SANDY BROWN

Consultants in Acoustics, Noise & Vibration

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London Road Fire Station

Revised scheme – Acoustic planning report

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Version	Date	Comments	Author	Reviewer
A	25 Nov 19		Thomas Dent	Matthew Robinson
B	2 Dec 19	Updates to Section 8.2 and 8.3	Thomas Dent	Matthew Robinson
C	4 Dec 19	Further updates to Section 8.2 and 8.3 & inclusion of residential units	Thomas Dent	Matthew Robinson
D	6 Dec 19	Update to facade sound insulation mark-ups in Appendix C	Christian Clark	Matthew Robinson

Summary

Sandy Brown has been commissioned by Allied London Fire Station Ltd to provide acoustic advice in relation to the proposed re-development of London Road Fire Station, Manchester.

An environmental noise survey has been carried out at the site. The noise survey was carried out between 13 May 2016 and 20 May 2016.

The representative background sound levels measured during the survey were:

- London Road facade – $L_{A90,15min}$ 64 dB during the daytime and $L_{A90,15min}$ 60 dB at night
- Fairfield Street facade – $L_{A90,15min}$ 59 dB during the daytime and $L_{A90,15min}$ 52 dB at night
- Minshull Street South facade – $L_{A90,15min}$ 60 dB during the daytime and $L_{A90,15min}$ 54 dB at night (23:00 – 0:00 and 05:30 – 07:00), $L_{A90,15min}$ 46 dB at night (00:00 – 05:30)
- Whitworth Street facade – $L_{A90,15min}$ 60 dB during the daytime and $L_{A90,15min}$ 51 dB at night.

Based on the requirements of the Manchester City Council and on the results of the noise survey, all plant must be designed such that the cumulative noise level at 1 m from the worst affected windows of the nearby noise sensitive premises does not exceed:

- London Road facade – L_{Aeq} 59 dB during the daytime and L_{Aeq} 55 dB during the night
- Fairfield Street facade – L_{Aeq} 54 dB during the daytime and L_{Aeq} 47 dB during the night
- Minshull Street South facade – L_{Aeq} 55 dB during the daytime and L_{Aeq} 49 dB during the night (23:00 – 0:00 and 05:30 – 07:00), L_{Aeq} 41 dB at night (00:00 – 05:30)
- Whitworth Street facade – L_{Aeq} 55 dB during the daytime and L_{Aeq} 46 dB during the night.

The average ambient noise levels measured during the survey were $L_{Aeq,16h}$ 66-69 dB during the daytime and $L_{Aeq,8h}$ 62-66 dB at night.

An initial facade sound insulation assessment has been carried out to determine the required acoustic performance of the facade and provide guidance on the ventilation strategy. Based on the predicted external noise levels and the required indoor ambient noise levels in hotel guestroom and apartment bedrooms, guidance on example glazing configurations and ventilation strategies capable of meeting the facade sound insulation requirements are provided.

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1 Introduction

Sandy Brown has been commissioned by Allied London Fire Station Ltd to provide acoustic advice in relation to the proposed re-development of London Road Fire Station.

An environmental noise survey has been carried out to establish:

- background sound levels around the site and by nearby noise sensitive premises
- ambient and maximum noise levels at the site.

The background sound levels measured during the survey are used as the basis of limits for noise emission from proposed building services plant. These limits are set in accordance with the requirements of the Manchester City Council.

Noise egress and noise transfer from amplified music will be assessed to determine the necessary performances required to achieve noise levels set in accordance with Manchester City Council guidelines and the proposed hotel operator criteria.

The facade sound insulation will be assessed in order to determine the necessary performance required to achieve internal noise levels for residences set in accordance with Manchester City Council guidelines and the proposed hotel operator criteria.This report provides details of the noise survey, including measurement results, and provides recommendations.

2 Site description

2.1 The site and its surroundings

London Road Fire Station is a Grade II* listed site comprising a number of joint buildings across a building block in the centre of Manchester. The site location in relation to its surroundings is shown in Figure 1.

The site is bordered by Whitworth Street to the North, London Road to the East, Fairfield Street to the South, and Minshull Street South to the West. London Road and Fairfield Street are both busy thoroughfares. Manchester Piccadilly station lies directly across London Road, with Metrolink lines to and from the station running approximately 15 m from the north eastern edge of the London Road Fire Station site.

Unattended and attended noise measurement locations are indicated by letter ‘A’ to ‘E’.



Figure 1 Site map (courtesy of Google Earth Pro)

2.2 Adjacent premises

The adjacent premises to the London Road Fire Station site include commercial, residential and hotel buildings. The nearest identified noise sensitive premises (NSPs) in Figure 1 are as follows:

- Residential apartments, highlighted in blue: 5 Piccadilly Place and 14-16 Whitworth Street across Whitworth Street to the North of the site, residences across Minshull Street South.
- Short stay accommodation, highlighted in green: Motel One hotel and Monroe's public house, across Whitworth Street to the North.
- Student residential accommodation, highlighted in yellow: Warehouse One and Fairfield House, across Fairfield Street to the South.

Other nearby premises include the central Manchester University campus further along Whitworth Street to the South West of the London Road Fire Station site.

3 Development proposals

The proposed development of the site will restore and refurbish the existing buildings into a mixed use development. Proposals includes office and meeting spaces, hotel accommodation, residential apartments and commercial units. There is also a gym proposed, an events space, and outdoor cinema and bar areas.

3.1 Hours of operation

At this stage, the commercial uses proposed as part of the development do not have precise operating times, therefore generic opening times are assumed. These include cafes opening at 07:00, restaurants closing at 23:00, bars closing at 02:00 and offices used mainly between 09:00-17:00.

3.2 Potential noise sources

The potential noise sources associated with the scheme can be broadly divided into two categories:

- Building services plant
- Internal activity in commercial units.

The potential impact of these sources has been assessed and mitigation measures have been proposed to minimise impact on existing noise sensitive premises around the development.

4 Survey method

4.1 Noise survey method

The survey included unattended and attended noise measurements.

The environmental noise survey was carried out in May 2016, however the results are still expected to be a valid representation of noise levels at the site. There has been no significant changes to the site surroundings and no significant change to the road traffic scheme around the site since the survey was carried out.

4.1.1 Unattended measurements

Unattended noise monitoring was undertaken at the site over 7 days.

Details of the equipment used and the noise indices measured are provided in Appendix A.

The unattended measurements were taken over 15 minute periods between 17:10 on 13 May 2016 and 16:00 on 20 May 2016. The equipment was installed by Matthew Robinson and Luis Ruivo and collected by Luis Ruivo.

The measurement positions used during the survey are indicated in Figure 1, denoted by the letters ‘A’ to ‘D’. At all positions, the microphones were attached to an extended pole and installed out of second floor windows. Photographs showing the measurement locations are provided by Figure 2 to Figure 5.

These locations were representative of the noise levels experienced by the nearest noise sensitive premises. Due to the varying profile of the building facades, the microphones were installed approximately 0.5 m to 1 m from the building facade. All microphone positions were approximately 7 m from the ground.



Figure 2 Photograph denoting microphone location at position ‘A’ along London Road



Figure 3 Photograph denoting microphone location at position ‘B’ along Fairfield Street



Figure 4 Photograph denoting microphone location at position ‘C’ along Minshull Street South



Figure 5 Photograph denoting microphone location at position 'D' along Whitworth Street

4.1.2 Attended measurements

Attended external and internal sample measurements were performed by Luis Ruivo at a number of locations around the site.

The external attended measurements were taken at street level directly beneath the unattended noise logging positions indicated in Figure 1, as well as an additional position within the courtyard, indicated by the marker 'E'. The external measurements were carried out on 18 May 2016, over 15 minute periods, with the purpose of determining the existing noise levels from road traffic, pedestrians and other significant noise sources in the area.

In each case the microphone was mounted on a tripod approximately 1.5 m above the ground level, 1 m from the building facade and at least 3 m from any other reflective surface. The only exception was for the measurements carried out at position 'E', where the microphone was mounted on a tripod approximately 1.5 m above the ground level and at least 3 m from any other reflective surfaces.

Details of the equipment used and the noise indices measured are provided in Appendix A.

Dominant noise sources occurring during the measurements were noted.

4.2 Weather conditions

Weather conditions during the survey are described in Appendix A.

Some rain showers occurred throughout the survey however, the survey duration was sufficiently long to include periods affected by adverse weather and no variation in noise levels was seen to correlate with the weather.

5 Measurement results

5.1 Observations

5.1.1 Noise

The dominant noise sources observed at the site during the survey consisted of traffic along the adjacent roads. Of these, London Road and Fairfield Street are particularly busy thoroughfares.

Less significant noise sources included trams approaching and leaving Piccadilly Station and airplanes overhead.

5.2 Unattended measurement results

The results of the unattended noise measurements are summarised in the following tables. Graphs showing the results of the unattended measurements are provided in Appendix B. All of the results presented within this section are facade measurements.

5.2.1 London Road facade

The day and night time ambient noise levels measured during the unattended survey at position 'A' are presented in Table 1.

Table 1 Ambient noise levels measured during the survey at position 'A'

Date	Daytime (07:00 – 23:00) $L_{Aeq,16h}$ (dB)	Night (23:00 – 07:00) $L_{Aeq,8h}$ (dB)
Friday 13 May 2016	71[1]	67
Saturday 14 May 2016	69	68
Sunday 15 May 2016	68	64
Monday 16 May 2016	70[1]	-
Average	69	66

[1] Measurement not made over full period due to monitoring start and end time (the measurement on 13 May 16 was over 6 hours, and on 16 May 2016 over 3 hours) are not included in the average

In line with BS 4142:2014+A1:2019, representative background sound levels have been determined using statistical analysis of the continuous measurements.

Daytime and night time statistical analyses of representative values for position 'A' are given in Figure 6 and Figure 7.

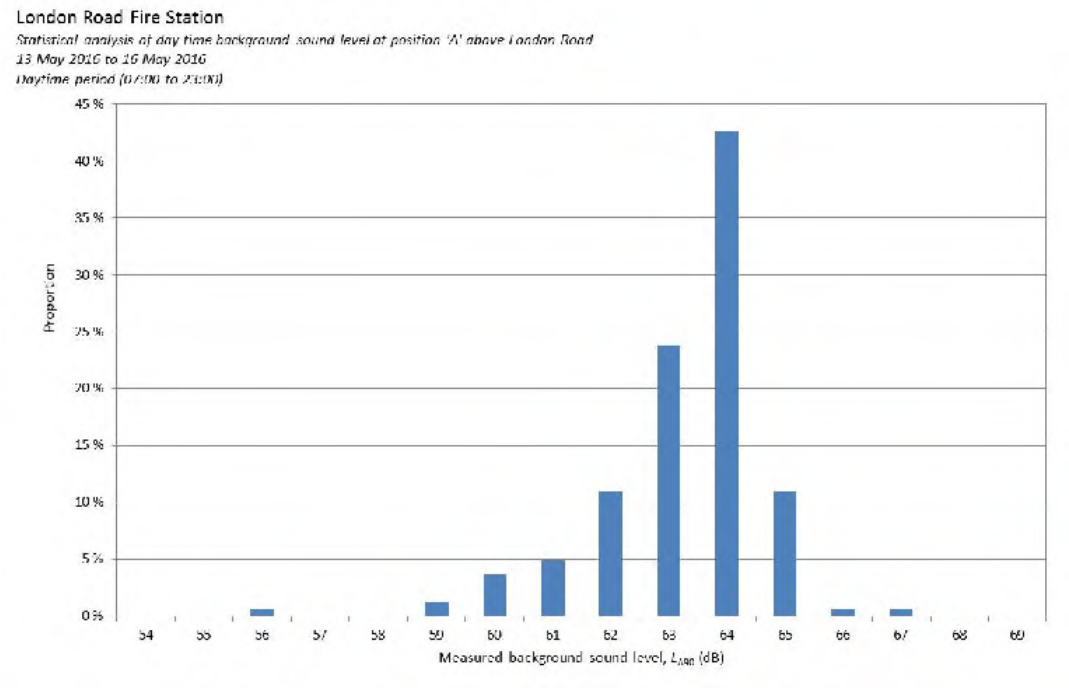


Figure 6 Daytime statistical analysis of background sound levels along London Road, position 'A'

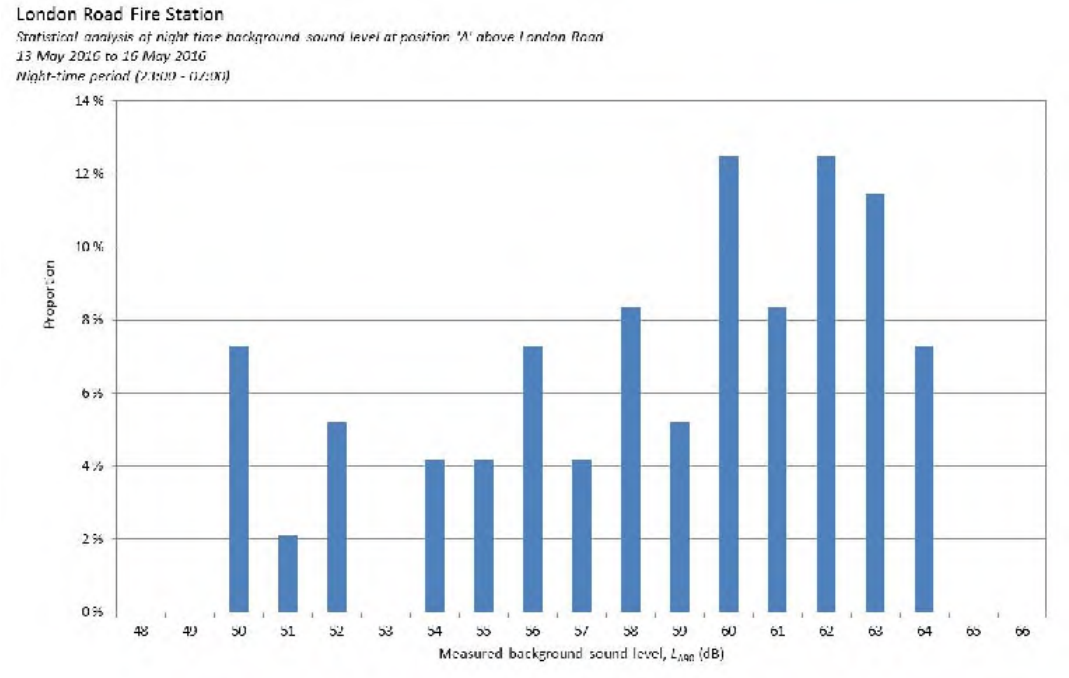


Figure 7 Night-time statistical analysis of background sound levels along London Road, position 'A'

From this analysis, the representative background sound levels measured during the survey were $L_{A90,15min}$ 64 dB during the daytime and $L_{A90,15min}$ 60 dB at night. The corresponding octave band levels are provided in Table 2.

Table 2 Representative measured background sound levels along London Road, position 'A'

Time of day	Representative background sound level, L_{90} (dB) Octave-band centre frequency (Hz)						
	63	125	250	500	1000	2000	4000
Daytime (07:00 – 23:00)	70	61	61	60	60	55	48
Night-time (23:00 – 07:00)	63	57	56	56	57	52	42

5.2.2 Fairfield Street facade

The day and night time ambient noise levels measured during the unattended survey at position 'B' are presented in Table 3.

