

Island, Manchester

Planning Condition 7 and 9 – Noise Assessment

Bowmer & Kirkland

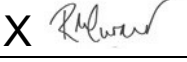
Job No: 1020044
Doc ref: TIS-CDL-XX-XX-RP-Y-4551
Revision: P03
Revision date: 18 October 2024

Project title	Island, Manchester	Job number
Report title	Planning Condition 7 and 9 – Noise Assessment	1020044

Document revision history

Revision ref	Issue date	Purpose of issue / description of revision
P01	23 March 2023	First Issue
P02	10 May 2024	Revised wording of Planning Conditions
P03	18 October 2024	Update to include validation measurements

Document validation (latest issue)

		
Principal author: George Richards	Checked by: Michael Pimlott	Verified by: Robert Turner
		Signed by: Rob Turner

Contents

1.0	Introduction	2
2.0	Local authority requirements	4
2.1	Planning condition 7	4
2.2	Planning condition 9	5
3.0	Site context and noise surveys	7
3.1	Site Context	7
3.2	Baseline noise survey	8
3.3	Results summary	9
4.0	Planning condition 7	11
4.1	Limiting noise levels	11
4.2	Office Development - Condition 7 a) (i)	11
4.3	Commercial unit break-out assessment – to inform Condition 7 a) ii)	12
4.4	Next steps	13
5.0	Planning condition 9	15
5.1	Limiting noise levels	15
5.2	Noise sensitive receptors	15
5.3	Plant noise data and assumptions	15
5.4	Plant noise impact assessment – Condition 9 a) (i)	18
5.5	Next steps	19
Appendix I	Plant noise façade noise map	22

1.0

Introduction

1.0 Introduction

This report has been prepared by Cundall in support of discharging Conditions 7 and 9 attached to planning permission 130553/FO/2021 issued by Manchester City Council for the development of a new 10-storey office development known as 'Island' in Manchester city centre.

The prevailing noise climate across the existing site and at nearby sensitive receptors has been determined through two long-term noise surveys undertaken between 17–20 and 29–30 January 2020. Full details of the noise surveys are presented in the Cundall Noise Impact Assessment Report TIS-CDL-ZZ-XX-RP-Y-4590 (Rev P04 October 2022) issued in support of the initial planning application and a summary of the results is reproduced herein.

1.1.1 Report revision P04 update – Validation measurements

This Revision P04 report update is provided following the completion of validation inspections and additional pre-completion plant noise measurements undertaken on 16 October 2024.

2.0

Local authority requirements

2.0 Local authority requirements

2.1 Planning condition 7

Condition 7a and 7b of the approved decision notice relate to entertainment noise break-out from the Development. The condition wording is reproduced in full below:

a) Prior to the first occupation of the premises, the property shall be acoustically insulated and treated to limit the break out of noise in accordance with a noise study of the premises and a scheme of acoustic treatment including particulars of the acoustic glazing and acoustically treated ventilation to be installed as part of (i) the office development and (ii) the ground floor commercial uses within the building that has been submitted to and approved in writing by the City Council as local planning authority. The approved scheme shall then be implemented in full before the use commences.

Where entertainment noise is proposed the LAeq (entertainment noise) shall be controlled to 10dB below the LA90 (without entertainment noise) in each octave band at the façade of the nearest noise sensitive location, and internal noise levels at structurally adjoined residential properties in the 63Hz and 125Hz octave frequency bands shall be controlled so as not to exceed (in habitable rooms) 47dB and 41dB, respectively.

b) Prior to occupation of the development a verification report will be required to validate that the work undertaken throughout the development in relation to (i) the office development and (ii) the ground floor commercial uses conforms to the recommendations and requirements in the approved acoustic consultant's report. The report shall also undertake post completion testing to confirm that acceptable 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 - In the interests of the amenities of occupiers of nearby properties, pursuant to policies SP1 and DM1 of the Core Strategy.

2.1.1 Condition 7 a) (i) and 7 b) (i)

Whilst there are no significant noise sources expected to occur within the Office Development, in accordance with Condition 7 a) (i) this report presents a summary of the proposed glazing and ventilation strategy.

There are no entertainment noise sources proposed in the office development.

2.1.2 Condition 7 a) (ii) and 7 b) (ii)

For Condition 7 a) ii) and 9 b) ii) it should be noted that the proposed commercial units ('Unit A' and 'Unit B') will only be completed to shell and core standards; no future Tenants have yet been confirmed at the time of writing. As such, it is not yet possible to undertake a detailed assessment of entertainment noise break-out as operational information (e.g. opening times, internal layout, typical noise levels) is not available.

Nevertheless, this report presents an indicative assessment of noise-break-out based on reference data for typical noise levels and provides further guidance on requirements for the installation of noise limiters to amplified music systems.

Whilst the above condition references "noise levels at structurally adjoined residential properties", there are no existing or proposed residential elements which adjoin the Development. The assessment of structurally adjoining noise transfer is therefore not discussed further within this report.

