

101 Princess Street Manchester, M1 6DD

Mechanical Services Plant Verification Noise Impact Assessment

Report ref.

RK3420/20141/Rev 0

Issued to

Jones Lang LaSalle

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1. INTRODUCTION

Planning permission has been granted for two separate planning applications, subject to conditions, to remove some existing mechanical services plant equipment associated with the 3rd, 4th and 5th floor and install new replacement equipment at 101 Princess Street in Manchester. One of the conditions in permission 129765/FO/2021 (21 May 2022) relates to noise.

Condition 3) *a) The externally mounted ancillary equipment hereby approved shall be acoustically treated in accordance with the Mechanical Services Plant Noise Impact Assessment referenced RK3198/20141/Rev 0 prepared by Spectrum Acoustic Consultants in order to secure a reduction in the level of noise emanating from the site.*

b) Prior to first operation of the equipment hereby approved, a verification report shall be submitted to and approved in writing by the City Council as local planning authority to validate that the work undertaken throughout the works conforms to the recommendations and requirements in the approved acoustic report. The report shall also undertake post completion testing to confirm that the noise criteria have been met. Any instances of non-conformity with the recommendations in the report shall be detailed along with any measures required to ensure compliance with the agreed noise criteria.

Reason - *To safeguard the amenities of the occupiers of nearby accommodation, pursuant to saved policy DC26 of the Unitary Development Plan for the City of Manchester and policies SP1 and DM1 of the Core Strategy.*

One of the conditions in permission 132394/FO/2021 (02 December 2022) relates to noise.

Condition 3) Prior to the operation of the rooftop condenser a verification report shall be submitted to and approved in writing by the City Council as local planning authority to validate that the work undertaken throughout the development conforms to the recommendations and requirements in the approved acoustic report. The report shall also undertake post completion testing to confirm that the noise criteria have been met. Any instances of nonconformity with the recommendations in the report shall be detailed along with any measures required to ensure compliance with the agreed noise criteria.

Reason - To minimise the impact of the development and to prevent a general increase in pre-existing background noise levels around the site and in accordance with saved Manchester Unitary Development Plan policy DC26.1 and Manchester Core Strategy policies SP1 and DM1.

Accordingly, for both planning consents, a noise impact assessment verification report is required.

Spectrum Acoustic Consultants have been instructed by Jones Lang LaSalle to carry out a noise impact verification assessment. This report is submitted with the intention of providing sufficient information to both inform and satisfy the requirements of Condition 3 in both planning consents, set by the Local Planning Authority.



2. SITE DESCRIPTION

The site is located at 101 Princess Street, Manchester, M1 6DD. The seven storey high commercial building comprises of a night-club at basement level, with offices above. Princess Street bounds the site to the west and has a number of commercial properties located along it. Silver Street bounds the site to the north and has a seven storey high hotel building directly opposite (Townhouse Hotel Manchester). Abingdon Street bounds the site to the east and has a large ten storey high hotel building opposite (Hotel Brooklyn). To the south is Major Street which has a number of commercial buildings located on it, along with a car park. An existing site location plan is included in Appendix A.

The permitted works involved removing some of the previous Mitsubishi air conditioning condenser units located at roof level and replacing them with three new Daikin air conditioning condenser units in order to provide air conditioning in a more efficient manner to the 3rd, 4th and 5th floors of the building. The offices are used during the daytime only i.e. typically 08:00 to 18:00, Monday to Friday. Consented scheme plans are included in Appendix B.

3. NOISE CRITERIA

3.1 BS 4142:2014 METHODS FOR RATING AND ASSESSING INDUSTRIAL AND COMMERCIAL SOUND

The noise impact assessment relating to mechanical plant will be carried out in accordance with the procedures set out in BS 4142:2014 *Methods for rating and assessing industrial and commercial sound*. The principle of BS 4142 is to determine an initial estimate of impact of industrial/commercial sound on nearby residents by comparing the Rating Level (sound level from the industrial/commercial source, with a correction applied for any acoustic features that characterise the sound) with the Background Sound Level (L_{A90} as measured in absence of the industrial/commercial source).

Generally, the greater the difference by which the Rating Level exceeds the Background Sound Level, the greater the magnitude of impact. BS 4142 states that *'a difference of around +10 dB or more is likely to be an indication of a significant adverse impact [...]. A difference of around +5 dB is likely to be an indication of an adverse impact [...]. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact.'*

However, BS 4142 also advises that *'when making assessments and arriving at decisions [...] it is essential to place the sound in context'* so in each case, the context in which the sound is placed must be considered and the initial estimate of impact should be modified accordingly.

For example it advises *'Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.'*

It also indicates that impacts estimated during *'the middle of the night can be distinctly different (and potentially of lesser importance) compared to the start or end of the night-time period for sleep purposes.'*



3.2 MANCHESTER CITY COUNCIL'S PLANNING & NOISE TECHNICAL GUIDANCE - NOISE AND VIBRATION FROM FIXED PLANT / EQUIPMENT

Noise from fixed plant, equipment or machinery can be very annoying and disruptive to people living nearby particularly where that item involved emits a noise with impulsive or tonal characteristics.

Many of the noise complaints Environmental Health receive about noise from plant, equipment and machinery specifically concern the character of the noise emitted. Any noise assessment needs to consider not only the overall level of noise emitted but also its particular characteristics. The noise assessment should be based on BS 4142:2014 and any application for fixed plant, equipment or machinery must demonstrate that:

'Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location'.

By designing the sound pressure level of any plant items to generate a noise impact of at least 5dB below the existing background level, any plant noise impact should be of a negligible level which should not give rise to complaints from users or occupiers of existing noise-sensitive usages.

Past experience has shown that this criterion can be readily achieved. Where available, product specification data for new items should be submitted with the acoustic report. Consultants should be using these to compare with data from the noise survey, and propose mitigation where the levels are above those specified in the criterion. Where this information is not available a consultant may choose to measure the noise levels generated by the equipment in question where the equipment has already been installed elsewhere (and in accordance with the guidance in BS 4142).

Where fixed plant, equipment or machinery is attached to a building the vibration caused by it can pass through the building structure and cause structure borne noise elsewhere in the building. Where it is to be installed in or on a building containing a noise sensitive use structure borne noise should be considered in the noise assessment and adequate control measures should be proposed. An example of where this would be required is where there is a proposal to install fixed plant or equipment on the roof of a residential apartment block.

