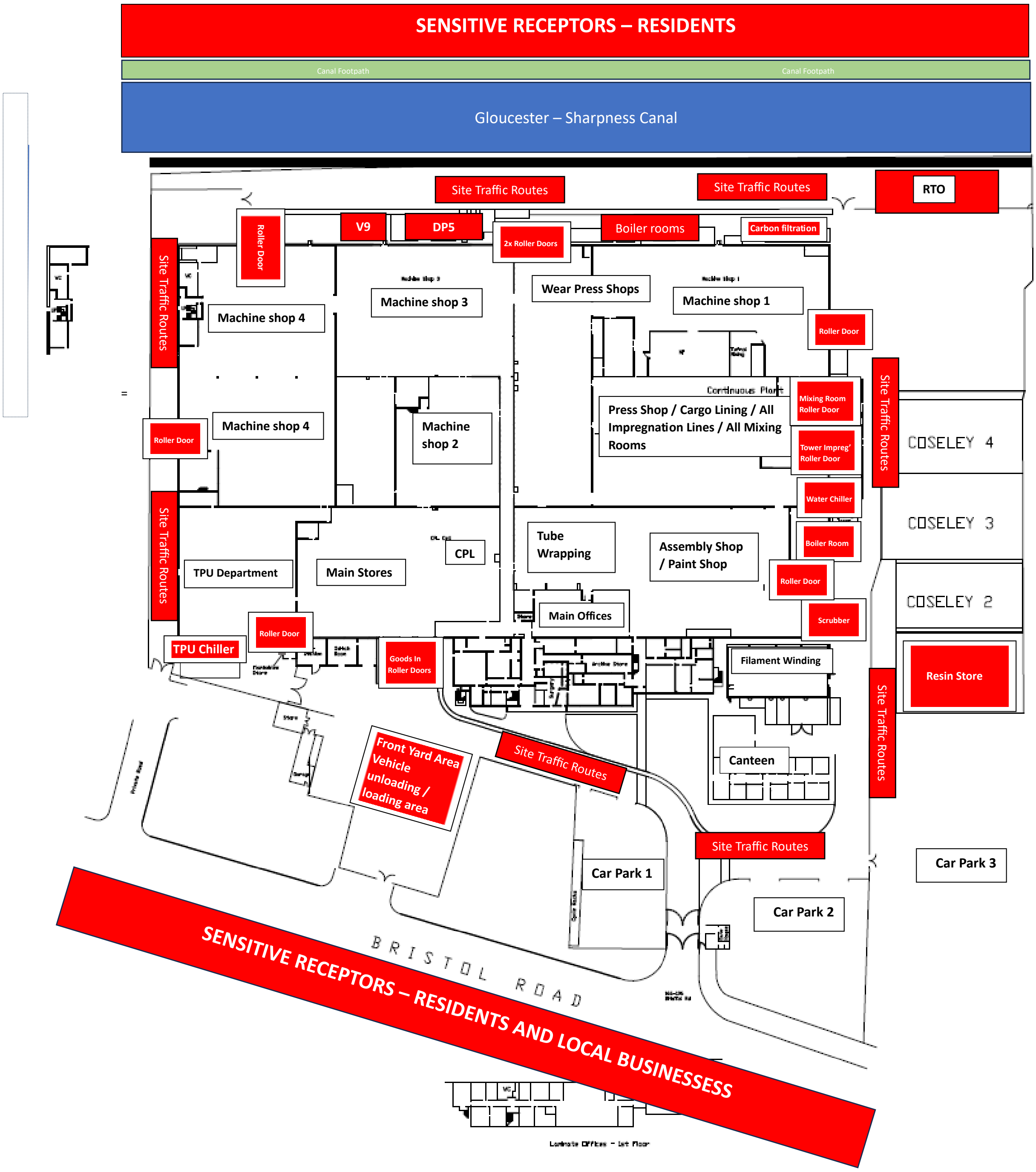
11. Management & Responsibilities:

Environmental Noise:	Personnel Responsible:
Adherence to all operational controls implemented to minimise noise emissions being generated from onsite activities, to include: Control of site operational hours. Control of site fork-lift truck operations during evening and night shift. Control of external plant operating times. Controls for closing of roller doors / final exit doors / factory windows during evening and night work. Controlling waste collection times. Control of logistics – deliveries and collection times. Control of maintenance activities. Control of contractor activities.	All Employees Production Managers Supervisors Team Leaders HS&E Manager Facilities Manager Maintenance Manager Operations Director 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 Facilities Management Team Remote Monitoring Service 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 Facilities Management Team Remote Monitoring Service Integration Team
Employees responsible for dealing with noise management. 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 Facilities Manager Maintenance Manager Integration Manager Operations Director Managing Director
Employees responsible for collation of measuring and monitoring records	Facilities Management Team HS&E Manager
Completion and submission of mandatory annual reporting to permit regulators.	Facilities Management Team 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 Maintenance Manager

Employees responsible for all external plant and equipment. PPM scheduled at correct frequencies for manufacturing processes and external abatement equipment are established.	Facilities Manager Maintenance Manager Facilities Co-ordinator HS&E Team
Effective engagement with residents and local authority	Operations Director HS&E Manager
Annual Management Review of this document	Facilities Manager Operations Manager HS&E Manager Managing Director

12. Noise Emission Points:

Site noise emission point highlighted on map below from access, egress points, site traffic movements and external plant and equipment:



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.

