Panther House and 156-164 Grays Inn Road

Panther House Developments Limited

Noise and Vibration Impact Assessment

August 2019

Panther House and 156-164 Gray's Inn Road London

Environmental Noise Survey and Plant Noise Assessment Report

25625/PNA1

16 May 2019

For:

Second Home
68 Hanbury Street
London
E1 5JL

Hann Tucker Associates
Consultants in Acoustics Noise & Vibration

Head Office: Duke House, 1-2 Duke Street, Woking, Surrey, GU21 5BA (t) +44 (0) 1483 770 595
Manchester Office: First Floor, 346 Deansgate, Manchester, M3 4LY (t) +44 (0) 161 832 7041
(w) hanntucker.co.uk (e) enquiries@hanntucker.co.uk

Hann Tucker Associates

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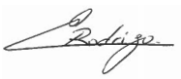
Document Control

Rev	Date	Comment	Prepared by	Authorised by
0	16/05/2019	First Issue	 Rodrigo Espinosa-Garcia Principal Consultant MSc, BEng(Hons), MIOA	 Adam Kershaw Senior Associate BSc(Hons), MIOA

Hann Tucker Associates

Environmental Noise Survey and Plant Noise Assessment Report 25625/PNA1

Contents

Attachments

1.0 Introduction

156-164 Gray's Inn Road and Panther House are proposed to undergo redevelopment to a mixed use residential and commercial premises.

Hann Tucker Associates have therefore been commissioned to undertake a detailed environmental noise survey to determine the currently prevailing noise climate around the site, the results of which will be used in design assessments in order to assess compliance with the Local authority's requirements.

2.0 Objectives

To establish by means of a detailed survey (fully covering both daytime and night-time periods) the existing environmental noise levels around the development site.

The survey will enable noise emission limits from the development to be identified with reference to the requirements of the Local Authority and the application of BS 4142: 2014 and to minimise the possibility of noise nuisance by neighbours.

To assess the noise emissions from the proposed plant, based upon data with which we are provided, and comment upon the acceptability.

To advise on noise control measures if required with reference to the requirements of the Local Authority.

3.0 Site Description

3.1 Location

The site is located at Gray's Inn Road and Mount Pleasant, in London, and falls within the London Borough of Camden's jurisdiction. See following Location Map.

Location Map (maps.google.co.uk)

3.2 Description

The existing site comprises mixed commercial and retail property. Directly to the north and east is predominantly residential property, to the south and west is mixed residential, commercial and retail. The site currently comprises three to six storey buildings. Many of the adjacent properties extend taller than 6 storeys.

See following Site Plan.

Site Plan (maps.google.co.uk)

4.0 Acoustic Terminology

For an explanation of the acoustic terminology used in this report please refer to Appendix A enclosed.

5.0 Methodology

The survey was undertaken by Rodrigo Espinosa-Garcia MSc, BEng(Hons), MIOA; and Adam Kershaw BSc(Hons), MIOA.

5.1 Procedure

Fully automated environmental noise monitoring was undertaken from approximately 09:30 hours on Thursday 18 April 2019 to approximately 09:30 hours on Tuesday 23 April 2019.

Owing to the nature of the survey, i.e. unmanned, it is not possible to accurately comment on the weather conditions throughout the entire survey period. However at the beginning and end

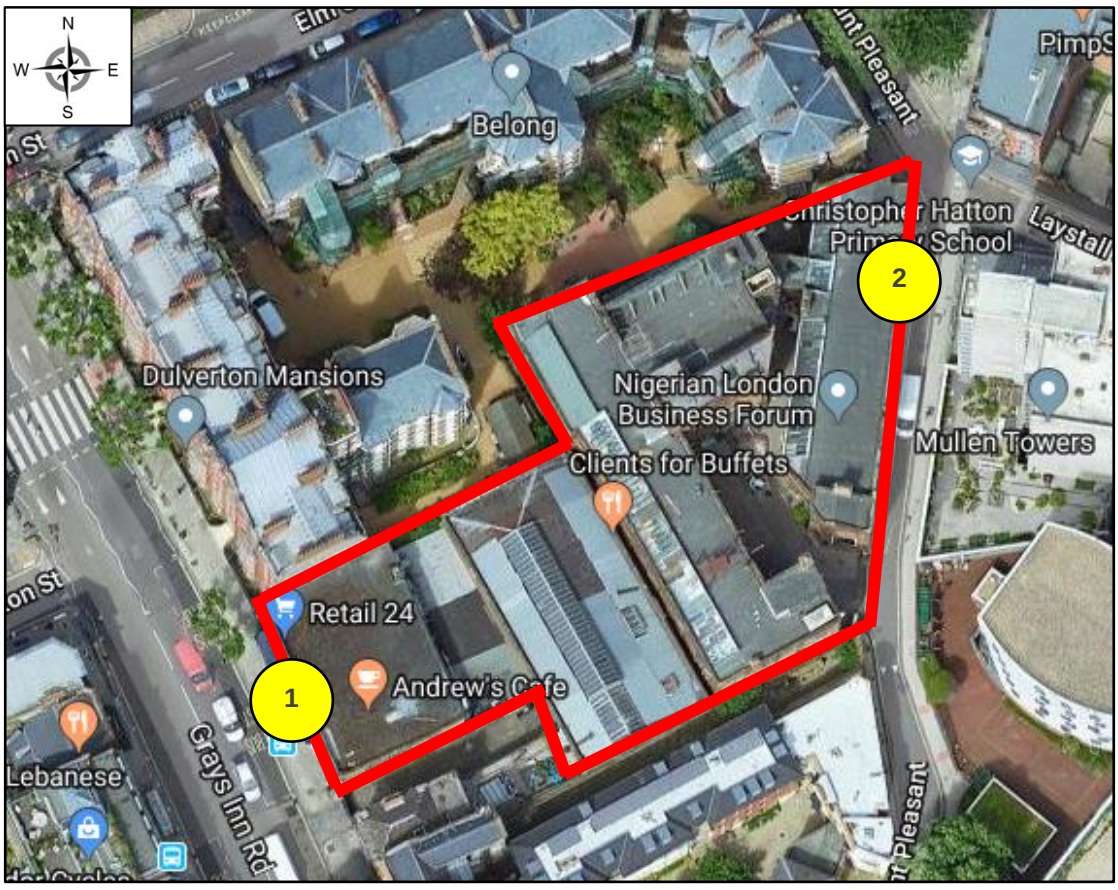
of the survey period the wind conditions were moderate. The sky was generally patchy cloud. We understand that generally throughout the survey period the weather conditions were similar to this. Measurements were taken continuously of the A-weighted (dBA) L_{90}, L_{eq} and L_{max} sound pressure levels over 15 minute periods.