4. BACKGROUND NOISE MEASUREMENT SURVEY

To inform the noise impact assessment, measurements of existing background noise levels were previously carried out during a noise survey conducted at the site from Friday 14 to Monday 17 May 2021. The results of these measurements formed the basis of the original planning noise impact assessment report provided by Spectrum Acoustic Consultants (reference RK3198/20141/Rev 0).

A summary of the representative background noise level measured during the daytime period when the plant items would be operating is shown in Table 1.

Measurement Location	Period	Background Noise Level
Opposite Townhouse Hotel Manchester	07:00 – 20:00	$L_{A90,1hour}$ 52 dB

Table 1: Summary of the representative background noise level measured during the sensitive daytime period



As shown in Table 1, the representative background noise level at the nearest noise sensitive receptors to the new mechanical plant is $L_{A90,1hour}$ 52dB during the daytime when the new equipment operates. This reflects a typical steady noise profile controlled by traffic movements and other nearby mechanical plant in the area.

5. ASSESSMENT OF NOISE IMPACT

5.1 PROJECTED NOISE FROM MECHANICAL PLANT

For the purpose of this assessment, the specific L_{Aeq} noise levels produced by the newly installed mechanical services plant at the nearest noise sensitive receptor locations will be established by prediction.

During a site visit on Friday 17 June 2022, it was possible to measure sound pressure levels close to each of the plant items in isolation, in order to calculate the equipment sound power levels. During the survey, it was hot, resulting in the equipment operating at a high duty.

Prediction methodologies use the sound power level (L_w) of a source as input data, so for this purpose, the measured mechanical plant noise levels, expressed in terms of $L_{Aeq,T}$, need to be converted to the equivalent sound power levels. This is derived using the measured plant $L_{Aeq,T}$ (where T is the measurement period), corrected for the measurement surface area enveloping the noise source. A summary of the calculated sound power levels associated with the newly installed plant items is shown in Table 2 below. Detailed sound pressure to sound power calculations are included in Appendix C.

Plant Item	Measured Sound Pressure Level at 0.3m (dB)	L_p to L_w Correction (dB)	Sound Power Level L_w (dB)
5th Floor Daikin REYQ18U7Y1B VRF unit (right unit)	71	12	83
3rd Floor Daikin REYQ18U7Y1B VRF unit (Centre unit)	68	12	80
4th Floor Daikin REYQ18U7Y1B VRF unit (left unit)	72	12	84

Table 2: Summary of the plant equipment noise levels

To accurately evaluate the overall effect of the existing plant, it is necessary to consider the noise that is generated by the equipment, at the nearby residential receptor locations.

Predictions of how the noise from each of the mechanical plant sources propagates to sensitive community receptors, together with the cumulative effect of all these noise sources, has been determined by noise modelling using proprietary software (Predictor¹) which meets the requirement of ISO 9613 Part 2:1996².

¹ SoftNoise – Predictor V2021 Environmental Noise Calculation Software Package, Type 7810

² ISO 9613-2:1996 "Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation to determine Noise Levels

The noise model takes account of the following in its calculations procedures:

- Source sound power level (for point, line and area sources)
- Reflection from nearby structures and source directivity
- Distance from noise source (geometric spreading)
- Atmospheric absorption
- Acoustic screening of intervening structures and topography
- Ground absorption
- Ground effects (which includes the height of ground relative to the noise source)

Detailed noise calculations, providing information on the total specific noise at each receptor, together with the contributions from each individual noise source, at each receptor location, are computed. To illustrate the scheme, a diagram showing the distribution and locations of mechanical plant noise sources, superimposed on a 3D view of the site, is included in Appendix C.

Note, the condenser units operate on thermostatic, speed and timer controls according to heat loads and occupation rates and so would not be operating 100% of the time. Whilst a typical on-time for this type of equipment might only 20-35%, a conservative and therefore more robust assessment assumes a 50% on-time for a typical worst-case scenario (i.e. 50% of all condensers operating at any one time).

Predicted specific noise levels from the newly installed new plant equipment at each of the nearby sensitive receptor location for the daytime operating scenario are provided in Table 3 below.

Receptor	L_{Aeq} dB(A)	L_{Aeq} Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
R1. Townhouse Hotel Manchester	44	35	34	36	39	36	30	22	12

Table 3: Predicted specific noise contribution from the newly installed mechanical services plant at the nearest sensitive receptor location.

As indicated in Table 3, predicted noise levels at the nearest sensitive receptor location, from the newly installed mechanical services plant are L_{Aeq} 44dB.

5.2 MECHANICAL PLANT NOISE IMPACT ASSESSMENT

Table 4 shows a BS 4142 assessment covering the mechanical plant noise impact during the daytime. None of the mechanical plant items emit any distinct tones or impulses. Furthermore, as there has been existing plant operating in the vicinity of the nearest sensitive receptor for many years, the proposals would result in no change in the character of the noise currently experienced. Therefore, no acoustic feature correction has been included in the rating level.

Residential Position	Rating Level (dB)	Background L_{A90} (dB)	Assessment Level (dB) (Background excess)
R1. Townhouse Hotel Manchester	44	52	-8

Table 4: Predicted rating levels from mechanical plant at the nearest sensitive receptor location, compared with the representative daytime (07:00-20:00) background $L_{A90,1hour}$ level



During the daytime, the study predicts that at the nearest sensitive receptor location, the mechanical plant rating level are 8dB lower than the background noise level. The difference between the rating level and background level is such that any uncertainty would have no significance on the outcome of the assessment. Furthermore, the nearest sensitive receptor is a hotel where guests stay for short periods of time. The times when guests typically stay at the hotel are usually outside of the hours of operation of the plant equipment. Therefore, when considering these contextual elements, the sensitivity of the receptor is less than that of a typical dwelling.

In view of the above, noise emitted from the plant equipment during the daytime meets the requirements of Manchester City Council's Planning and Noise Technical Guidance. In line with BS 4142:2014 guidance, the mechanical services plant has a low noise impact. Consequently, the requirements of Condition 3 have been satisfied.

6. CONCLUSIONS

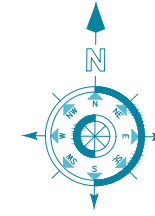
A validation noise assessment has been completed to consider the impacts of noise produced by newly installed mechanical services plant serving the 3rd, 4th and 5th floors at 101 Princess Street in Manchester.