2.2 Planning condition 9

Condition 9a and 9b of the approved decision notice relate to noise break-out from the Development. The condition wording is reproduced in full below:

a) 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 (LAeq) below the typical background (LA90) level at the nearest noise sensitive location. Prior to commencement of the (i) office use and (ii) the ground floor commercial uses hereby approved the scheme shall be submitted to and approved in writing by the City Council as local planning authority in order to secure a reduction in the level of noise emanating from the site.

b) Prior to occupation of the (i) office use and (ii) the ground floor commercial uses, 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 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 minimise the impact of the development and to prevent a general increase in pre-existing background noise levels around the site in accordance with Core Strategy Policy DM1 and the National Planning Policy Framework.

2.2.1 Condition 9 a) (i) and 9 b) (i)

In accordance with Condition 9 a) (i) this report presents a design stage assessment of predicted noise impacts based on manufacturers' noise level data for proposed new external plant selections.

To satisfy Condition 9 a) (i), verification measurements of in-situ plant noise levels have been undertaken following the installation and commissioning testing of rooftop plant.

2.2.2 Conditions 9 a) (ii) and 9 b) (ii)

Conditions 9 a) (ii) and 9 b) (ii) for ground floor commercial plant are outside the scope of this assessment.

3.0

Site context and noise surveys

3.0 Site context and noise surveys

3.1 Site Context

The site extends to approximately 0.13 hectares and is located at the heart of Manchester City Centre. The site comprises a rectangular block of buildings bound by John Dalton Street to the south, South King Street to the north, Bow Street to the east and Ridgefield to the west. Three existing buildings are located within the site boundary comprising:

- Old Colony House (25,968 sq ft), a vacant 7-storey building comprising office accommodation with a vacant former restaurant at ground floor level. The building fronts onto South King Street;
- 5 Ridgefield (11,748 sq ft), a 3-storey building comprising a former restaurant use at basement and ground floor level and vacant offices at first and second floors. The site fronts onto Ridgefield and Bow Street; and,
- Grange House (17,309 sq ft), a 6-storey building comprising ground floor retail/restaurant/office use with vacant upper floors formerly in office use. The building fronts onto John Dalton Street.

The buildings vary in age and character and are no longer fit for purpose as office accommodation. A significant proportion of the accommodation is currently vacant and/or underutilised.

The site is located within the St Ann's Square Conservation Area and adjacent to the Albert Square Conservation Area. None of the buildings within the site are listed.

A site location with approximate red line boundary is given in Figure 3-1 below.