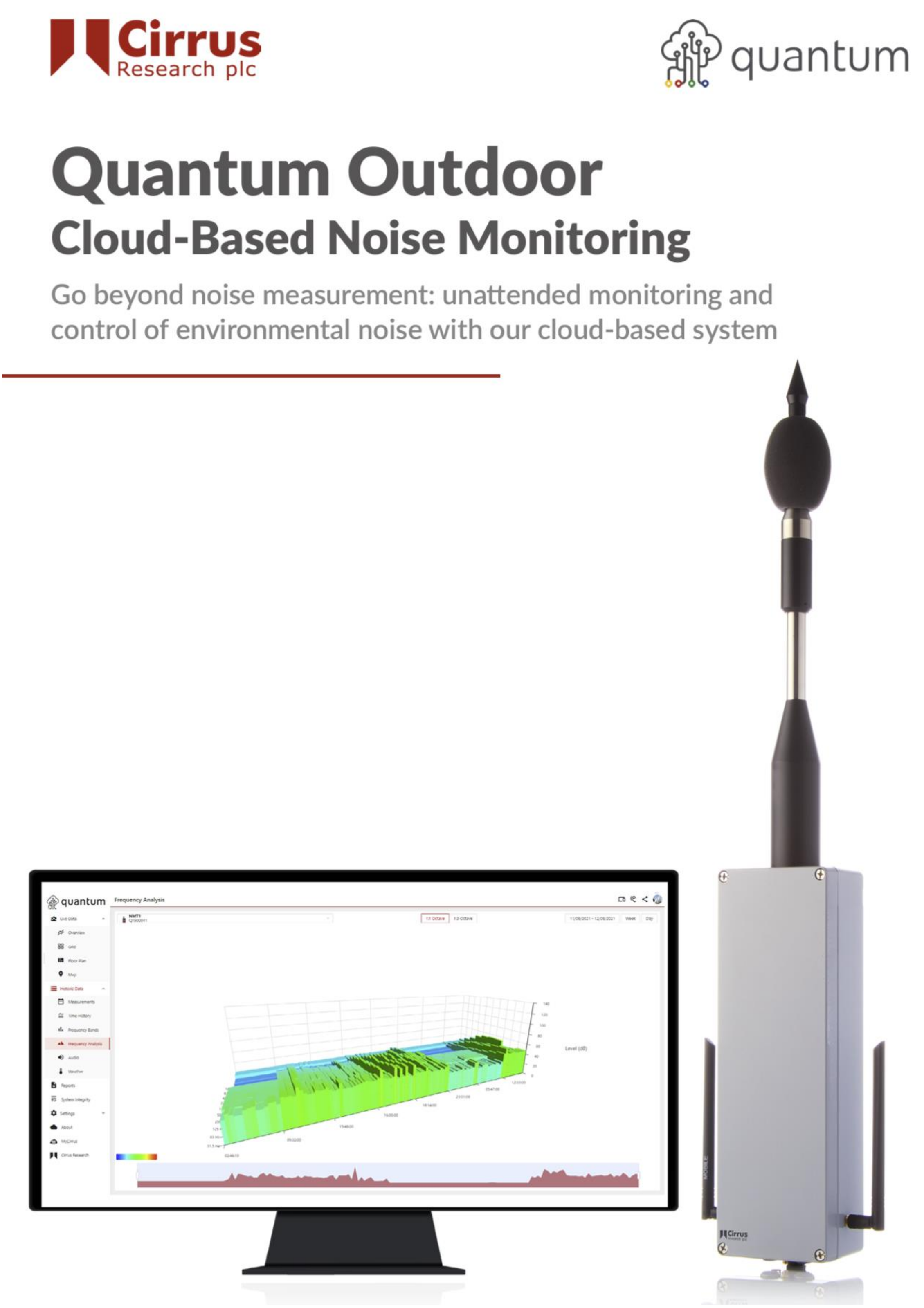
- **PROACTIVE NOISE MANAGEMENT**
  The monthly reports will be used to:
  - **Verify** – compliance with the permit.
  - **Identify** – whether an exceedance originated from Permali or a third-party source.
  - **Interpret** – whether an exceedance constituted a valid breach of permit.
  - **Investigate** – 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

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.



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Quantum Outdoor

Cloud-Based Noise Monitoring

Go beyond noise measurement: unattended monitoring and control of environmental noise with our cloud-based system

ENVIRONMENTAL
SERVICES

Report for the Periodic Monitoring of Emissions to Atmosphere

Permali Ltd (Gloucester)

Thermal Oxidiser

Permit No: np
Installation: Gloucester
Monitoring Dates: 31st August 2023
Site Address: Permali 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)

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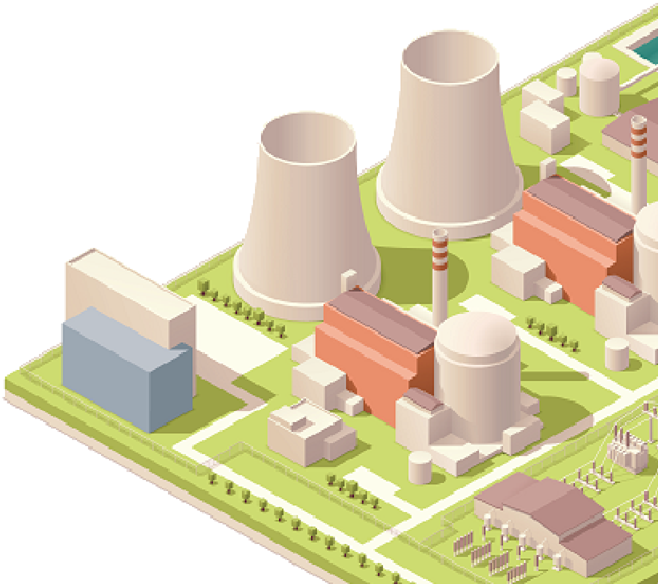
Unit 36, Bradford Chamber Business Park, New Lane, Bradford, BD4 8BX

YOUR INDUSTRY EXPERTS

UKAS TESTING 2522



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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_2)	✓
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)

		Concentration				Mass Emission				
Substance		**Limit (mg/m^3)**	**Result (mg/m^3)**	**Measurement Uncertainty (MU) +/-**	**Reference Conditions**	**Limit (g/hr)**	**Result (g/hr)**	**Measurement Uncertainty (MU) +/-**	**Sampling Date**	**Sampling Times**
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_2)	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^3/h	2790	As Measured	-	-	-	31/08/2023	17:00-17:10
Volumetric Flow (REF)	R1	-	44,713 m^3/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	Extration 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

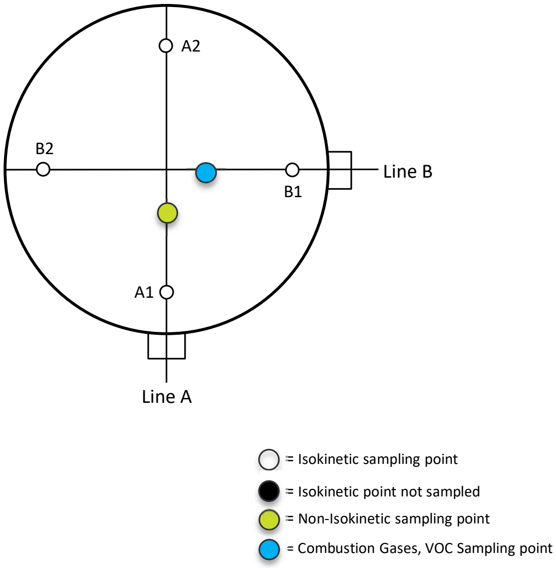
Equipment Checklist

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	m²	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
	Platform has adequate drainage to prevent accumulation of free-standing water	Yes
Fall Prevention	Platform has 2 levels of handrails (approx. 0.5m & 1.0m high)	Yes
	Gaps between handrails not >0,5m	Yes
Access	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^2)	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^3/hr	Nm^3/hr	Nm^3/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

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	-

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/Nm³
Has breakthrough occurred?	No	-

Emissions Calculations		
Emission Limit Value	-	mg/Nm³
Corrected Emission	<0.01	mg/Nm³

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

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	-

Analysis Details		
1st Collector Reference	RTOPF	
1st Collector Concentration	<1	µg
2nd Collector Reference	RTOPB	
2nd Collector Concentration	<1	µg
Blank Concentration	<0.02	mg/Nm³
Has breakthrough occurred?	No	-

Emissions Calculations		
Emission Limit Value	-	mg/Nm³
Corrected Emission	<0.04	mg/Nm³

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

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	-

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/Nm³
Has breakthrough occurred?	No	-