A background noise measurement survey has been previously conducted at a location representative of the most sensitive receptor position to the plant. On site noise measurements have been carried out following the installation of the plant to enable the equipment sound power levels to be determined. Predictions of noise from the cumulative mechanical plant equipment have been completed, utilising a proprietary software package.

Noise limits for mechanical services plant have been established, based on the measured background noise levels, Manchester City Council's Planning and Noise Technical Guidance, as well as taking account of BS 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound*. Predictions have indicated that the overall noise levels from the equipment meet noise limit objectives and consequently have a low impact. Therefore, the requirements of Condition 3 in both planning consents have been satisfied.

APPENDIX A

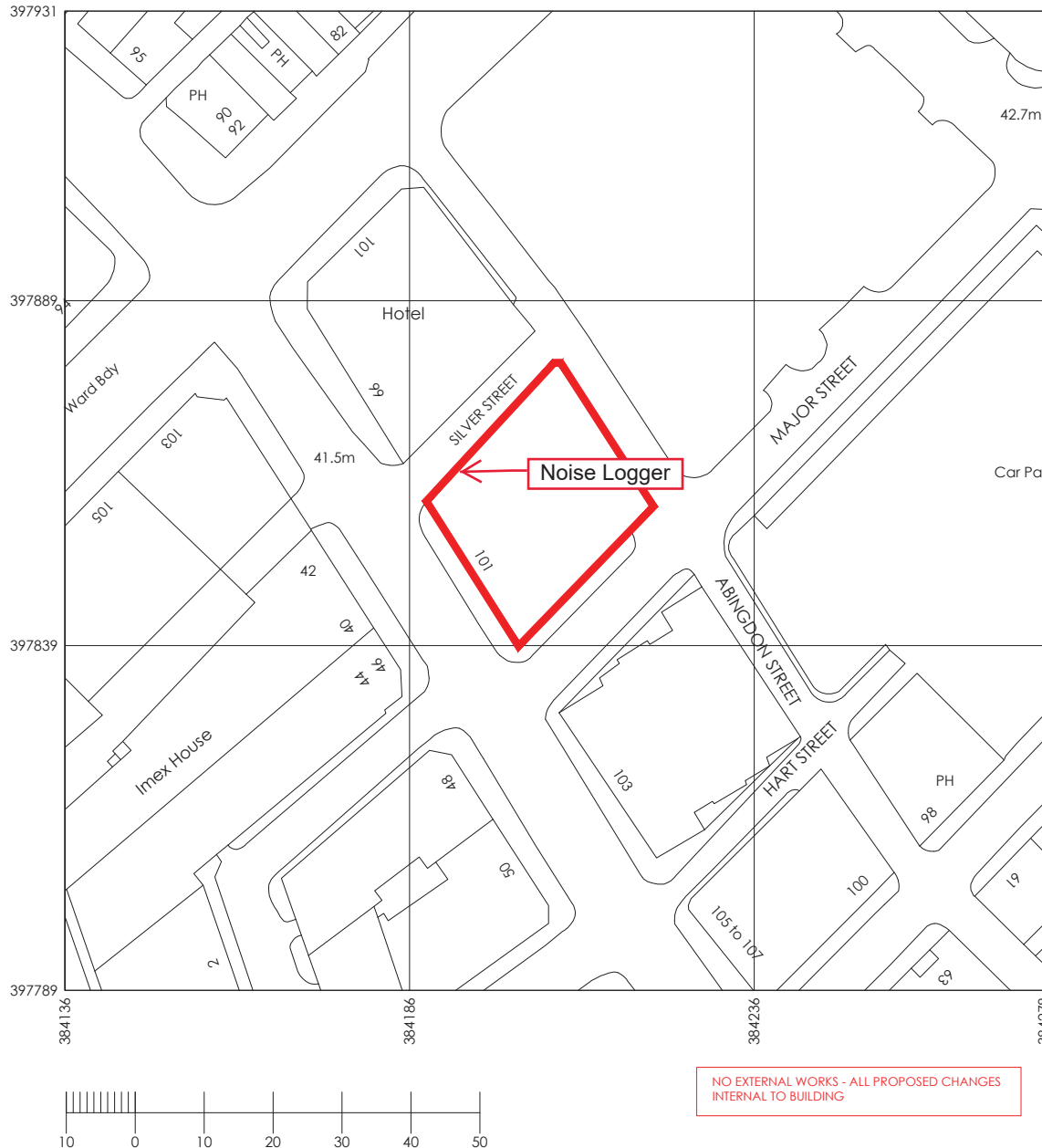
Site Location Plan



Rev	Date	Description	Initials
B	19.02.21	Issued for Construction.	FLC

FOR CONSTRUCTION

Client:	ASI
Project:	CAT A + REFURBISHMENT
Address:	101 PRINCESS ST MANCHESTER
Drawing Title:	3RD FLOOR EXISTING & PROPOSED SITE PLAN
Date:	04.03.2021
Project Number:	1213
Scale:	1:500@A2
Drawn by:	FLC
Drawing Number:	1213-03-LP02



101 PRINCESS ST - MANCHESTER

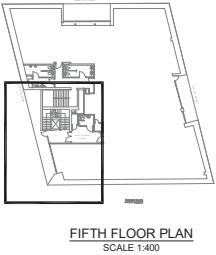
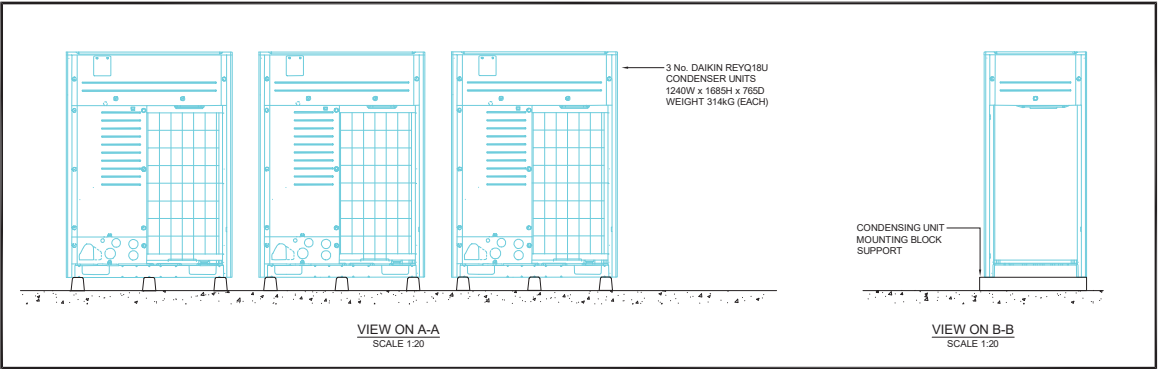
SITE PLAN 1:500

bluesky Design
INTERIORS LIMITED

Studio 1, 169 High Street, Boston Spa, Leeds LS23 6BH
Tel: 01937 845 399 www.blueskydesigninteriors.co.uk

