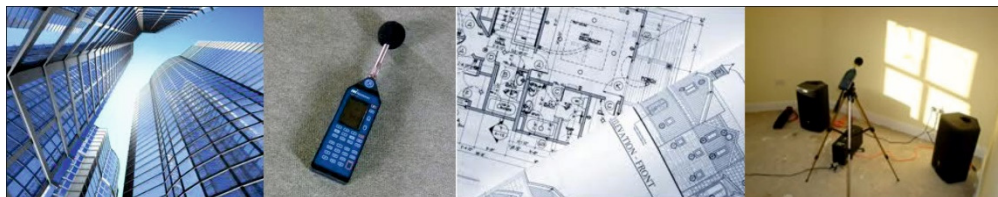


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PRINTWORKS CARDIFF ROAD READING BERKSHIRE

ASSESSMENT OF NOISE IMPACT FROM NEW MECHANICAL PLANT v.1

Client:
BELLWAY HOMES LIMITED
Pacific House
Imperial Way
Reading
Berkshire RG2 0TD

25th July 2021
Ref: M4496

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Project Reference	M4496
Issue No.	1
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Date	25th July 2021

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1. SUMMARY

- 1.1 An acoustic assessment has been conducted by Ian Sharland Limited to determine the potential impact of new mechanical plant associated with the Printworks development on Cardiff Road, Reading.
- 1.2 In order to judge the pre-existing ambient noise climate, a 4-day environmental noise survey has been undertaken at the property. The data from this exercise indicates the following assessed levels of background noise levels:

Period	Day Time, 0700 – 2300	Night Time, 2300 – 0700
Typical Free Field L_{A90}	42 dB(A)	34 dB(A)

Table 1.1 – Measured Background Noise Levels

- 1.3 Condition 14 of the planning consent requires that new noise sources should be designed to a BS4142 Rating Level which is 10 dB below the assessed levels of background noise, assessed at the windows of any noise sensitive facades.
- 1.4 The schedule of plant includes 3 car park circulation fans (day time operation only), and a UPS system in an adjacent, internal plant room.
- 1.5 Noise sensitive receivers have been identified adjacent to the car park entrance, and in the terrace of houses directly to the south. Predictions of noise emissions from the heat pumps are summarised below, alongside the design limits derived from Condition 14 of the Planning Consent:

Receptor	Predicted Façade Rating Level At 1m from Neighbouring Buildings	
	Day Time, 0700 -2300	Night Time 2300 – 0700
<i>Design Target</i>	$\leq 35 L_{Aeq, 1 hr}$	$\leq 27 dB(A) L_{Aeq, 5 mins}$
Plots 3 & 5, by Car Park Entrance	34 $L_{Aeq, 1 hr}$	10 dB(A) $L_{Aeq, 5 mins}$
Plots 44 & 45	33 $L_{Aeq, 1 hr}$	5 dB(A) $L_{Aeq, 5 mins}$

Table 1.2 – Predicted Noise Levels

- 1.6 It is concluded that the proposed installation will be compliant with the requirements of the Planning Condition.

2. INTRODUCTION

- 2.1 Ian Sharland Limited has been instructed to prepare a formal noise impact assessment relating to the installation of new mechanical plant at the Printworks development, on Cardiff Road, Reading (see Figure 1).
- 2.2 The site, formerly industrial buildings, is located to the west of Reading town centre, close to the mainline railway.
- 2.3 The buildings have been cleared, and consent has been granted for the construction of some 48 houses and 2 blocks of apartments, including a shared apartment (see Figure 2).
- 2.4 Condition 14 of the planning consent states:

No mechanical plant shall be installed until a noise assessment of the proposed mechanical plant has been submitted to and approved in writing by the Local Planning Authority. The assessment shall be carried out in accordance with BS4141:2014 methodology. The predicted specific sound level ($L_{Aeq,TR}$) as measured at a point 1 metre external to sensitive facades shall be at least 10dB below the existing background sound level, $LA_{90,T}$ when all plant/equipment (or any part of it) is in operation. The predicted rating level, $L_{Ar,Tr}$ (specific sound level plus any adjustment for the characteristic features of the sound) as measured at a point 1 metre external to sensitive facades shall not exceed the existing background sound level, $LA_{90,T}$ when all plant/equipment (or any part of it) is in operation. The plant shall thereafter only be installed in accordance with the assessment.

