

Didsbury Point Manchester

Acoustic Assessment Report -
Planning Condition 20 (Plant Noise)

Client:

Bridgestone Construction Limited
Hyde Park House, Cartwright St, Hyde, SK14 4EH

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Consultants in acoustics,
noise and vibration

Document Control

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Author	Andrew Jameson (AJ)
Position	Director
Qualifications	BSc(Hons) Acoustics, MIOA, MIET
Signature	
Date	07-11-2025

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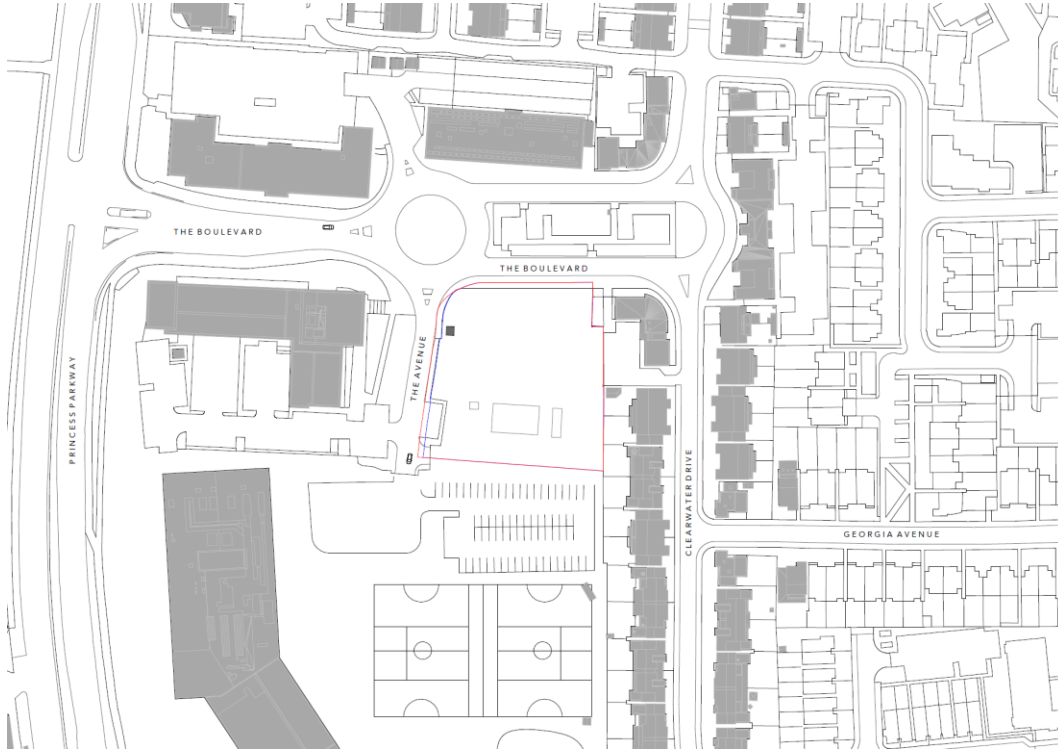
1.0 Introduction

Jameson Acoustics Limited has been commissioned by Bridgestone Construction Limited to provide acoustic design services to assist in the discharge of Part A of Planning Condition 20 pertaining to the consented residential and medical centre development at Didsbury Point in Manchester. The condition is as follows.

No	Wording
20	a) Externally and internally 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 use 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. The scheme shall be implemented in full before the use commences or as otherwise agreed in writing by the City Council as local planning authority. b) Prior to the first operation of the approved scheme (other than for the reasons and purposes of testing equipment to demonstrate compliance with this condition), 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.

2.0 Project & Assessment Overview

The development comprises a Part 8 and Part 6 storey building to form 76 no. residential apartments (Class C3) with ground floor medical centre use (Class E(e)) with associated car parking provided on a two-tiered decked car park, landscaping and infrastructure. See below site location plan and proposed site plan.