Emissions Calculations		
Emission Limit Value	-	mg/Nm³
Corrected Emission	<0.29	mg/Nm³

Instrumental Gas Analyser Calibrations

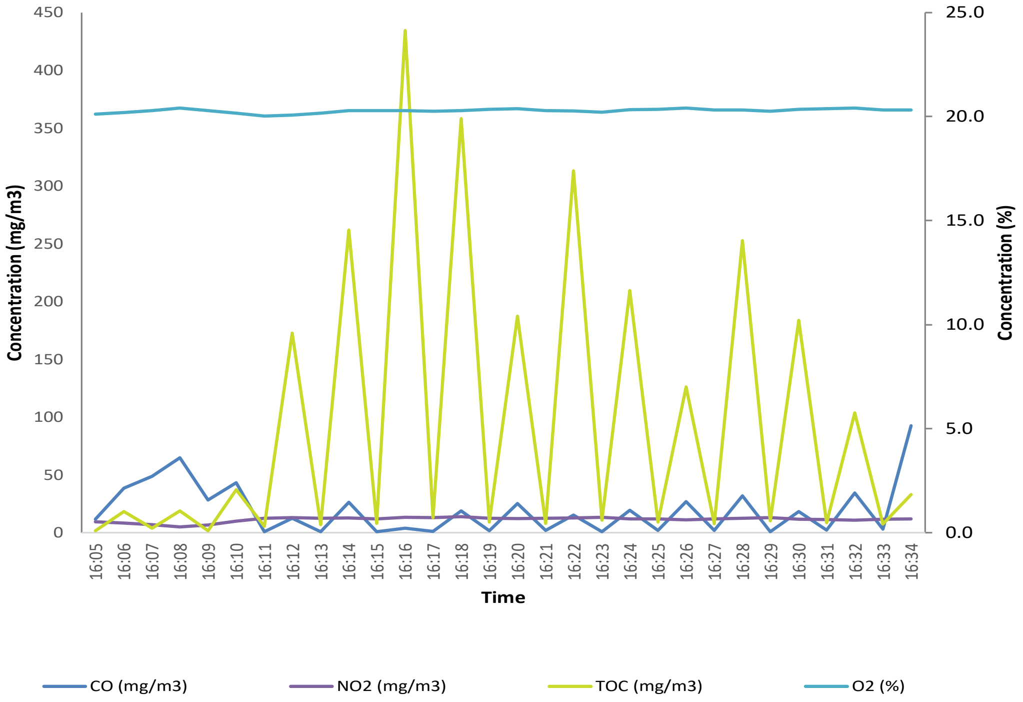
Date	Operators	Combustion Gas Analyser	Flame Ionisation Detector
31/08/2023	JG SD TC	12.1	13.1

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_2 Correction
		Average	Max	Min			
Carbon Monoxide	1	19.3	92.7	0.70	mg/m^3	-	-
Oxides of Nitrogen (as NO_2)	1	11	14	5.0	mg/m^3	NO_x as NO_2	-
Total VOC	1	94.1	434.4	1.84	mg/m^3	VOC as C	-
Oxygen	1	20.3	20.4	20.0	%	-	-

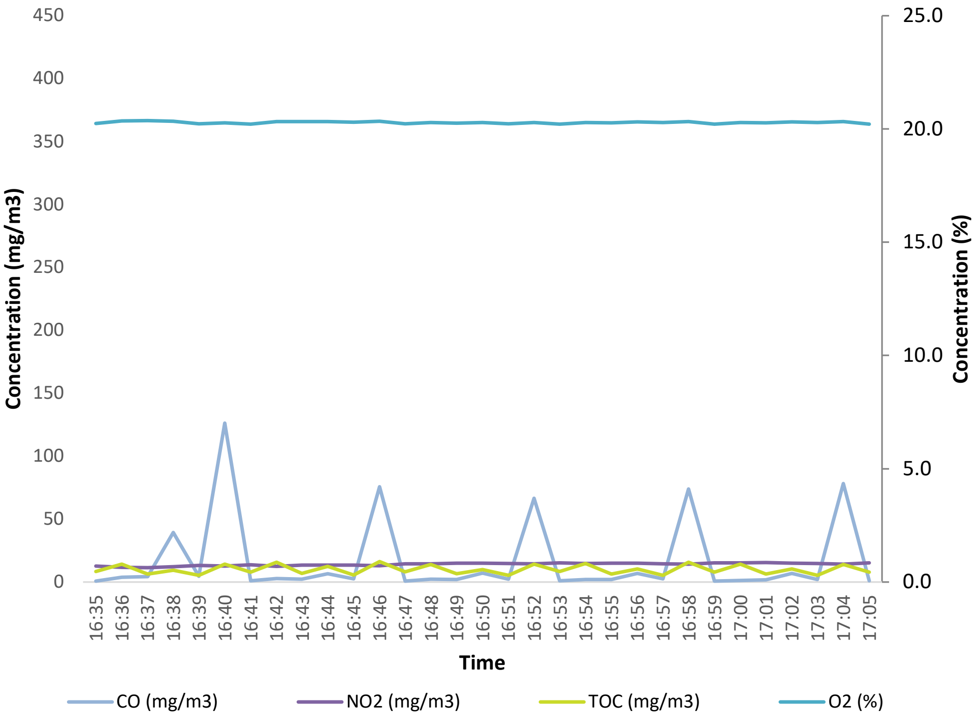
Instrumental Gas Analyser Chart - Run 1



Instrumental Gas Analyser Results (continued)

Substance	Run	Corrected Concentration			Units	Basis	O_2 Correction
		Average	Max	Min			
Carbon Monoxide	2	17.06	126.3	0.70	mg/m^3	-	-
Oxides of Nitrogen (as NO_2)	2	14	15	11.5	mg/m^3	NO_x as NO_2	-
Total VOC	2	9.87	16.14	5.19	mg/m^3	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^3
Mean Sampling Rate	1.0	L/min
Barometric Pressure	1007	mbar

Parameter	Value	Unit
Emission Concentration	0.01	mg/m^3
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^2
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
					Total	0.000
					Combined Standard Uncertainty $[(\text{sum } u^2)^{0.5}]$	0.002
					Expanded Total Uncertainty as a % of emission conc. (95% confidence)	24.91
					Expanded Total Uncertainty (mg/m^3) (95% confidence)	0.004
					Expanded Total Uncertainty as a % of emission limit value (95% confidence)	-

Uncertainty of Phenol by Pump - Run 1

Parameter	Value	Unit
Emission Limit Value (ELV)	-	mg/m^3
Mean Sampling Rate	1.0	L/min
Barometric Pressure	1007	mbar

Parameter	Value	Unit
Emission Concentration	0.04	mg/m^3
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^2
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	0.00000000002
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
					Total	0.000
					Combined Standard Uncertainty $[(\text{sum } u^2)^{0.5}]$	0.005
					Expanded Total Uncertainty as a % of emission conc. (95% confidence)	24.91
					Expanded Total Uncertainty (mg/m^3) (95% confidence)	0.009
					Expanded Total Uncertainty as a % of emission limit value (95% confidence)	-