- 2.5 The objective of the current exercise may therefore be summarised as follows:
- (i) To determine the existing ambient noise climate in the locality.
 - (ii) With reference to the planning condition above, and other relevant guidance, to confirm a design target for new noise emissions.
 - (iii) To calculate the level of noise arising from the new mechanical equipment, and to compare against the design targets.
 - (iv) As necessary, to specify any noise or vibration control measures necessary.
- 2.6 This report summarises the work carried in support of these objectives, and the conclusions which have been drawn.

3. GUIDELINE ACOUSTIC VALUES

3.1 Introduction

- 3.1.1 There are number of relevant acoustic guideline values which can be used to assess the acceptability of noise within a particular environment.
- 3.1.2 The remaining paragraphs within this section of the report will briefly summarise the most commonly referenced documents, and the noise targets and other guidance which are quoted therein

3.2 BS8233:2014 – 'Guidance on Sound Insulation and Noise Reduction for Buildings'

- 3.2.1 There is much guidance on the levels of intrusive noise which would be considered acceptable within residential accommodation such as this. Typical advice is found in British Standard 8233:2014 "Guidance on Sound Insulation and Noise Reduction for buildings". Following similar guidance in the 1999 World Health Organisation report "Guidelines for Community Noise", the Standard sets out the following limits for indoor ambient noise levels within living rooms and bedrooms. This suggests:

BS 8233 Guideline Values

Activity	Location	0700 - 2300	2300 - 0700
Resting	Living Room	35 dB(A) LAeq, 16 hr	-
Dining	Dining room/Area	40 dB(A) LAeq, 16 hr	-
Sleeping	Bedroom	35 dB(A) LAeq, 16 hr	30 dB(A) LAeq, 8 hr

Table 3.1 – BS8233 Internal Guidelines

- 3.2.2 It is usually considered that an open window will provide a reduction of some 10-15 dB(A)¹. Therefore the 'good' internal standards quoted above would equate to the following targets immediately outside:

Activity	Location	0700 - 2300	2300 - 0700
Resting	Living Room	48 dB(A) LAeq, 16 hr	-
Dining	Dining room/Area	53 dB(A) LAeq, 16 hr	-
Sleeping	Bedroom	48 dB(A) LAeq, 16 hr	43 dB(A) LAeq, 8 hr

Table 3.2 – BS8233 External Guidelines

¹ Reference PPG24 Planning & Noise, which adopted a mid-range value of 13 dB(A)

- 3.2.3 BS8233 recognises that, where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB, and reasonable conditions will be achieved.
- 3.2.4 It should be noted that the levels quoted in BS8233 are intended to reflect the acceptability of steady, continuous noise. Sources of intermittent and tonal noise may generate greater annoyance for a similar overall magnitude. Whilst BS8233 does not explicitly state a correction for those circumstances, it may be appropriate to consider that the Good and Reasonable standards would be achieved with levels which are some 5 dB lower than stated in the table above.
- 3.2.5 An alternative approach is to consider the noise levels over a shorter period, representing the duration of the greatest activity rather than standard 16-hour day or 8-hour night time periods.
- 3.2.6 It is also noted that BS8233 was written from a view of designing new buildings to protect occupants from existing noise sources. This does infer that the acceptability of an occupant to an absolute level noise within a building may be different if the introduction of the noise source post-dates the construction of the building. Other factors may be relevant in certain circumstances, and they are covered in large part by BS4142, discussed below.