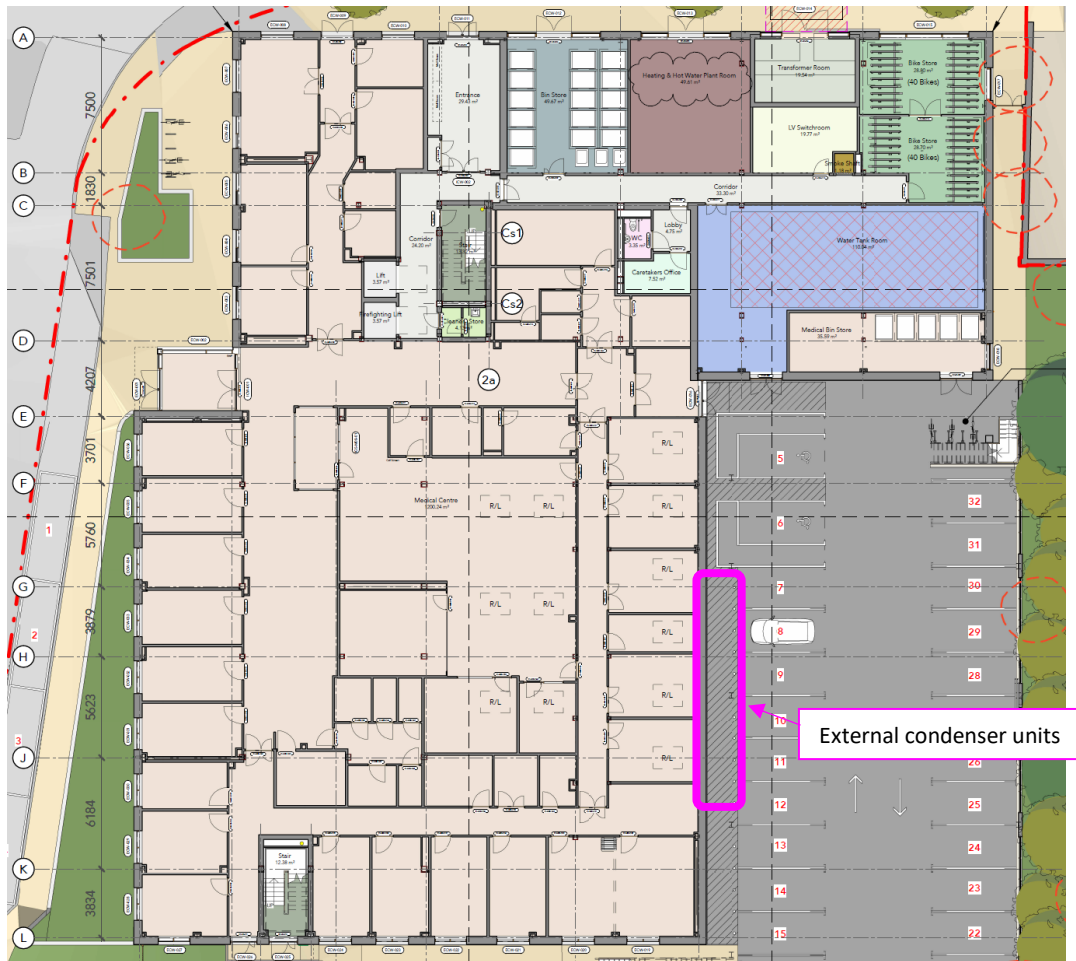


Site location plan



Typical upper floor plan

External plant will comprise heat rejection condenser units to serve the medical centre. These units will be installed within the lower (ground level) deck of the car park, as indicated below. The nearest noise sensitive receptors will be apartment windows within the development itself (at Level 1 and above) and rear windows of houses to the east on Clearwater Drive.



Ground floor plan illustrating location of external plant

The assessment shall assess the '*for construction*' plant specifications against the acoustic performance requirements set out in the approved Hann Tucker Associates' *Noise Impact Assessment Report* Ref. 28562/NIA1 (Rev 6) dated 15 February 2021 ['the Hann Tucker Report'].