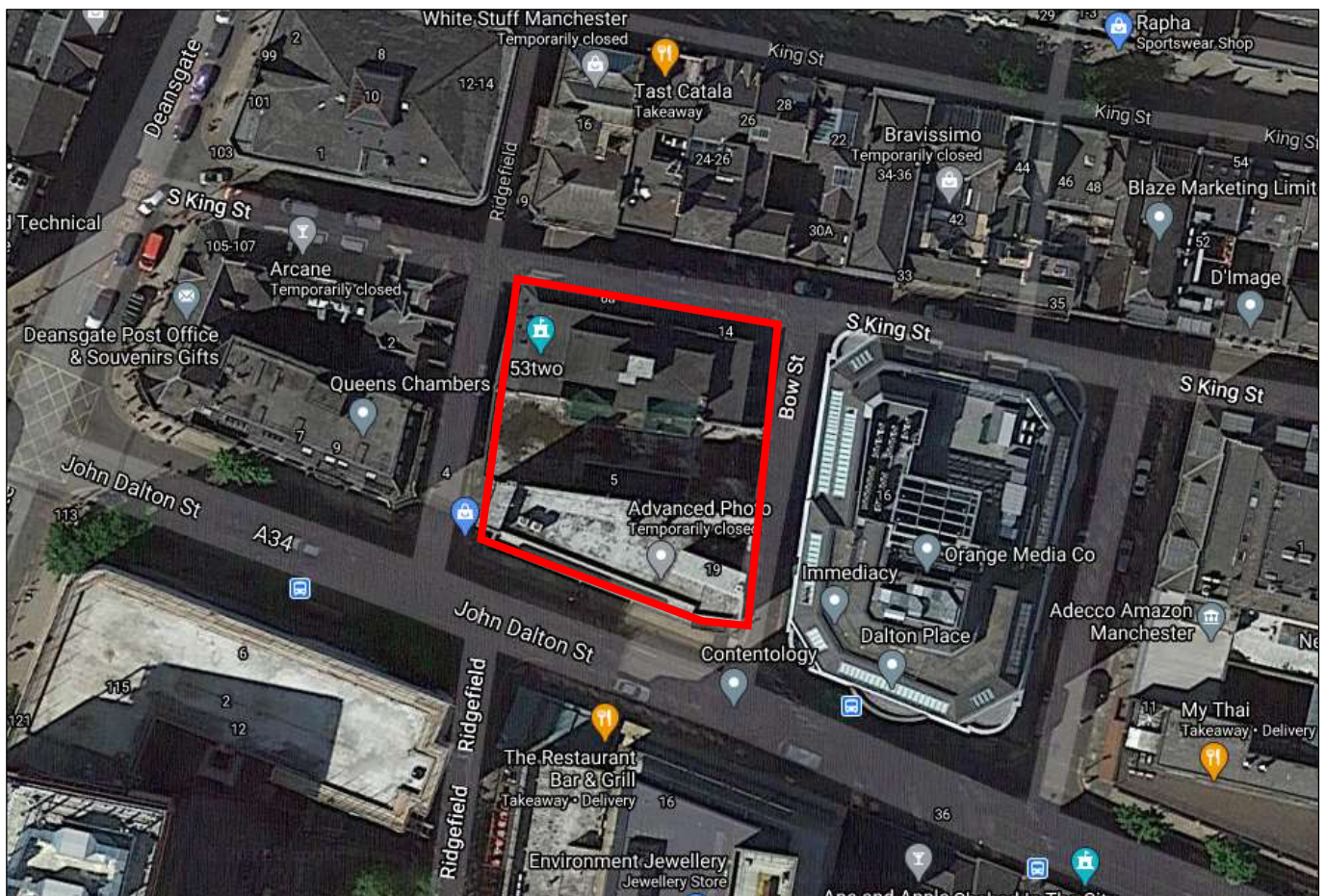


Figure 3-1: Site location and approximate red line boundary

3.2 Baseline noise survey

In order to assess prevailing levels of environmental noise affecting the proposed Development and nearby noise-sensitive receptors, unattended continuous noise surveys were undertaken at two measurement positions. The noise monitoring at position MP1 was carried out between approximately 11:00 hours on Friday 17 January to 09:00 hours Monday 20 January 2020 and at position MP2 was carried out between approximately 14:30 hours on Wednesday 29 January to 14:30 hours on Thursday 30 January 2020.

The approximate measurement locations are shown in Figure 3-2:

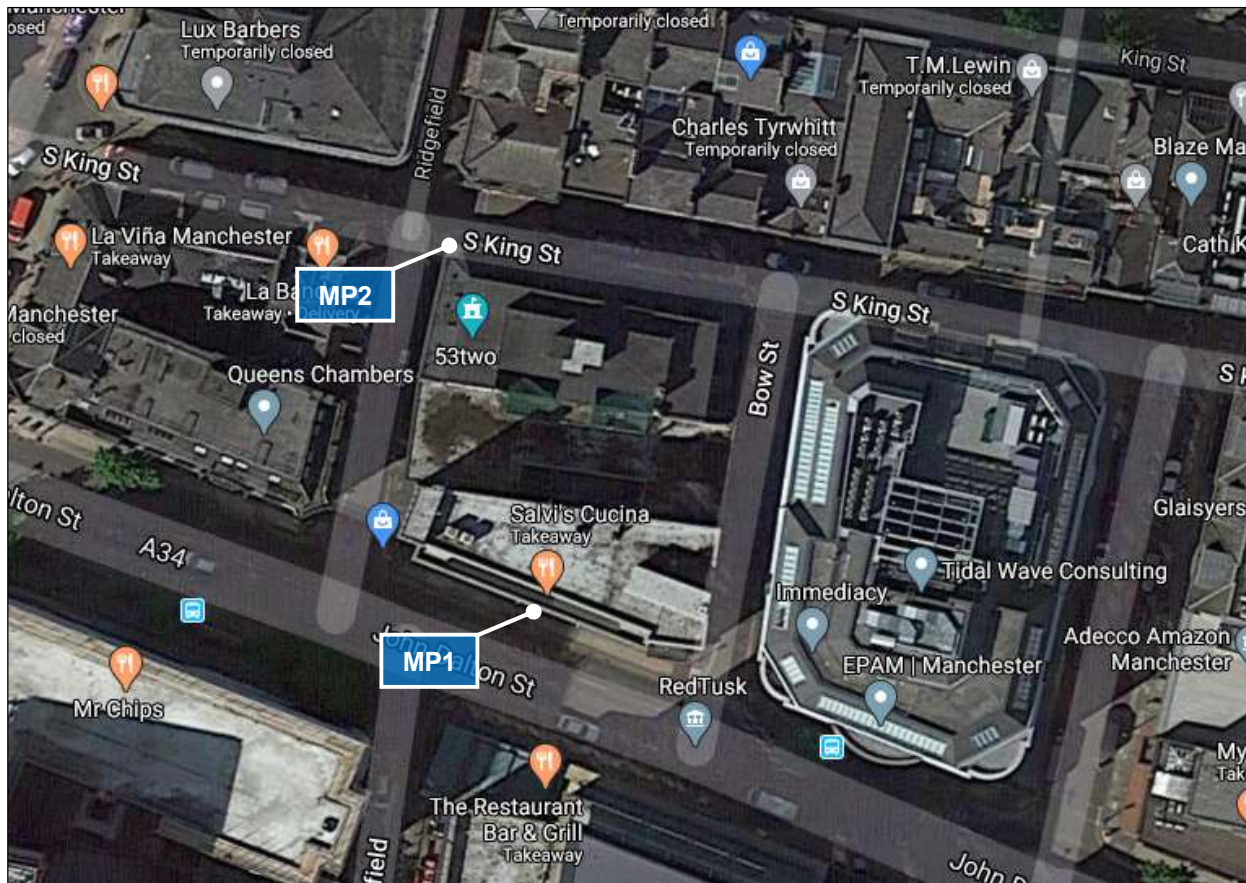


Figure 3-2: Survey measurement positions

Position MP1 was located at 3rd floor level approximately 9 m above ground and Position MP2 was located at 4th floor level approximately 12 m above ground. Sound level meters were placed inside the building with microphones attached to poles protruding from slightly open windows at a distance of approximately 1m from the façade.