5.2 Measurement Positions

The noise level measurements were undertaken at two positions around the development site. The approximate positions are described in the table below:

Position No	Description
1	The sound level meter was installed at the first floor office level. The microphone was attached to a pole which protruded out of a first floor window overlooking Gray's Inn Road approximately one metre from the façade and five metres above street level.
2	The sound level meter was installed at fourth floor roof level. The microphone was attached to a pole which protruded over the edge of the building overlooking Mount Pleasant approximately one metre from the façade and fourteen metres above street level.

The approximate measurement positions are shown on the plan below:



Plan Showing Unmanned Measurement Positions (maps.google.co.uk)

5.3 Instrumentation

The instrumentation used during the survey is presented in the following table:

Description	Manufacturer	Type	Serial Number
Type 1, ½" Condenser Microphone	ACO Pacific	7052E	71839
Preamp	Svantek	SV18	75733
Type 1, Data Logging Sound Level Meter	Svantek	971	74368
Type 1, ½" Condenser Microphone	ACO Pacific	7052E	71786
Preamp	Svantek	SV18	75754
Type 1, Data Logging Sound Level Meter	Svantek	971	74415
Type 1 Calibrator	Larson Davis	CAL200	3082

The sound level meters, including the extension cable, were calibrated prior to and on completion of the surveys. No significant change was found to have occurred (no more than 0.1 dB).

The sound level meters were located in an environmental case with the microphone connected to the sound level meter via an extension cable.

The microphone was fitted with a manufacturer windshield.

6.0 Results

The results have been plotted on Time History Graph 25625/TH1 and 25625/TH2 enclosed presenting the 15 minute A-weighted (dBA) L_{90}, L_{eq} and L_{max} levels at each measurement position throughout the duration of the survey.

6.1 Measured L_{eq} Noise Levels

The measured daytime $L_{Aeq(16\text{-}hour)}$ and night-time $L_{Aeq(8\text{-}hour)}$ noise levels are presented in the table below.

Daytime (07:00 to 23:00 hours) and Night-time (23:00 to 07:00 hours) Measured L_{Aeq} Noise Levels (dBA re 2.0 x 10^{-5} Pa)			
Date	**Position**	**Daytime $L_{Aeq(16\text{-}hour)}$**	**Night-Time $_{(LAeq(8\text{-}hour)}$**
18/04/2019 to 19/04/2019	1	70	65
	2	60	49
19/04/2019 to 20/04/2019	1	67	67
	2	58	49
20/04/2019 to 21/04/2019	1	68	64
	2	59	47
21/04/2019 to 22/04/2019	1	67	63
	2	53	48
22/04/2019 to 23/04/2019	1	66	64
	2	54	51

6.2 Lowest Measured L_{90} Noise Levels

The following table presents the lowest measured L_{A90} background noise levels during the survey:

Daytime (07:00 to 23:00 hours) and Night-time (23:00 to 07:00 hours) Lowest Measured L_{A90} Noise Level (dB re 2 x 10^{-5} Pa)			
Date	**Position**	**Daytime $L_{Aeq(16\text{-}hour)}$**	**Night-Time $_{(LAeq(8\text{-}hour)}$**
18/04/2019 to 19/04/2019	1	56	46
	2	46	44
19/04/2019 to 20/04/2019	1	52	46
	2	43	42
20/04/2019 to 21/04/2019	1	51	44
	2	43	41
21/04/2019 to 22/04/2019	1	47	44
	2	42	41
22/04/2019 to 23/04/2019	1	49	43
	2	42	40

7.0 Discussion Of Noise Climate

Due to the nature of the survey, i.e. unmanned, it is not possible to accurately describe the dominant noise sources, or specific noise events throughout the entire survey period. However at the beginning and end of the survey period the dominant noise source was noted to be road traffic from Gray's Inn and Mount Pleasant.

8.0 Acoustic Standards and Guidelines

8.1 External Noise Intrusion

We understand Camden Council usually considers the acoustic guidance from British Standard 8233: 2014 “Guidance on sound insulation and noise reduction for buildings” acceptable for residential dwellings.

On the basis of BS8233:2014 we propose the following internal noise levels be adopted as design targets in the proposed habitable rooms:

Activity	Location	Desirable Internal Ambient Criteria	
		07:00 – 23:00	23:00 to 07:00
Resting	Living Rooms	35 dB $L_{Aeq,16hour}$	-
Dining	Dining Room/Area	40 dB $L_{Aeq,16hour}$	-
Sleeping (Daytime Resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

Note: For this site the $L_{Aeq,T}$ noise parameter alone is considered to be sufficient given the character of the noise climate we have measured. This is consistent with Section 2.2.2 of The World Health Organisation Environmental Noise Guidelines for the European Region and Note 4 of Section 7.7.2 of BS8233:2014).

8.2 Plant Noise Criteria

The site lies within London Borough of Camden’s jurisdiction. Their advice regarding criteria for atmospheric noise emissions from building service plant is contained within their Local Plan, version June 2017 as follows:

> **Industrial and Commercial Noise Sources**
>
> A relevant standard or guidance document should be referenced when determining values for LOAEL and SOAEL for non-anonymous noise. Where appropriate and within the scope of the document it is expected that British Standard 4142:2014 ‘Methods for rating and assessing industrial and commercial sound’ (BS 4142) will be used. For such cases a ‘Rating Level’ of 10 dB below background (15dB if tonal components are present) should be considered as the design criterion).