External plant comprises:

- 2 x heat pumps (for heating), ground level in car park - zone highlighted above,
- 2 x condensers (for cooling internal a/c units), ground level in car park - zone highlighted above.

Internal plant comprises:

- Substation at ground floor with air ventilation grilles onto street facing north,
- Medical centre heat recovery units with ducted air inlet/outlets (all elevations),
- MVHR units to apartments.

3.0 Plant Noise Limits

The Hann Tucker Report sets the following plant noise limits for the scheme. The limits are to be achieved at 1 metre from (incident onto) residential windows when assessed to BS 4142.

Desc.	Daytime (07:00-23:00)	Night-time (23:00-07:00)
Plant Noise Rating Limit, dB L _{A,r,Tr}	37	30

4.0 External Plant Noise Assessment

4.1 Proposals

The external plant comprises 4nr condensers (2nr heating mode heat pumps and 2nr cooling mode heat pumps).

The manufacturer's noise data for the units are tabulated below. This information has been taken directly from manufacturer datasheets and is understood to be representative of the final plant selections operating at full (maximum) duty.

Unit	Index	Sound Level (dB) at OBCF (Hz)							(dB) L _A
		63	125	250	500	1k	2k	4k	
Heat Pump 1 <i>Mitsubishi CAHV-R450YA</i>	SPL @ 1m (stand'd)	64	66	67	60	54	52	52	63
	SPL @ 1m (night, 75%)	-	-	-	-	-	-	-	58
Heat Pump 2 <i>Mitsubishi CAHV-R450YA</i>	SPL @ 1m (stand'd)	64	66	67	60	54	52	52	63
	SPL @ 1m (night, 75%)	-	-	-	-	-	-	-	57
Heat Pump 3 (CU01) <i>Mitsubishi PURY-EP300YNW</i>	SPL @ 1m (stand'd)	74	62	62	60	54	49	45	61
	SPL @ 1m (night)	54	53	47	46	40	35	33	47
Heat Pump 4 (CU02) <i>Mitsubishi PUZ-ZM71VHA</i>	SPL @ 1m	51	49	47	44	42	38	31	47

Heat pumps 1-2 are for central heating and could therefore run during night-time hours. However, the unit can be centrally controlled with limiting duties assigned. It is expected that the units can be set to a reduced duty of 75% of full to obtain a noise reduction of at least 6 dB. This will need to be programmed into the unit. The services engineers, Prana, have confirmed that this will be added to the equipment commissioning requirements. Furthermore, the heat pumps will operate on an N+1 basis, meaning only one unit would ever operate (one running, one in standby).

Heat pumps 3-4 are serving internal air conditioning units which would only be operational during operational hours (daytime only). However, should the units be required to operate at night, the larger unit would do so on a night set back mode, which is pre-programmed into the equipment settings.

Based on the spectral curves above, no acoustic feature correction for tonality is deemed necessary. The units are new and can be expected to operate with smooth ramp up/down characteristics, meaning no correction for impulsivity or intermittency shall be necessary.

4.2 Assessment

Noise output shall be assessed to 2nr receptors; (1) nearest and most exposed upper floor apartment windows within the development itself – Level 6 windows approx. 20-25 metres from the plant area and partially screened by the car park upper deck, and (2) rear windows to houses to the east - approx. 35 metres from the plant and partially screened by the car park structure. Consideration shall be given to reflections off the building.

Our calculations of resultant noise rating levels to each receptor are summarised below.