3.3 World Health Organisation Guidelines

- 3.3.1 Further advice is provided in the 1999 WHO report "Guidelines for Community Noise".
- 3.3.2 This indicates that the steady noise level in external amenity areas, such as gardens or outdoor living areas should not exceed 55 dB(A) $L_{Aeq, t}$, and should preferably be designed below 50 dB(A) $L_{Aeq, t}$.
- 3.3.3 The document also provides guidance on the impact of peak noise levels on sleeping conditions. This suggests that levels above 45 dB(A) L_{Amax} inside a bedroom would be disturbing to sleep. With windows open, this would equate to a level of approximately 58 dB(A) L_{Amax} externally.

3.4 BS4142:2014 - 'Method for Rating and Assessing Industrial and Commercial Sound'

- 3.4.1 Any formal assessment of commercial noise affecting residential properties would in all likelihood be based upon the recommendations of British Standard 4142:2014 "Methods for rating and assessing industrial and commercial sound".
- 3.4.2 In brief, this rating method determines "specific sound level" generated by the new plant, assessed immediately outside the residential properties most likely to be affected. For daytime (07.00 – 23.00hrs) only operation of the new plant, this would be the equivalent continuous

noise level of the new noise, evaluated over a 1hr sampling period, its $L_{Aeq,1hr}$. For plant operating during the night-time (23.00 – 07.00hrs) only the reference time interval is 15mins.

- 3.4.3 Corrections of up to + 9 dB (A) are then made to this “specific sound level” if the new noise has certain acoustic features such as tonality, impulsivity, intermittency and any other sound characteristics, to give the "rating level".
- 3.4.4 An assessment of the impact of the specific sound level can be determined by subtracting the measured background level from the rating level, and consider the following;
- a) Typically, the greater this difference, the greater the magnitude of the impact.
 - b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
 - c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.
 - d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant 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, depending on the context.

NOTE: Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact.

4. ASSESSMENT OF EXISTING CONDITIONS

- 4.1 In order to clarify the current acoustic conditions around the plant location, a 96-hour environmental noise survey was undertaken.
- 4.2 Rion NL52 Sound Level Meters were set up on the north and south boundaries of the site (see Figure 1).
- 4.3 The microphones were set on lighting stands, approximately 3m above ground (and clear of any site hoarding).
- 4.4 The equipment was configured to measure 5-minute samples of the following acoustic parameters:

L_{Aeq} The A-weighted equivalent continuous sound pressure level which, over the sample period, contains the same acoustic energy as the time-varying signal being recorded.

$L_{Amax,f}$ The A-weighted maximum sound pressure level recorded during each sample period (as measured on fast response).

L_{A90} A statistical parameter representing the A-Weighted noise level exceeded for 90% of each sample period. This is commonly used to describe background noise levels.

- 4.5 The equipment was calibrated before and after the survey and indicated no shift.
- 4.6 The survey ran from Friday 25th September 2020 to Tuesday 29th September 2020.
- 4.7 Weather conditions during the survey were variable, as detailed below:

Date	Average Temperature (°C)	Events	Wind Speed (m/s)	
			Average	Direction
Friday 25/9/20	10	Rain am	8.8	NW
Saturday 26/9/20	10	None	6.6	NE
Sunday 27/9/20	12	None	6.6	N
Monday 28/9/20	12	None	2.6	NW
Tuesday 29/9/20	16	None	2.2	Var

Table 4.1 – Weather Conditions During Survey

- 4.8 The full results of the survey are shown graphically in Figures 3 & 4. This demonstrates a typical diurnal variation in noise levels during the day time and night time in this urban location.
- 4.9 Of particular interest here is the typical level of background noise during day time and night periods.

4.10 It is noted that winds speeds were consistently above 5m/s from the start of the survey through to the Sunday afternoon. Analysis of background noise is therefore limited to the last 48 hours of the survey.