Table 3 Ambient noise levels measured during the survey at position 'B'

Date	Daytime (07:00 – 23:00) $L_{Aeq,16h}$ (dB)	Night (23:00 – 07:00) $L_{Aeq,8h}$ (dB)
Friday 13 May 2016	68[1]	66
Saturday 14 May 2016	67	66
Sunday 15 May 2016	66	63
Monday 16 May 2016	69[1]	-
Average	67	65

[1] Measurement not made over full period due to monitoring start and end time (the measurement on 13 May 16 was over 6 hours, and on 16 May 2016 over 3 hours) are not included in the average

In line with BS 4142:2014+A1:2019, representative background sound levels have been determined using statistical analysis of the continuous measurements.

Daytime and night time statistical analysis of representative values for the site are given in Figure 8 and Figure 9.

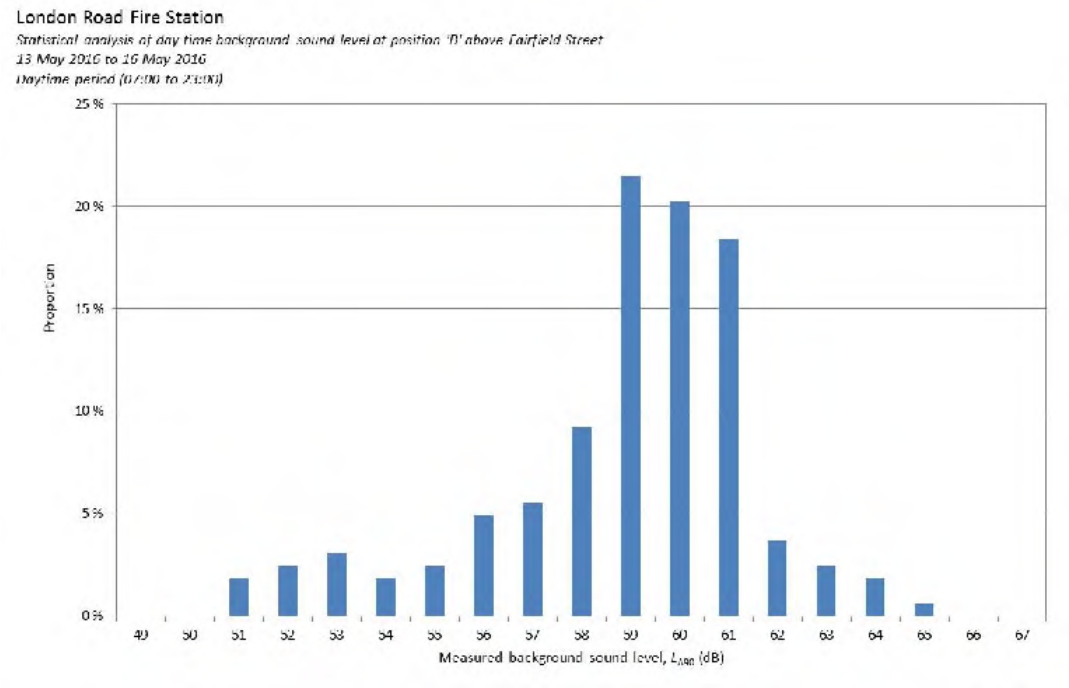


Figure 8 Daytime statistical analysis of background sound levels along Fairfield Street, position 'B'

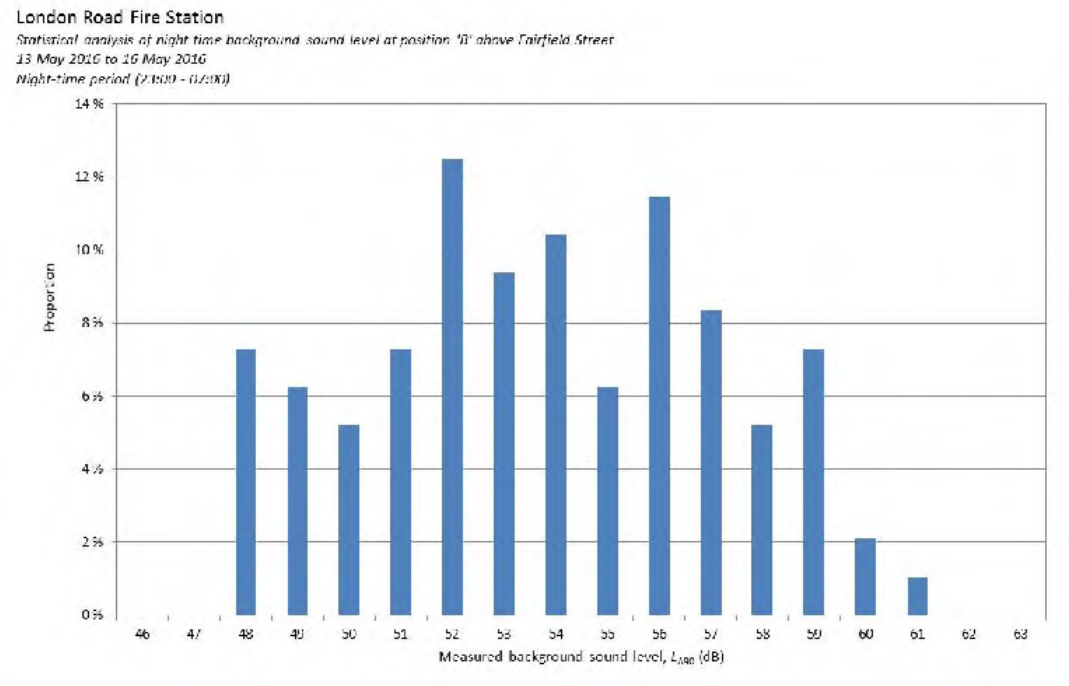


Figure 9 Night-time statistical analysis of background sound levels along Fairfield Street, position 'B'

From this analysis, the representative background sound levels measured during the survey were $L_{A90,15min}$ 59 dB during the daytime and $L_{A90,15min}$ 52 dB at night. The corresponding octave band levels are provided in Table 4.

Table 4 Representative measured background sound levels along Fairfield Street, position 'B'

Time of day	Representative background sound level, L_{90} (dB) Octave-band centre frequency (Hz)						
	63	125	250	500	1000	2000	4000
Daytime (07:00 – 23:00)	68	61	57	54	55	51	43
Night-time (23:00 – 07:00)	59	57	51	47	48	43	33

5.2.3 Minshull Street South facade

The day and night time ambient noise levels measured during the unattended survey at position 'C' are presented in Table 5.

Table 5 Ambient noise levels measured during the survey at position 'C'

Date	Daytime (07:00 – 23:00) $L_{Aeq,16h}$ (dB)	Night (23:00 – 07:00) $L_{Aeq,8h}$ (dB)
Monday 16 May 2016	66[1]	61
Tuesday 17 May 2016	66	62
Wednesday 18 May 2016	67[1]	-
Average	66	62

[1] Measurement not made over full period due to monitoring start and end time (the measurement on 16 May 16 was over 12 hours, and on 16 May 2016 over 9 hours) are not included in the average

In line with BS 4142:2014+A1:2019, representative background sound levels have been determined using statistical analysis of the continuous measurements.

Daytime and night time statistical analysis of representative values for the site are given in Figure 10 and Figure 11.

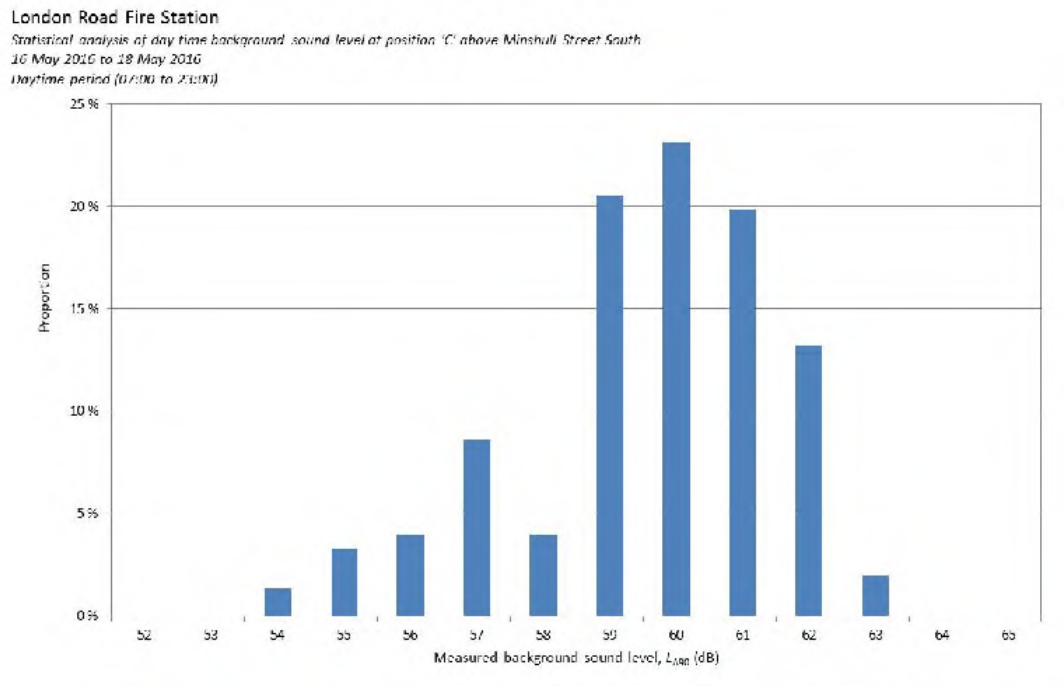


Figure 10 Daytime statistical analysis of background sound levels along Minshull Street South, position 'C'

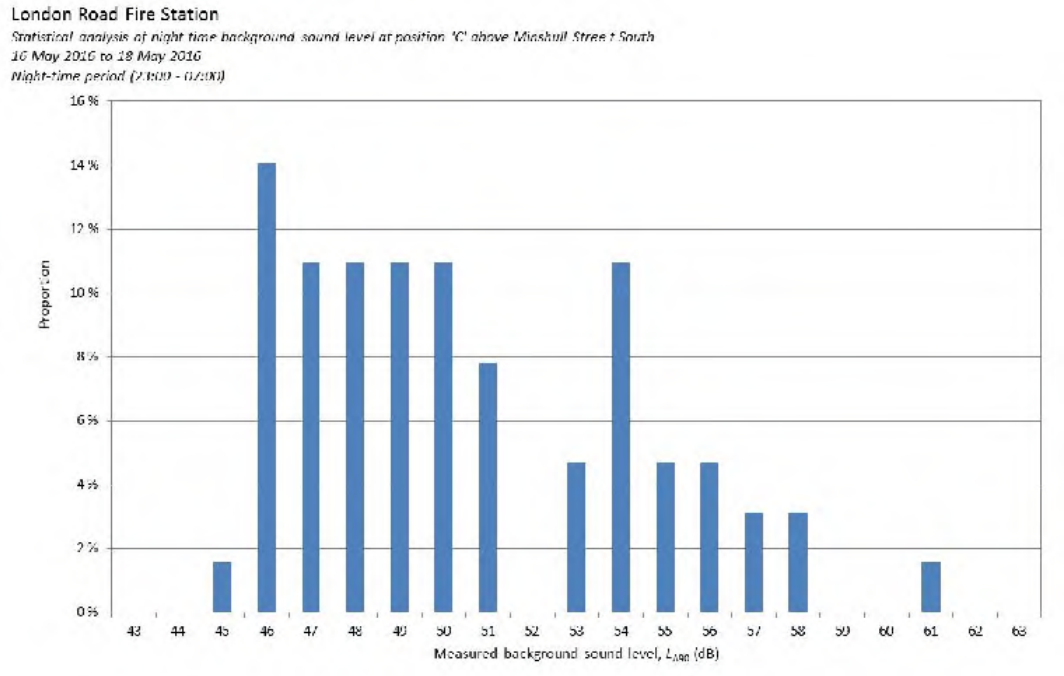


Figure 11 Night-time statistical analysis of background sound levels along Minshull Street South, position 'C'

From this analysis, the representative background sound levels measured during the survey were $L_{A90,15min}$ 60 dB during the daytime.

Further analysis of the time history at this location, presented in Appendix B, yields two distinct periods of activity during the night time period. The representative background sound levels for the first period, occurring during the 23:00 – 00:00 period and again from approximately from 05:30-07:00 were $L_{A90,15min}$ 54 dB. Throughout the rest of the night time period, the representative background sound levels were $L_{A90,15min}$ 46 dB.

The corresponding octave band levels are provided in Table 6.

Table 6 Representative measured background sound levels along Minshull Street South, position 'C'

Time of day	Representative background sound level, L_{90} (dB) Octave-band centre frequency (Hz)						
	63	125	250	500	1000	2000	4000
Daytime (07:00 – 23:00)	67	58	56	56	56	52	45
Night time (23:00 – 00:00 and 05:30 – 07:00)	61	53	50	50	50	46	38
Night time (00:00 – 05:30)	53	50	46	44	43	37	27

5.2.4 Whitworth Street facade

The day and night time ambient noise levels measured during the unattended survey at position 'D' are presented in Table 7.

Table 7 Ambient noise levels measured during the survey at position 'D'

Date	Daytime (07:00 – 23:00) $L_{Aeq,16h}$ (dB)	Night (23:00 – 07:00) $L_{Aeq,8h}$ (dB)
Wednesday 18 May 2016	69[1]	63
Thursday 19 May 2016	69	63
Friday 20 May 2016	69[1]	-
Average	69	63

[1] Measurement not made over full period due to monitoring start and end time (the measurement on 18 May 16 was over 7 hours, and on 20 May 2016 over 9 hours); not included in the average

In line with BS 4142:2014+A1:2019, representative background sound levels have been determined using statistical analysis of the continuous measurements. Daytime and night time statistical analysis of representative values for the site are given in Figure 12 and Figure 13.