Due to the unattended nature of the survey, it is not possible to comment on weather conditions throughout the entirety of the survey period; however, when the survey was setup the weather conditions were calm and dry, with daytime temperatures on both days of setting up equipment around 6°C and wind speeds below 5 m/s. From weather data records it understood that weather conditions throughout the survey period were generally unchanged from this.

Noise measurements were made using a NtI XL2 (serial number A2A-16315-E0) precision sound level meter, in accordance with BS EN 60651:1994 and BS 7445:1993. The meter was field calibrated before and after with no significant drift witnessed. Calibration certificates for all equipment are available upon request.

Monitoring equipment was set up by competently trained Cundall staff. Subjective impressions from site were that the noise climate was generally dictated by surrounding road traffic noise, with John Dalton Street being the primary noise source.

3.3 Results summary

A summary of the average ambient noise levels recorded is detailed within Table 3-1. Values given are the logarithmically averaged $L_{Aeq,T}$, the maximum L_{AFmax} , the highest $L_{A01,1hour}$ and lowest $L_{A90,15min}$ values measured.

All values have been corrected for free-field conditions by subtracting 3 dB from recorded values and rounded to the nearest integer value (as fractions of a decibel are imperceptible) and are given in dBA.

Position	Date	Time Period	$L_{Aeq,T}$ (dB)	L_{AFmax} (dB)	Highest $L_{A01,1hour}$ (dB)	Lowest $L_{A90,15min}$ (dB)
MP1	17 January 2020	Daytime (10:45 – 23:00 hrs)	70	92	81	59
	17– 8 January 2020	Night-time (23:00 – 07:00 hrs)	67	104*	78	49
	18 January 2020	Daytime (07:00 – 23:00 hrs)	67	90	81	55
	18–19 January 2020	Night-time (23:00 – 07:00 hrs)	66	99	78	49
	19 January 2020	Daytime (07:00 – 23:00 hrs)	64	95	76	49
	19–20 January 2020	Night-time (23:00 – 07:00 hrs)	65	95	84	49
	20 January 2020	Daytime (07:00 – 08:45 hrs)	69	97	76	56
MP2	29 January 2020	Daytime (14:45 – 23:00 hrs)	61	90	78	51
	29 – 30 January 2020	Night-time (23:00 – 07:00 hrs)	63	102*	79	46
	30 January 2020	Daytime (07:00 – 14:45 hrs)	64	91	74	52
* High max level likely the result of non-representative intermittent noise sources i.e. emergency sirens						

Table 3-1: Noise level results summary

4.0

Planning condition 7

4.0 Planning condition 7

4.1 Limiting noise levels

To meet the requirements of Condition 7a, sound levels attributable to amplified music break-out should be limited to 10 dB below the background sound level (L_{90}) at nearby sensitive receptors.

The octave band spectrums for the lowest measured daytime and night-time $L_{90,15min}$ periods as measured at Position MP2 have been used to define these limits.

	1/1-Octave Band Centre Frequency (Hz)						
	63	125	250	500	1k	2k	4k
Daytime & Evening (07:00 – 23:00)							
Existing background level L_{90} , dB	47	43	44	42	41	37	25
MCC noise limits L_{Zeq}, dB	37	33	34	32	31	27	15
Night-time (23:00 – 23:00)							
Existing background level L_{90} , dB	42	38	40	38	36	31	21
MCC noise limits L_{Zeq}, dB	32	28	30	28	26	21	11

Table 4-1: Limiting entertainment noise levels

The above L_{Zeq} noise limits are not to be exceeded at 1 m from the façade of the nearest noise-sensitive receptors:

4.2 Office Development - Condition 7 a) (i)

The proposal for the ventilation strategy of the building is to utilise mechanical ventilation via centralised air handling plant during the coldest and warmest parts of the year, with natural ventilation the preferable solution during mid-season.

The sound insulation of external glazed elements to the Office Development are summarised in the following table:

Glazing reference	Build-up	Sound insulation performance
GL1	8.8mm Laminated SKN176 - Outer 16mm Argon Cavity 6mm Clear Toughened HST – Inner	$R_w(C_{tr}) = 38(-5)$ dB
GL2	10.8mm Laminated SKN176 – Outer 16mm Argon Cavity 8mm Clear Toughened HST – Inner	$R_w(C_{tr}) = 43(-6)$ dB

Table 4-2: Proposed glazing specification

The above glazing systems offer a very high level of acoustic sound isolation performance. As such, the level of external noise break-out from a typical office noise environment (45 – 60 dBA) is expected to be imperceptible.

4.3 Validation of glazing installations - Condition 7 b) (ii)

The Main Contractor has confirmed that the glazing systems installed at the completed Development are in accordance with the specifications identified in Table 4-2. A visual inspection undertaken on 16 October 2024 identified that window installations are well sealed throughout.