Uncertainty of Ethanol by Pump - Run 1

Parameter	Value	Unit
Emission Limit Value (ELV)	-	mg/m³
Mean Sampling Rate	1.0	L/min
Barometric Pressure	1007	mbar

Parameter	Value	Unit
Emission Concentration	0.29	mg/m³
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 u²
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	0.000000002
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
					Total	0.001
					Combined Standard Uncertainty [(sum u²)$^{0.5}$]	0.036
					Expanded Total Uncertainty as a % of emission conc. (95% confidence)	24.91
					Expanded Total Uncertainty (mg/m³) (95% confidence)	0.071
					Expanded Total Uncertainty as a % of emission limit value (95% confidence)	-

Uncertainty of Carbon Monoxide by Horiba Gas Analyser - Run 1

Parameter	Value	Unit
Emission Limit Value (ELV)	-	mg/m³
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 u²
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

Total	1.70
Combined Standard Uncertainty [(sum u²)$^{0.5}$]	1.31
Expanded Total Uncertainty (ppm) (95% confidence)	2.6
Expanded Total Uncertainty as a % of emission conc. (95% confidence)	17
Expanded Total Uncertainty (mg/m³) (95% confidence)	3.2
Expanded Total Uncertainty as a % of emission limit value (95% confidence)	-

Uncertainty of Carbon Monoxide by Horiba Gas Analyser - Run 2

Parameter	Value	Unit
Emission Limit Value (ELV)	-	mg/m³
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 u²
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

Total	1.703
Combined Standard Uncertainty [(sum u²)$^{0.5}$]	1.30
Expanded Total Uncertainty (ppm) (95% confidence)	2.56
Expanded Total Uncertainty as a % of emission conc. (95% confidence)	18.74
Expanded Total Uncertainty (mg/m³) (95% confidence)	3.20
Expanded Total Uncertainty as a % of emission limit value (95% confidence)	-

Uncertainty of Oxides of Nitrogen by Horiba Gas Analyser - Run 1

Parameter	Value	Unit
Emission Limit Value (ELV)	-	mg/m^3
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^2
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
Total					0.12
Combined Standard Uncertainty $[(\text{sum } u^2)^{0.5}]$					0.35
Expanded Total Uncertainty (ppm) (95% confidence)					0.7
Expanded Total Uncertainty as a % of emission conc. (95% confidence)					12.1
Expanded Total Uncertainty (mg/m^3) (95% confidence)					1.4
Expanded Total Uncertainty as a % of emission limit value (95% confidence)					-

Uncertainty of Oxides of Nitrogen by Horiba Gas Analyser - Run 2

Parameter	Value	Unit
Emission Limit Value (ELV)	-	mg/m^3
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^2
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
Total					0.12
Combined Standard Uncertainty $[(\text{sum } u^2)^{0.5}]$					0.35
Expanded Total Uncertainty (ppm) (95% confidence)					0.68
Expanded Total Uncertainty as a % of emission conc. (95% confidence)					10.0
Expanded Total Uncertainty (mg/m^3) (95% confidence)					1.4
Expanded Total Uncertainty as a % of emission limit value (95% confidence)					-

Uncertainty of Total VOC by FID - Run1

Parameter	Value	Unit
Emission Limit Value (ELV)	-	mg/m^3
Reading	58.55	ppm
Span Gas Certified Value	79.8	ppm
Range	100	ppm

Cal Gas
C_3H_8

Source of Uncertainty	Uncertainty Criteria	Probability Distribution	Divisor	Source Uncertainty u	Combined Uncertainty u²
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
				Total	0.65
				Combined Standard Uncertainty $[(\text{sum } u^2)^{0.5}]$	0.81
				Expanded Total Uncertainty (ppm) (95% confidence)	1.58
				Expanded Total Uncertainty as a % of emission conc. (95% confidence)	2.7
				Expanded Total Uncertainty (mg/m^3) (95% confidence)	2.5
				Expanded Total Uncertainty as a % of emission limit value (95% confidence)	-

Uncertainty of Total VOC by FID - Run 2

Parameter	Value	Unit
Emission Limit Value (ELV)	-	mg/m^3
Reading	6.1	ppm
Span Gas Certified Value	79.8	ppm
Range	100	ppm

Cal Gas
C_3H_8

Source of Uncertainty	Uncertainty Criteria	Probability Distribution	Divisor	Source Uncertainty u	Combined Uncertainty u²
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
				Total	0.447
				Combined Standard Uncertainty $[(\text{sum } u^2)^{0.5}]$	0.668
				Expanded Total Uncertainty (ppm) (95% confidence)	1.310
				Expanded Total Uncertainty as a % of emission conc. (95% confidence)	21.3
				Expanded Total Uncertainty (mg/m^3) (95% confidence)	2.1
				Expanded Total Uncertainty as a % of emission limit value (95% confidence)	-

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_2

Source of Uncertainty	Uncertainty Criteria	Probability Distribution	Divisor	Source Uncertainty u	Combined Uncertainty u^2
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
				Total	0.006
				Combined Standard Uncertainty [(sum u^2)$^{0.5}$]	0.08
				Expanded Total Uncertainty (%) (95% confidence)	0.15
				Expanded Total Uncertainty as a % of emission conc. (95% confidence)	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_2

Source of Uncertainty	Uncertainty Criteria	Probability Distribution	Divisor	Source Uncertainty u	Combined Uncertainty u^2
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
				Total	0.006
				Combined Standard Uncertainty [(sum u^2)$^{0.5}$]	0.078
				Expanded Total Uncertainty (%) (95% confidence)	0.15
				Expanded Total Uncertainty as a % of emission conc. (95% confidence)	0.75

Uncertainty of Volumetric Flow - Run 1

Parameter	Value	Unit
Measured Volumetric Flow Rate Actual	61620	m³/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
Expanded Uncertainty Mean Velocity (95% confidence)	0.13	m/s
Expanded Uncertainty Mean Velocity (95% Confidence), Relative	1.3	%
Standard Uncertainty - Volumetric Flow Rate	1424	-
Standard Uncertainty - Volumetric Flow Rate (95% Confidence)	2790	m³/hr
Standard Uncertainty - Volumetric Flow Rate (95% Confidence), Relative	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.