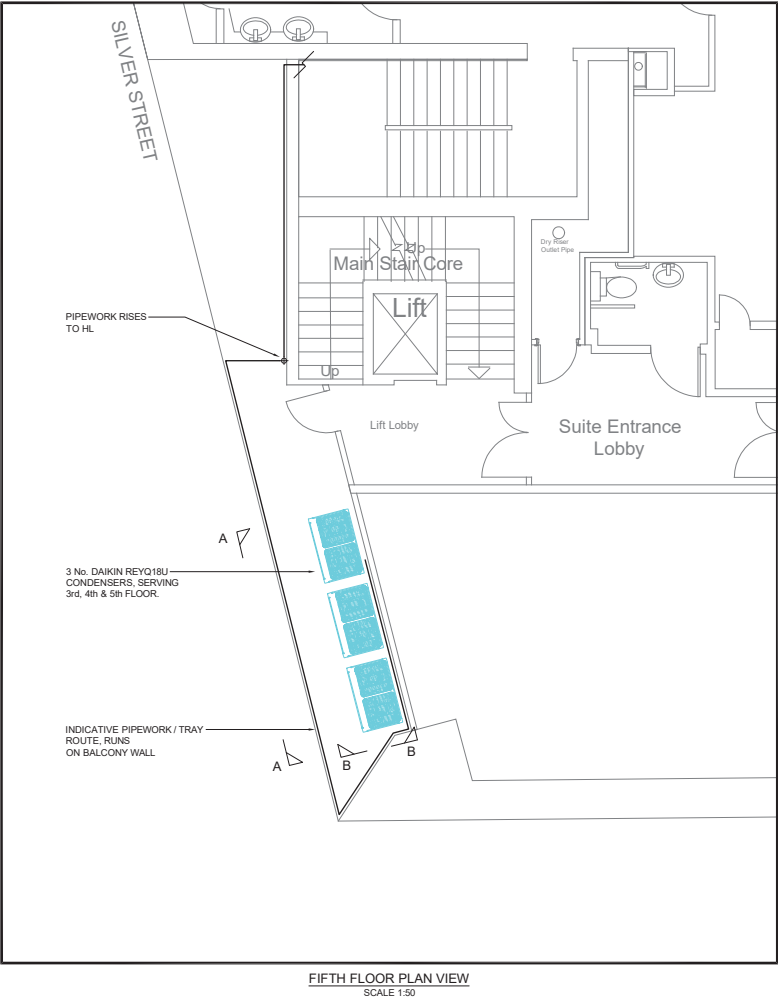
APPENDIX B

Consented Scheme Plans



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION	
IN ADDITION TO THE HAZARDOUSNESS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAIL ON THIS DRAWING, NOTE THE FOLLOWING:	
CONSTRUCTION	
MAINTENANCE/CLEANING	
DECOMMISSIONING/DEMOLITION	
IT IS ASSURED THAT ALL WORK WILL BE COMPLETED BY COMPETENT CONTRACTORS/ENGINEERS, USING APPROPRIATE, TO AN APPROVED SERVICE/LEVELMENT	

- NOTES
- PIPEWORK TRAY ROUTE / SIZE, INDICATIVE ONLY.

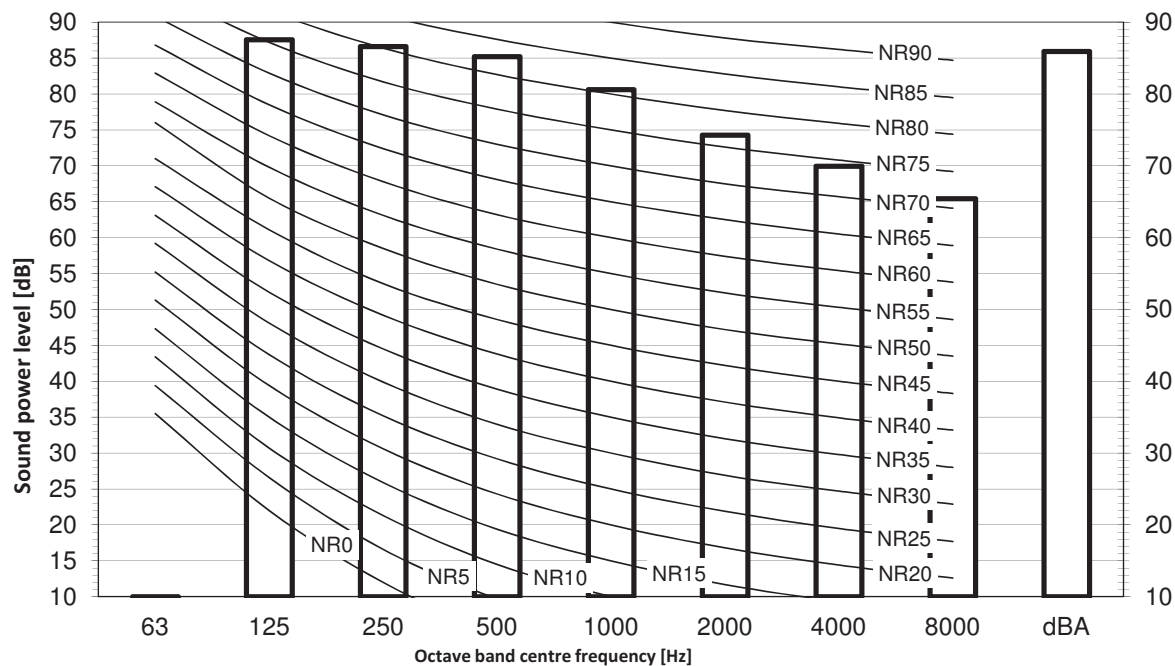


P0	18-11-21	FOR INFORMATION	LO
REV	DATE	DESCRIPTION	BY
 EVORA EDGE EVORA EDGE Ltd, The Pump House, Cotton Hill, Shrewsbury, SY1 2DP (T) 01743 341903 (W) www.evoraedge.com (E) cad@evoraedge.com Twitter @evoraedgetd Linked In www.linkedin.com/company/evora-edge-limited/			
CLIENT AberdeenStandard Investments			
PROJECT 101 PRINCESS STREET			
TITLE FIFTH FLOOR PROPOSED EXTERNAL CONDENSER LAYOUT			
DATE	18-11-2021	DRAWN BY LO	CHECKED JG
SCALE	1:50	PAPER A1	DRAWING No: 1989-EDGE-10-05-DR-M-0102
STATUS INFORMATION			REVISION P0