Furthermore, it was confirmed that there are no entertainment noise sources present within the Office Development which would be subject to the criteria identified in Table 4-1.

4.4 Commercial unit break-out assessment – to inform Condition 7 a) (ii)

4.4.1 Limitations on assessment

The flexible Use Class E units at basement and/or ground floor level will be completed to 'shell and core' stage only. No future Tenants have yet been confirmed and it is therefore not possible to undertake a detailed assessment of entertainment noise break-out as operational information (e.g. opening times, internal layout, typical noise levels) is not available.

However, the following sub-sections present an indicative break-out assessment based on the sound insulation performance of the proposed external glazing system and assumed internal noise levels based on best practice guidance.

4.4.2 Internal noise levels assumptions

Break out calculations have been conducted using the 'typical indicative' internal noise level octave band data for a 'Busy pub/bar' as stated in the Institute of Acoustics Good Practise Guide on Control of Noise from Places of Entertainment (Draft 2016). These assumed octave band values are reproduced in Table 4-3 below:

Source	L _{Ze,q,T} (dB) in 1/1-Octave Band Centre Frequency (Hz)						
	63	125	250	500	1k	2k	4k
Busy Pub/Bar (based on Table 1 of Good Practice Guide on the Control of Noise from Places of Entertainment Draft 2016)	32	28	30	28	26	21	11

Table 4-3: Assumed internal noise levels

4.4.3 Break-out calculations.

The ground floor commercial unit sound insulation performance has been analysed based on composite façade sound insulation from the selected curtain walling glazing system and pre-case concrete elements. Ground floor commercial unit facades have then been treated as a finite plane surface for sound radiation, and the distance from the centre of the sound radiating façade to the closest noise-sensitive receptor has been measured with appropriate sound attenuation values applied.

Based on these assumptions, the calculated entertainment façade noise levels at the worst-case affected receptor (8 King Street) are detailed below along with a comparison against the identified MCC entertainment noise limits:

	L _{Ze,q,T} (dB) in 1/1-Octave Band Centre Frequency (Hz)						
	63	125	250	500	1k	2k	4k
MCC night-time noise limits (dB L _{eq})	32	28	30	28	26	21	11
Predicted night-time noise level at 8 King Street (dB)	19	31	32	20	15	14	-10
Excess over MCC noise limits (dB)	-13	+3	+2	-8	-11	-7	-21

Table 4-4: Break-out calculations for worst-case predicted impacts

From the above it can be seen that there is the potential that, based on the 'typical' assumed internal ambient noise levels, the resultant entertainment impacts may marginally exceed the MCC limits at 125 Hz and 250 Hz. It should, however, be reiterated that this indicative assessment does not constitute non-compliance as full details of operation are not yet known and a number of worst-case assumptions have currently been allowed for. These include:

- The assessment assumes the entertainment noise emissions radiate through all areas of the ground floor commercial unit facades. In practice, a number of back-of-house area will be required which will likely be located at

the façade (e.g. kitchens, stores) which will act as 'buffer' zones and significantly reduce noise break-out via the façade in such locations.

- The calculations do not include an allowance for any screening afforded by existing buildings. In practice the massing of surrounding buildings will provide further noise attenuation at the identified sensitive receptors.

Notwithstanding the above, the indicative assessment identifies that potential exceedances may occur in the future and that further mitigation may be required to limit future entertainment noise breakout to compliant levels.

To this end, it is confirmed that Tenant(s) of future commercial units will be subject to the following requirements as part of their tenancy lease agreement:

- All amplified music should be brought under control of an automatic volume control system to see that the noise limits identified in Table 4-1 are not exceeded. The installed noise limiter should be capable of limiting noise at 1/1-octave band frequencies. An example system that may be appropriate is as follows: Formula Sound AVC2D Automatic Volume Controller.
- To see that any noise limiting equipment operates effectively, the installation of such equipment should be overseen by an appropriately experienced noise consultant. Furthermore, due to the uncertainty of factors such as on-site workmanship, it is advised that the process of establishing acceptable limiting values for the system should be determined via in-situ testing of any PA systems.

4.5 Next steps

A full acoustic assessment of noise break-out and validation testing/reporting should be undertaken once the detailed fit-out proposals and operations are known. This is only possible once future Tenets of the units have been confirmed.

5.0

Planning condition 9

5.0 Planning condition 9

5.1 Limiting noise levels

Table 5-1 below summarises the existing background noise levels measured at the site along with limiting noise levels for all new items fixed services plant, when measured at 1 m from the nearest noise-sensitive receptors, in accordance with the requirements of Condition 7a:

Time period	Representative background noise level* dB L _{A90}	Plant noise rating level not to be exceeded at 1 m from nearest noise-sensitive receptor dB L _{A,r,Tr}
Daytime (07:00 – 23:00 hrs)	51	46
Night-time (23:00 – 07:00 hrs)	46	41
* Existing background noise value based on lowest measured L _{A90,15min} value during attended noise surveys at MP2. It is understood that		

Table 5-1: Limiting rating noise levels for building services plant

The above limits applicable to the cumulative noise level from all new items of plant when running under normal operation. Where applicable, acoustic feature corrections should be applied to the specific plant noise level to account for any distinguishable acoustic characteristics (e.g. tonality, impulsivity, intermittency).