ENVIRONMENTAL
SERVICES

Report for the Periodic Monitoring of Emissions to Atmosphere

Permali Ltd (Gloucester)

Carbon Filter

Permit No: np
Installation: Gloucester
Monitoring Dates: 31st August 2023
Site Address: Permali 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)

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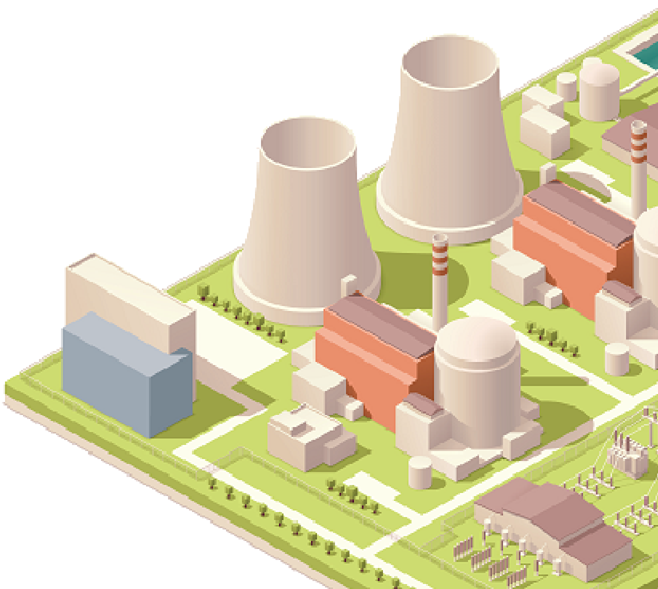
YOUR INDUSTRY EXPERTS

MCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME
UKAS TESTING 2522



Contents

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)

		Concentration				Mass Emission				
Substance		**Limit (mg/m^3)**	**Result (mg/m^3)**	**Measurement Uncertainty (MU) +/-**	**Reference Conditions**	**Limit (g/hr)**	**Result (g/hr)**	**Measurement Uncertainty (MU) +/-**	**Sampling Date**	**Sampling Times**
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^3/h	544	As Measured	-	-	-	31/08/2023	14:53-14:59
Volumetric Flow (REF)	R1	-	11,004 m^3/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	Catbon 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	Technian	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

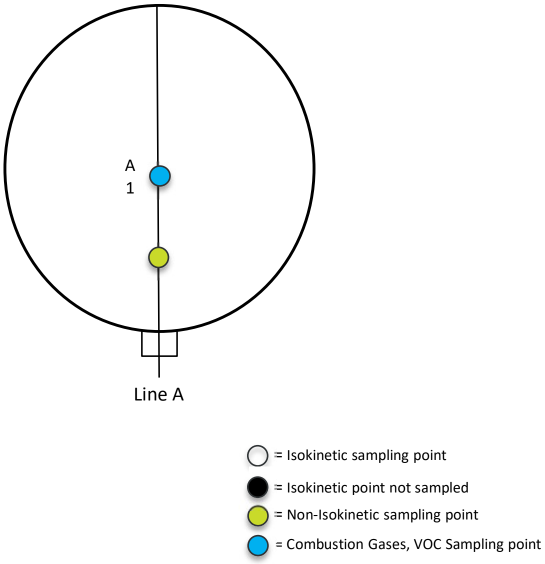
Equipment Checklist

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



Duct Characteristics

Parameter	Units	Value
Type	-	Circular
Depth	m	0.95
Width	m	-
Area	m²	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
	Platform has adequate drainage to prevent accumulation of free-standing water	N/A
Fall Prevention	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 (m²)	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 (cmH2O)				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	m³/hr	Nm³/hr	Nm³/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^3
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^3
Corrected Emission	<0.12	mg/Nm^3

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^3
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^3
Corrected Emission	<0.01	mg/Nm^3

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

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	-

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^3
Has breakthrough occurred?	No	-

Emissions Calculations		
Emission Limit Value	-	mg/Nm^3
Corrected Emission	<0.77	mg/Nm^3

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

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	-

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^3
Has breakthrough occurred?	No	-

Emissions Calculations		
Emission Limit Value	-	mg/Nm^3
Corrected Emission	<0.12	mg/Nm^3

Instrumental Gas Analyser Calibrations

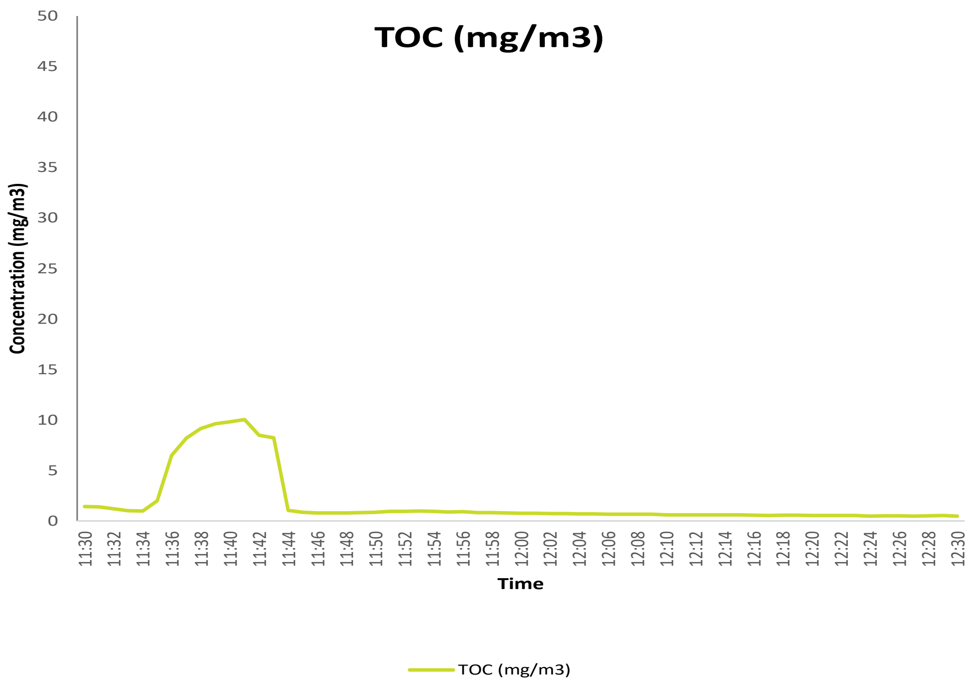
Date	Operators	Combustion Gas Analyser	Flame Ionisation Detector
31/08/2023	JG SD TC	-	13.1

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_2 Correction
		Average	Max	Min			
Total VOC	1	1.63	10.04	0.46	mg/m^3	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^3
Mean Sampling Rate	1.0	L/min
Barometric Pressure	1007	mbar

Parameter	Value	Unit
Emission Concentration	0.12	mg/m^3
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^2
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

Total	0.00024
Combined Standard Uncertainty [(sum u^2)$^{0.5}$]	0.02
Expanded Total Uncertainty as a % of emission conc. (95% confidence)	24.91
Expanded Total Uncertainty (mg/m^3) (95% confidence)	0.03
Expanded Total Uncertainty as a % of emission limit value (95% confidence)	-

Uncertainty of Formaldehyde by Pump - Run 1

Parameter	Value	Unit
Emission Limit Value (ELV)	-	mg/m^3
Mean Sampling Rate	1.0	L/min
Barometric Pressure	1007	mbar

Parameter	Value	Unit
Emission Concentration	0.01	mg/m^3
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^2
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

Total	0.000002
Combined Standard Uncertainty [(sum u^2)$^{0.5}$]	0.002
Expanded Total Uncertainty as a % of emission conc. (95% confidence)	24.91
Expanded Total Uncertainty (mg/m^3) (95% confidence)	0.003
Expanded Total Uncertainty as a % of emission limit value (95% confidence)	-