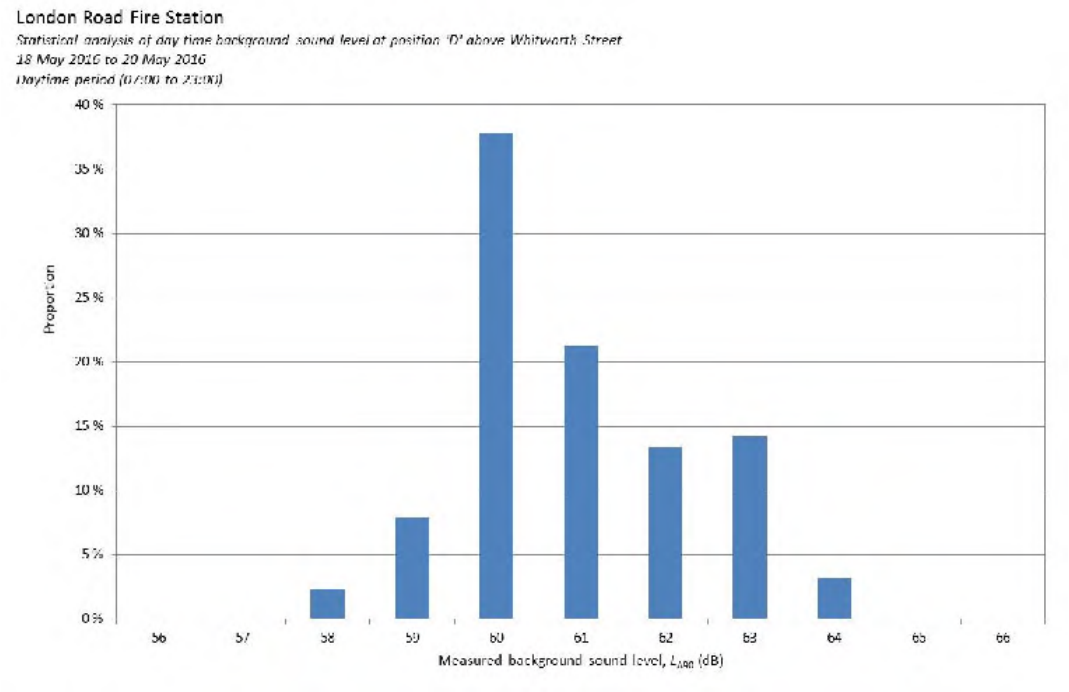


Figure 12 Daytime statistical analysis of background sound levels along Whitworth Street, position 'D'

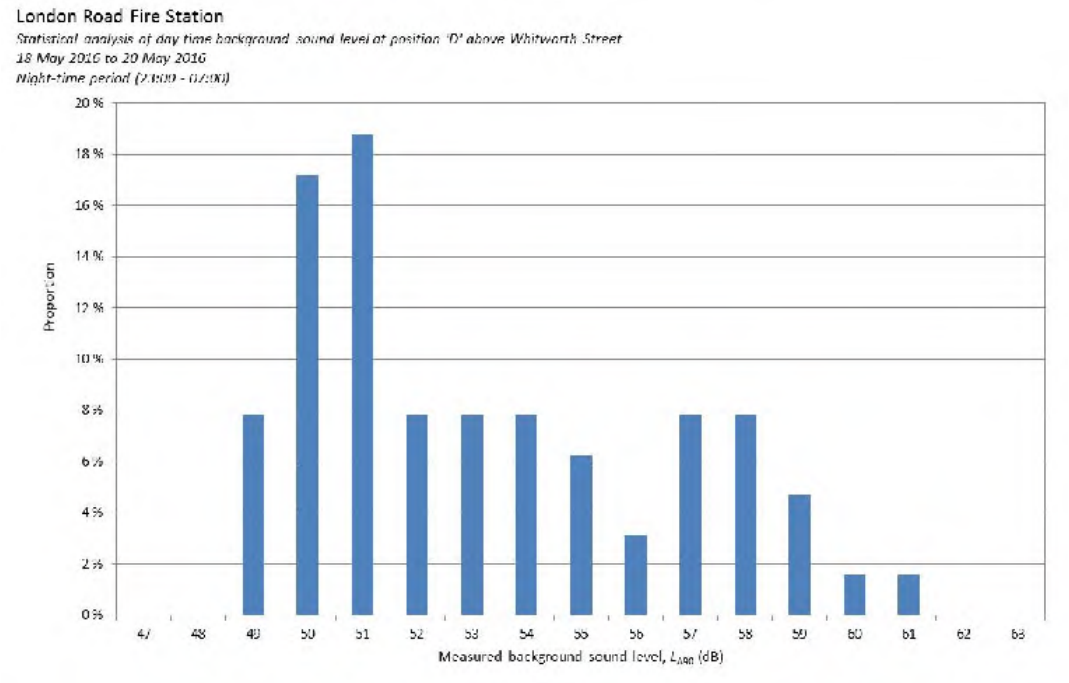


Figure 13 Daytime statistical analysis of background sound levels along Whitworth Street, position 'D'

From this analysis, the representative background sound levels measured during the survey were $L_{A90,15min}$ 60 dB during the daytime and $L_{A90,15min}$ 51 dB at night. The corresponding octave band levels are provided in Table 8.

Table 8 Representative measured background sound levels along Whitworth Street, position 'D'

Time of day	Representative background sound level, L_{90} (dB) Octave-band centre frequency (Hz)						
	63	125	250	500	1000	2000	4000
Daytime (07:00 – 23:00)	65	59	58	56	56	52	46
Night-time (23:00 – 07:00)	55	50	51	46	46	42	36

5.3 Attended measurement results

Noise levels and key sources recorded during the attended measurements are summarised in Table 9.All the attended measurements were performed over 15 minute periods, with the exception of the measurements taken at position 'E', where three consecutive 5 minute measurements were taken, in order to better capture noise level variations within the courtyard of London Road Fire Station.

All of the attended external measurements are facade measurements with the exception of those taken at position 'E', which are free-field measurements.

Table 9 Sound pressure levels from attended measurements at positions

Position	Start time	Sound pressure levels (dB)			Noise sources
		$L_{Aeq,15min}$	$L_{AFmax,15min}$	$L_{A90,15min}$	
A	08:47	72	88	65	Congested road traffic along London Road, distant trams
	15:31	70	84	63	Free flowing road traffic along London Road, distant trams
B	08:28	70	88	64	Congested road traffic along Fairfield Street, bus brake screeches
	15:10	72	91	65	As above, increased number of heavy goods vehicles (HGV)

Position	Start time	Sound pressure levels (dB)			Noise sources
		$L_{Aeq,15min}$	$L_{AFmax,15min}$	$L_{A90,15min}$	
C	08:10	66	78	60	Dominated by road traffic on Fairfield Street and Whitworth Street, occasional car on Minshull Street South, distant trams
	14:55	65	84	60	Dominated by road traffic on Fairfield Street, bus / HGV brake screeches
D	09:10	70	88	61	Dominated by buses approaching stop on Whitworth Street, congested road traffic on Whitworth street, trams to/from Piccadilly Station
	15:55	66	80	59	Free flowing road traffic along Whitworth Street, otherwise as above
E	09:30	51[1]	64[1]	49[1]	Road traffic noise ingress to courtyard via London Road entrance, airplanes overhead, seagulls and crows on rooftops
	09:35	51[1]	61[1]	48[1]	As above
	09:41	49[1]	61[1]	48[1]	Road traffic noise ingress from London Road only

[1] Measurements taken over 5 minute periods.

6 Assessment criteria

6.1 NPPF and NPSE

The National Planning Policy Framework, July 2018 (NPPF) sets out the UK government's planning policies for England. It supersedes previous guidance notes such as PPG24. No specific noise criteria are set out in the NPPF, or in the Noise Policy Statement for England (NPSE) to which it refers.

The NPPF states:

> *'Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:*
>
> - *mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life.*
> - *identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.'*

and

> *'Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.'*

The NPSE states that its aims are as follows:

> *'Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:*
>
> - *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.'*

As such, neither document sets out specific acoustic criteria for new residential developments, but they require consideration of the effect of existing noise on the new development and the effect of noise from the development on the surroundings.

6.2 Noise egress

6.2.1 Local authority external noise criteria (plant noise)

Manchester City Council (MCC) provides guidance in relation to plant noise emissions in their *Planning and Noise Technical Guidance* document dated December 2015. The following criteria are stipulated:

a) *'achieve a noise level (L_{Aeq}) of at least 5 dB below the typical background noise levels (L_{A90}) at the nearest noise sensitive location at the quietest time the equipment will be in operation; and*
b) *not contain any discernible tonal characteristics at the nearest noise sensitive location at the quietest time the equipment will be in operation.*

Where the product data suggests there may be a tonal element to the noise (i.e. the octave band noise data shows a peak at a particular frequency) it will be required to demonstrate that noise from the equipment will be at least 5 dB below the typical background noise level (L_{90}) in each octave band at the nearest noise sensitive location at the time the equipment will be in operation, the assessment will be carried out in line with BS4142:2014.'

6.2.2 Local authority external noise criteria (amplified music)

MCC stipulates the following in relation to amplified music associated with a new development:

'*Entertainment noise (L_{Aeq}) should be controlled to 10 dB below the background noise level (L_{A90}) without the entertainment noise present, in each octave band at the nearest noise sensitive location.'*

6.3 Noise ingress

6.3.1 Internal noise criteria (residential)

MCC stipulates the criteria provided in Table 10 with regards to internal noise in residential developments.

Table 10 Manchester City Council internal noise criteria for residential developments

Internal space	Internal noise limit, L_{Aeq} (dB)	
	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)
Living rooms	35	-
Bedrooms	-	30

It is also stipulates that individual noise events in bedrooms should not exceed L_{Amax} 45 dB by more than 15 times.

In addition, where entertainment noise is a factor in the noise climate, MCC states the following:

'Music noise levels in the 63 Hz and 125 Hz octave centre frequency bands should be controlled so as not to exceed (in habitable rooms) 47 dB and 41 dB (L_{eq}), respectively.'

These criteria apply to both music noise from existing premises in the surrounding area and from any non-residential units proposed as part of the development.

From discussions with MCC it is understood that the low frequency noise criteria only applies to living-areas during the daytime (07:00 – 23:00) and to bedrooms during night-time (23:00 – 07:00).

6.3.2 Local authority internal noise criteria (hotel guestrooms)

Based on the latest MCC Planning & Noise Technical Guidance (December 2015) and further to discussion with Richard Knightley (EHO for MCC), it is understood that there is no specific internal noise criteria for hotel accommodation and that MCC indoor ambient noise levels criteria in Planning & Noise Technical Guidance only applies for residential accommodation. For hotel developments, controlling noise ingress on the basis for any operator requirements is acceptable.

6.4 Development criteria

In addition the Local Authority criteria discussed above the following criteria is also proposed for the development.

6.4.1 Internal noise criteria (hotel guestrooms)

It is proposed that internal noise levels in hotel guestrooms meets the MCC internal noise criteria for residential developments as set out in Section 6.3.1 (including amplified music noise criteria).

6.4.2 Internal noise criteria (workspaces)

To minimise disturbance to workspaces, it is proposed to control noise transfer from amplified music so that it does not exceed 5 dB below NR 35. This is based on an internal noise level from building services of NR 35 in the workspaces.

7 Plant noise limits – noise egress

7.1 Noise egress limits

Based on the above criteria and the measurement results, the cumulative noise level resulting from the operation of all new plant at 1 m from the worst affected windows of the nearest noise sensitive premises should not exceed 5 dB below the typical A-weighted background external noise level (L_{A90}). These limits are set out in Table 11.

Table 11 Plant noise limits at 1 m from the nearest noise sensitive premises

Location	Maximum sound pressure level at 1 m from noise sensitive premises, $L_{Aeq,15min}$ (dB)	
	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)
London Road	59	55
Fairfield Street	54	47
Minshull Street South	55	49 (23:00 – 00:00 and 05:30 – 07:00) 41 (00:00 – 05:30)
Whitworth Street	55	46

Where an item of plant contains tonal characteristic, the limits should not exceed 5 dB below the typical external background sound level in octave bands. These limits are set out in Table 12.

Table 12 Octave band plant noise limits at 1 m from the nearest noise sensitive premises

Location/Time of day	Maximum sound pressure level at 1 m from noise sensitive premises, L_{eq} (dB) Octave-band centre frequency (Hz)						
	63	125	250	500	1000	2000	4000
London Road							
Daytime (07:00 – 23:00)	65	56	56	55	55	50	43
Night-time (23:00 – 07:00)	58	52	51	51	52	47	37
Fairfield Street							
Daytime (07:00 – 23:00)	63	56	52	49	50	46	38
Night-time (23:00 – 07:00)	54	52	46	42	43	38	28
Minshull Street South							
Daytime (07:00 – 23:00)	62	53	51	51	51	47	40
Night time (23:00 – 00:00 and 05:30 – 07:00)	56	48	45	45	45	41	33
Night time (00:00 – 05:30)	48	45	40	38	36	31	21
Whitworth Street							
Daytime (07:00 – 23:00)	60	54	53	51	51	47	41
Night-time (23:00 – 07:00)	50	45	46	41	41	37	31

7.2 Assessment

All building services plant will be designed to achieve the noise limits set out above, including any corrections for attention catching features. The penalty corrections for attention catching features may be significant and will need to be considered as the building services design progresses. This is discussed in Appendix D.

At this stage, no information is available in relation to the proposed plant. This will need to be assessed as the design progresses.

8 Amplified sound

8.1 Noise egress to nearby noise sensitive premises

The cumulative noise level resulting from amplified sound egress at 1 m from the most affected windows of the nearest noise sensitive premises should not exceed 10 dB below the existing background sound level in octave bands. These limits set out in Table 13.

Table 13 Octave band amplified music limits at 1 m from the nearest noise sensitive premises

Location/Time of day	Maximum sound pressure level at 1 m from noise sensitive premises, L_{eq} (dB) Octave-band centre frequency (Hz)						
	63	125	250	500	1000	2000	4000
London Road							
Daytime (07:00 – 23:00)	60	51	51	50	50	45	38
Night-time (23:00 – 07:00)	53	47	46	46	47	42	32
Fairfield Street							
Daytime (07:00 – 23:00)	58	51	47	44	45	41	33
Night-time (23:00 – 07:00)	49	47	41	37	38	33	23
Minshull Street South							
Daytime (07:00 – 23:00)	57	48	46	46	46	42	35
Night time (23:00 – 00:00 and 05:30 – 07:00)	51	43	40	40	40	36	28
Night time (00:00 – 05:30)	43	40	35	33	31	26	16
Whitworth Street							
Daytime (07:00 – 23:00)	55	49	48	46	46	42	36
Night-time (23:00 – 07:00)	45	40	41	36	36	32	26

8.2 Noise transfer noise sensitive spaces within the development

To control noise transfer from the amplified sound associated with hotel and commercial premises within the development premises to office, hotel and apartment spaces above, minimum sound insulation performances for partition and floors are recommended and are set out in Table 14.

Table 14 Recommended minimum airborne sound insulation performances

Location	Separating element	Amplified sound in source room	Minimum airborne sound insulation performance
Ground floor Unit F to first floor Workspaces	Floor	Yes	$D_{nT,w}+C_{tr}$ 55 dB
Ground floor Unit G to first floor Workspaces	Floor	Yes	$D_{nT,w}+C_{tr}$ 55 dB
Basement (double height) Court to first floor Hotel Rooms	Floor	Yes	$D_{nT,w}+C_{tr}$ 55 dB
Ground floor (double height) Unit D to second floor Hotel Rooms	Floor	Yes	$D_{nT,w}+C_{tr}$ 55 dB
First floor Unit D to Hotel Rooms	Partition	Yes	$D_{nT,w}+C_{tr}$ 55 dB
Ground floor Unit A to first floor Workspaces	Floor	Yes	$D_{nT,w}+C_{tr}$ 55 dB
Second floor Social Club to third floor Laundry – Workspace	Floor	Yes	$D_{nT,w}+C_{tr}$ 55 dB
Ground floor Unit E & Unit H to first floor Workspaces	Floor	No	$D_{nT,w}+C_{tr}$ 48 dB
First floor, second floor and third floor Workspaces to Hotel Rooms	Partition	No	$D_{nT,w}+C_{tr}$ 48 dB
First floor Workspaces to Second floor Live/Work units (residential apartments)	Floor	No	$D_{nT,w}+C_{tr}$ 48 dB

8.3 Operational noise limits

The maximum operational noise levels (L_{eq}) from amplified sound within the proposed noise generating units are set out in Table 15. Maximum internal sound pressure levels (L_{Fmax}) should be limited to values 5 dB above those set out below. These are based on the following:

- Meeting the noise egress criteria set out in 6.2.2 and the external noise limits in Section 8.1.
- A minimum overall facade sound insulation performance of R_w+C_{tr} 28 dB to the ground floor Units A, F, G and D.
- Meeting the noise transfer criteria for noise generating spaces adjacent to hotel guest rooms out in Sections 6.3.2 and 6.4.1.
- The minimum internal sound insulation performances set out in Section 8.2.

The limits are provided for guidance only as in practice, there will be some variation in background noise levels within noise sensitive spaces (office space, hotel guestrooms, apartments). It is recommended that the exact amplified noise limits are determined in-situ along with setting of electronic limiters. These limits would typically be included in a tenant lease agreement in order to control noise transfer and minimise disturbance to the occupants of the office spaces and hotel guestrooms.