4.11 An analysis of this data yields the following information:

Measure of L _{A90}	North Boundary		South Boundary	
	Day Time 0700 - 2300	Night Time 2300 – 0700	Day Time 0700 - 2300	Night Time 2300 – 0700
Mean Value	48 dB(A)	36 dB(A)	48 dB(A)	35 dB(A)
Median	41 dB(A)	34 dB(A)	43 dB(A)	33 dB(A)
Modal	44 dB(A)	36 dB(A)	46 dB(A)	34 dB(A)
90 th Percentile ²	41 dB(A)	32 dB(A)	40 dB(A)	32 dB(A)

Table 4.2 – Typical Background Noise Levels

4.12 From this data analysis, it will be taken that the assessed values of background noise are as follows:

Day Time, 0700 – 2300	42 dB(A) L _{A90}
Night Time, 2300 – 0700	34 dB(A) L _{A90}

4.13 It is noted that these levels are free-field measurements. If background noise levels were recorded 1m from a building façade (for example, out of a bedroom or living room window), the equivalent conditions would be expected to result in values some 3 dB higher, due to façade reflections.

4.14 Section 5 of this report will provide a further analysis of these measurements, in the context of the Local Authority planning policy.

² The value of LA90 which is exceeded by 90% of the recordings.

5. DESIGN TARGETS

5.1 Condition 14 of the planning consent states:

The predicted specific sound level ($L_{Aeq,TR}$) as measured at a point 1 metre external to sensitive facades shall be at least 10dB below the existing background sound level, $L_{A90,T}$ when all plant/equipment (or any part of it) is in operation.

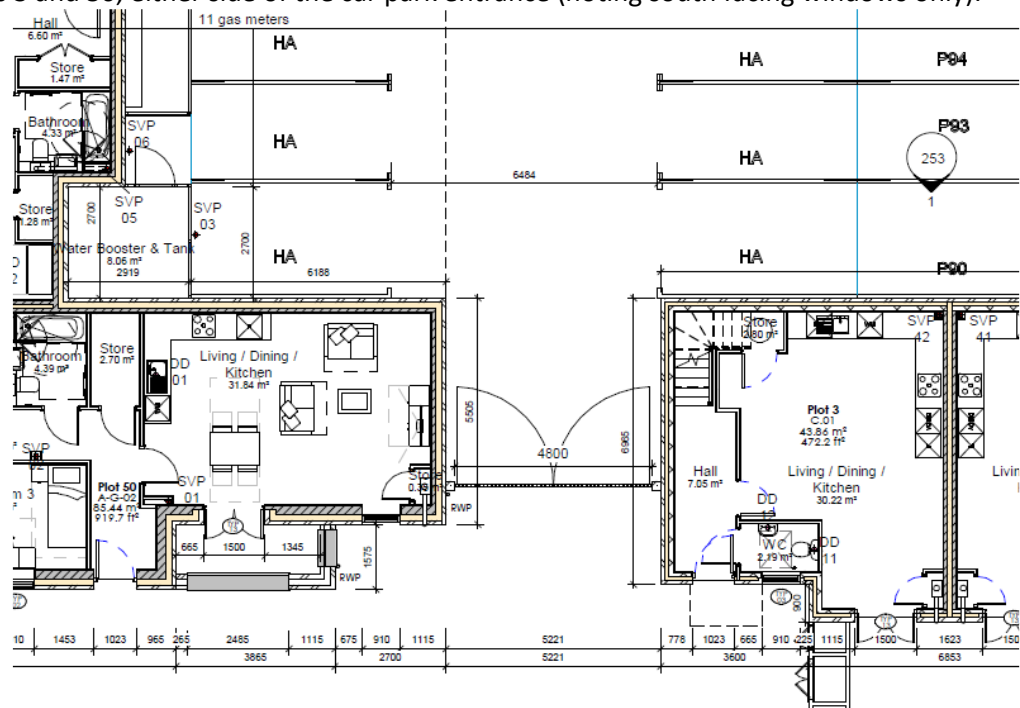
5.2 From this, and the measured free-field façade background noise levels described in Section 5, it is recommended that the following façade noise limits be applied to the project:

	Maximum Acceptable Façade Rating Level, assessed 1m from the façade of noise sensitive neighbours	
	0700 -2300	2300 - 0700
Limiting Level	35 dB(A) $L_{Aeq, 1hr}$	27 dB(A) $L_{Aeq, 5 mins}$

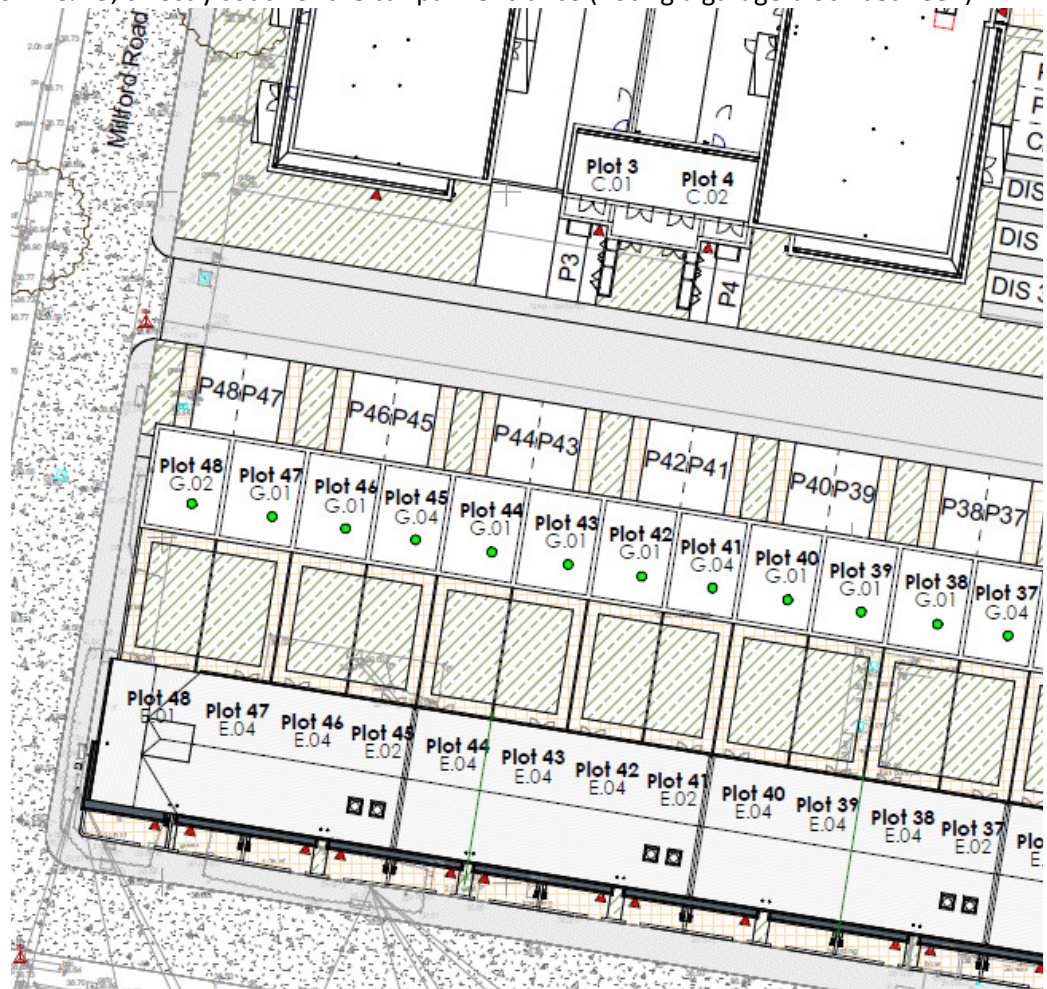
Table 5.1 – Design Targets

5.3 The nearest noise sensitive neighbours are in this case deemed to be:

(i) Plots 3 and 50, either side of the car park entrance (noting south facing windows only):