Uncertainty of Ethanol & 2-methoxyethanol by Pump - Run 1

Parameter	Value	Unit
Emission Limit Value (ELV)	-	mg/m^3
Mean Sampling Rate	0.5	L/min
Barometric Pressure	1007	mbar

Parameter	Value	Unit
Emission Concentration	0.77	mg/m^3
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^2
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
Total						0.010
Combined Standard Uncertainty [(sum u^2)$^{0.5}$]						0.10
Expanded Total Uncertainty as a % of emission conc. (95% confidence)						25.12
Expanded Total Uncertainty (mg/m^3) (95% confidence)						0.19
Expanded Total Uncertainty as a % of emission limit value (95% confidence)						-

Uncertainty of Total Phenol & Cresol by Pump - Run 1

Parameter	Value	Unit
Emission Limit Value (ELV)	-	mg/m^3
Mean Sampling Rate	1.0	L/min
Barometric Pressure	1007	mbar

Parameter	Value	Unit
Emission Concentration	0.12	mg/m^3
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^2
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
Total						0.0002
Combined Standard Uncertainty [(sum u^2)$^{0.5}$]						0.02
Expanded Total Uncertainty as a % of emission conc. (95% confidence)						24.91
Expanded Total Uncertainty (mg/m^3) (95% confidence)						0.03
Expanded Total Uncertainty as a % of emission limit value (95% confidence)						-

Uncertainty of Total VOC by FID - Run1

Parameter	Value	Unit
Emission Limit Value (ELV)	-	mg/m³
Reading	1.01	ppm
Span Gas Certified Value	79.8	ppm
Range	100	ppm

Cal Gas
C_3H_8

Source of Uncertainty	Uncertainty Criteria	Probability Distribution	Divisor	Source Uncertainty u	Combined Uncertainty u²
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
				Total	1.04
				Combined Standard Uncertainty [(sum u²)$^{0.5}$]	1.02
				Expanded Total Uncertainty (ppm) (95% confidence)	2.00
				Expanded Total Uncertainty as a % of emission conc. (95% confidence)	198
				Expanded Total Uncertainty (mg/m³) (95% confidence)	3.2
				Expanded Total Uncertainty as a % of emission limit value (95% confidence)	-

Uncertainty of Volumetric Flow - Run 1

Parameter	Value	Unit
Measured Volumetric Flow Rate Actual	12002	m³/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
Expanded Uncertainty Mean Velocity (95% confidence)	0.12	m/s
Expanded Uncertainty Mean Velocity (95% Confidence), Relative	2.4	%
Standard Uncertainty - Volumetric Flow Rate	278	-
Standard Uncertainty - Volumetric Flow Rate (95% Confidence)	544	m³/hr
Standard Uncertainty - Volumetric Flow Rate (95% Confidence), Relative	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.

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ENVIRONMENTAL
SERVICES

Report for the Periodic Monitoring of Emissions to Atmosphere

Permali Ltd (Gloucester)

Layup Table

Permit No: np
Installation: Gloucester
Monitoring Dates: 31st August 2023
Site Address: Permali 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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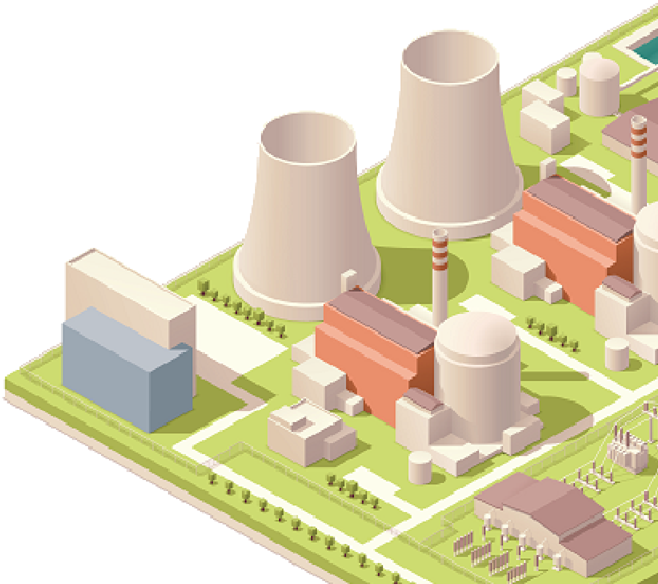
YOUR INDUSTRY EXPERTS

MCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

UKAS TESTING 2522



Contents

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)

		Concentration				Mass Emission				
Substance		Limit (mg/m³)	Result (mg/m³)	Measurement Uncertainty (MU) +/-	Reference Conditions	Limit (g/hr)	Result (g/hr)	Measurement Uncertainty (MU) +/-	Sampling Date	Sampling Times
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 m³/h	156	As Measured	-	-	-	31/08/2023	14:45-14:50
Volumetric Flow (REF)	R1	-	3,174 m³/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

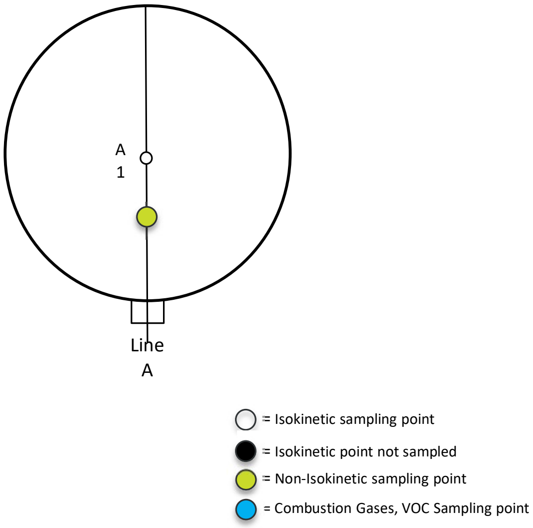
Equipment Checklist

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



Duct Characteristics

Parameter	Units	Value
Type	-	Circular
Depth	m	0.35
Width	m	-
Area	m²	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
	Platform has adequate drainage to prevent accumulation of free-standing water	N/A
Fall Prevention	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 (m²)	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	m³/hr	Nm³/hr	Nm³/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

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	-

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/Nm³
Has breakthrough occurred?	No	-

Emissions Calculations		
Emission Limit Value	-	mg/Nm³
Corrected Emission	1.02	mg/Nm³

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

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	-

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/Nm³
Has breakthrough occurred?	No	-

Emissions Calculations		
Emission Limit Value	-	mg/Nm³
Corrected Emission	<0.44	mg/Nm³

Uncertainty

Uncertainty of Total VOCs by Pump - Run 1

Parameter	Value	Unit
Emission Limit Value (ELV)	-	mg/m^3
Mean Sampling Rate	0.8	L/min
Barometric Pressure	1007	mbar

Parameter	Value	Unit
Emission Concentration	1.02	mg/m^3
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^2
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	0.0000001
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
					Total	0.017
					Combined Standard Uncertainty $[(\text{sum } u^2)^{0.5}]$	0.13
					Expanded Total Uncertainty as a % of emission conc. (95% confidence)	24.95
					Expanded Total Uncertainty (mg/m^3) (95% confidence)	0.25
					Expanded Total Uncertainty as a % of emission limit value (95% confidence)	-