Table 15 Operational noise limits from amplified sound in restaurant, bar and amenity areas

Space	Maximum noise level in source room, L_{eq} (dB) Octave band centre frequency (Hz)						
	63	125	250	500	1000	2000	4000
Ground floor Unit F	77	90	85	79	81	81	76
Ground floor Unit G	77	90	85	79	81	81	76
Ground floor (double height) Unit D	77	87	75	75	77	75	76
Basement Court – See comments in Section 8.3.1	96	96	87	83	83	81	81
Ground floor Unit A	77	90	85	79	81	81	76
Second floor Social Club	77	90	85	79	81	81	76

8.3.1 Comments on proposed noise limits

For the ground floor Unit G and Unit A and the second floor Social Club, the levels detailed above would be suitable for a restaurant or bar with low level background music, though electronic limiters on the amplification equipment would be recommended to provide control of the noise levels. The noise levels would not allow permit any heavily amplified or live music (eg, DJ or live band).

Similarly, for the ground Unit F and double height Unit D, the noise levels would not allow permit any heavily amplified or live music.

For the Basement Court the proposed noise limits would allow the amplified sound noise egress criteria to be met. However, based on activities in these spaces operating at the noise levels set out in Table 15 there will be noise transfer to adjacent occupied spaces. This will be managed by the Landlord and the respective tenants.

8.3.2 Possible tenant enhancement works

If higher noise levels are required by the tenant then the enhancement works to improve the sound insulation performance of the separating floor and/or building envelope will be required in order that the criteria are still met. Typical enhancement works would be expected to include:

- Independent lining to the external flanking walls – where it has not been provided
- Independent lining to all internal flanking elements (columns – where it has not been provided, existing walls running between floors)
- Provision of an additional sound insulating ceiling
- Secondary glazing to windows
- Lobbied external doors.

8.3.3 Courtyard

Operational noise limits from amplified sound in the courtyard are set out in Table 16. Limits are provided for:

- Regular use based on meeting the noise egress criteria set out in 6.2.2 and the external noise limits in section 8.1
- Limited use based on the guidance contained in Code of practice on environmental noise control at concerts (CoP) – 13-30 events per year: '*Music noise levels should not exceed the background noise levels by more than 5 dB over a 15 minute period.'*

Table 16 Operational noise limits from amplified sound in the courtyard

Space	Maximum noise level in courtyard, L_{eq} (dB) Octave band centre frequency (Hz)						
	63	125	250	500	1000	2000	4000
Based on regular use							
Daytime (07:00 – 19:00)	71	65	66	63	63	59	54
Evening (19:00 – 23:00)	68	63	63	62	63	59	57
Based on 13-30 events per year							
Daytime (07:00 – 19:00)	86	80	81	78	78	74	69
Evening (19:00 – 23:00)	83	78	78	77	78	74	72

9 Facade sound insulation – noise ingress

This section describes an assessment of facade sound insulation to control noise ingress. The required facade specification largely depends on the external noise levels and the internal noise criteria.

The following assessment is based on achieving the internal noise levels recommended in BS 8233 and by Manchester City Council, which are set out in Section 6.3.

9.1 External noise levels

A 3D computer model of the site and its surroundings has been generated using CadnaA (version 4.2) software by Datakustik. This allows for an assessment of noise ingress by incorporating the screening that proposed buildings will provide when completed.

The software carries out calculations using a ray tracing technique. This takes account of the effects of topography, reflections, screening and distance attenuation for noise sources to predict noise levels in three dimensions. Calculations are carried out in accordance with ISO 9613 *Attenuation of sound during propagation outdoors.*

The 3D noise model has been based on the results of the noise survey that has been carried out around the site and the proposed layouts. A plan view of the daytime and night-time noise levels are shown in Figure 14 and Figure 15.

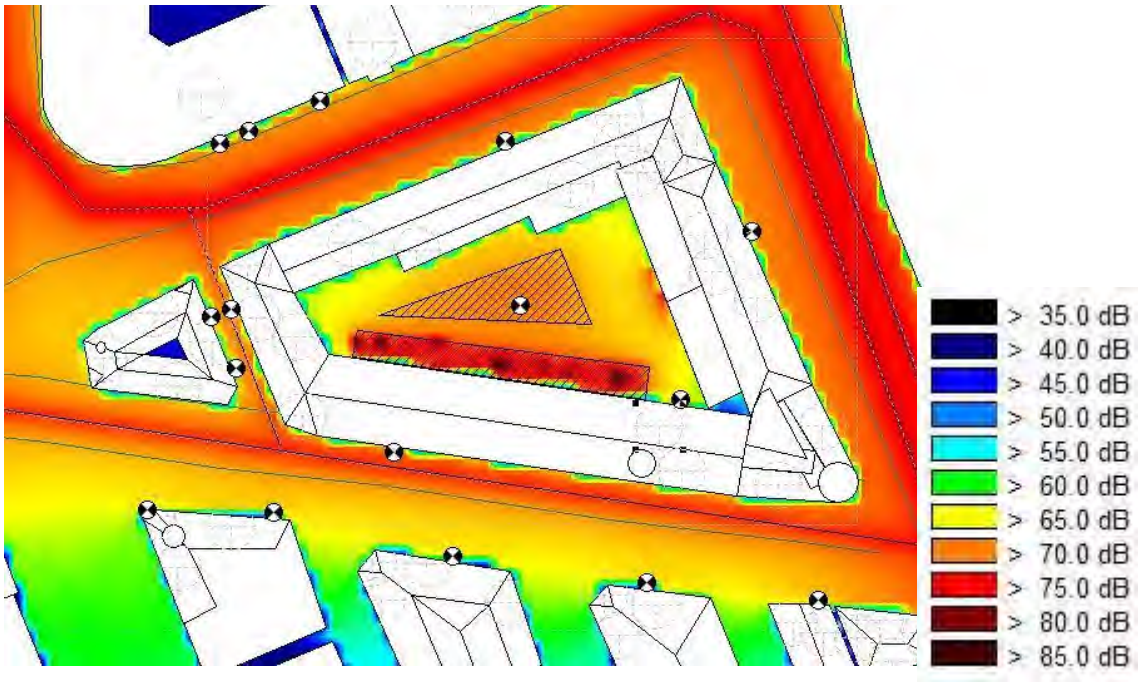


Figure 14 3D noise model, daytime noise levels

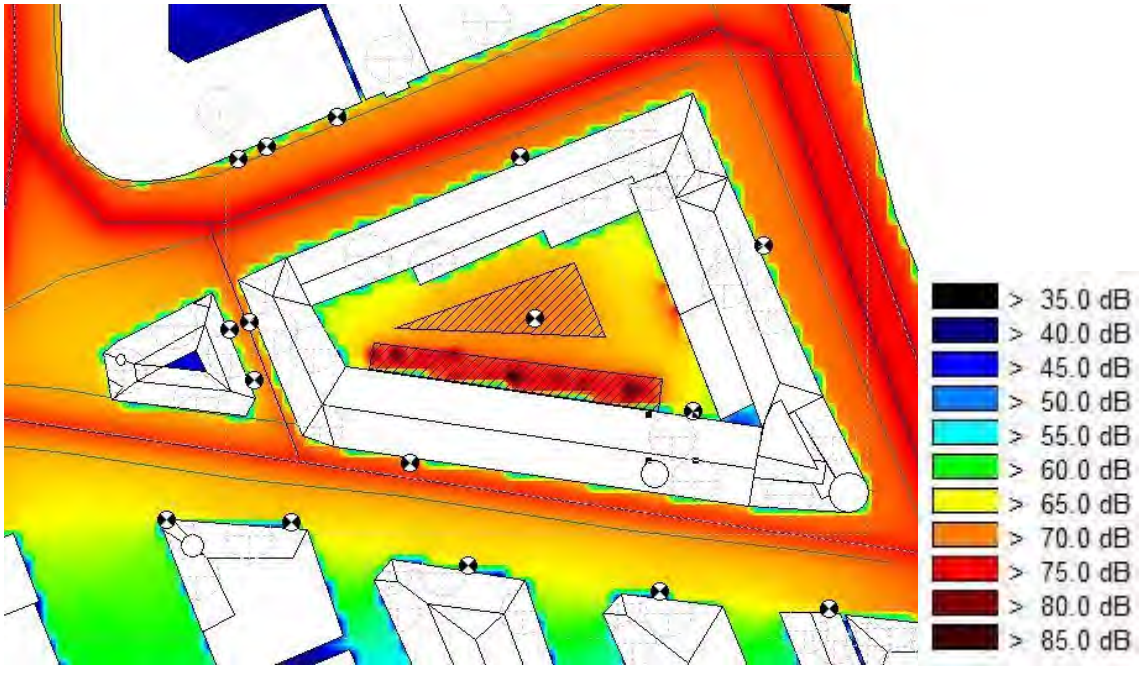


Figure 15 3D noise model, daytime noise levels

9.2 Facade sound insulation

9.2.1 Overall facade sound insulation requirements

Based on the results of the environmental noise survey and the 3D model, and in order to allow an assessment of the worst case scenario, the highest external noise levels predicted at each of the proposed facades in the 3D model have been used to assess noise ingress.

The following assessment is based on achieving the internal noise levels for hotel guest rooms and apartments recommended in Section 6.3.1. The guidance set out in the following sections is based on the current layouts, should these change the requirements may need to be revised.

The recommended minimum overall facade sound insulation performances are set out in Table 17 and mark-ups of the predicted external noise levels/facade zones for hotel guestrooms and apartments are provided in Appendix C.

Depending on the room location the average noise level (L_{Aeq}) or the maximum noise level not normally exceeded at night (L_{AFmax}) may result in a higher minimum overall facade sound insulation performance. The higher performance should be use in order to meet the internal noise criteria.

Table 17 Minimum overall facade sound insulation requirements

Facade zone (see Appendix C)	External noise level (dB)		Minimum overall facade sound insulation performance, $R_w + C_{tr}$ (dB)			
	L_{Aeq}	L_{Amax} not normally exceeded at night	Living rooms – Daytime (See Appendix C)		Bedrooms/Hotel guestrooms – Night-time (See Appendix C)	
			Corner	General	Corner	General
A	72	-	No residential apartments or hotel guestrooms indicated to facade zone A			
B	71	-	No residential apartments or hotel guestrooms indicated to facade zone B			
C	69	-	37	34	42	39
D	67	-	35	32	39	37
E	65	-	33	30	37	35
F	63	-	31	28	35	33
AA	-	82	-	-	39	37
BB	-	76	No residential apartments or hotel guestrooms indicated to facade zone BB			

9.2.2 Guidance on facade construction, glazing, and ventilation strategy

The following table sets out some examples of glazing build ups and ventilation strategies that could be employed to achieve the required sound insulation performance for the various elevations.

Table 18 Example glazing configurations and ventilation strategies

Sound insulation R_w+C_{tr} (dB)	Example glazing configuration	Ventilation Strategy
28-32	6.4 mm/12 mm/6 mm OR Existing 6 mm glazing/100 mm cavity with sound absorbent reveals/6 mm secondary glazing	Attenuated passive ventilation
33-35	6.4 mm/12 mm/10 mm OR Existing 6 mm glazing/100 mm cavity with sound absorbent reveals/6 mm secondary glazing	High performance acoustically attenuated passive ventilation
36-38	12.8 mm/12 mm/10 mm OR Existing 6 mm glazing /100 mm cavity with sound absorbent reveals/6 mm secondary glazing	Mechanical ventilation (eg, whole house ventilation)
39-41	12.8 mm/20 mm/10 mm OR Existing 6 mm glazing /150 mm cavity with sound absorbent reveals/6.4 mm secondary laminate glazing	Mechanical ventilation (eg, whole house ventilation)
42-43	This represents a very high sound insulation performance. The highest performance typically achievable using double glazing is around R_w+C_{tr} 42 dB, either 16.8 mm glazing/20 mm air-space/16.8 mm glazing OR Existing 6 mm glazing/200 mm cavity with sound absorbent reveals/6.4 mm secondary laminate glazing. For higher performances, a substantial facade construction, limited glazing area, and mechanical ventilation is likely to be required.	

The performance required by each element will depend on the relative areas of glazed and non-glazed elements, and the ventilation strategy. If applicable, this includes the acoustic performance of trickle ventilators and the number of ventilators per room. As a guide, for a mechanically ventilated room with a 50% glazed facade, the glazing sound insulation requirement would typically be 3 dB lower than the overall facade sound insulation requirement. This is provided the non-glazed external wall elements provide at least 10 dB more sound insulation than the glazed elements.

As the design progresses, a more detailed facade sound insulation assessment will need to be performed, taking into account the factors listed above, to ensure that the overall performance requirements will be met.

10 Conclusion

A noise survey has been carried out to determine the existing background sound levels in the vicinity of the site and surrounding noise sensitive premises. The representative background sound levels measured during the survey were:

- London Road facade – $L_{A90,15min}$ 64 dB during the daytime and $L_{A90,15min}$ 60 dB at night
- Fairfield Street facade – $L_{A90,15min}$ 59 dB during the daytime and $L_{A90,15min}$ 52 dB at night
- Minshull Street South facade – $L_{A90,15min}$ 60 dB during the daytime and $L_{A90,15min}$ 54 dB at night (23:00 – 0:00 and 05:30 – 07:00), $L_{A90,15min}$ 46 dB at night (00:00 – 05:30)
- Whitworth Street facade – $L_{A90,15min}$ 60 dB during the daytime and $L_{A90,15min}$ 51 dB at night.

Based on the requirements of Manchester City Council and on the results of the noise survey, the cumulative noise level from plant at 1 m from the worst affected window of the nearby noise sensitive premises is to be at least 5 dB below the typical background noise level measured.

These limits are cumulative, and apply with all plant operating under normal conditions. If plant items contain tonal or attention catching features the limits should not exceed 5 dB below the typical external noise level in octave bands. These limits are set out in Table 12. At this stage, no detailed information is available in relation to the proposed installation of building services plant, and this will need to be assessed in details as the design progresses.

Based on the Manchester City Council criteria for noise egress and noise transfer from amplified music, maximum operational limits for amplified music from the hotel and commercial units have been set. These limits are cumulative and apply 1 m from the nearest noise sensitive premises.

A 3D environmental noise model has been developed, using survey data, and has been used to assess the facade sound insulation performance requirements for the development. Based on the predicted external noise levels and the required indoor ambient noise level in hotel

guestrooms and residential apartments, guidance on example glazing configurations and ventilation strategies capable of meeting the facade sound insulation requirements are provided. For the majority of hotel guestrooms and residential apartments either high performance double glazing or secondary glazing to existing windows will be required, as well mechanical ventilation.

Appendix A

Survey details

Equipment

Rion NL-52 sound levels meter (internal reference: D and G) were used to undertake the unattended measurements. The attended measurements were carried out using a Rion NL-52 sound level meter (internal reference: C). The calibration details for the equipment used during the survey are provided in Table A1.

Table A1 Equipment calibration data

Equipment description	Type/serial number	Manufacturer	Calibration expiry	Calibration certification number
NL-52 C				
Sound level meter	NL-52/00932326	Rion	24 Feb 17	1502114
Microphone	UC-59/035549	Rion	24 Feb 17	1502114
Pre-amp	NH-25/32354	Rion	24 Feb 17	1502114
Calibrator	NC-74/34125432	Rion	24 Feb 17	1502110
NL-52 G				
Sound level meter	NL-52/00242704	Rion	20 May 16	1405274
Microphone	UC-59/06187	Rion	20 May 16	1405274
Pre-amp	NH-25/32732	Rion	20 May 16	1405274
Calibrator	CAL200/4501	Larson Davis	20 May 16	1405270
NL-52 G				
Sound level meter	NL-52/01143564	Rion	5 May 18	1605230
Microphone	UC-59/08880	Rion	5 May 18	1605230
Pre-amp	NH-25/43581	Rion	5 May 18	1605230
Calibrator	NC-74/34257023	Rion	5 May 18	1605221

Calibration of the sound level meters used for the tests is traceable to national standards. The calibration certificates for the sound level meters used in this survey are available upon request.