(ii) Plots 44 & 45, directly south of the car park entrance (noting a garage block between):



6. PREDICTION OF NOISE FROM MECHANICAL PLANT

6.1 The equipment under assessment here comprises:

- 3 No. IDV50 Car park circulation fans, located on soffit of ground floor car park
100% load for CO extraction, 57 dB(A) @3m (est SWL 75 dB(A))³
Fans to operate at 40% of capacity, est SWL 69 dB(A).
- 1 No. UPS system located within an internal basement plant room
40 dB(A) @1m (est SWL 50 dB(A))

6.2 Figure 6 provides a plan of the ground floor, indicating the location of the circulation fans (set to the back of the space, and the UPS system.

6.3 The designers of the car park ventilation system have confirmed:

The system will operate twice per day on an adjustable timeclock (this can be reduced if required). The majority of the time the system will be switched off, only operating when certain CO thresholds are exceeded. Car movements are required to trigger these detectors so the system should be switched off at night (unless the car park is in use).

6.4 Given the residential nature of the car park, it may reasonably be concluded that the ventilation fans will not operate through the night.

6.5 In respect of the UPS system, this is a far less significant noise source and will be located within an internal plant room. There is a louvred air supply to the plant room, off the car park, and it will very pessimistically be assumed that all of the sound power from the UPS may be transmitted into the car park.

6.6 Appendix 1 provides a calculation of noise from the units, at the first-floor window of these properties, and the table below summarises the results:

Receptor	Predicted Noise Level	
	Day Time, 0700 -2300	Night Time 2300 – 0700 ⁴
Plots 3 & 5, by Car Park Entrance	32 L _{Aeq} , 1 hr	10 dB(A) L _{Aeq} , 5 mins
Plots 44 & 45	31 L _{Aeq} , 1 hr	5 dB(A) L _{Aeq} , 5 mins

Table 7.1 – Predicted Noise Levels

6.7 Noise from the induction fans have a modest tonal concentration in the 250 Hz octave band (3 dB higher than the levels in the adjacent bands, and this may give rise to a slightly perceptible

³ The fans can run at a higher duty for smoke extraction, in the event of a fire. This would be considered an exceptional operation, and outside the scope of the Planning Condition.

⁴ The calculation pessimistically assumes all units might operate at night. Those serving offices are likely to be idle out of office working hours.

tone in the noise signal at the adjacent properties. Using the guidance of BS4142:2014, a 2 dB increment should be applied to the predicted noise levels, to give the Rating Noise Level:

Receptor	Predicted Rating Level	
	Day Time, 0700 -2300	Night Time 2300 – 0700 ⁵
Plots 3 & 5, by Car Park Entrance	34 L _{Aeq} , 1 hr	10 dB(A) L _{Aeq} , 5 mins
Plots 44 & 45	33 L _{Aeq} , 1 hr	5 dB(A) L _{Aeq} , 5 mins

Table 7.2 – Predicted Rating Levels

- 6.8 With reference to the noise targets confirmed in Para 5.2, it is concluded that the plant, and its proposed operation, will comply with the requirements of the Planning Condition.

⁵ The calculation pessimistically assumes all units might operate at night. Those serving offices are likely to be idle out of office working hours.