Table C: Noise levels applicable to proposed industrial and commercial developments (including plant and machinery)

Existing Noise sensitive receptor	Assessment Location	Design Period	LOAEL (Green)	LOAEL to SOAEL (Amber)	SOAL (Red)
Dwellings**	Garden used for main amenity (free field) and Outside living or dining or bedroom window (façade)	Day	'Rating level' 10dB* below background	'Rating level' between 9dB below and 5dB above background	'Rating level' greater than 5dB above background
Dwellings**	Outside bedroom window (façade)	Night	'Rating level' 10dB* below background and no events exceeding 57dBL_{Amax}	'Rating level' between 9dB below and 5dB above background or noise events between 57dB and 88dB L_{Amax}	'Rating level' greater than 5dB above background and/or events exceeding 88dBL_{Amax}

*10dB should be increased to 15dB if the noise contains audible tonal elements. (day and night). However, if it can be demonstrated that there is no significant difference in the character of the residual background noise and the specific noise from the proposed development then this reduction may not be required. In addition, a frequency analysis (to include, the use of Noise Rating (NR) curves or other criteria curves) for the assessment of tonal or low frequency noise may be required.

**levels given are for dwellings, however, levels are use specific and different levels will apply dependent on the use of the premises.

The periods in Table C correspond to 0700 hours to 2300 hours for the day and 2300 hours to 0700 hours for the night. The Council will take into account the likely times of occupation for types of development and will be amended according to the times of operation of the establishment under consideration.

There are certain smaller pieces of equipment on commercial premises, such as extract ventilation, air conditioning units and condensers, where achievement of the rating levels (ordinarily determined by a BS:4142 assessment) may not afford the necessary protection. In these cases, the Council will generally also require a NR curve specification of NR35 or below, dependant on the room (based upon measured or predicted Leq,5mins noise levels in octave bands) 1 metre from the façade of affected premises, where the noise sensitive premise is located in a quiet background area.

On the basis of the above guidance, together with the results of the environmental noise survey, we propose that the following plant noise emission criteria be achieved at 1 metre from the nearest, noise sensitive windows with all plant operating simultaneously.

Plant Noise Emission Criteria (dB re $2x10^{-5}$ Pa)		
Daytime (07:00 – 23:00 hours)	**Night-time (23:00 – 07:00 hours)**	**Position**
37dBA	33dBA	1
32dBA	30dBA	2

9.0 Achievable Internal Noise Levels

We have predicted the levels that would be achievable in the worst-case dwellings with windows partially opened and also with windows closed.

9.1 Windows Partially Open

It is generally accepted that the typical noise reduction achieved with partially opened windows is around 15dBA (ref. BS 8233:2014 Annex G.1). This value is the difference between dBA levels measured outside and inside typical dwellings, therefore 3dBA should be added to free field noise levels to determine outside levels.

A simple assessment thus indicates the following noise levels may be expected within the proposed worst case habitable rooms with partially opened windows.

Description	**Predicted Worst Case Internal Noise Levels with Windows Partially Opened**			
	Position 1		**Position 2**	
	Daytime $L_{Aeq(16\text{-hour})}$	**Night-time $L_{Aeq(8\text{-hour})}$**	**Daytime $L_{Aeq(16\text{-hour})}$**	**Night-time $L_{Aeq(8\text{-hour})}$**
External free field level	67dBA	57dBA	64dBA	48dBA
Façade correction	+3dBA	+3dBA	+3dBA	+3dBA
Façade noise level	70dBA	60dBA	67dBA	51dBA
Noise reduction for conventional thermal double glazing	-15dBA	-15dBA	-15dBA	-15dBA
Predicted internal noise levels	55dBA	45dBA	52dBA	36dBA

9.2 Windows Closed

Provision exists to provide appropriate sound insulation solutions as required including, where necessary, suitably specified glazing and attenuated ventilators. We have carried out preliminary calculations to determine the likely façade sound insulation performance

requirements for the worst affected facade. Our calculation methods follow those outlined in BS 8233:2014. Our preliminary calculations are based on the following assumptions:

- Conventional brick/block cavity external wall or equivalent;
- 75m^3 approximate room volume;
- 1.6m^2 approximate window area;
- Typical furnishings including beds, sofas, chairs etc.;
- Uprated double glazing having an $R_w + C_{tr}$ of at least 38dB;
- Suitably attenuated ventilation.

The following table summarises our assessment of achievable noise levels within the proposed worst case habitable rooms with closed windows.

Description	Predicted Worst Case Internal Noise Levels with Windows Closed	
	Daytime LAeq(16-hour)	Night-time LAeq(8-hour)
External free field level	67dBA	57dBA
Outside to inside noise reduction for closed windows[1]	35dBA	35dBA
Predicted internal noise levels	32dBA	22dBA

[1] Calculated in accordance with BS8233:2014 assuming mitigation measures above.

Note: At detailed design stage octave band acoustic specifications will need to be developed, and it will be essential that the prospective glazing/cladding system suppliers can demonstrate compliance with these specifications, rather than simply offering generic glazing configurations as described above.

10.0 Noise Intrusion Mitigation

The predicted worst case internal noise levels with windows closed meet the proposed criteria. It is thus demonstrated that acceptable internal noise levels are achievable with an uprated double glazing and suitably attenuated mechanical ventilation.

The predicted worst case internal noise levels with windows partially opened exceed the proposed target levels (as is often the case). The minimum mitigation available to future occupants would be to close their window. Ventilation (incorporating suitable acoustic

attenuation) will be provided to comply with the requirements of the Building Regulations Approved Document F whole dwelling ventilation. The occupants will thus have the option of keeping windows closed for most of the time and opening windows for purge ventilation.

This form of mitigation is supported within the Pro:PG which advises the following:

2.34 Where the LPA accepts that there is a justification that the internal target noise levels can only be practically achieved with windows closed, which may be the case in urban areas and at sites adjacent to transportation noise sources, special care must be taken to design the accommodation so that it provides good standards of acoustics, ventilation and thermal comfort without unduly compromising other aspects of the living environment. In such circumstances, internal noise levels can be assessed with windows closed but with façade openings used to provide *"whole dwelling ventilation"* in accordance with Building Regulations Approved Document F (e.g. trickle ventilators) in the open position (see Supplementary Document 2). Furthermore, in this scenario the internal L_{Aeq} target noise levels should not generally be exceeded.