Uncertainty of Styrene by Pump - Run 1

Parameter	Value	Unit
Emission Limit Value (ELV)	-	mg/m^3
Mean Sampling Rate	0.8	L/min
Barometric Pressure	1007	mbar

Parameter	Value	Unit
Emission Concentration	0.44	mg/m^3
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^2
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	0.00000002
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
					Total	0.003
					Combined Standard Uncertainty $[(\text{sum } u^2)^{0.5}]$	0.06
					Expanded Total Uncertainty as a % of emission conc. (95% confidence)	24.95
					Expanded Total Uncertainty (mg/m^3) (95% confidence)	0.11
					Expanded Total Uncertainty as a % of emission limit value (95% confidence)	-

Uncertainty of Volumetric Flow - Run 1

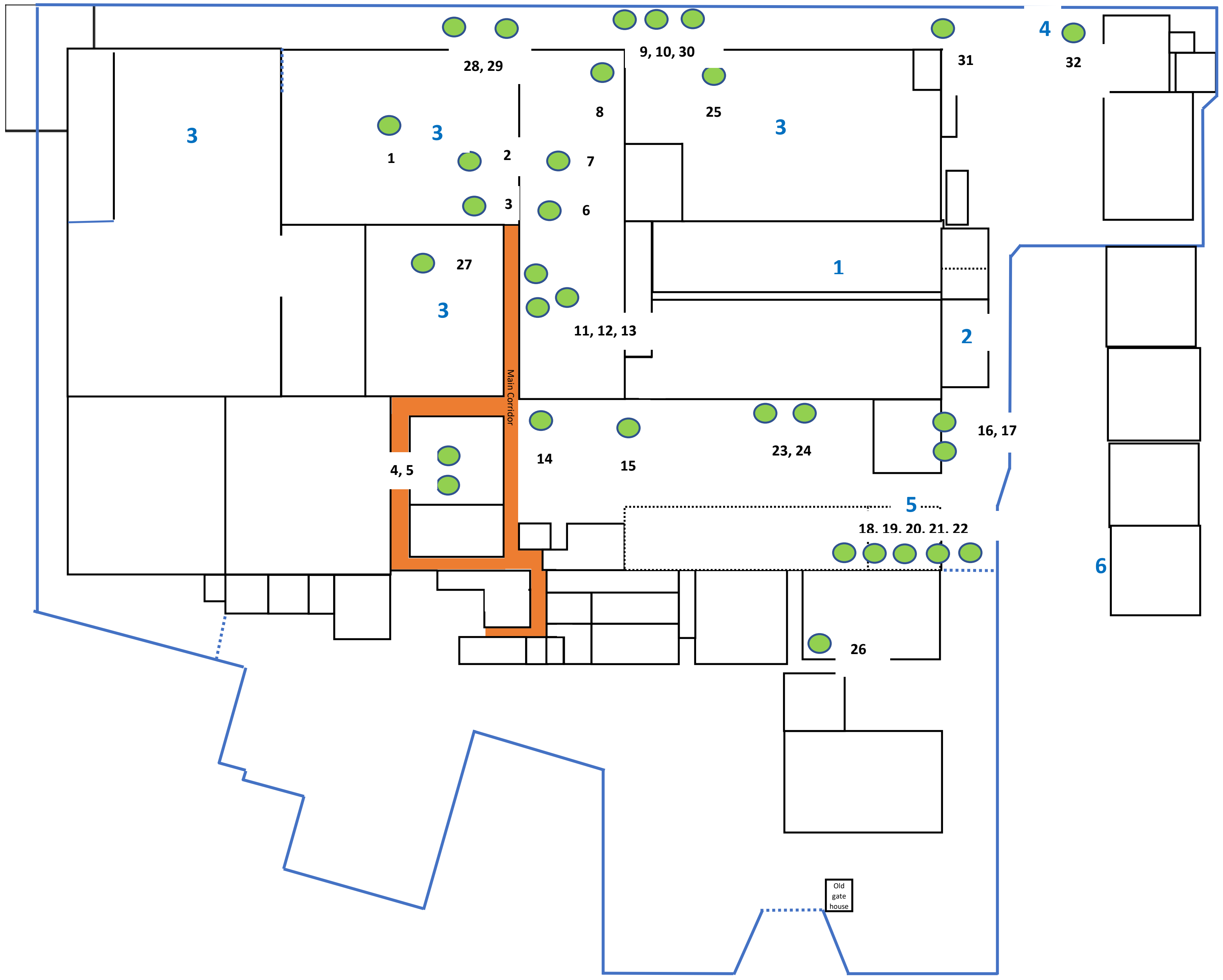
Parameter	Value	Unit
Measured Volumetric Flow Rate Actual	3450	m³/hr

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
Expanded Uncertainty Mean Velocity (95% confidence)	0.25	m/s
Expanded Uncertainty Mean Velocity (95% Confidence), Relative	2.5	%
Standard Uncertainty - Volumetric Flow Rate	80	-
Standard Uncertainty - Volumetric Flow Rate (95% Confidence)	156	m³/hr
Standard Uncertainty - Volumetric Flow Rate (95% Confidence), Relative	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

Permali Map 005
25092023

Gloucester City Council

Permit with introductory note

The Environmental Permitting (England & Wales) Regulations 2016

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 Permali 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.

Status log of the permit		
Description	**Date**	**Comments**
Application received 03/03/23	Duly made 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 23/00006/A2	DD/MM/YYYY	

End of introductory note

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	Date
Gupti Gosine	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

(a) maximise the availability and performance of equipment critical to the protection of the environment;

(b) 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:

(a) 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;

(b) 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:

(a) point source emissions specified in tables S3.1,

(b) 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:

(a) be legible;

(b) be made as soon as reasonably practicable;

(c) if amended, be amended in such a way that the original and any subsequent amendments remain legible, or are capable of retrieval; and

(d) 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 **C=Compliant NC=Non Compliant**	Date Received
Review of Environmental Management System	Summary of BAT review (BAT 1,2, and 13) *Assessment of BAT conclusion requirements doc*. 1,2 **NC** EMS systems under development 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 **NC** EMS to include procedures	13/6/2023
BAT Reviews	Summary of the BAT review (BAT 4 and 5) Assessment of BAT conclusion requirements doc 4. **C** Working with suppliers and customers to reduce VOCs where feasible. 5 **NC** – 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 **C=Compliant NC=Non Compliant**	Date Received
	doc 6 ***NC*** New dedicated solvent mixing area being installed. *7* ***C*** Coating techniques 8.**NC** Drying system to be upgraded . 9. **C** Techniques to minimise solvent based cleaning agents	
	Summary of the BAT review (BAT 14 to 17) Assessment of BAT conclusion requirements doc 14. **C** Techniques used. 15.**C** RTO Techniques 16.**C** RTO Process controls 17.**C** RTO Process controls	13/6/2023
	Summary of the BAT review (Bat 18) Assessment of BAT conclusion requirements doc 14 **C**	13/6/2023
Energy Efficiency	Energy Efficiency Plan (BAT 19) **NC** EEP to be developed	13/6/2023
Odour management plan	Odour management plan (BAT 23) **C**	4/10/2023
Noise management plan	Noise management plan **C**	4/10/2023