11 Sound data

11 - 1 Sound Power Spectrum

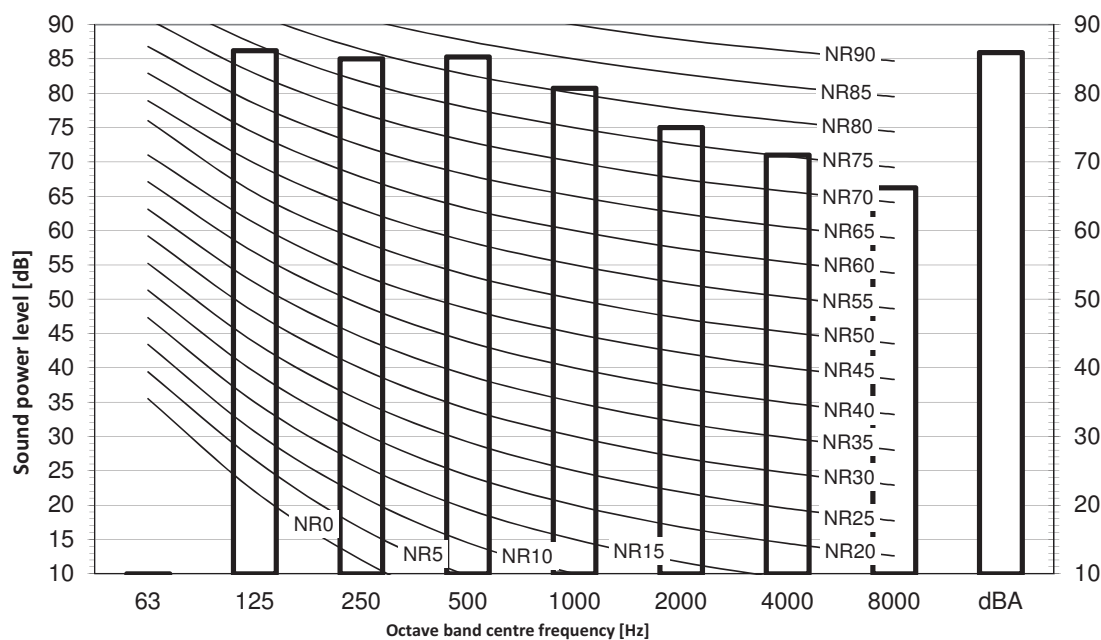
REYQ16T



- Notes :
1. dBA = A-weighted sound power level (A scale according to IEC).
 2. Reference acoustic intensity $0\text{dB} = 10^{-10}\text{E-}\mu\text{W/m}^2$.
 3. Measured according to ISO 3744

3D079911B

REYQ18T



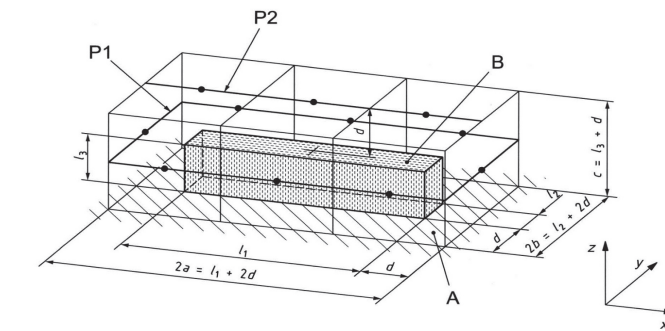
- Notes :
1. dBA = A-weighted sound power level (A scale according to IEC).
 2. Reference acoustic intensity $0\text{dB} = 10^{-10}\text{E-}\mu\text{W/m}^2$.
 3. Measured according to ISO 3744

3D079912B

APPENDIX C

Noise Prediction Model

Site Name: 5th Floor Daikin REYQ18U7Y1B VRF unit (right unit)

BS EN ISO 3746:2010
ISO 3746:2010(E)

- | | |
|------------|----------------------------|
| Key | |
| ● | microphone positions |
| A | reflecting plane |
| B | reference box |
| 2a | measurement surface length |
| 2b | measurement surface width |
| c | measurement surface height |
| d | measurement distance |
| l_1 | reference box length |
| l_2 | reference box width |
| l_3 | reference box height |
| P1, P2 | path 1, path 2 |

Site Boundary Measurement Position	LAeq (dB(A))
A	67.5
B	69.8
C	70.5
D	70.4
E	69.2
F	71.4
G	
H	
Time Averaged LAeq	70

Figure C.4 — Example of a measurement surface and microphone positions and paths for a long machine (with dimensions $4d < l_1 \leq 7d$, $l_2 \leq d$, $l_3 \leq 2d$)

The parallelepiped shall have the same orientation with respect to the co-ordinate origin, O, as the reference box. The measurement distance, d , shall be at least 0,15 m, but preferably 1 m or more.

If there is only one reflecting plane (see Figures C.2 to C.6), the area S of the measurement surface is given by Equation (7):

$$S = 4(ab + bc + ca) \quad (7)$$

$$S = 4(ab + bc + ca) \quad (7)$$

$$a = 0,5l_1 + d$$

$$a = 0,5l_1 + d$$

$$b = 0,5l_2 + d$$

$$c = l_3 + d$$

in which l_1 , l_2 , and l_3 are the length, width, and height, respectively, of the reference box.