2.35 It should also be noted that the internal noise level guidelines are generally not applicable under *"purge ventilation"* conditions as defined by Building Regulations Approved Document F, as this should only occur occasionally (e.g. to remove odour from painting and decorating or from burnt food).

At this stage of the design scheme the precise details of window to be used are not known, nor are the precise details of the ventilation. The external envelope of the proposed residences will incorporate suitably specified glazing so as to achieve the proposed design target internal noise levels presented above. Where ventilation is provided through the façade it shall be suitably acoustically attenuated to ensure the achievement of the proposed target internal noise levels is not compromised.

11.0 External Plant Proposals

11.1 Proposed Plant

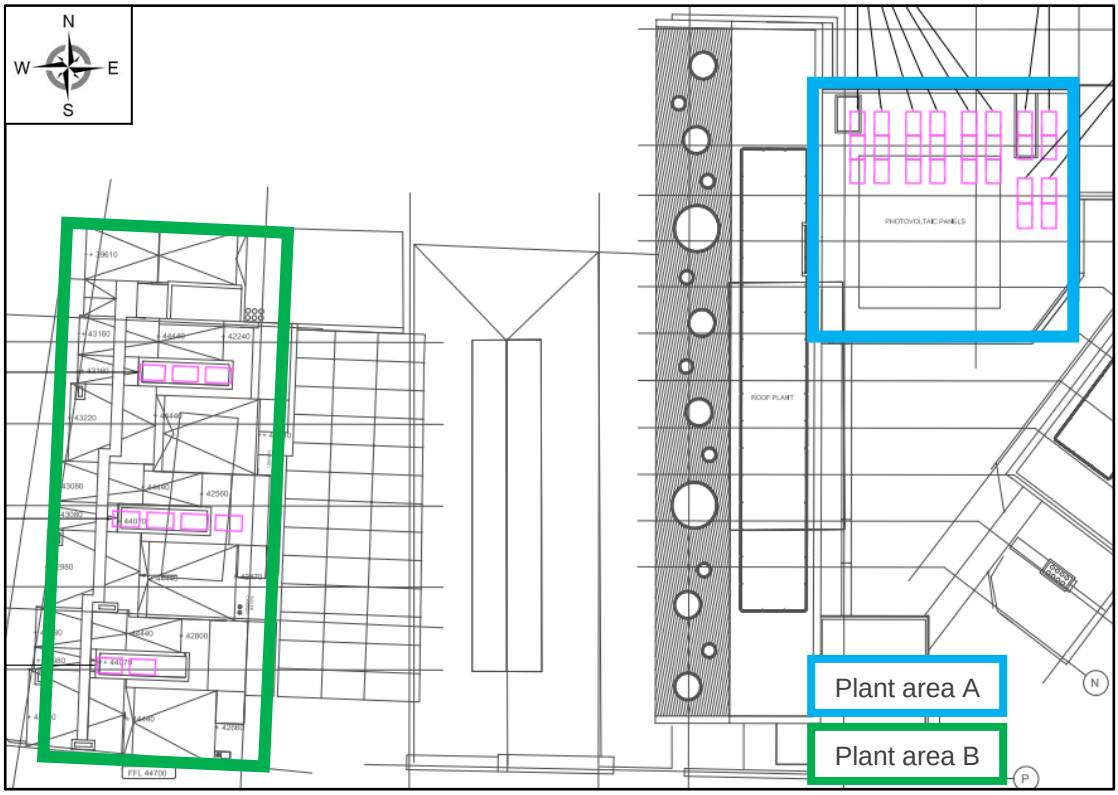
We understand it is proposed to install 35No. condenser units externally at roof level.

11.2 Operating Hours

We understand that the above proposed plant could operate during daytime and night-time hours.

11.3 Location of Plant

It is proposed to install the external 35No. condenser units at roof level, as indicated in the following drawing courtesy of Max Fordham (drawing ref.: job no. J6410 dated April 2019):



Roof plant areas layout courtesy of Max Fordham.

12.0 Plant Noise Impact Assessment

12.1 Proposed Plant

We understand a total of 35No. condenser units are to be installed at roof level, as illustrated in the drawing presented in Section 5.3.

Plant Description	Location	Qty	Plant Make	Model Number
Condenser	Rooftop	2	Daikin	EMRQ10AAY1
Condenser		5	Daikin	EMRQ16AAY1
Condenser		1	Daikin	REYQ12T
Condenser		3	Daikin	REYQ16T
Condenser		21	Daikin	REYQ18T
Condenser		3	Daikin	REYQ20T

In Section 13.3 it is made reference to plant areas A and B. Each area comprises the following amount of condenser units:

- Plant area A: 2No. REYQT16T, 18No. REYQT18T, 2No. REYQT20T, 2No. EMRQ10AAY1 and 2No. EMRQ16AAY1.
- Plant area B: 1No. REYQT12T, 1No. REYQT16T, 3No. REYQT18T, 1No. REYQT20T and 3No. EMRQ16AAY1.

The plant mentioned on the above table could operate 24hours.

12.2 Plant Noise Data

We understand the manufacturer's noise data of the condensers to be as follows:

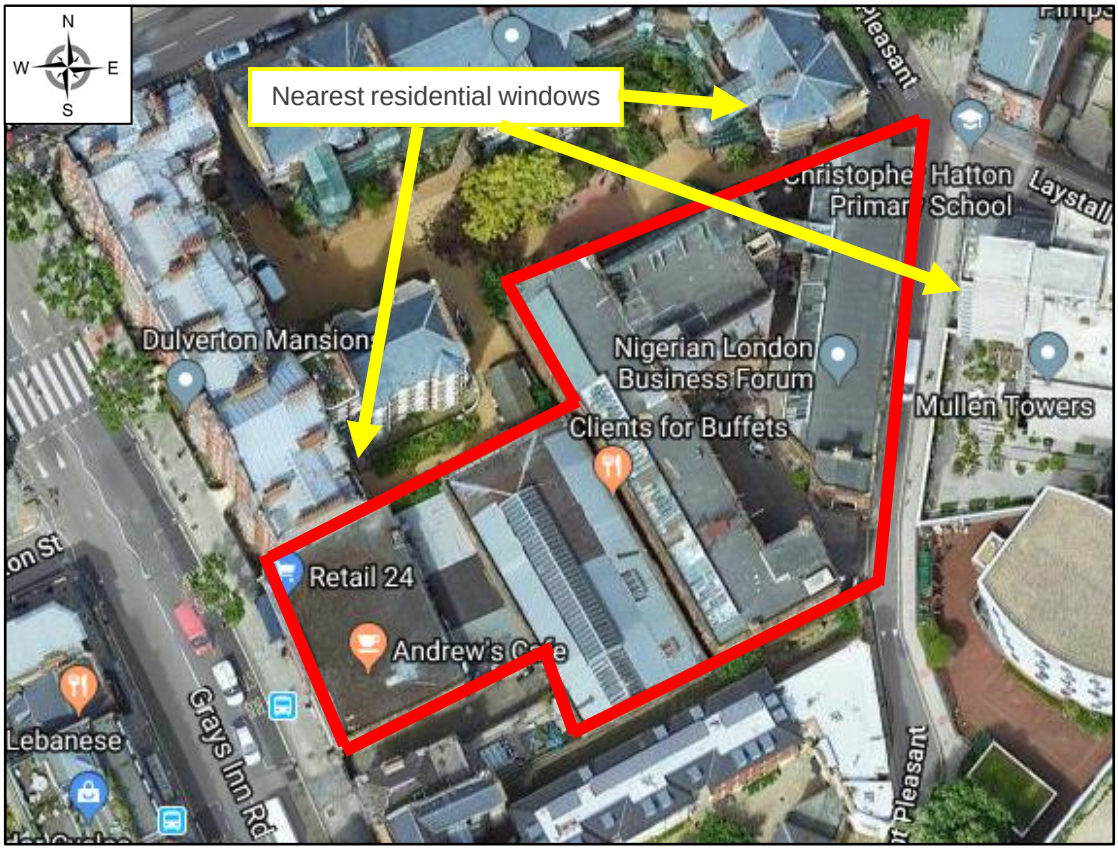
Plant Description	Sound Power Level (dB re 10^{-12} Watts) at Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
REYQ12T	90	84	80	77	76	72	66	55	81
REYQ16T	95	89	85	82	81	77	71	60	86
REYQ18T	95	89	85	82	81	77	71	60	86
REYQ20T	97	91	87	84	83	79	73	62	88
EMRQ10AAY1	93	87	83	80	79	75	69	58	84
EMRQ16AAY1	94	88	84	81	80	76	70	59	85

The manufacturer noise data was available as a single figure number. A typical condenser noise spectrum has therefore been used and equally increased in order to achieve the manufacturer single figure numbers presented above.

12.3 Nearest residential window

Based on our site inspections and information received, we understand the nearest and worst affected residential windows to the plant area A to be located approximately 25 metres horizontally from the centre of plant area to the residential building located to the north and residential tower located to the east. We understand the nearest and worst affected residential window to the plant area B to be located approximately 20 metres, 27 metres and 30 metres horizontally from each group of condenser units of plant area B (top, middle and bottom groups respectively) to the residential building located to the north.

The approximate location of these receptors are indicated in the following plan:



Plan showing the nearest/worst affected residential windows to the roof plant (maps.google.co.uk)

12.4 Plant Noise Impact Assessment

The following table presents our noise impact assessment for the new plant proposed, without taking into account the effect of any noise mitigation measures such as a perimeter acoustic screening, an acoustic enclosures, etc. We would suggest that suitable vibration isolation mounts should be installed to all items of plant.

Plant Area A

Item	Sound Level at Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
REYQ18T Manufacturer's Noise Level (L_w)	95	89	85	82	81	77	71	60	86
Cumulative Effect for 18 units	+13	+13	+13	+13	+13	+13	+13	+13	-
25m Distance Loss (L_w to L_p)	-40	-40	-40	-40	-40	-40	-40	-40	-
Façade Effect	+3	+3	+3	+3	+3	+3	+3	+3	-
Calculated Noise Level at Window	71	65	61	58	57	53	47	36	62

REYQ16T Manufacturer's Noise Level (L_w)	95	89	85	82	81	77	71	60	86
Cumulative Effect for 2 units	+3	+3	+3	+3	+3	+3	+3	+3	-
25m Distance Loss (L_w to L_p)	-40	-40	-40	-40	-40	-40	-40	-40	-
Façade Effect	+3	+3	+3	+3	+3	+3	+3	+3	-
Calculated Noise Level at Window	61	55	51	48	47	43	37	26	52
REYQ20T Manufacturer's Noise Level (L_w)	97	91	87	84	83	79	73	62	88
Cumulative Effect for 2 units	+3	+3	+3	+3	+3	+3	+3	+3	-
25m Distance Loss (L_w to L_p)	-40	-40	-40	-40	-40	-40	-40	-40	-
Façade Effect	+3	+3	+3	+3	+3	+3	+3	+3	-
Calculated Noise Level at Window	63	57	53	50	49	45	39	28	54
EMRQ10AAY1 Manufacturer's Noise Level (L_w)	93	87	83	80	79	75	69	58	84
Cumulative Effect for 2 units	+3	+3	+3	+3	+3	+3	+3	+3	-
25m Distance Loss (L_w to L_p)	-40	-40	-40	-40	-40	-40	-40	-40	-
Façade Effect	+3	+3	+3	+3	+3	+3	+3	+3	-
Calculated Noise Level at Window	59	53	49	46	45	41	35	24	50
EMRQ16AAY1 Manufacturer's Noise Level (L_w)	94	88	84	81	80	76	70	59	85
Cumulative Effect for 2 units	+3	+3	+3	+3	+3	+3	+3	+3	-
25m Distance Loss (L_w to L_p)	-40	-40	-40	-40	-40	-40	-40	-40	-
Façade Effect	+3	+3	+3	+3	+3	+3	+3	+3	-
Calculated Noise Level at Window	60	54	50	47	46	42	36	25	51
Cumulative Noise Level at Window	72	66	62	59	58	54	48	37	63

Our calculations indicate that, without the implementation of noise mitigation measures, cumulative noise levels from the plant area A would exceed the requirements of the Local Authority outlined in Section 8.0 by 31dBA during the daytime and 33dBA during the night-time. Mitigation measures will need to be considered as per Section 15.0.