Table S1.3 Improvement programme requirements		
Reference	**Requirement**	**Date**
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

Schedule 3 – Emissions and monitoring

Table S3.1 Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location	**Source**	**Parameter**	**Limit (including unit)**	**Reference period**	**Monitoring frequency**	**Monitoring standard or method**
Point 32 on site plan in Schedule 7.2	Thermal Oxidiser	Oxides of Nitrogen (NO and NO_2 expressed as NO_2)	130 mg/Nm^3	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^3	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^3	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^3	Average over the sampling period	Continous 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^3	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^3	Average over the sampling period	By guarantee from manufacturuer or by annual extractive monitoring	BS EN 13284-1

Note 1: Certification to the MCERTS performance standards indicates compliance with BS EN 15267-3

Table S3.2 Annual limits for fugitive emissions		
Substance	**Medium**	**Limit (including unit)**
TVOC	Fugitive	< 5% of the solvent input

Table S3.3 Process monitoring requirements				
Emission point reference or source or description of point of measurement	**Parameter**	**Monitoring frequency**	**Monitoring standard or method**	**Other specifications**
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^3
Particulate Filtration Systems 28 and 29	System Pressure Drop indicator	Continuous		Audible & Visual Alarms

Schedule 4 – Reporting

Parameters, for which reports shall be made, in accordance with conditions of this permit, are listed below.

Table S4.1 Reporting of monitoring data

Parameter	Emission or monitoring point/reference	Reporting period	Period begins
Emissions to air Parameters as required by condition 3.1.1	(Dust plants 28,29), (Carbon Filter 31) and (RTO 32)	Every 12 months	1 January

Table S4.2: Annual production/treatment

Parameter	Units
Area of coated surface	m^2 of coated surface
Mass of Solvent Consumed	kg

Table S4.3 Performance parameters

Parameter	Frequency of assessment	Units
Specific energy consumption	Annually	kWh/m^2 of coated surface

Table S4.4 Reporting forms

Media/parameter	Reporting format	Date of form
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

Permit Number	
Name of operator	
Location of Facility	
Time and date of the detection	

(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	
To be notified within 24 hours of detection	
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) Notification requirements for the breach of a limit	
To be notified within 24 hours of detection unless otherwise specified below	
Emission point reference/ source	
Parameter(s)	
Limit	
Measured value and uncertainty	
Date and time of monitoring	

(b) Notification requirements for the breach of a limit	
To be notified within 24 hours of detection unless otherwise specified below	
Measures taken, or intended to be taken, to stop the emission	

(c) Notification requirements for the breach of permit conditions not related to limits	
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.	

(d) Notification requirements for the detection of any significant adverse environmental effect	
To be notified within 24 hours of detection	
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.	
Name*	
Post	
Signature	
Date	

* 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.

Schedule 7 – Site Location, Plan and Emission Points

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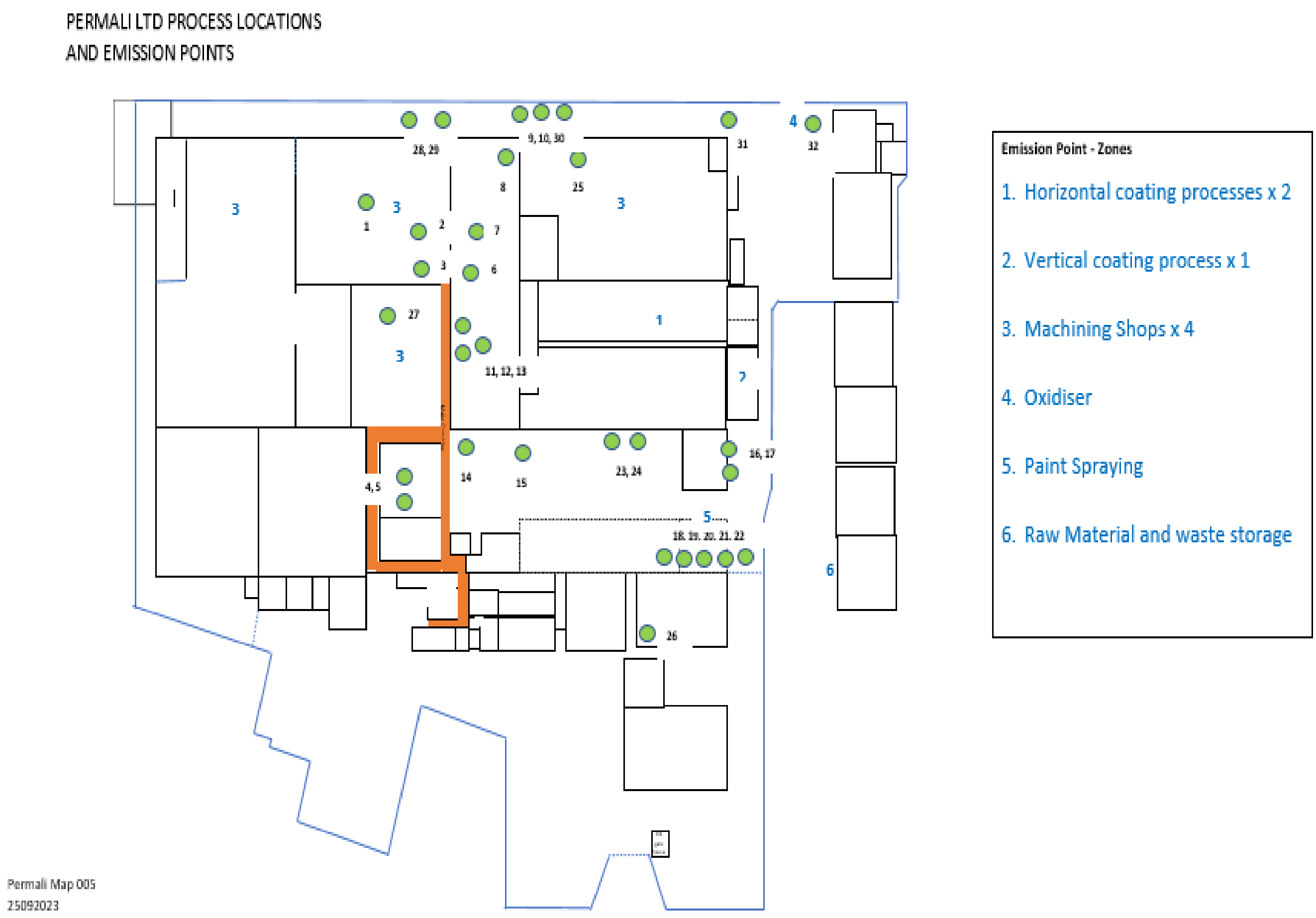
7.1 Emission Points



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 atmoshere 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