Receptor: NSR A (apt windows)				Receptor: NSR B (houses to east)			
Description	HP1/HP2	HP3	HP4	Description	HP1	HP3	HP4
Source Sound Level (dB)	63	61	47	Source Sound Level (dB)	63	61	47
Index	SPL@1m	SPL@1m	SPL@1m	Index	SPL@1m	SPL@1m	SPL@1m
Nr of Units (NP1/HP2 = N+1)	1	1	1	Nr of Units (NP1/HP2 = N+1)	1	1	1
Correction for Nr of Units (dB)	0	0	0	Correction for Nr of Units (dB)	0	0	0
Distance (m)	22	26	28	Distance (m)	35	35	35
Distance Loss (dB)	-27	-28	-29	Distance Loss (dB)	-31	-31	-31
Directionality ?	N/A	N/A	N/A	Directionality ?	N/A	N/A	N/A
Directionality Correction (dB)	0	0	0	Directionality Correction (dB)	0	0	0
Reflections (within 3.5m of façade)?	Yes	Yes	Yes	Reflections (within 3.5m of façade)?	Yes	Yes	Yes
Reflection Correction (dB)	3	3	3	Directionality/Reflection Correction (dB)	3	3	3
Screening?	Partial	Partial	Partial	Screening?	Full	Full	Full
Screening Loss (dB)	-5	-5	-5	Screening Loss (dB)	-10	-10	-10
Specific Noise Level at NSR, L _{Aeq} (dB)	34	31	16	Specific Noise Level at NSR, L _{Aeq} (dB)	25	23	9
Acoustic Feature Correction, re. BS 4142 (dB)	0	0	0	Acoustic Feature Correction, re. BS 4142 (dB)	0	0	0
Noise Rating Level at Receptor, L _{A,rTr} (dB)	34	31	16	Noise Rating Level at Receptor, L _{A,rTr} (dB)	25	23	9
Cumul. Rating Level at Receptor, L _{A,rTr} (dB)	36			Cumul. Rating Level at Receptor, L _{A,rTr} (dB)	27		
Plant Noise Limit [Day], L _{A,rTr} (dB)	37			Plant Noise Limit [Day], L _{A,rTr} (dB)	37		
Compliance/Exceedance?	✓			Compliance/Exceedance?	✓		
Receptor: NSR A (apt windows)				Receptor: NSR B (houses to east)			
Description	HP1	HP3	HP4	Description	HP1	HP3	HP4
Source Sound Level (dB)	57	47	47	Source Sound Level (dB)	57	47	47
Index	SPL@1m	SPL@1m	SPL@1m	Index	SPL@1m	SPL@1m	SPL@1m
Nr of Units (NP1/HP2 = N+1)	1	1	1	Nr of Units (NP1/HP2 = N+1)	1	1	1
Correction for Nr of Units (dB)	0	0	0	Correction for Nr of Units (dB)	0		0
Distance (m)	22	26	28	Distance (m)	35	35	35
Distance Loss (dB)	-27	-28	-29	Distance Loss (dB)	-31	-31	-31
Directionality ?	N/A	N/A	N/A	Directionality ?	N/A	N/A	N/A
Directionality Correction (dB)	0	0	0	Directionality Correction (dB)	0	0	0
Reflections (within 3.5m of façade)?	Yes	Yes	Yes	Reflections (within 3.5m of façade)?	Yes	Yes	Yes
Reflection Correction (dB)	3	3	3	Directionality/Reflection Correction (dB)	3	3	3
Screening?	Partial	Partial	Partial	Screening?	Full	Full	Full
Screening Loss (dB)	-5	-5	-5	Screening Loss (dB)	-10	-10	-10
Specific Noise Level at NSR, L _{Aeq} (dB)	28	17	16	Specific Noise Level at NSR, L _{Aeq} (dB)	19	9	9
Acoustic Feature Correction, re. BS 4142 (dB)	0	0	0	Acoustic Feature Correction, re. BS 4142 (dB)	0	0	0
Noise Rating Level at Receptor, L _{A,rTr} (dB)	28	17	16	Noise Rating Level at Receptor, L _{A,rTr} (dB)	19	9	9
Cumul. Rating Level at Receptor, L _{A,rTr} (dB)	29			Cumul. Rating Level at Receptor, L _{A,rTr} (dB)	20		
Plant Noise Limit [Night], L _{A,rTr} (dB)	30			Plant Noise Limit [Night], L _{A,rTr} (dB)	30		
Compliance/Exceedance?	✓			Compliance/Exceedance?	✓		

The results demonstrate that, in each case, the total noise output complies with the daytime/night-time plant noise limit.