Dimension	Length (m)
d=	0.3
l1=	1.685
l2=	1.24
l3=	1.31

Parameter	Value
a=	1.1425
b=	0.92
c=	1.61

Measurement Surface S (m²) = 17.4869

Sound Pressure to Sound Power Correction Factor (dB) = 12

Mean time-averaged Sound Pressure Level over measurement Surface= 70

Calculated Sound Power Level= 82 dB (A)

Calculation of approximate environmental noise levels using BS5228 calculation procedure

Figure F.4 Distance adjustment K' for plant sound power method

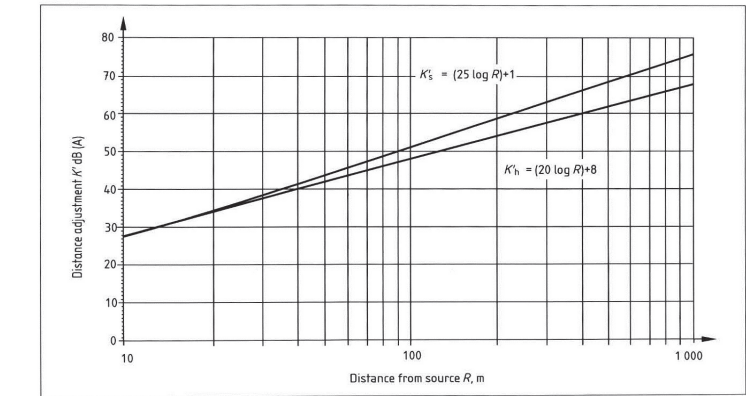


Figure F.5 Adjustment to sound level to give resulting L_{Aeq} (plant sound power method)

For hard ground $K'=K'_s$ and for soft ground $K'=K'_h$
 For source or receiver heights >2.5m reduce the value of K'_h until for heights>15m $K'_h=K'_s$

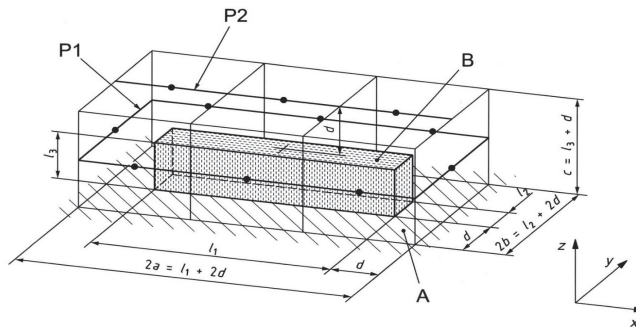
Calculated Sound Power Level= 82 dB (A)

Calculated Environmental Sound Pressure Levels at Distance D from Plant Centre:-

Distance (m)	Calculated LAeq (dB)
115	32
880	12
1100	9
1150	9
1850	4
1200	9

- Notes :
- (1) The distance attenuation is assumed to be midway between K'_s and K'_h to allow for the variation in the noise source heights.
 - (2) The effects of acoustic screening and ground contours are not included.
 - (3) The above predictions are intended to be indicative only. If more accurate calculated noise levels are required (e.g. in the event of complaints) a model in full compliance with ISO 9613 should be used.

Site Name: 3rd Floor Daikin REYQ18U7Y1B VRF unit (Centre unit)

BS EN ISO 3746:2010
ISO 3746:2010(E)

- | | |
|------------|----------------------------|
| Key | |
| ● | microphone positions |
| A | reflecting plane |
| B | reference box |
| 2a | measurement surface length |
| 2b | measurement surface width |
| c | measurement surface height |
| d | measurement distance |
| l_1 | reference box length |
| l_2 | reference box width |
| l_3 | reference box height |
| P1, P2 | path 1, path 2 |

Site Boundary Measurement Position	L _{Aeq} (dB(A))
A	66.4
B	68.2
C	67
D	
E	
F	
G	
H	
Time Averaged L _{Aeq}	67

Figure C.4 — Example of a measurement surface and microphone positions and paths for a long machine (with dimensions $4d < l_1 \leq 7d$, $l_2 \leq d$, $l_3 \leq 2d$)

The parallelepiped shall have the same orientation with respect to the co-ordinate origin, O, as the reference box. The measurement distance, d , shall be at least 0,15 m, but preferably 1 m or more.

If there is only one reflecting plane (see Figures C.2 to C.6), the area S of the measurement surface is given by Equation (7):

$$S = 4(ab + bc + ca) \quad (7)$$

$$a = 0,5l_1 + d$$

$$b = 0,5l_2 + d$$

$$c = l_3 + d$$

in which l_1 , l_2 , and l_3 are the length, width, and height, respectively, of the reference box.

Dimension	Length (m)
d=	0.3
l1=	1.685
l2=	1.24
l3=	1.31

Parameter	Value
a=	1.1425
b=	0.92
c=	1.61

Measurement Surface S (m²) = 17.4869

Sound Pressure to Sound Power Correction Factor (dB) = 12

Mean time-averaged Sound Pressure Level over measurement Surface= 67

Calculated Sound Power Level= 80 dB (A)

Calculation of approximate environmental noise levels using BS5228 calculation procedure

BRITISH STANDARD

BS 5228-1:2009

Figure F.4 Distance adjustment K' for plant sound power method

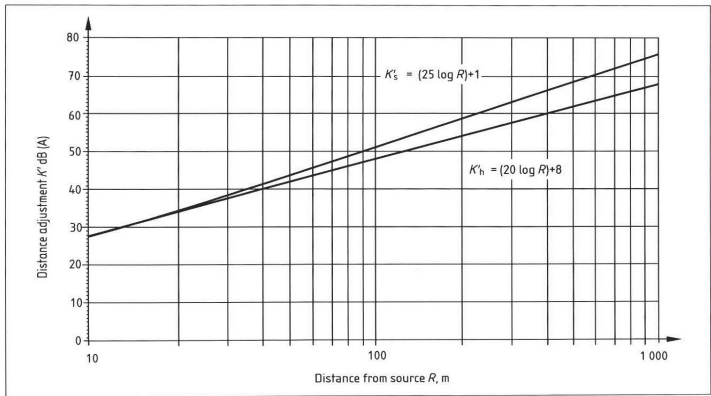


Figure F.5 Adjustment to sound level to give resulting L_{Aeq} (plant sound power method)

For hard ground $K'=K'_s$ and for soft ground $K'=K'_h$
 For source or receiver heights >2.5m reduce the value of K'_h until for heights>15m $K'_h=K'_s$