The sound level meters and microphones were calibrated at the beginning and end of the measurements using their respective sound level calibrators. No significant deviation in calibration occurred.

Noise indices

The equipment was set to record a continuous series of broadband sound pressure levels. Noise indices recorded included the following:

- $L_{Aeq,T}$ The A-weighted equivalent continuous sound pressure level over a period of time, T.
- $L_{AFmax,T}$ The A-weighted maximum sound pressure level that occurred during a given period with a fast time weighting.
- $L_{A90,T}$ The A-weighted sound pressure level exceeded for 90% of the measurement period. Indicative of the background sound level.

The L_{A90} is considered most representative of the background sound level for the purposes of complying with any local authority requirements.

Sound pressure level measurements are normally taken with an A-weighting (denoted by a subscript 'A', eg L_{A90}) to approximate the frequency response of the human ear.

A more detailed explanation of these quantities can be found in BS7445: Part 1: 2003 *Description and measurement of environmental noise, Part 1. Guide to quantities and procedures.*

Weather conditions

During the attended measurements carried out on 18 May 2016, the weather was overcast and damp during the morning survey. It cleared towards the afternoon to be clear and dry during the second round of measurements. No rain occurred during the attended noise survey period.

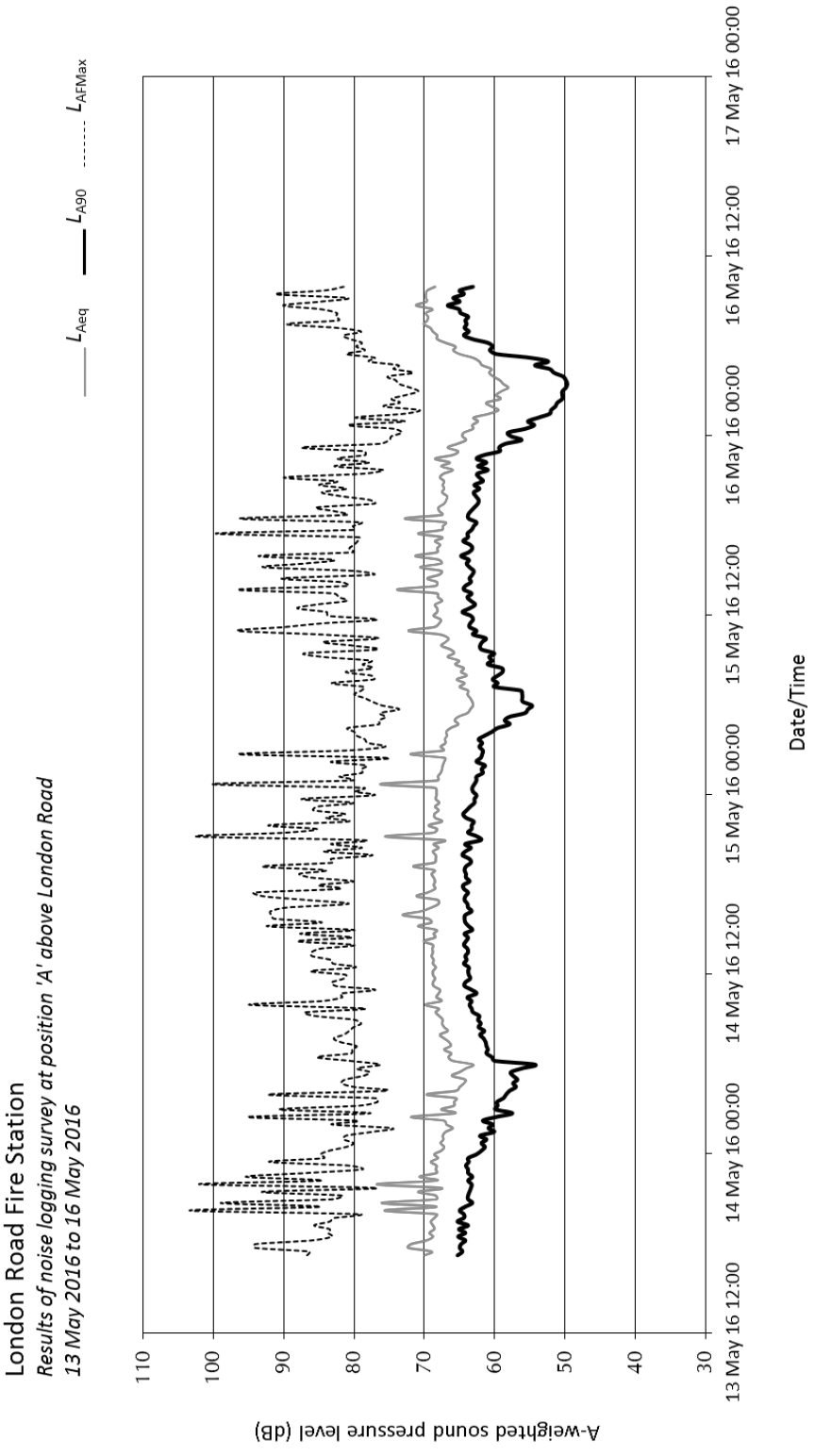
During the unattended noise measurements between 13 May 2016and 20 May 2016, weather reports for the area indicated that temperatures varied between 3°C at night and 18°C during the day, and the wind speed was generally less than 5 m/s.

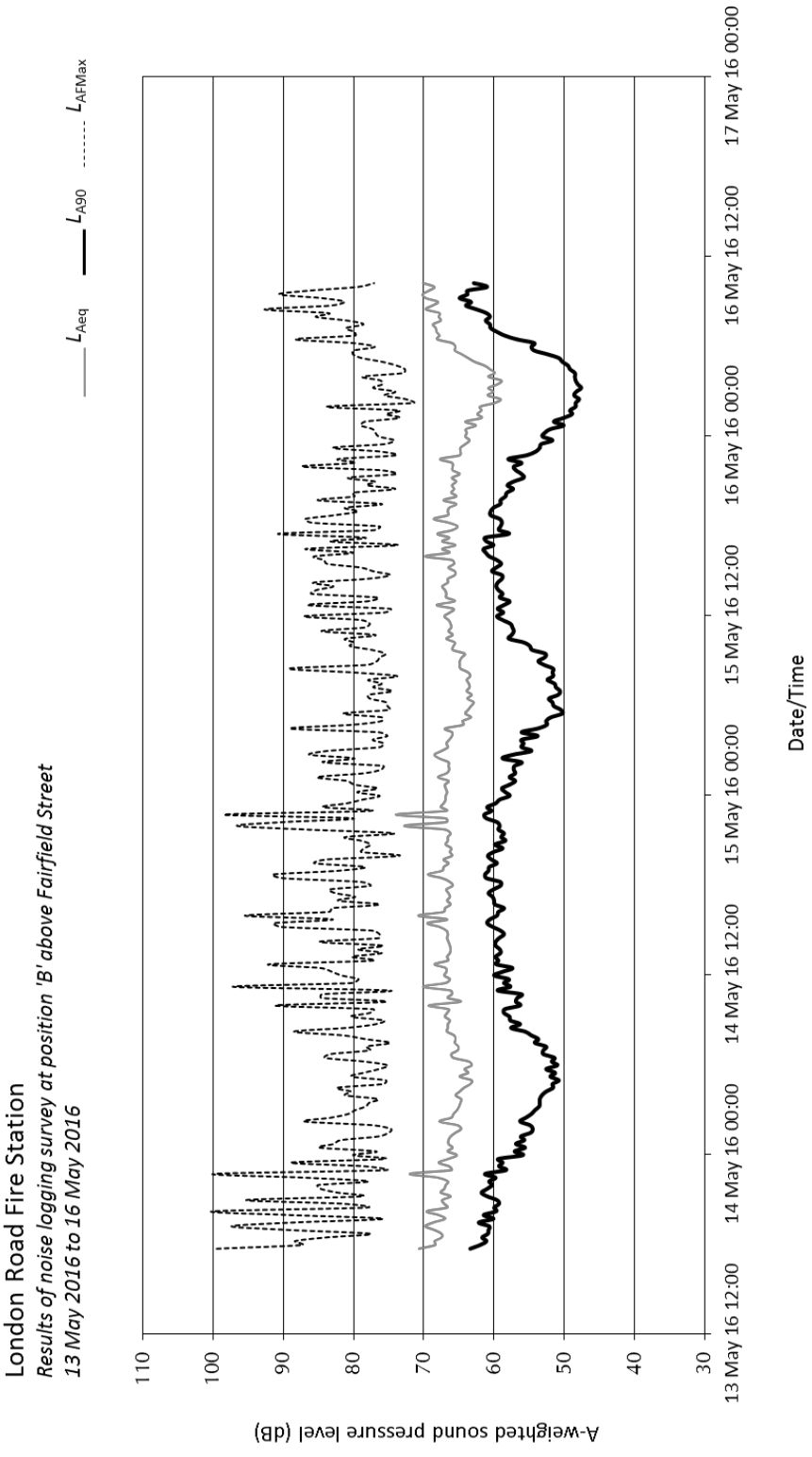
Some rain showers occurred throughout the survey however, the survey duration was sufficiently long to include periods affected by adverse weather and no variation in noise levels was seen to correlate with the weather.

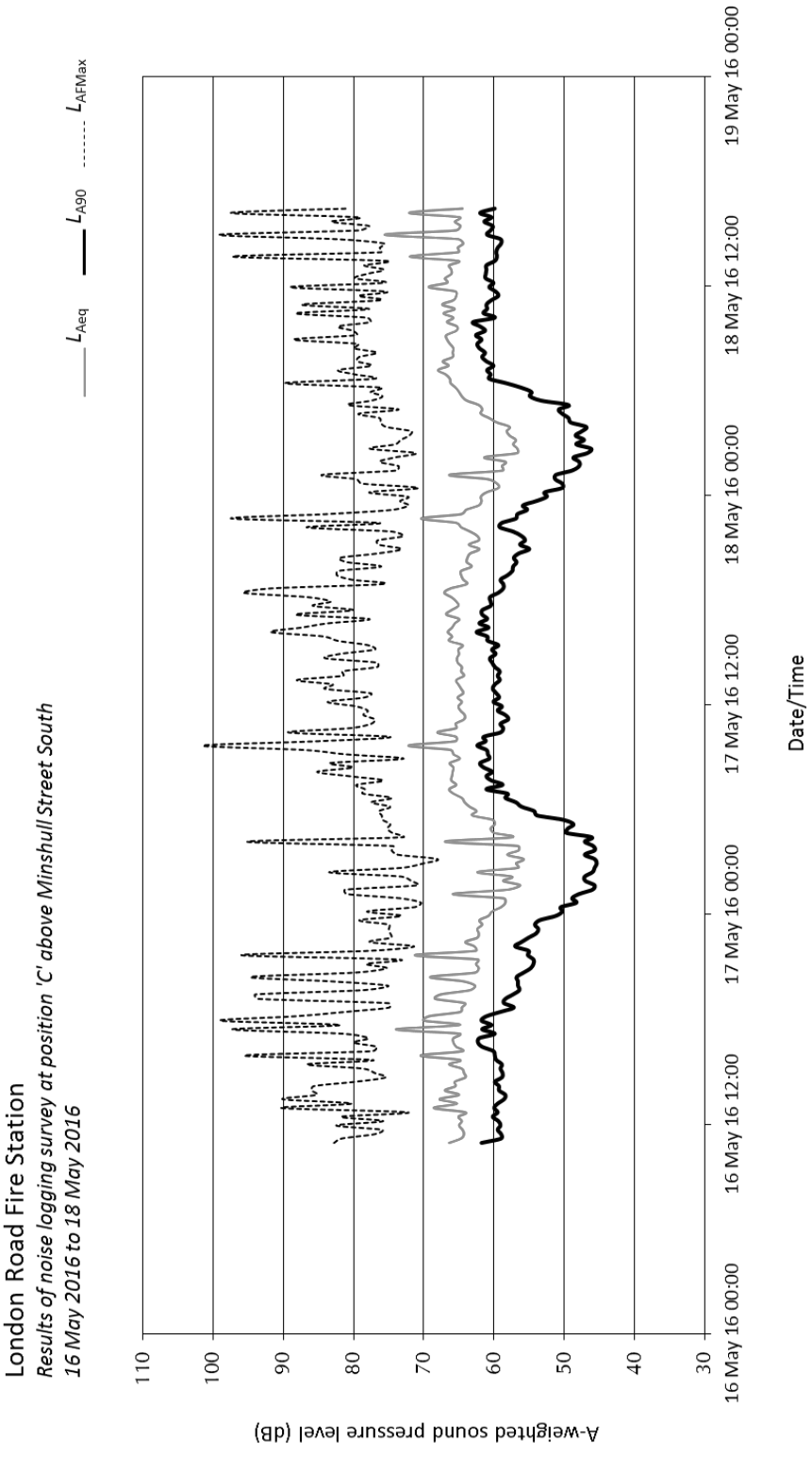
These measurements are consequently considered to have obtained a representative sample of noise data.