5.0 Internal Plant Noise Assessment

5.1 Substation

Please see our Technical Note 22163-TN-1-R0.

The results indicate compliance with all relevant acoustic requirements.

5.2 Medical Centre HRUs

The medical centre contains 14nr internal (soffit mounted) heat recovering units (HRUs). The units are all of an equivalent specification: Mitsubishi LGH-65/80/100RVX3-E. These units are rated with sound pressure level of 30-35 dB when measured in an anechoic room 1.5 m below the unit with open inlet and outlets.

Based on typical spectral data for HRUs, the following table presents our estimated in-duct sound power levels which, when added and calculated to a sound pressure level at 1.5m below the unit, would equate to 35 dB (the highest noise output). This assumes equal contributions from inlet and outlet grilles, and nominal contributions from the casing (worst-case). We shall assume all HRUs operate with these noise levels.

Unit	Index	Sound Level (dB) at OBCF (Hz)							(dB) L _A
		63	125	250	500	1k	2k	4k	
Heat Recovery Units	Inlet (in-duct) SWL	62	59	56	54	52	49	42	-
	Outlet (in-duct) SWL	62	59	56	54	52	49	42	-

With duct corrections and end corrections applied (but no atmospheric side attenuation), the resultant noise level at 1 m from each single unit inlet/outlet grille would be **44 dB at 1m**.

These grilles are present in all four main building elevations. The worst-case scenario is the south and east facing elevations, to which the nearest off-site dwellings to the east would be exposed to. The highest concentration of HRU grilles is on the southern elevation, to which 6nr HRUs are served by 5nr grilles (12nr inlet/outlets in total). There are a further 2nr HRUs serving 2nr grilles on the east elevation (4nr in total).

Our calculations shall therefore consider (a) noise breakout from southern elevation grilles to first floor development apartment windows on the south elevation, and (b) noise breakout from south and east elevation grilles to the off-site dwellings to the east, with a mean distance of 45 m and full screening provided by the car park upper deck.

The following table presents our calculation against daytime plant noise limits, owing to the fact that the units would only run when the facility is occupied during the day.

Receptor: Dvlpmt Apt Windows (South Elev)		Receptor: NSR B (houses to east)	
Description	HRU	Description	HRUs
Source Sound Level (dB)	44	Source Sound Level (dB)	44
Index	SPL@1m	Index	SPL@1m
Nr of Inlet/Outlets	12	Nr of Inlet/Outlets	16
Correction for Nr of Units (dB)	11	Correction for Nr of Units (dB)	12
Distance (m)*	10	Distance (m)	45
Distance Loss (dB)	-20	Distance Loss (dB)	-33
Directionality ?	90deg off	Directionality ?	on-axis*
Directionality Correction (dB)	-6	Directionality Correction (dB)	0
Reflections (within 3.5m of façade)?	N/A	Reflections (within 3.5m of façade)?	N/A
Reflection Correction (dB)	0	Reflection Correction (dB)	0
Screening?	None	Screening?	Full
Screening Loss (dB)	0	Screening Loss (dB)	-10
Specific Noise Level at NSR, L_{Aeq} (dB)	29	Specific Noise Level at NSR, L_{Aeq} (dB)	13
Acoustic Feature Correction, re. BS 4142 (dB)	0	Acoustic Feature Correction, re. BS 4142 (dB)	0
Noise Rating Level at Receptor, $L_{Ae,Tr}$ (dB)	29	Noise Rating Level at Receptor, $L_{Ae,Tr}$ (dB)	13
Plant Noise Limit [Day], $L_{Ae,Tr}$ (dB)	37	Plant Noise Limit [Day], $L_{Ae,Tr}$ (dB)	37
Compliance/Exceedance?	✓	Compliance/Exceedance?	✓
*mean distance (from all grilles spread along façade)		*worst-case	

The results demonstrate compliance with the daytime plant noise limit in both cases. There would no cumulative effects (when considered together with noise from external plant in Section 4.0) as the first receptor is a different façade (different apartments) to those closest to the external condensers, and the HRU noise contribution to the houses to the east is less than 10 dB below the limit, meaning this noise source would have no influence on the cumulative level.