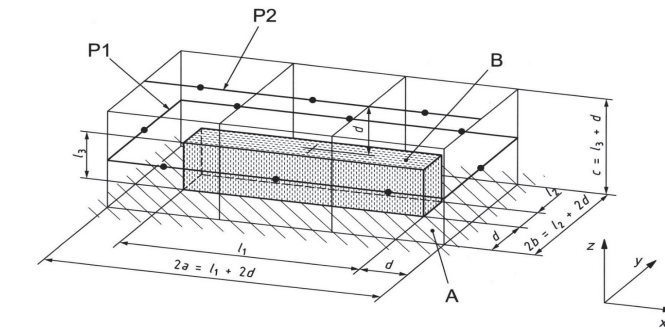
Calculated Sound Power Level= 80 dB (A)

Calculated Environmental Sound Pressure Levels at Distance D from Plant Centre:-

Distance (m)	Calculated LAeq (dB)
115	29
880	9
1100	7
1150	6
1850	2
1200	6

- Notes :
- (1) The distance attenuation is assumed to be midway between K'_s and K'_h to allow for the variation in the noise source heights.
 - (2) The effects of acoustic screening and ground contours are not included.
 - (3) The above predictions are intended to be indicative only. If more accurate calculated noise levels are required (e.g. in the event of complaints) a model in full compliance with ISO 9613 should be used.

Site Name: 4th Floor Daikin REYQ18U7Y1B VRF unit (left unit)

BS EN ISO 3746:2010
ISO 3746:2010(E)

- | | |
|------------|----------------------------|
| Key | |
| ● | microphone positions |
| A | reflecting plane |
| B | reference box |
| 2a | measurement surface length |
| 2b | measurement surface width |
| c | measurement surface height |
| d | measurement distance |
| l_1 | reference box length |
| l_2 | reference box width |
| l_3 | reference box height |
| P1, P2 | path 1, path 2 |

Site Boundary Measurement Position	L _{Aeq} (dB(A))
A	67.7
B	66.3
C	70.2
D	73.2
E	73.2
F	73.2
G	
H	
Time Averaged L _{Aeq}	71

Figure C.4 — Example of a measurement surface and microphone positions and paths for a long machine (with dimensions $4d < l_1 \leq 7d$, $l_2 \leq d$, $l_3 \leq 2d$)

in which l_1 , l_2 , and l_3 are the length, width, and height, respectively, of the reference box.

Dimension	Length (m)
d=	0.3
l1=	1.685
l2=	1.24
l3=	1.31

Parameter	Value
a=	1.1425
b=	0.92
c=	1.61

Mean time-averaged Sound Pressure Level over measurement Surface= 71

Calculated Sound Power Level= 84 dB (A)

Calculation of approximate environmental noise levels using BS5228 calculation procedure

BRITISH STANDARD

BS 5228-1:2009

Figure F.4 Distance adjustment K' for plant sound power method

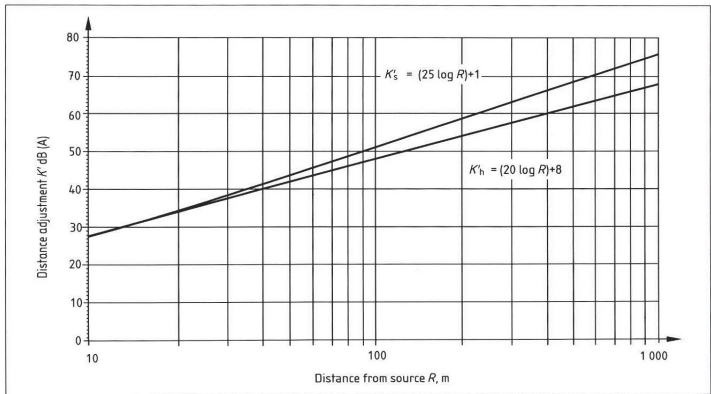


Figure F.5 Adjustment to sound level to give resulting L_{Aeq} (plant sound power method)

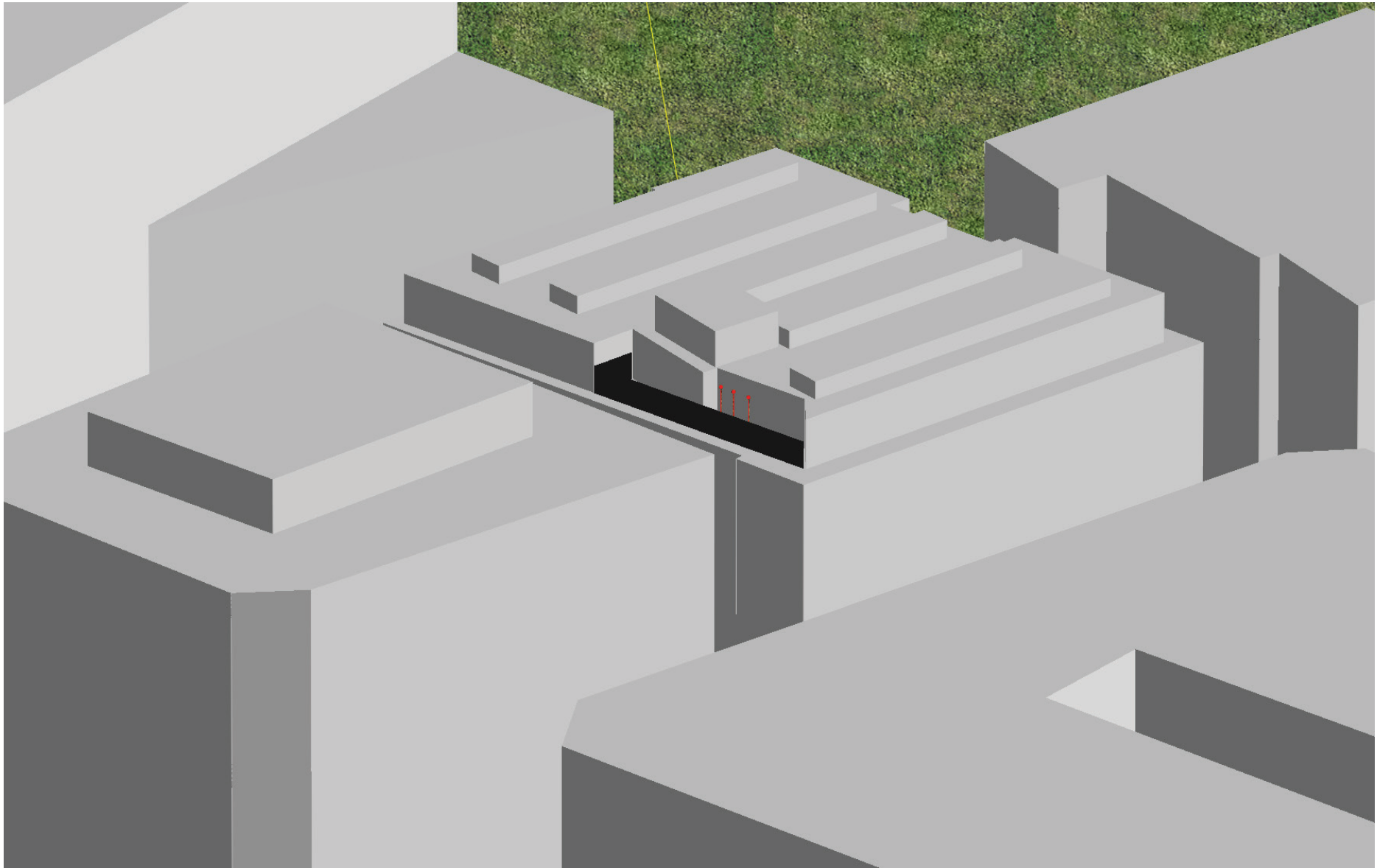
For hard ground $K'=K's$ and for soft ground $K'=K'h$
For source or receiver heights >2.5m reduce the value of $K'h$ until for heights>15m $K'h=K's$