Plant Area B

Item	Sound Level at Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
REYQ18T Manufacturer's Noise Level (L_w)	95	89	85	82	81	77	71	60	86
Cumulative Effect for 3 units	+5	+5	+5	+5	+5	+5	+5	+5	-
12m Distance Loss (L_w to L_p)	-33	-33	-33	-33	-33	-33	-33	-33	-
Façade Effect	+3	+3	+3	+3	+3	+3	+3	+3	-
Calculated Noise Level at Window	70	64	60	57	56	52	46	35	61
REYQ16T Manufacturer's Noise Level (L_w)	95	89	85	82	81	77	71	60	86
30m Distance Loss (L_w to L_p)	-41	-41	-41	-41	-41	-41	-41	-41	-
Façade Effect	+3	+3	+3	+3	+3	+3	+3	+3	-
Calculated Noise Level at Window	57	51	47	44	43	39	33	22	48
REYQ20T Manufacturer's Noise Level (L_w)	97	91	87	84	83	79	73	62	88
30m Distance Loss (L_w to L_p)	-41	-41	-41	-41	-41	-41	-41	-41	-
Façade Effect	+3	+3	+3	+3	+3	+3	+3	+3	-
Calculated Noise Level at Window	59	53	49	46	45	41	35	24	50
REYQ12T Manufacturer's Noise Level (L_w)	93	87	83	80	79	75	69	58	84
20m Distance Loss (L_w to L_p)	-37	-37	-37	-37	-37	-37	-37	-37	-
Façade Effect	+3	+3	+3	+3	+3	+3	+3	+3	-
Calculated Noise Level at Window	56	50	46	43	42	38	32	21	47
EMRQ16AAY1 Manufacturer's Noise Level (L_w)	94	88	84	81	80	76	70	59	85
Cumulative Effect for 3 units	+5	+5	+5	+5	+5	+5	+5	+5	-
20m Distance Loss (L_w to L_p)	-37	-37	-37	-37	-37	-37	-37	-37	-
Façade Effect	+3	+3	+3	+3	+3	+3	+3	+3	-
Calculated Noise Level at Window	63	57	53	50	49	45	39	28	54
Cumulative Noise Level at Window	71	65	61	58	57	53	47	36	62

Our calculations indicate that, without the implementation of noise mitigation measures, cumulative noise levels from the plant area B would exceed the requirements of the Local

Authority outlined in Section 6.4 by 30dBA during the daytime and 32dBA during the night-time. Mitigation measures will need to be considered as per Section 15.0.

13.0 Plant Noise Mitigation

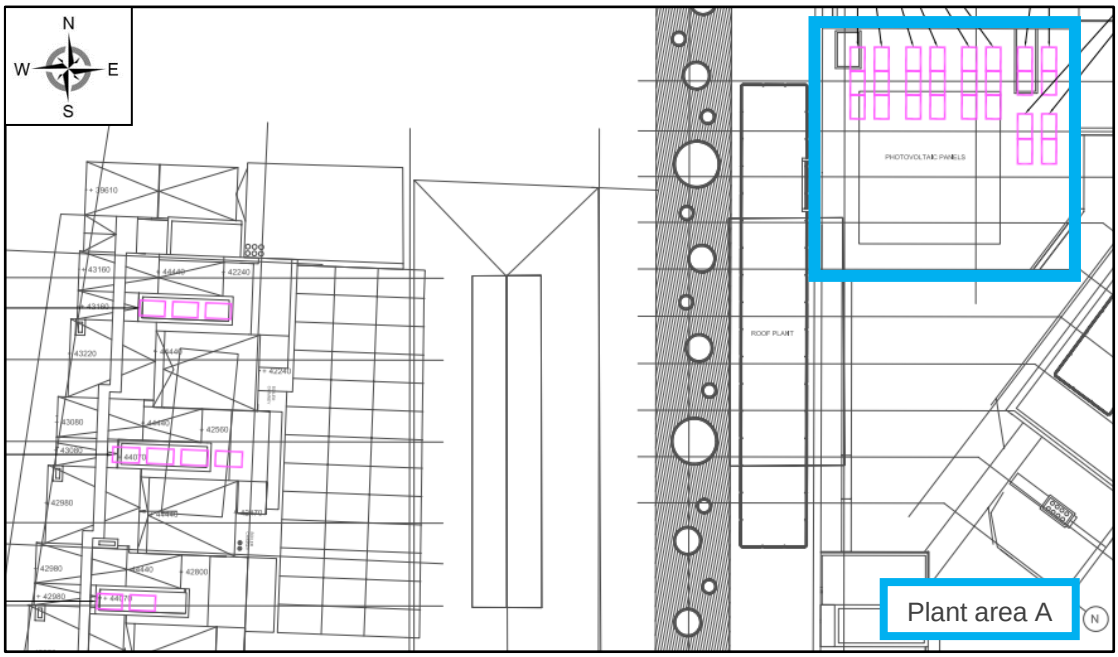
Our calculations indicate that the noise emissions from the proposed plant installation must be suitably attenuated in order to meet the requirements of the Local Authority outlined in Section 8.0. We recommend that for each plant area described in Section 13.3 the following noise mitigation measures would need to be considered.

13.1 Plant Area A Noise Mitigation Measures

Acoustic Enclosure

All condenser units shall be supplied complete with individual or a combined acoustic enclosure which shall achieve a minimum level of attenuation of 33dBA (free field over a reflecting plane) from the enclosure in any horizontal or vertical direction under design duty conditions.

An acoustic enclosure should be installed to incorporate all plant outlined in blue below.



Plant area A acoustic barrier location.

13.2 Plant Area B Noise Mitigation Measures

Acoustic Enclosure

All condenser units shall be supplied complete with individual or a combined acoustic enclosure which shall achieve a level of attenuation of 24dBA (free field over a reflecting plane) from the enclosure in any horizontal or vertical direction under design duty conditions.

13.3 General Comments

We realise achieving greater than around 25dBA attenuation from an enclosure may not be feasible.

We discuss the need to achieve 33dBA reduction from an enclosure for Plant Area A. For this area we firstly recommend reviewing the plant selection to find the quietest equipment possible. In addition please discuss maximum attenuation possibilities from acoustic enclosures with the companies listed in the suitable suppliers list enclosed.