FIGURE 1 – SITE LOCATION



FIGURE 2 – PROPOSED SITE PLAN

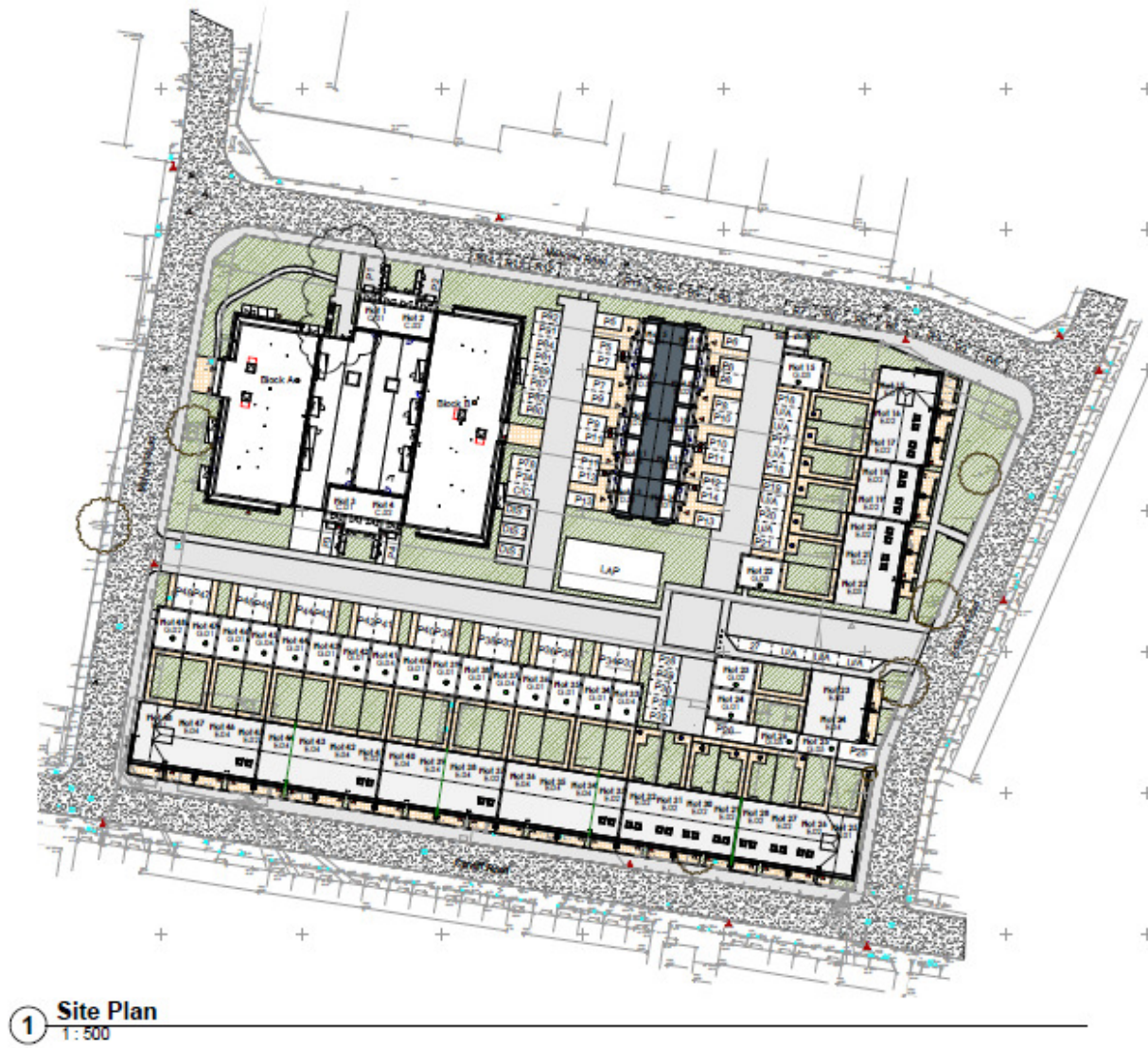