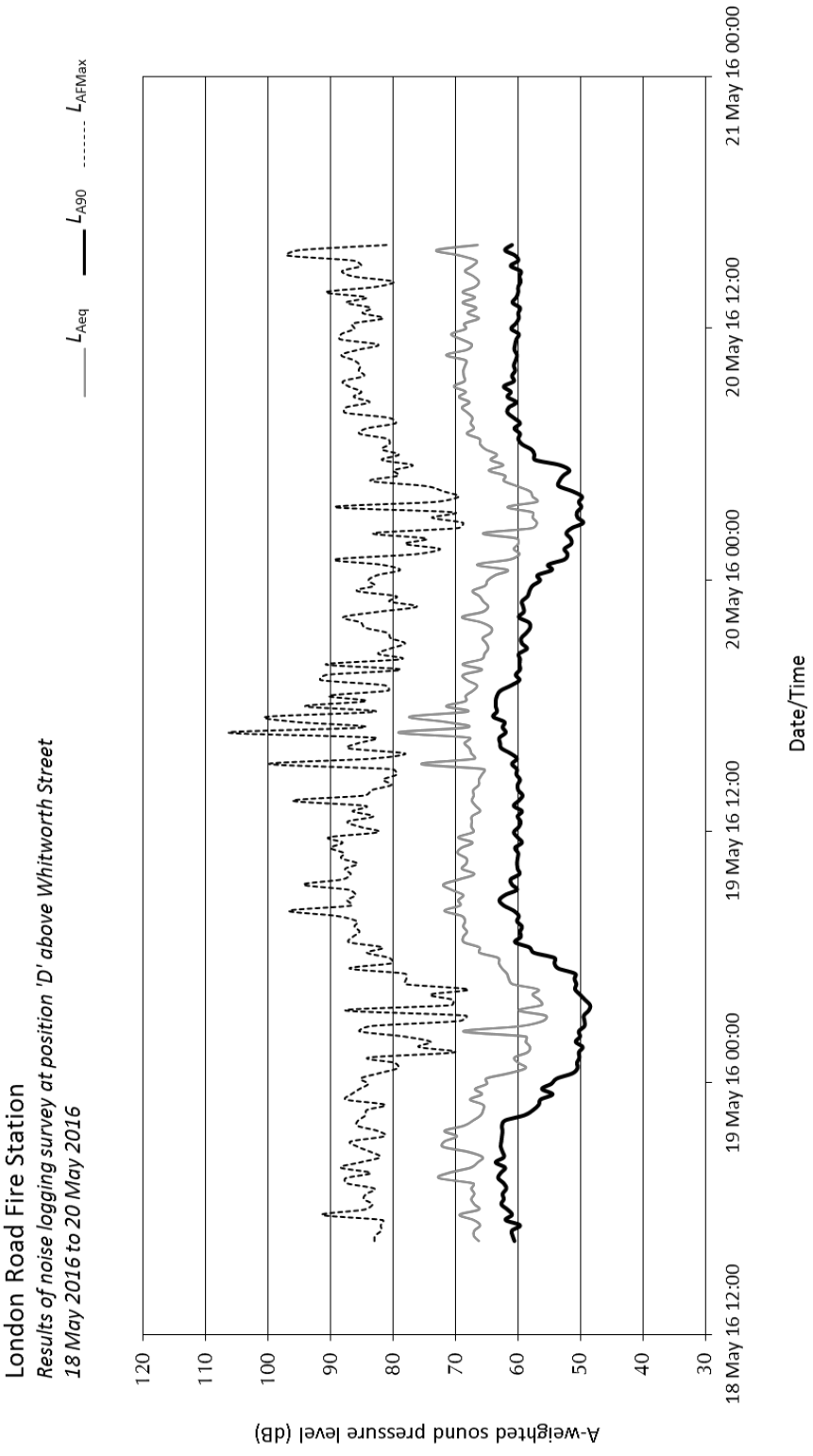
Appendix B

Results of unattended measurements


London Road Fire Station
Results of noise logging survey at position 'A' above London Road
13 May 2016 to 16 May 2016
L_{Aeq}
L_{A90}
L_{AFMax}
A-weighted sound pressure level (dB)
110
100
90
80
70
60
50
40
30
13 May 16 12:00
14 May 16 00:00
14 May 16 12:00
15 May 16 00:00
15 May 16 12:00
16 May 16 00:00
16 May 16 12:00
17 May 16 00:00
Date/Time


London Road Fire Station
Results of noise logging survey at position 'B' above Fairfield Street
13 May 2016 to 16 May 2016
L_{Aeq}
L_{A90}
L_{AFMax}
A-weighted sound pressure level (dB)
110
100
90
80
70
60
50
40
30
13 May 16 12:00
14 May 16 00:00
14 May 16 12:00
15 May 16 00:00
15 May 16 12:00
16 May 16 00:00
16 May 16 12:00
17 May 16 00:00
Date/Time


London Road Fire Station
Results of noise logging survey at position 'C' above Minshull Street South
16 May 2016 to 18 May 2016
L_{Aeq}
L_{A90}
L_{AFMax}
A-weighted sound pressure level (dB)
110
100
90
80
70
60
50
40
30
16 May 16 00:00
16 May 16 12:00
17 May 16 00:00
17 May 16 12:00
18 May 16 00:00
18 May 16 12:00
19 May 16 00:00
Date/Time


London Road Fire Station
Results of noise logging survey at position 'D' above Whitworth Street
18 May 2016 to 20 May 2016
L_{Aeq}
L_{A90}
L_{AFMax}
A-weighted sound pressure level (dB)
120
110
100
90
80
70
60
50
40
30
18 May 16 12:00
19 May 16 00:00
19 May 16 12:00
20 May 16 00:00
20 May 16 12:00
21 May 16 00:00
Date/Time

Appendix C

Predicted external noise levels



Title	Predicted external daytime noise levels
Project	London Road Fire Station
Project no.	16193
Version	D
Marked-up by	Christian Clark
Reviewed by	Matthew Robinson
Date	6 December 2019

Facade zone mark-up key

- Facade zone A: L_{Aeq} 72 dB
- Facade zone B: L_{Aeq} 71 dB
- Facade zone C: L_{Aeq} 69 dB
- Facade zone D: L_{Aeq} 67 dB
- Facade zone E: L_{Aeq} 65 dB
- Facade zone F: L_{Aeq} 63 dB
- Facade zone AA: $L_{AFmax} \leq 82$ dB
- Facade zone BB: $L_{AFmax} \leq 76$ dB

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1 / 2003 **00 Ground Floor GA**
1 : 200

0 2m 4m 6m 8m 10m 20m

Notes:

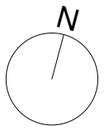
Drawings are based on survey data and may not accurately represent what is physically present.

Do not scale from this drawing. All dimensions are to be verified on site before proceeding with the work.

All dimensions are in millimeters unless noted otherwise.

Purcell shall be notified in writing of any discrepancies.

Key Plan
not to scale



- Coroner's Court (Sui generis)
- Hotel (C1)
- Unit A (A1, A3, A4)
- Unit D (B1, A3, A4, D2, C1)
- Unit E (A1, A3, A4)
- Unit F (A1, A3, A4, D2)
- Unit G (A1, A3, A4)
- Unit H (A1, A3, A4)
- Courtyard (A1, A3, A4, D2)
- Courtyard External (A1, A3, A4, D2)
- Landlord Areas

All furniture is shown indicatively

Hotel (C1)	598 m²
Landlord Areas	127 m²
Live & Work (B1, C3)	827 m²
Live & Work External (B1, C3)	85 m²
Unit L (B1, A3, A4)	149 m²
Workspace (B1)	576 m²
Workspace External (B1)	69 m²
Grand total: 92	2430 m²

Existing
Proposed

REV	DATE	DESCRIPTION
1	02/12/19	For planning
2	03/12/19	For Planning
3	06/12/19	For Planning

CLIENT
Allied London

PROJECT
London Road Fire Station

JOB NUMBER
240242

PURCELL

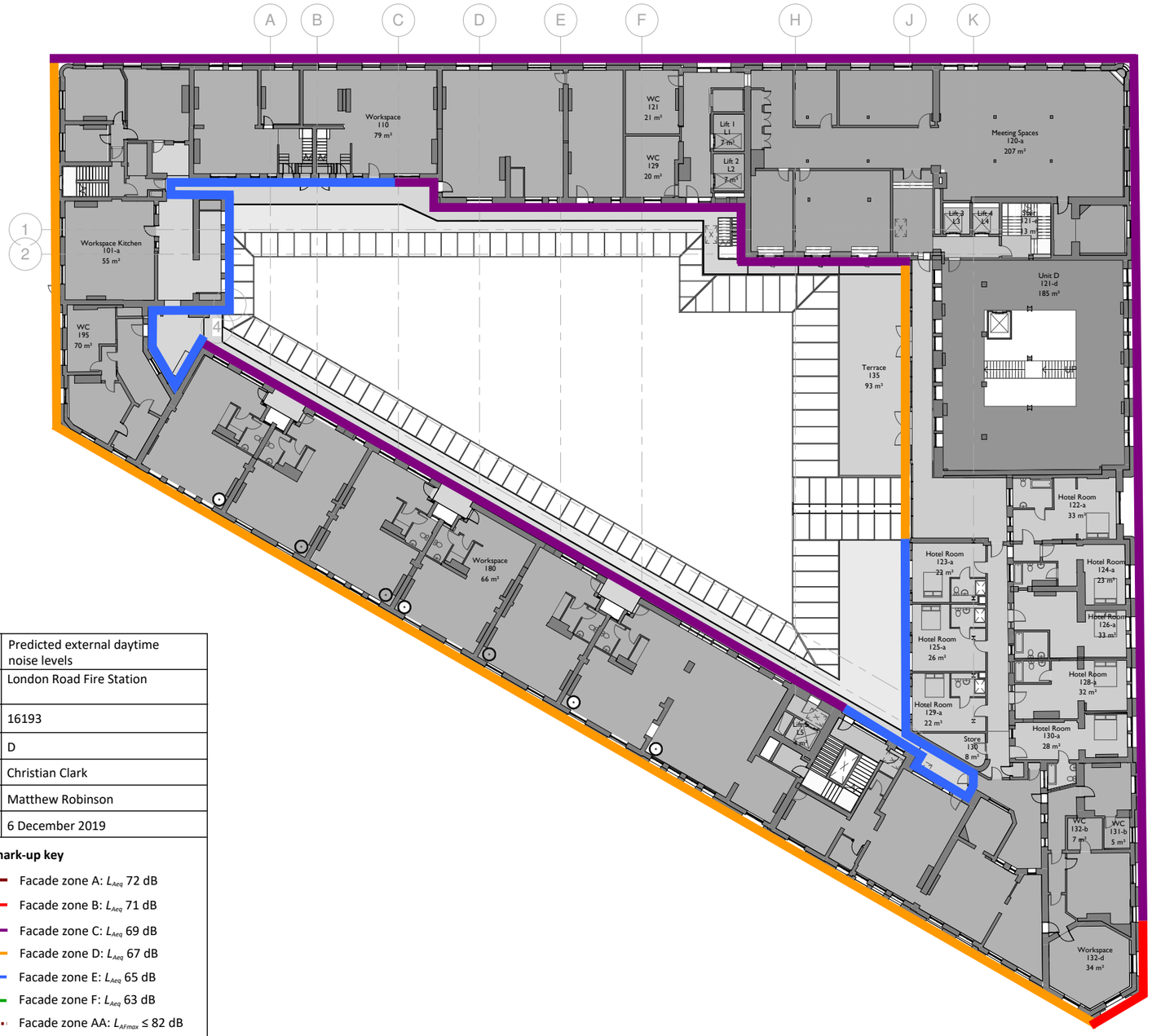
TITLE
Proposed Ground Floor Plan

SIZE	SCALE	LAST REVISED	DRAWN	CHECKED
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REV **3** SUITABILITY/REASON FOR ISSUE **S2 FOR PLANNING**

DRAWING NUMBER
240242-PUR-FS-00-DR-A-2003

St James', 79 Oxford Street, Manchester, M1 6FQ
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Title	Predicted external daytime noise levels
Project	London Road Fire Station
Project no.	16193
Version	D
Marked-up by	Christian Clark
Reviewed by	Matthew Robinson
Date	6 December 2019

Facade zone mark-up key

- Facade zone A: L_{Aeq} 72 dB
- Facade zone B: L_{Aeq} 71 dB
- Facade zone C: L_{Aeq} 69 dB
- Facade zone D: L_{Aeq} 67 dB
- Facade zone E: L_{Aeq} 65 dB
- Facade zone F: L_{Aeq} 63 dB
- Facade zone AA: $L_{AFmax} \leq 82$ dB
- Facade zone BB: $L_{AFmax} \leq 76$ dB

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Consultants in Acoustics, Noise & Vibration

1 / 2004 **01 First Floor GA**
1 : 200

0 2m 4m 6m 8m 10m 20m

N

Notes:
Drawings are based on survey data and may not accurately represent what is physically present.

Do not scale from this drawing. All dimensions are to be verified on site before proceeding with the work.

All dimensions are in millimeters unless noted otherwise.

Purcell shall be notified in writing of any discrepancies.

Key Plan
not to scale

- Hotel (C1)
- Unit D (B1, A3, A4, D2, C1)
- Workspace (B1)
- Workspace External (B1)
- Workspace (B1, D1)
- Workspace External (B1, D1)
- Landlord Areas

All furniture is shown indicatively

Hotel (C1)	463 m²
Landlord Areas	79 m²
Unit D (B1, A3, A4, D2, C1)	185 m²
Workspace (B1)	1353 m²
Workspace (B1, D1)	374 m²
Workspace External (B1)	256 m²
Workspace External (B1, D1)	17 m²
Grand total: 90	2726 m²

Existing
Proposed

REV	DATE	DESCRIPTION
1	02/12/19	For planning
2	03/12/19	For Planning
3	06/12/19	For Planning

CLIENT
Allied London

PROJECT
London Road Fire Station

JOB NUMBER
240242

PURCELL

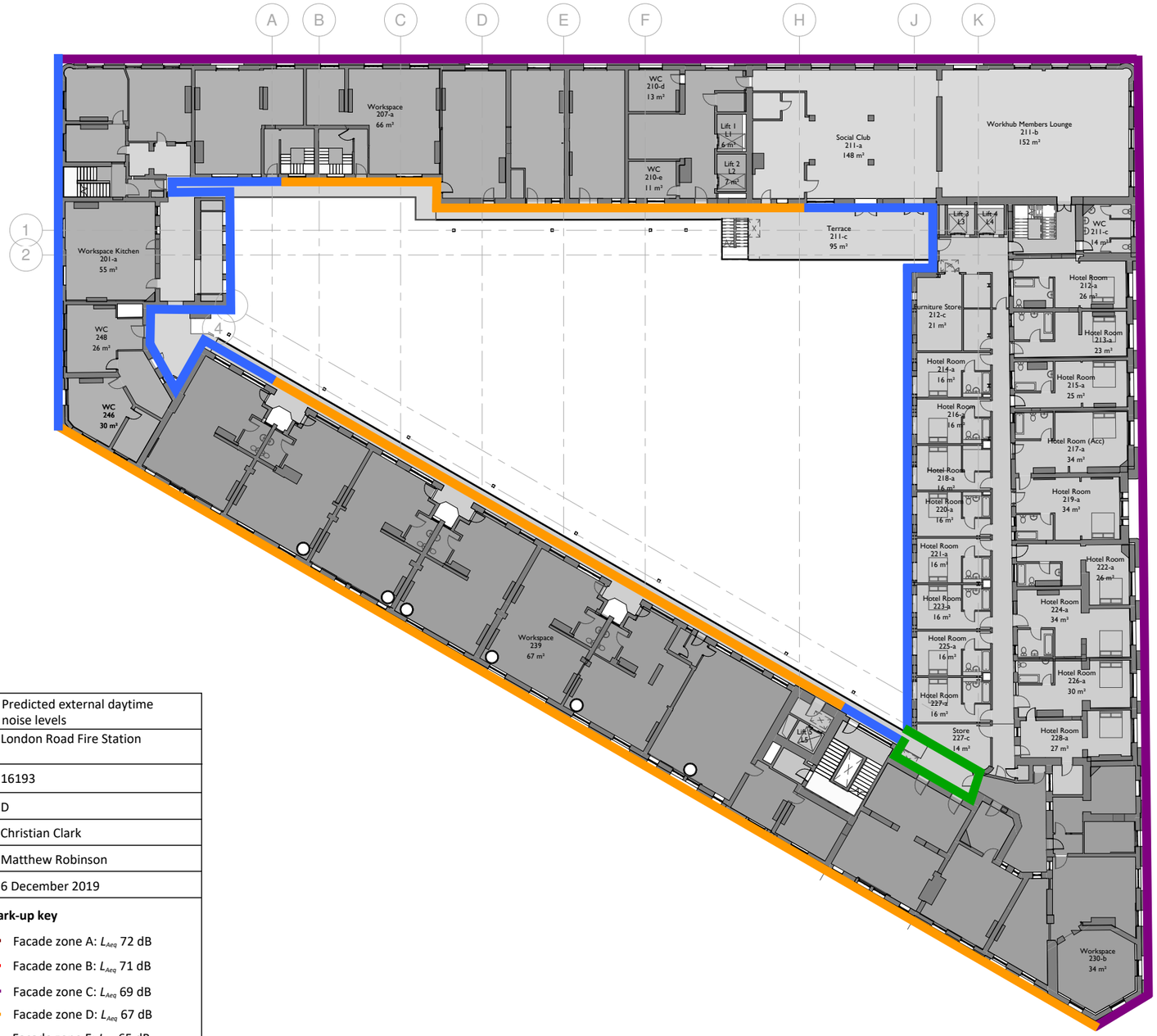
TITLE
Proposed First Floor Plan

SIZE	SCALE	LAST REVISED	DRAWN	CHECKED
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REV **3**
SUITABILITY/REASON FOR ISSUE **S2 FOR PLANNING**

DRAWING NUMBER
240242-PUR-FS-01-DR-A-2004

St James', 79 Oxford Street, Manchester, M1 6FQ
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Title	Predicted external daytime noise levels
Project	London Road Fire Station
Project no.	16193
Version	D
Marked-up by	Christian Clark
Reviewed by	Matthew Robinson
Date	6 December 2019

Facade zone mark-up key

- Facade zone A: L_{Aeq} 72 dB
- Facade zone B: L_{Aeq} 71 dB
- Facade zone C: L_{Aeq} 69 dB
- Facade zone D: L_{Aeq} 67 dB
- Facade zone E: L_{Aeq} 65 dB
- Facade zone F: L_{Aeq} 63 dB
- Facade zone AA: $L_{AFmax} \leq 82$ dB
- Facade zone BB: $L_{AFmax} \leq 76$ dB

SANDY BROWN
Consultants in Acoustics, Noise & Vibration

1 / 2005 **02 Second Floor GA**
1 : 200

0 2m 4m 6m 8m 10m 20m

N

Notes:
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Purcell shall be notified in writing of any discrepancies.