5.2 Noise sensitive receptors

Plant noise emissions have been analysed to predict the expected noise rating level at 1 m from the nearest noise sensitive receptors at:

- Residential apartments located at 8 King Street which is located approximately 10 m to the north-west of the site boundary.
- 261 suite hotel at Yotel Manchester, on corner of John Dalton Street / Deansgate

5.3 Plant noise data and assumptions

The development will necessitate the installation of the following external plant items as primary noise sources, as detailed in Table 5-2 overleaf.

Item description	Manufacturer and model number	Plant reference
Air Handling Unit	AirSource - TempAir 97TT EXT	▪ AHU 01
Air Handling Unit	AirSource - TempAir 84TT EXT	▪ AHU 02
Air Handling Unit	AirSource - TempAir 33T EXT	▪ AHU 03
Air Handling Unit	AirSource - CF53-0-EH-P-R0	▪ AHU 04
2x Variable Refrigerant Flow units	Mitsubishi Electronic - PURY-EP200YNW-A2	▪ CU-RLW-LL ▪ CU-RLW-GF
1x Variable Refrigerant Flow units	Mitsubishi Electronic - PURY-EP250YNW-A2	▪ CU-RLW-GF
7x Variable Refrigerant Flow units	Mitsubishi Electronic - PURY-EP300YNW-A2	▪ CU-RLW-01 ▪ CU-RLW-02 ▪ CU-RLW-03 ▪ CU-RLW-04 ▪ CU-RLW-05 ▪ CU-RLE-02 ▪ CU-RLE-03
10x Variable Refrigerant Flow units	Mitsubishi Electronic - PURY-EP350YNW-A2	▪ CU-RLW-06 ▪ CU-RLW-07 ▪ CU-RLW-08 ▪ CU-RLE-01 ▪ CU-RLE-04 ▪ CU-RLE-05 ▪ CU-RLE-06 ▪ CU-RLE-07 ▪ CU-RLE-08 ▪ CU-RLE-09
Extract fan	Flaktwood - Woods EC Twin Fan 350	▪ EF-RF-01
Extract fan	Flaktwood - Ropera (ILC) 125mm Steel (2CA)	▪ EF-00-01

Table 5-2: List of external noise emitting plant items

The above plant items included in the noise emission analysis have been assigned noise source information based on manufacturers' noise level data. This data is summarised in Table 5-3 to Table 5-5 overleaf.

AHU reference	Fan reference	Spectral sound power level, L_w (dB)							
		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
AHU 01 East	Supply	75.0	86.0	80.0	78.0	75.0	72.0	69.0	69.0
	Extract	77.0	90.0	82.0	84.0	82.0	78.0	75.0	70.0
AHU 02 West	Supply	83.0	83.0	80.0	76.0	74.0	70.0	67.0	70.0
	Extract	83.0	87.0	83.0	84.0	80.0	77.0	74.0	71.0
AHU 03	Supply	75.0	78.0	74.0	72.0	69.0	66.0	63.0	64.0
	Extract	78.0	84.0	79.0	81.0	78.0	74.0	71.0	67.0
AHU B1 04	Supply	65.0	69.0	73.0	71.0	69.0	70.0	70.0	62.0
	Extract	66.0	69.0	71.0	74.0	76.0	74.0	74.0	67.0

Table 5-3: Sound power level data of external noise emitting Air Handling Units plant selections

Extract fan reference	Fan reference	Spectral sound power level, L_w (dB)							
		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
EF-RF-01	Breakout	72.0	76.0	70.0	61.0	55.0	46.0	36.0	29.0
	Extract	84.0	87.0	82.0	78.0	76.0	70.0	61.0	53.0
EF-00-01	Extract	37.0	41.0	48.0	49.0	49.0	40.0	32.0	26.0

Table 5-4: Sound power level data of external noise emitting Extract Fans plant selections

Model No.	Spectral sound power level, L_w (dB)							
	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
PURY-EP200YNW-A2	69.0	61.0	60.5	58.0	52.0	47.5	48.0	42.5
PURY-EP250YNW-A2	69.0	62.5	62.0	60.0	54.0	49.5	50.5	44.0
PURY-EP300YNW-A2	74.5	70.0	68.5	65.5	60.5	56.5	52.0	48.0
PURY-EP350YNW-A2	72.0	70.5	64.0	62.0	57.0	54.0	51.5	48.0

Table 5-5: Sound power level data of external noise emitting Variable Refrigerant Flow units plant selections

In-duct attenuators are to be included on the atmosphere-side outlets of the Air Handling Units (AHU) supply and extract, as well as the roof extract fan. The insertion loss provided by these attenuators that has been summarised overleaf in Table 5-6.