5.3 Apartment MVHR Units

Each apartment is provided background ventilation via whole-house mechanical ventilation heat recovery (MVHR) units. These units are specified as the Envirovent energiSava ESAVA 200/260.

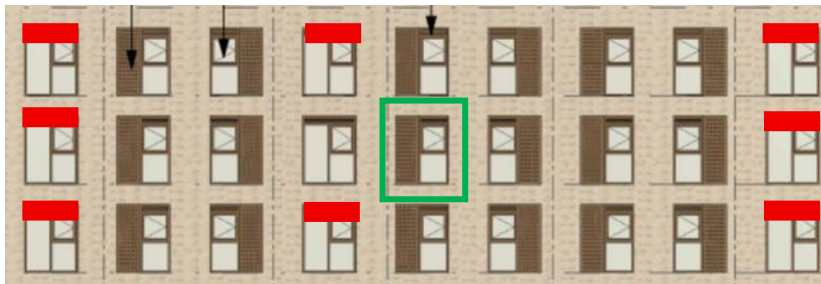
If we consider the worst-case apartment with the larger model unit, 260, running at typical background rates (circa 32 l/s at 26 Pa) the unit exhibits the following in-duct sound power levels, taken from manufacturer's laboratory test data in accordance with BS EN 13141-7. Note, the units will not run at a boost for summer cooling.

Unit	Index	Sound Level (dB) at OBCF (Hz)							(dB) L_A
		63	125	250	500	1k	2k	4k	
MVHR	Inlet (in-duct) SWL	44	48	40	32	41	36	30	-
	Outlet (in-duct) SWL	46	56	55	48	52	46	39	-

Based on the above noise data, the resultant external noise level at 1m from the inlet and outlet grilles in the façade are calculated to be:

- Inlet: 28 dBA at 1m
- Outlet: 39 dBA at 1m

We have calculated the cumulative effect of multiple apartment MVHR units running, calculated to the nearest noise sensitive receptor, which will be neighbouring apartment windows within the development. We shall consider a grid of 9nr apartments (3 x 3) with the receptor being the central apartment bedroom window and cumulative noise generated by the MVHRs to all outer apartment on the 3 x 3 grid (8nr MVHRs in total, grilles over living room windows). Other MVHR units beyond this grid can be discarded as the relative distance would mean their effect on the total noise would be insignificant. See below (green = receptor, red = noise sources).



The following table presents our calculation against night-time plant noise limits.

Receptor: Central apartment bedroom window in 3 x 3 grid						
Description	Apt to L/R		Apt to Above/Below		Apt to diagonal corners	
	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet
Source Sound Level (dB)	28	39	28	39	28	39
Index	SPL_{1m}	SPL_{1m}	SPL_{1m}	SPL_{1m}	SPL_{1m}	SPL_{1m}
Nr of Units	2	2	2	2	4	4
Correction for Nr of Units (dB)	3	3	3	3	6	6
Distance (m)	12	12	5	5	13	13
Distance Loss (dB)	-22	-22	-14	-14	-22	-22
Directionality ?	$90^\circ H$	$90^\circ H$	$90^\circ V, 45^\circ H$	$90^\circ V, 45^\circ H$	$90^\circ V, 45^\circ H$	$90^\circ V, 45^\circ H$
Directionality Correction (dB)	-3	-3	-5	-5	-5	-5
Reflections - Q factor (reference=2)	2	2	2	2	2	2
Directionality/Reflection Correction (dB)	0	0	0	0	0	0
Screening?	None	None	None	None	None	None
Screening Loss (dB)	0	0	0	0	0	0
Specific Noise Level at NSR, L_{Aeq} (dB)	6	17	12	23	7	18
Acoustic Feature Correction, re. BS 4142 (dB)	0	0	0	0	0	0
Noise Rating Level at Receptor, $L_{A_{r,Tr}}$ (dB)	6	17	12	23	7	18
10^A	4	50	16	200	5	63
Cumul. Rating Level at Receptor, $L_{A_{r,Tr}}$ (dB)	25					
Plant Noise Limit (night-time), $L_{A_{r,Tr}}$ (dB)	30					
Compliance/Exceedance?	-5					

The results demonstrate compliance with the night-time plant noise limit.