Key Plan
not to scale

- Hotel (C1)
- Live & Work (B1, C3)
- Live & Work External (B1, C3)
- Workspace (B1)
- Workspace External (B1)
- Unit K (B1, A3, A4)
- Landlord Areas

All furniture is shown indicatively

Hotel (C1)	616 m²
Landlord Areas	72 m²
Live & Work (B1, C3)	783 m²
Live & Work External (B1, C3)	107 m²
Unit K (B1, A3, A4)	300 m²
Workspace (B1)	572 m²
Workspace External (B1)	197 m²
Grand total: 98	2646 m²

Existing
Proposed

REV	DATE	DESCRIPTION
1	02/12/19	For planning
2	03/12/19	For Planning
3	06/12/19	For Planning

CLIENT
Allied London

PROJECT
London Road Fire Station

JOB NUMBER
240242

PURCELL

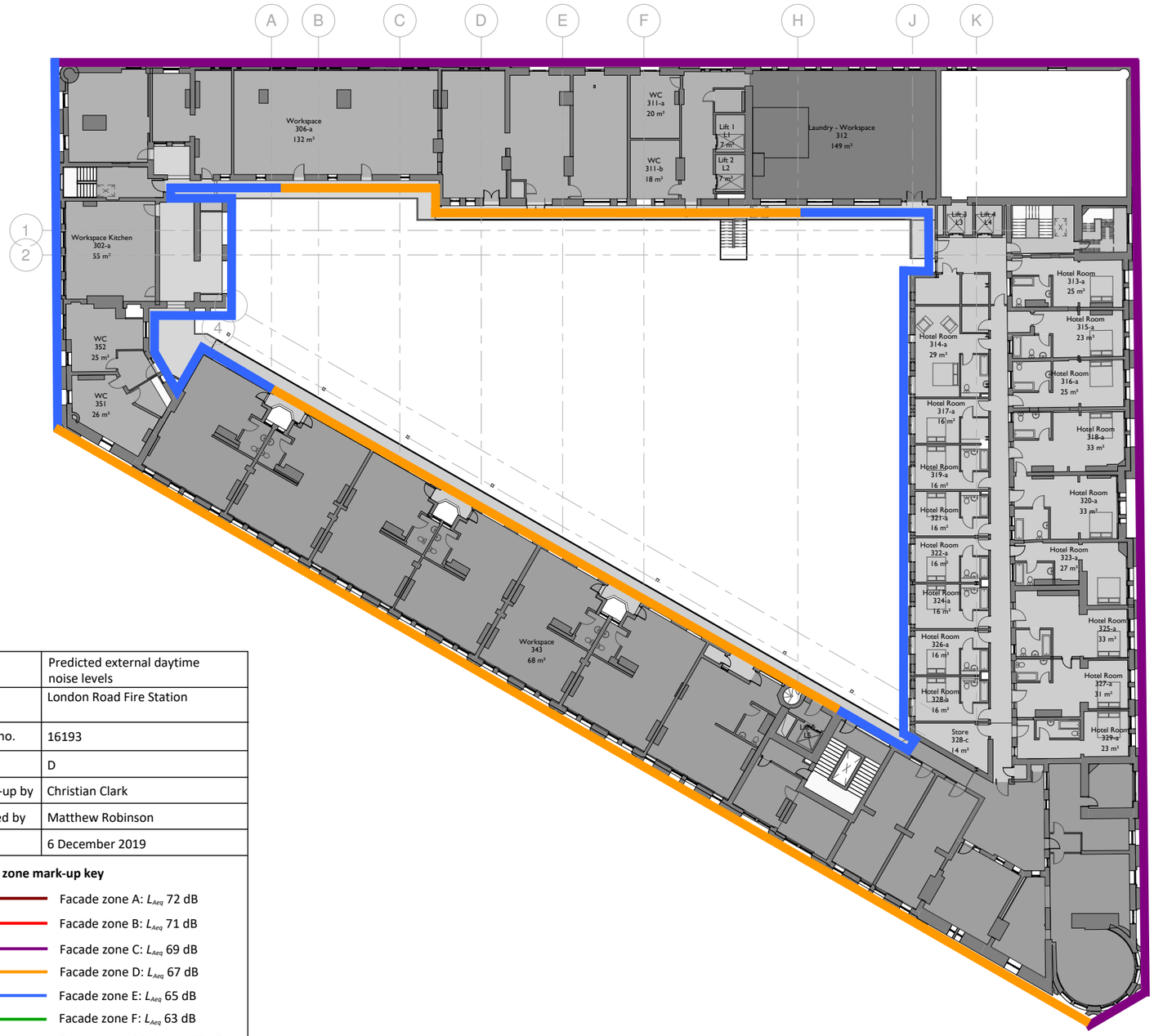
TITLE
Proposed Second Floor Plan

SIZE	SCALE	LAST REVISED	DRAWN	CHECKED
A1L	As indicated	06/12/2019 11:39:15	SA	

REV **3** SUITABILITY/REASON FOR ISSUE **S2 FOR PLANNING**

DRAWING NUMBER
240242-PUR-FS-02-DR-A-2005

St James', 79 Oxford Street, Manchester, M1 6FQ
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Title	Predicted external daytime noise levels
Project	London Road Fire Station
Project no.	16193
Version	D
Marked-up by	Christian Clark
Reviewed by	Matthew Robinson
Date	6 December 2019

Facade zone mark-up key

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- Facade zone F: L_{Aeq} 63 dB
- Facade zone AA: $L_{AFmax} \leq 82$ dB
- Facade zone BB: $L_{AFmax} \leq 76$ dB

SANDY BROWN
Consultants in Acoustics, Noise & Vibration

1 / 2006 **03 Third Floor GA**
1 : 200

0 2m 4m 6m 8m 10m 20m

Notes:
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Purcell shall be notified in writing of any discrepancies.

Key Plan
not to scale

- Hotel (C1)
- Live & Work (B1, C3)
- Live & Work External (B1, C3)
- Workspace (B1)
- Workspace External (B1)
- Unit L (B1, A3, A4)
- Landlord Areas

All furniture is shown indicatively

Hotel (C1)	598 m²
Landlord Areas	127 m²
Live & Work (B1, C3)	827 m²
Live & Work External (B1, C3)	85 m²
Unit L (B1, A3, A4)	149 m²
Workspace (B1)	576 m²
Workspace External (B1)	69 m²
Grand total: 92	2430 m²

Existing
Proposed

REV	DATE	DESCRIPTION
1	02/12/19	For planning
2	03/12/19	For Planning
3	06/12/19	For Planning

CLIENT
Allied London

PROJECT
London Road Fire Station

JOB NUMBER
240242

PURCELL

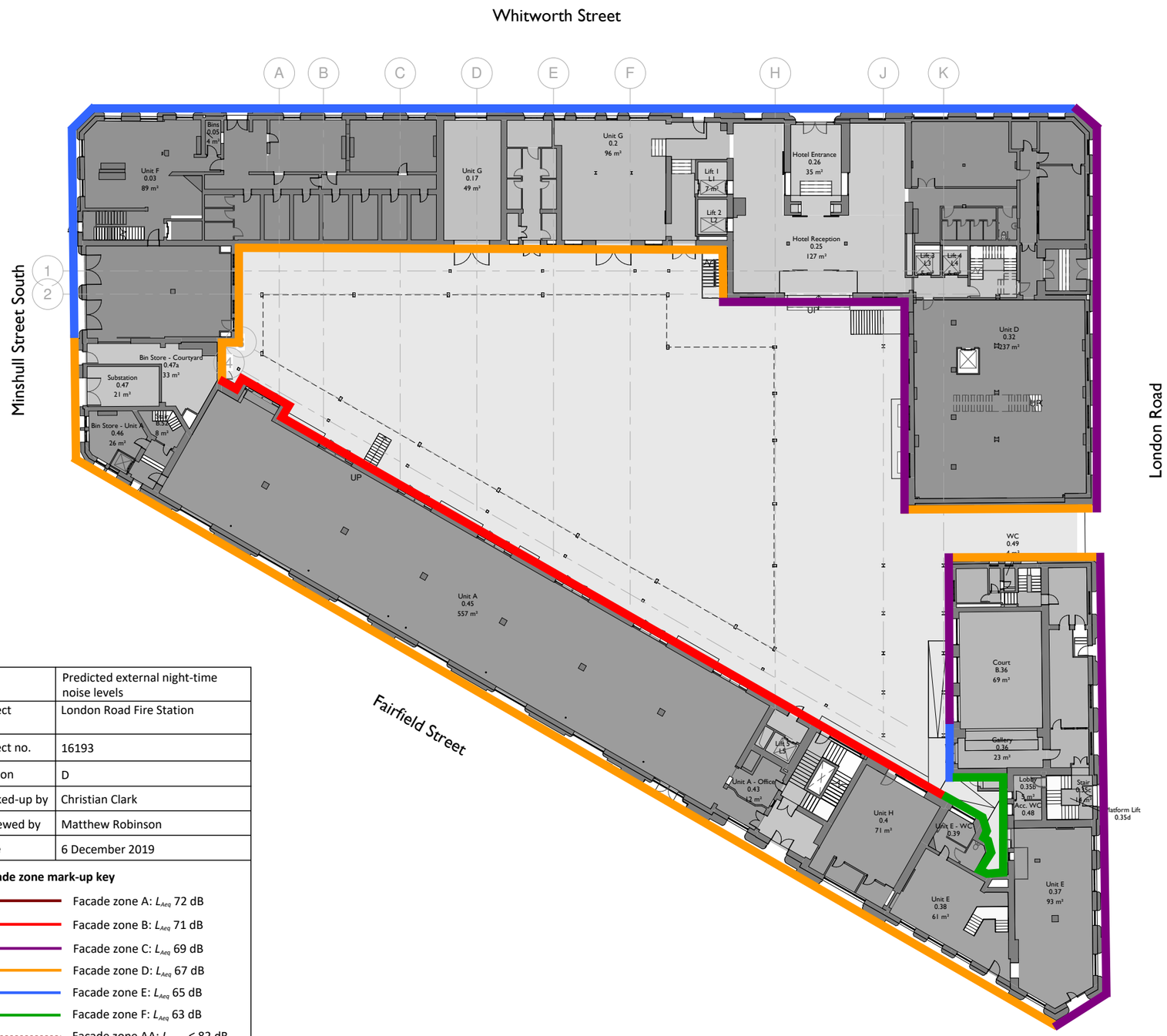
TITLE
Proposed Third Floor Plan

SIZE	SCALE	LAST REVISED	DRAWN	CHECKED
A1L	As indicated	06/12/2019 11:39:17	SA	

REV **3**
SUITABILITY/REASON FOR ISSUE **S2 FOR PLANNING**

DRAWING NUMBER
240242-PUR-FS-03-DR-A-2006

St James', 79 Oxford Street, Manchester, M1 6FQ
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Title	Predicted external night-time noise levels
Project	London Road Fire Station
Project no.	16193
Version	D
Marked-up by	Christian Clark
Reviewed by	Matthew Robinson
Date	6 December 2019

Facade zone mark-up key

- Facade zone A: L_{Aeq} 72 dB
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- Facade zone E: L_{Aeq} 65 dB
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- Facade zone BB: $L_{AFmax} \leq 76$ dB

SANDY BROWN
Consultants in Acoustics, Noise & Vibration

1 / 2003 — 00 Ground Floor GA
1 : 200

0 2m 4m 6m 8m 10m 20m

Notes:

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Key Plan
not to scale

- Coroner's Court (Sui generis)
- Hotel (C1)
- Unit A (A1, A3, A4)
- Unit D (B1, A3, A4, D2, C1)
- Unit E (A1, A3, A4)
- Unit F (A1, A3, A4, D2)
- Unit G (A1, A3, A4)
- Unit H (A1, A3, A4)
- Courtyard (A1, A3, A4, D2)
- Courtyard External (A1, A3, A4, D2)
- Landlord Areas

All furniture is shown indicatively

Hotel (C1)	598 m²
Landlord Areas	127 m²
Live & Work (B1, C3)	827 m²
Live & Work External (B1, C3)	85 m²
Unit L (B1, A3, A4)	149 m²
Workspace (B1)	576 m²
Workspace External (B1)	69 m²
Grand total: 92	2430 m²

Existing
Proposed

REV	DATE	DESCRIPTION
1	02/12/19	For planning
2	03/12/19	For Planning
3	06/12/19	For Planning