Noise source reference	Attenuator reference	Fan reference	Insertion loss (dB)							
			63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
AHU 01 East	AT-A1-01	Supply	8.0	13.0	23.0	40.0	36.0	26.0	17.0	13.0
	AT-A1-02	Extract	11.0	17.0	31.0	51.0	46.0	31.0	19.0	13.0
AHU 02 West	AT-A2-01	Supply	5.0	7.0	13.0	29.0	39.0	24.0	15.0	11.0
	AT-A2-02	Extract	6.0	9.0	18.0	36.0	35.0	26.0	18.0	14.0
AHU 03	AT-A3-01	Supply	6.0	10.0	19.0	32.0	30.0	20.0	14.0	10.0
	AT-A3-02	Extract	4.0	7.0	14.0	27.0	21.0	14.0	10.0	7.0
AHU B1 04	AT-A4-01	Supply	2.0	3.0	8.0	15.0	13.0	9.0	8.0	6.0
	AT-A4-02	Extract	2.0	3.0	8.0	15.0	13.0	9.0	8.0	6.0
EF-RF-01	AT-E1-01	Extract	5.0	8.0	15.0	24.0	25.0	19.0	12.0	7.0

Table 5-6: Insertion loss achieved by AHU atmosphere-side in-duct attenuators

5.4 Plant noise impact assessment – Condition 9 a) (i)

To determine plant noise propagation to the nearest affected residential properties, a 3D noise propagation model has been produced using SoundPLAN 8.2 acoustic modelling software. This model is capable of accurately determining sound propagation by considering variations in topography, barrier attenuation provided by plant screening, and distance attenuation.

The information listed in Table 5-3, Table 5-4, and Table 5-5 with the inclusion of the attenuation listed in Table 5-6 was modelled into SoundPLAN. The model was used to calculate the noise propagation to the facades of the nearest noise sensitive receptors.

A façade noise map indicating the calculated specific plant noise levels at the façade of the nearest noise-sensitive receptors is presented in Appendix I

5.4.1 Results

Based on the calculated specific sound levels presented in Appendix I, Table 5-7 sets out a BS 4142 numerical assessment of plant noise impacts at the nearest noise-sensitive receptors in accordance with the requirements of Condition 9 a) (i). Night-time has been assessed as it is assumed that plant could potentially operate 24/7

Assessment stage	Noise-sensitive receptor		BS 4142 Clause	Commentary
	8 King Street	Yotel Manchester		
Assessment Period, T_r	15 minutes	15 minutes	7.2	It has been assumed that plant will operate 24/7, and as such be in operation between the period of 23:00 – 07:00. This has therefore been considered as worst-case
Predicted specific sound level	$L_s = 27$ dB	$L_s = 31$ dB	7.3.6; 7.3.8	Highest specific sound predicted by calculation and assumed to be continuous
Acoustic feature corrections	+3 dB	+3 dB	9.2	Whilst there is no indication that the plant will be tonal or intermittent, a general penalty of + 3 dB has been applied as a worst-case assumption
Rating Level	$L_{A_r,Tr} = 30$ dB	$L_{A_r,Tr} = 34$ dB	9.1	Predicted specific sound levels
Background sound level (night-time)	46 dB	46 dB	8.1 8.2	
Excess over background sound level	-16 dB	- 12 dB	11	Rating levels are 16 & 12 dB below representative background sound level.

Table 5-7: Plant noise assessment results at nearest residential receptors

As can be seen from the results detailed above, the worst-case level of sound impact due to new building services plant associated with the development is predicted to be 16 dB and 12 dB below the representative background sound level during periods when plant is operational.

Plant noise impacts are therefore predicted to be fully compliant with the Condition 9 a) (i) requirement “to achieve a rating level of 5dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location.”

5.5 Validation measurements – Condition 9 b) (i)

As detailed in table .

As the design stage calculations determined that expected plant noise impacts at the nearest noise-sensitive receptors (NSRs) are expected to be at least 10 dB below prevailing background sound levels, it is not practicable to determine the level of noise impact through in-situ measurements at the NSRs.

To help validate the calculated level of the noise impact associated with external noise generating plant, post-commissioning noise level measurements were therefore undertaken for rooftop plant items on 16 October 2024. All items of plant were confirmed to be full balanced and operating at typical design duty at the time of measurement.

Measurements were undertaken in the rooftop plant enclosure in proximity to items of significant noise generating equipment (i.e. AHUs, extract fans and VRF units) to quantify the noise emissions at source and allow for calculation of the specific noise level at NSRs using standard corrections for distance attenuation.

Details of the measurements undertaken during the validation visit are provided below.

Measurement location	Measured source level
Rooftop plant zone in proximity to AHU 02 and associated VRF condensers	61 dB $L_{Aeq,T}$
Rooftop plant zone in proximity to AHU 03 and associated VRF condensers	56 dB $L_{Aeq,T}$
Rooftop plant zone in proximity to AHU 01 East	59 dB $L_{Aeq,T}$
Rooftop plant zone in proximity VRF condensers associated with AHU 01 East	65 dB $L_{Aeq,T}$

Table 5-8: Rooftop plant validation measurements

Visual validations checks were also undertaken to ensure that installed plant items are in accordance with the Cundall design stage assessment considerations.