Calculated Sound Power Level= 84 dB (A)

Calculated Environmental Sound Pressure Levels at Distance D from Plant Centre:-

Distance (m)	Calculated LAeq (dB)
115	33
880	13
1100	11
1150	10
1850	6
1200	10

- Notes :
- (1) The distance attenuation is assumed to be midway between $K's$ and $K'h$ to allow for the variation in the noise source heights.
 - (2) The effects of acoustic screening and ground contours are not included.
 - (3) The above predictions are intended to be indicative only. If more accurate calculated noise levels are required (e.g. in the event of complaints) a model in full compliance with ISO 9613 should be used.



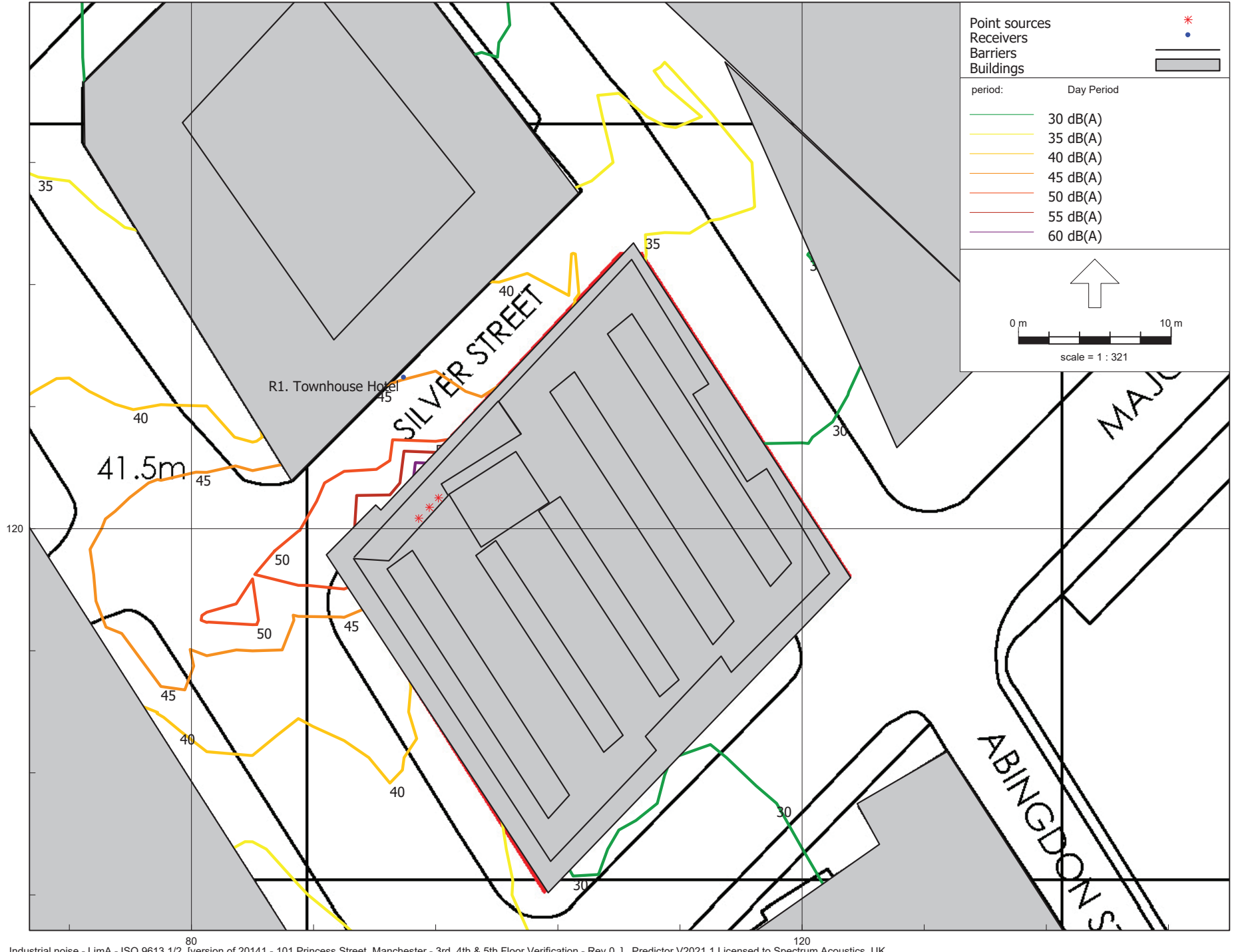
101 Princess Street, Manchester

Predicted Plant Noise Levels

Report: Table of Results
Model: 3rd, 4th & 5th Floor Verification - Rev 0
LAeq per octave: total results for receivers
Group: (main group)
Group Reduction: No

Name		Day									
Receiver	Description	Total	63	125	250	500	1000	2000	4000	8000	
_A	R1. Townhouse Hotel	44	35	34	36	39	36	30	22	12	

All shown dB values are A-weighted



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