Alternatively a dedicated large plant room with suitably designed acoustically attenuated ventilation strategy may be an option.

14.0 Conclusions

A detailed daytime and night-time fully automated environmental noise survey has been undertaken in order to establish the currently prevailing environmental noise climate around the development site. The results are presented herein.

Suitable environmental noise intrusion criteria have been proposed on the basis of the Local Authority and BS 8233:2014.

A preliminary acoustic analysis has been undertaken to assess the sound insulation requirements of the external building fabric.

Our assessment indicates that acceptable internal noise levels in apartments should be achievable with windows closed using uprated thermal double glazed windows alongside acoustically attenuated ventilation. Acoustic specifications will need to be provided for the external building fabric elements during detailed design stage.

Plant noise emission criteria has been set with reference to Local Authority requirements and proposed plant has been assessed.

Our calculations regarding plant noise indicate that without mitigation measures the Local Authority requirements would not be achieved. We have therefore specified acoustic enclosures for all items.

We discuss the need to achieve 33dBA reduction from an enclosure for Plant Area A. For this area we firstly recommend reviewing the plant selection to find the quietest equipment possible. In addition please discuss maximum attenuation possibilities from acoustic enclosures with the companies listed in the suitable suppliers list enclosed.

Alternatively a dedicated large plant room with suitably designed acoustically attenuated ventilation strategy may be an option.

A list of suitable suppliers has been enclosed with this report.

Appendix A

The acoustic terms used in this report are defined as follows:

dB — Decibel - Used as a measurement of sound level. Decibels are not an absolute unit of measurement but an expression of ratio between two quantities expressed in logarithmic form. The relationships between Decibel levels do not work in the same way that non-logarithmic (linear) numbers work (e.g. 30dB + 30dB = 33dB, not 60dB).

dBA — The human ear is more susceptible to mid-frequency noise than the high and low frequencies. The 'A'-weighting scale approximates this response and allows sound levels to be expressed as an overall single figure value in dBA. The $_A$ subscript is applied to an acoustical parameter to indicate the stated noise level is A-weighted

It should be noted that levels in dBA do not have a linear relationship to each other; for similar noises, a change in noise level of 10dBA represents a doubling or halving of subjective loudness. A change of 3dBA is just perceptible.

$L_{90,T}$ — L_{90} is the noise level exceeded for 90% of the period *T* (i.e. the quietest 10% of the measurement) and is often used to describe the background noise level.

$L_{eq,T}$ — $L_{eq,T}$ is the equivalent continuous sound pressure level. It is an average of the total sound energy measured over a specified time period, *T*.

L_{max} — L_{max} is the maximum sound pressure level recorded over the period stated. L_{max} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the L_{eq} noise level.

L_p — Sound Pressure Level (SPL) is the sound pressure relative to a standard reference pressure of 2×10^{-5} Pa. This level varies for a given source according to a number of factors (including but not limited to: distance from the source; positioning; screening and meteorological effects).

L_w — Sound Power Level (SWL) is the total amount of sound energy inherent in a particular sound source, independent of its environment. It is a logarithmic measure of the sound power in comparison to a specified reference level (usually 10^{-12} W).

SUITABLE SUPPLIERS

of

ACOUSTIC ENCLOSURES

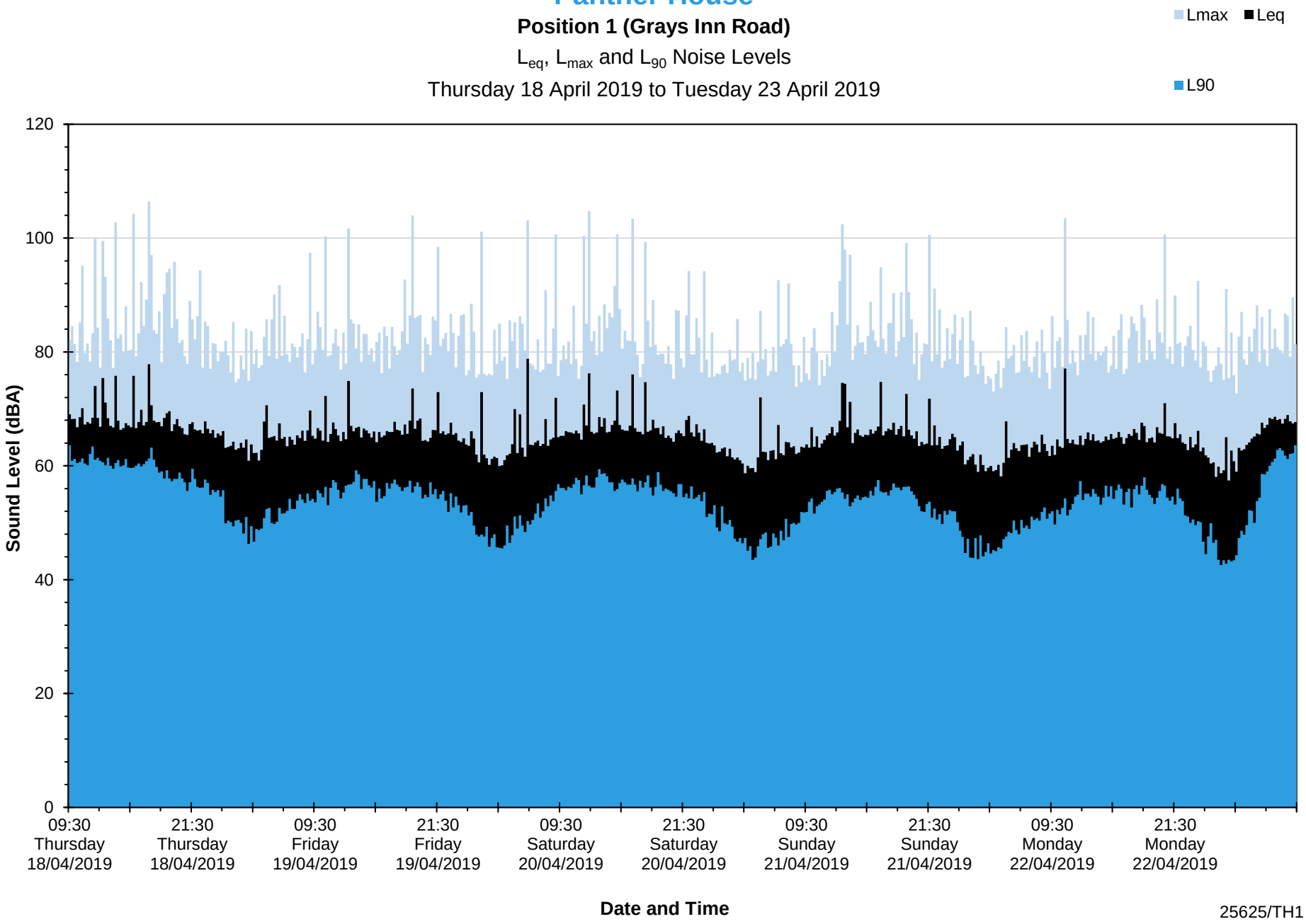
Name & Address	Telephone Number	Contact
Environ Technologies Ltd Regus House 1010 Cambourne Business Park Cambourne CB3 6DP	0870 383 3344	Steve Cox
Acoustic Engineering Services (UK) Ltd The Redwood Suite Guardian House Borough Road Godalming Surrey GU7 2AE	01483 495963	Barry Austin Mark Stagg
IAC Acoustics IAC House Moorside Road Winchester SO23 7US	01962 873000	Paul Gilbert
Allaway Acoustics Ltd 1 Queens Road Hertford SG14 1EN	01992 550825	Jim Grieves Roger Wade
Acoustic Engineering Services (UK) Ltd The Redwood Suite Guardian House Borough Road Godalming Surrey GU7 2AE	01483 495963	Barry Austin Mark Stagg
QuietStar Limited 1 Glen Road Fleet Hampshire GU51 3QS	01252 674327	Luke Willis