For Level 1 apartments also exposed to noise from the medical centre HRUs grilles, the cumulative effect during the daytime would still comfortably comply with the daytime plant noise limit.

For apartments also exposed to external plant noise from the condenser units, the cumulative level (25 dBA + 29 dBA) would still achieve the 30 dBA night-time plant noise limit.

6.0 Conclusion

Jameson Acoustics Limited has been commissioned by Bridgestone Construction Limited to provide acoustic design services to assist in the discharge of Part A of Planning Condition 20 pertaining to the consented residential and medical centre development at Didsbury Point in Manchester.

The report confirms the design intent/specifications for internal and external plant and equipment complies with the plant noise emission limits stipulated in the Hann Tucker Report, in accordance with MCC requirements.

In terms of specific noise mitigation measures, this report confirms that:

- Heat pumps CAHV-R450YA shall be programmed to restrict operational duty at night. The reduced % duty should be capable of at least 6 dB noise reduction between 23:00-07:00hr.
- Heat pumps CAHV-R450YA shall operate on a run/standby operation, so that only one unit operates at any given time.
- Heat pump PURY-EP300YNW shall be programmed to run at its night set back mode between 23:00-07:00hr.

Appendix A – Acoustic Terminology

dB	Decibel - Used as a measurement of sound level. Decibels are not an absolute unit of measurement but an expression of ratio between two quantities expressed in logarithmic form.
dB(A)	The human ear is more susceptible to mid-frequency noise than the high and low frequencies. The 'A'-weighting scale approximates this response and allows sound levels to be expressed as an overall single figure value in dBA. The _A subscript is applied to an acoustical parameter to indicate the stated noise level is A-weighted (e.g. $L_{Aeq,T}$ in dB). Noise levels in dBA do not have a linear relationship to each other; for similar noises, a change in noise level of 10dBA represents a doubling or halving of subjective loudness. A change of 3dBA is only just perceptible.
$L_{Aeq,T}$	$L_{Aeq,T}$ is the equivalent continuous sound pressure level. It is an average of the total sound energy measured over a specified time measurement period, T .
$L_{10,T}$	L_{10} is the noise level exceeded for 10% of the measurement period T (i.e. the quietest 10% of the measurement) and has, for many years, been used in the assessment of road traffic noise.
$L_{90,T}$	L_{90} is the noise level exceeded for 90% of the measurement period T (i.e. the quietest 10% of the measurement) and is often used to describe the 'background' noise level.
L_{max}	L_{max} is the maximum sound pressure level recorded over the measurement period, T . L_{max} is often used in assessing scheduled environmental noise 'events' (such as train passbys), particularly at night where such events may cause sleep disturbance.
R_w	The weighted sound reduction index, R_w , is a single figure description of sound reduction as defined in BS EN ISO 717-1. It is single-number quantity which characterizes the airborne sound insulating properties of a material or building element over a range of frequencies. The R_w is calculated from sound insulation measurements taken in an acoustic laboratory. Sound insulation ratings derived from site measurements are invariably lower than the laboratory figures and are referred to as the apparent weighted sound reduction index, R'_w .
$D_{n,e,w}$	The weighted element-normalised level difference, $D_{n,e,w}$, is a single figure description of the sound insulation performance of small building elements, such as a trickle ventilator.
C_{tr}	C_{tr} is correction term applied against the sound insulation single-number values (e.g. R_w) to provide a weighting against low frequency performance. The reference values used within the C_{tr} calculation are based on urban traffic noise.