CLIENT
Allied London

PROJECT
London Road Fire Station

JOB NUMBER
240242

PURCELL

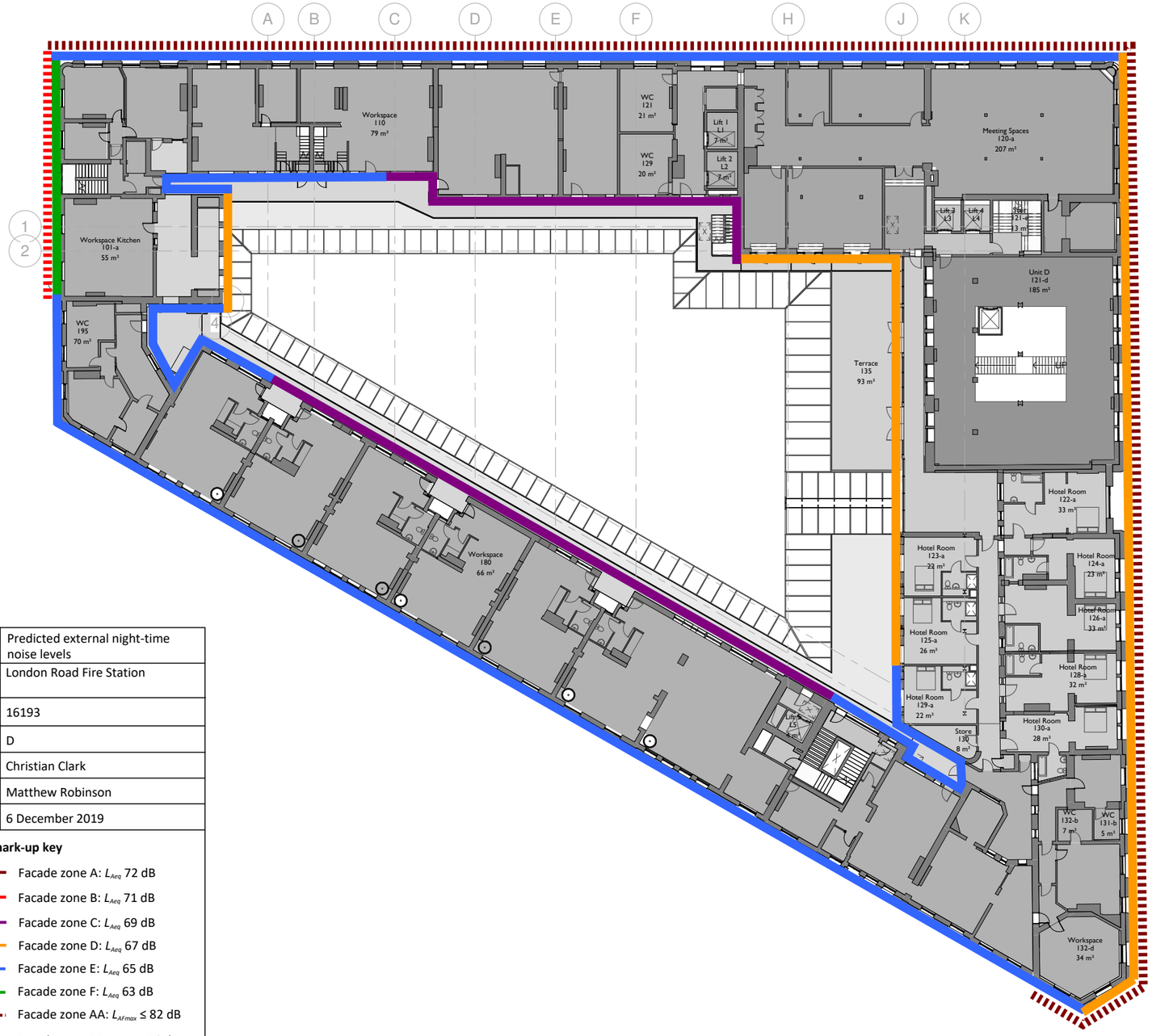
TITLE
Proposed Ground Floor Plan

SIZE	SCALE	LAST REVISED	DRAWN	CHECKED
A1L	As indicated	06/12/2019 11:39:09	SA	

REV **3** — SUITABILITY/REASON FOR ISSUE **S2 FOR PLANNING**

DRAWING NUMBER
240242-PUR-FS-00-DR-A-2003

St James', 79 Oxford Street, Manchester, M1 6FQ
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Title	Predicted external night-time noise levels
Project	London Road Fire Station
Project no.	16193
Version	D
Marked-up by	Christian Clark
Reviewed by	Matthew Robinson
Date	6 December 2019

Facade zone mark-up key

- Facade zone A: L_{Aeq} 72 dB
- Facade zone B: L_{Aeq} 71 dB
- Facade zone C: L_{Aeq} 69 dB
- Facade zone D: L_{Aeq} 67 dB
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- Facade zone F: L_{Aeq} 63 dB
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- Facade zone BB: $L_{AFmax} \leq 76$ dB

SANDY BROWN
Consultants in Acoustics, Noise & Vibration

01 First Floor GA
1 : 200

0 2m 4m 6m 8m 10m 20m

Notes:

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Key Plan
not to scale

- Hotel (C1)
- Unit D (B1, A3, A4, D2, C1)
- Workspace (B1)
- Workspace External (B1)
- Workspace (B1, D1)
- Workspace External (B1, D1)
- Landlord Areas

All furniture is shown indicatively

Hotel (C1)	463 m²
Landlord Areas	79 m²
Unit D (B1, A3, A4, D2, C1)	185 m²
Workspace (B1)	1353 m²
Workspace (B1, D1)	374 m²
Workspace External (B1)	256 m²
Workspace External (B1, D1)	17 m²
Grand total: 90	2726 m²

Existing

Proposed

REV	DATE	DESCRIPTION
1	02/12/19	For planning
2	03/12/19	For Planning
3	06/12/19	For Planning

CLIENT
Allied London

PROJECT
London Road Fire Station

JOB NUMBER
240242

PURCELL

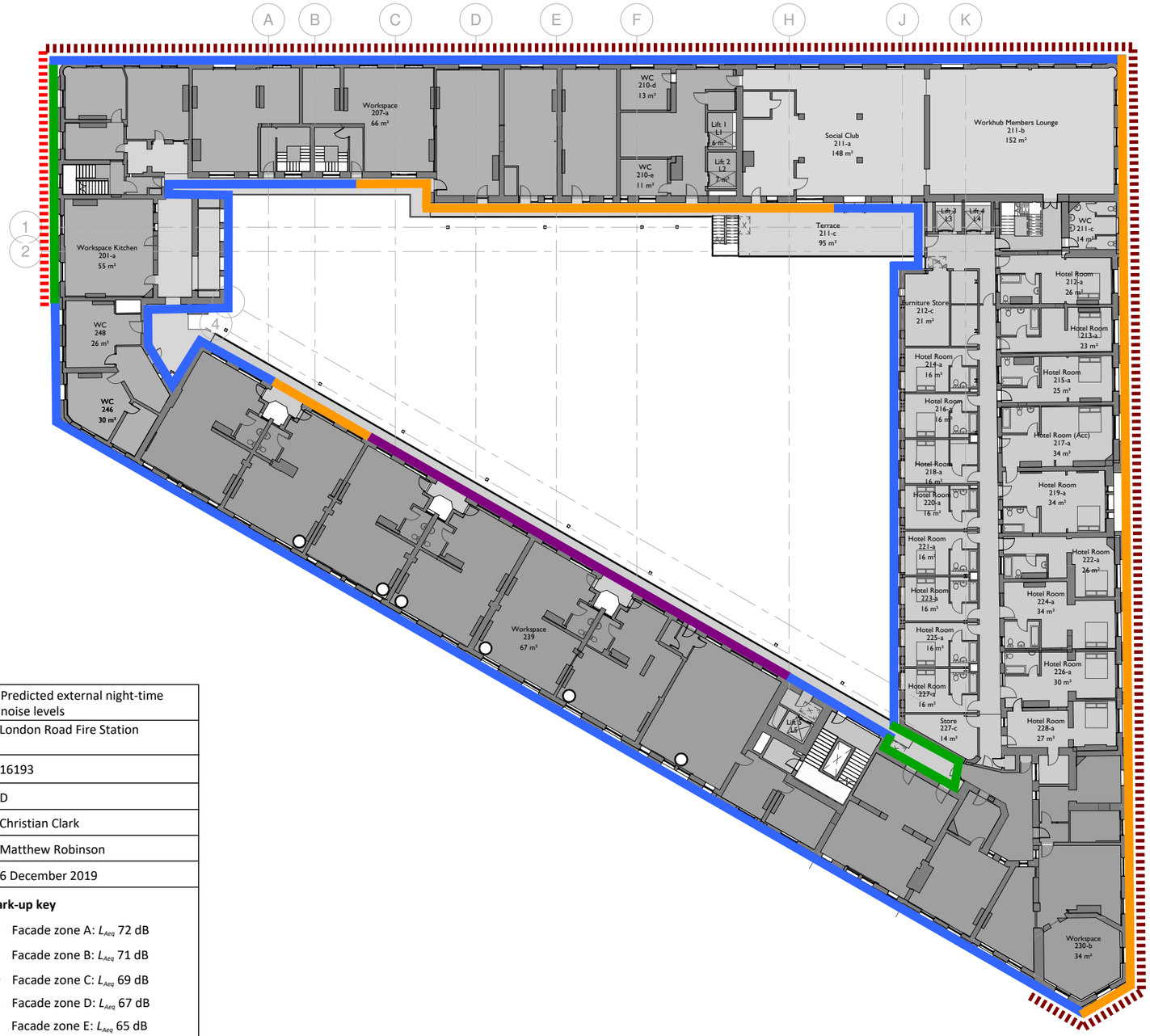
TITLE
Proposed First Floor Plan

SIZE	SCALE	LAST REVISED	DRAWN	CHECKED
A1L	As indicated	06/12/2019 11:46:00	SA	

REV **3**
SUITABILITY/REASON FOR ISSUE **S2 FOR PLANNING**

DRAWING NUMBER
240242-PUR-FS-01-DR-A-2004

St James', 79 Oxford Street, Manchester, M1 6FQ
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Title	Predicted external night-time noise levels
Project	London Road Fire Station
Project no.	16193
Version	D
Marked-up by	Christian Clark
Reviewed by	Matthew Robinson
Date	6 December 2019

Facade zone mark-up key

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SANDY BROWN
Consultants in Acoustics, Noise & Vibration

02 Second Floor GA
1 : 200

0 2m 4m 6m 8m 10m 20m

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not to scale

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- Live & Work External (B1, C3)
- Workspace (B1)
- Workspace External (B1)
- Unit K (B1, A3, A4)
- Landlord Areas

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Grand total: 98	2646 m²

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Allied London

PROJECT
London Road Fire Station

JOB NUMBER
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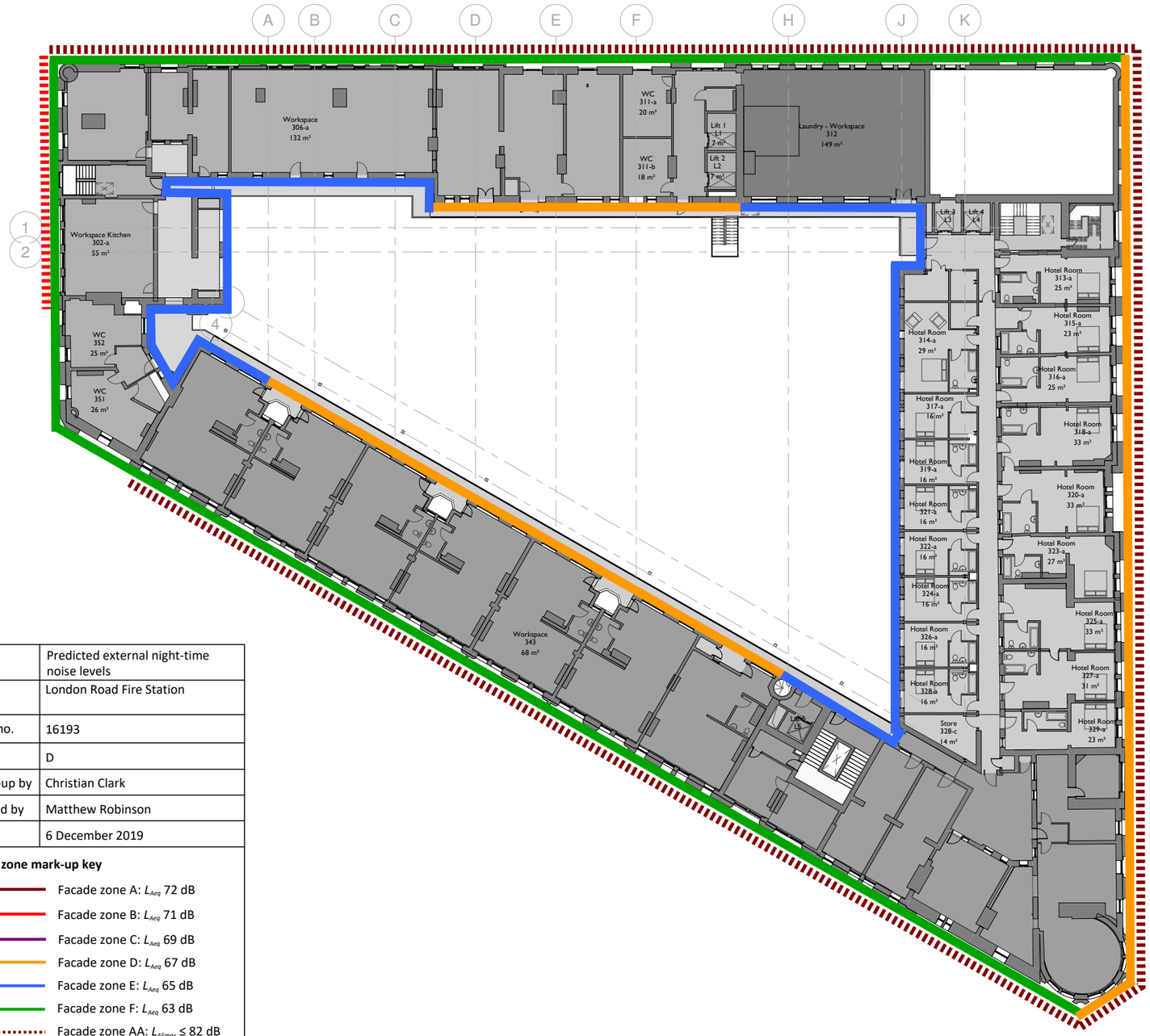
TITLE
Proposed Second Floor Plan

SIZE	SCALE	LAST REVISED	DRAWN	CHECKED
A1L	As indicated	06/12/2019 11:39:15	SA	

REV **3** SUITABILITY/REASON FOR ISSUE **S2 FOR PLANNING**

DRAWING NUMBER
240242-PUR-FS-02-DR-A-2005

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SANDY BROWN
Consultants in Acoustics, Noise & Vibration

1 / 2006 **03 Third Floor GA**
1 : 200

0 2m 4m 6m 8m 10m 20m

N

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Key Plan
not to scale

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Existing
Proposed

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1	02/12/19	For planning
2	03/12/19	For Planning
3	06/12/19	For Planning

CLIENT
Allied London

PROJECT
London Road Fire Station

JOB NUMBER
240242

PURCELL

TITLE
Proposed Third Floor Plan

SIZE	SCALE	LAST REVISED	DRAWN	CHECKED
A1L	As indicated	06/12/2019 11:39:17	SA	

REV **3** SUITABILITY/REASON FOR ISSUE **S2 FOR PLANNING**

DRAWING NUMBER
240242-PUR-FS-03-DR-A-2006

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Appendix D

BS 4142 corrections for attention catching features

The following applies where plant noise is assessed in accordance with BS 4142:2014+A1:2019.

If the proposed plant noise contains attention catching features (such as tonal elements, whines, whistles, bangs etc), penalty corrections should be applied based on the type and impact of the features.

If appropriate, a subjective assessment of the plant features can be adopted. Where the plant noise contains tonal elements, the following corrections can be made depending on how perceptible the tone is at the noise receptor:

- 0 dB where the tone is not perceptible
- 2 dB where the tone is just perceptible
- 4 dB where the tone is clearly perceptible
- 6 dB where the tone is highly perceptible.

Where the plant noise is impulsive, the following corrections can be made depending on how perceptible the impulsivity is at the noise receptor:

- 0 dB where the impulse is not perceptible
- 3 dB where the impulse is just perceptible
- 6 dB where the impulse is clearly perceptible
- 9 dB where the impulse is highly perceptible.

For noise which is equally both impulsive and tonal, then both features can be accounted for by linearly summing the corrections for both characteristics.

If the plant has other distinctive characteristics, such as intermittency, then a 3 dB correction can be made.

If a subjective assessment of tonality is not appropriate, an objective assessment can be made by analysis of time-averaged, third-octave band sound pressure levels. A noise source is deemed to be tonal if the level in a third-octave band exceeds the level in adjacent third-octave bands by the level differences given below:

- 15 dB in the low frequency third-octave bands (25 Hz to 125 Hz)
- 8 dB in the mid frequency third-octave bands (160 Hz to 400 Hz)
- 5 dB in the high frequency third-octave bands (500 Hz to 10000 Hz).

If an objective assessment identifies the plant noise to be tonal then a 6 dB correction must be made.