Panther House

Position 1 (Grays Inn Road)

L_{eq}, L_{max} and L_{90} Noise Levels

Thursday 18 April 2019 to Tuesday 23 April 2019



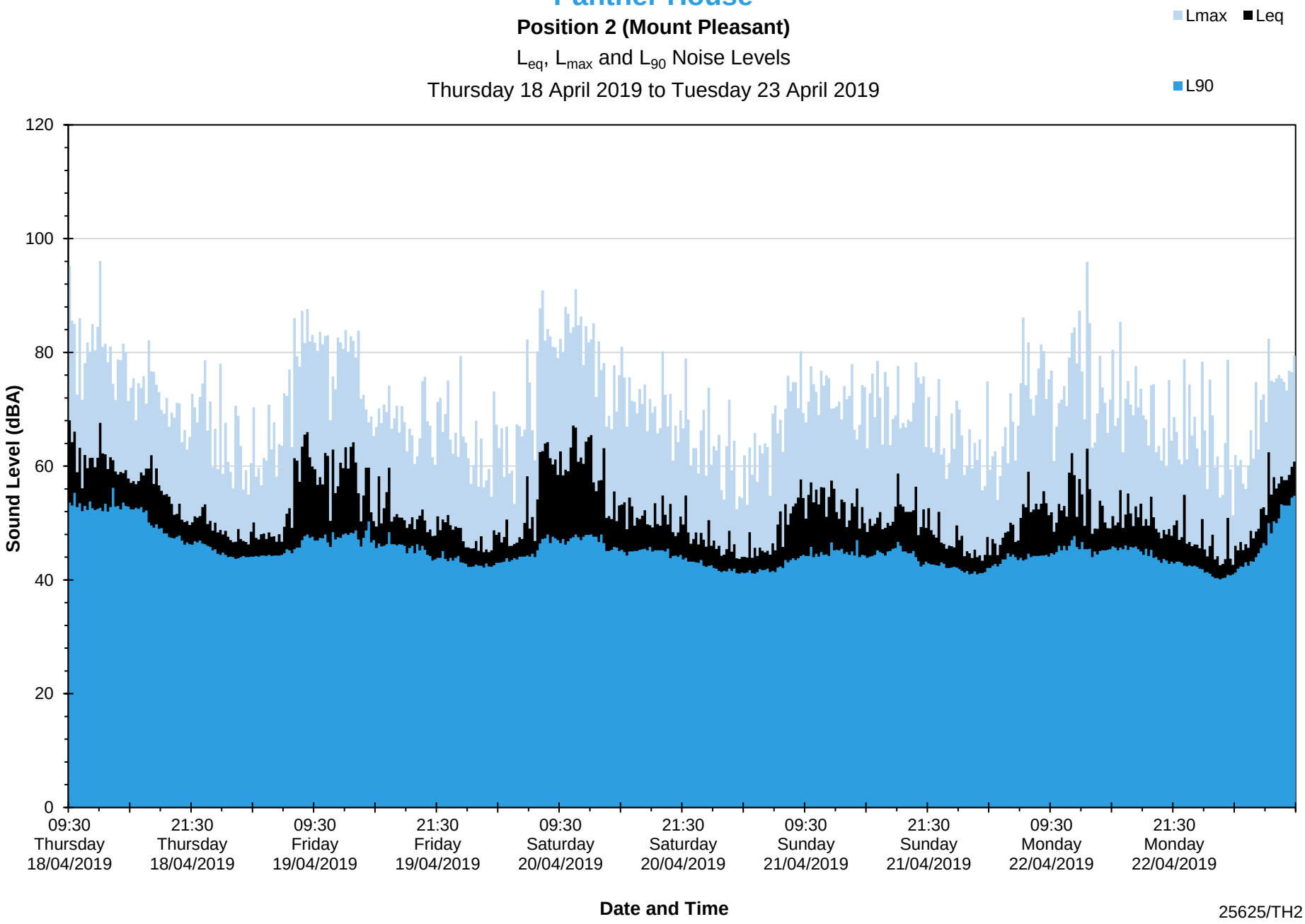
25625/TH1

Panther House

Position 2 (Mount Pleasant)

L_{eq}, L_{max} and L_{90} Noise Levels

Thursday 18 April 2019 to Tuesday 23 April 2019



25625/TH2