5.5.1 Comparison with design stage assessment

As detailed above, all plant items were fully commissioned at the time of measurements and were operating at the necessary design duty values as specified by the centralised Building Management System (BMS).

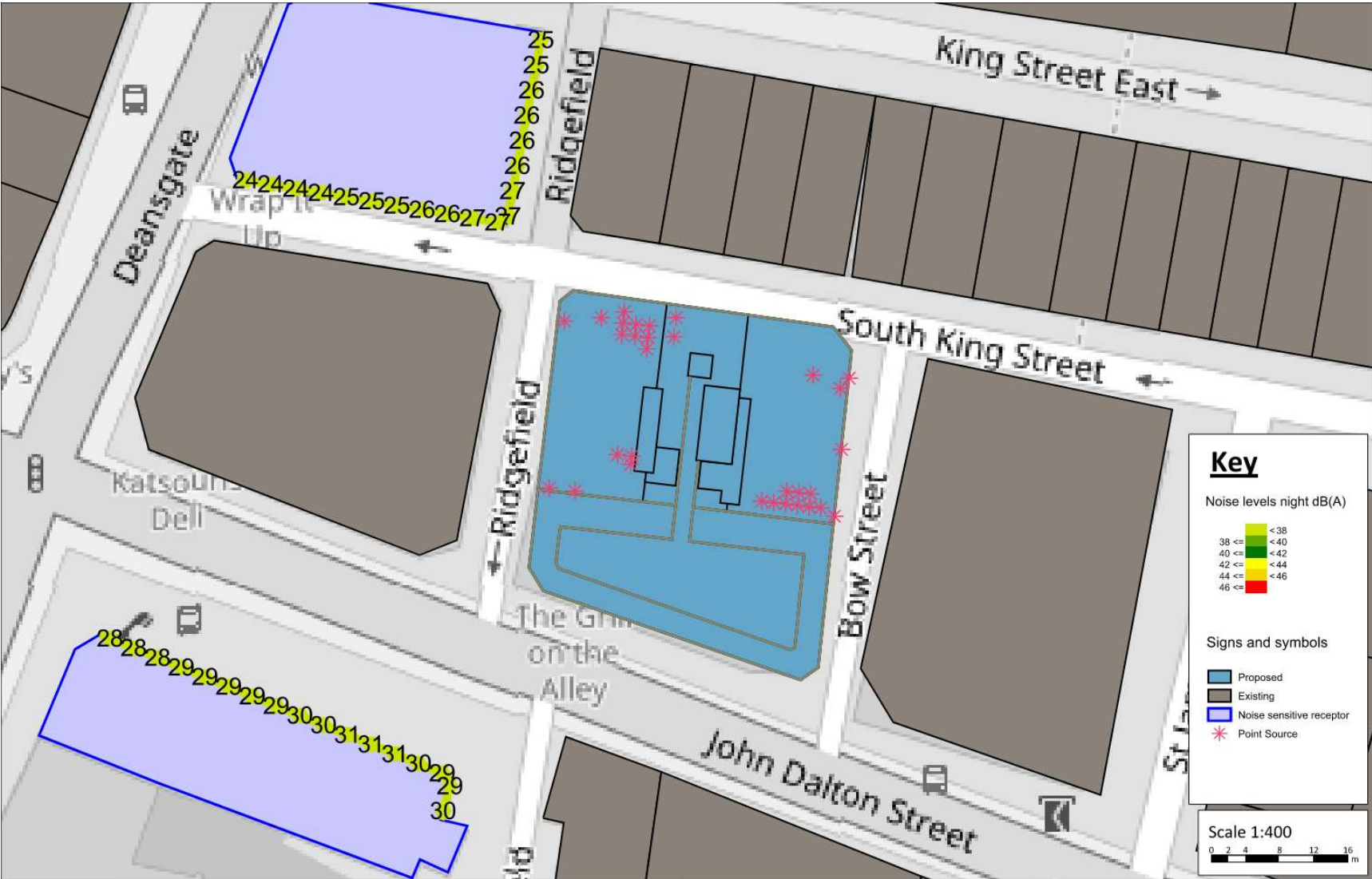
Measured rooftop plant enclosure values ranged from 56 - 65 dB $L_{Aeq,T}$, and once subsequent distance attenuation calculations and rooftop plant screening are considered, the resultant rating levels at the nearest Noise Sensitive Receptors (NSRs) will be significantly lower than the 46 dB representative background sound level as well as being predicted to be lower than the design stage BS 4142 assessment values presented in 5.4.1.

However, it is acknowledged that under theoretical maximum design load conditions, the source sound pressure level of the rooftop plant could exceed the values recorded during the validation measurements.

It is therefore concluded that the findings of the design stage 3D noise propagation model provide the most reliable method for assessing potential 'worst-case' noise impacts, and that the plant noise rating level is at least 5 dB below the representative background sound level at the nearest noise-sensitive receptors.

Appendices

Appendix I Plant noise façade noise map



Cundall Johnston & Partners LLP

Fourways House 57 Hilton St Manchester M1 2EJ
Tel: +44 (0)161 244 5660

Asia Australia Europe MENA UK and Ireland
www.cundall.com