FIGURE 3 – MEASURED LEVELS, NORTH BOUNDARY

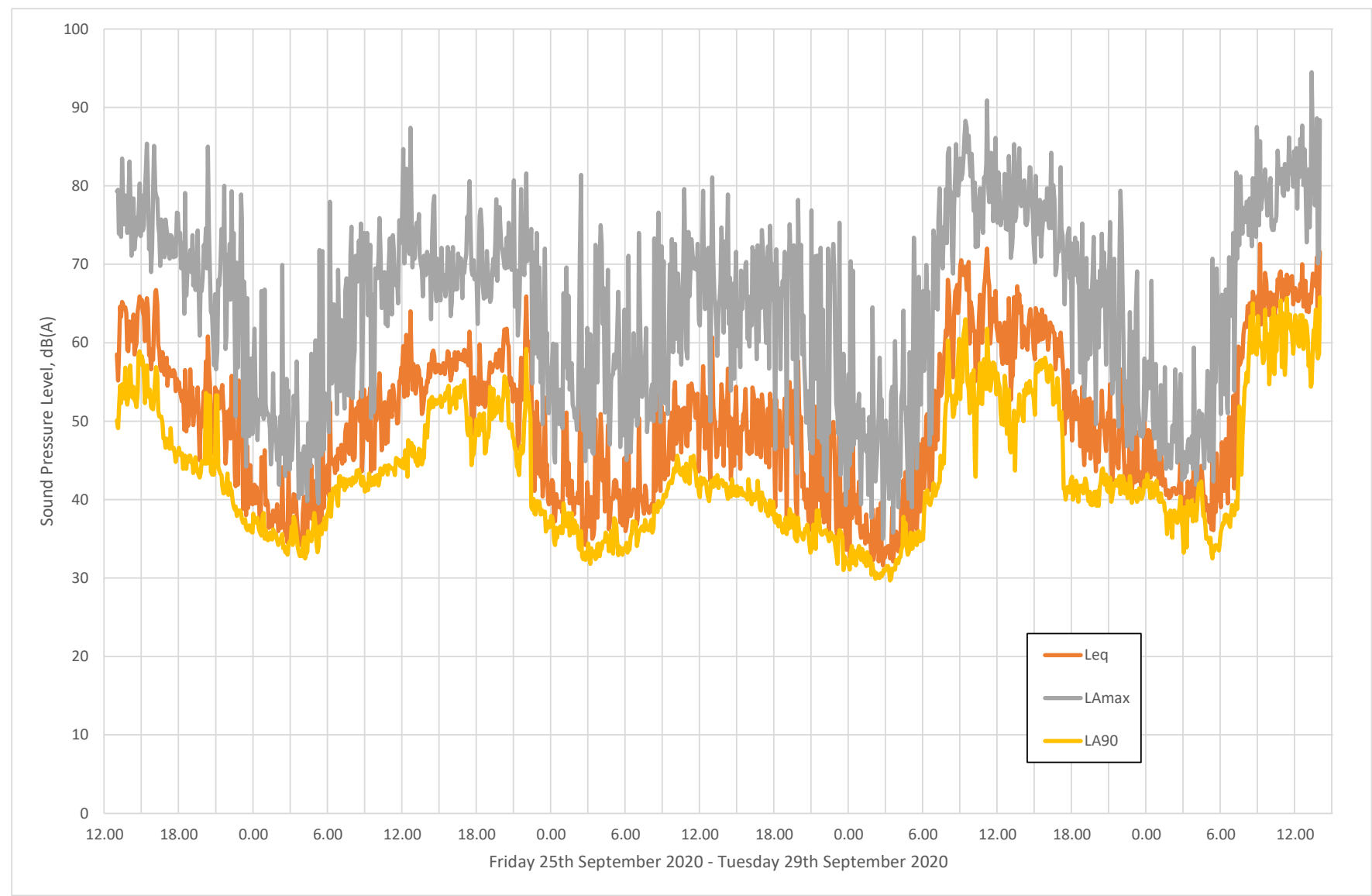


FIGURE 4 – MEASURED LEVELS, SOUTH BOUNDARY

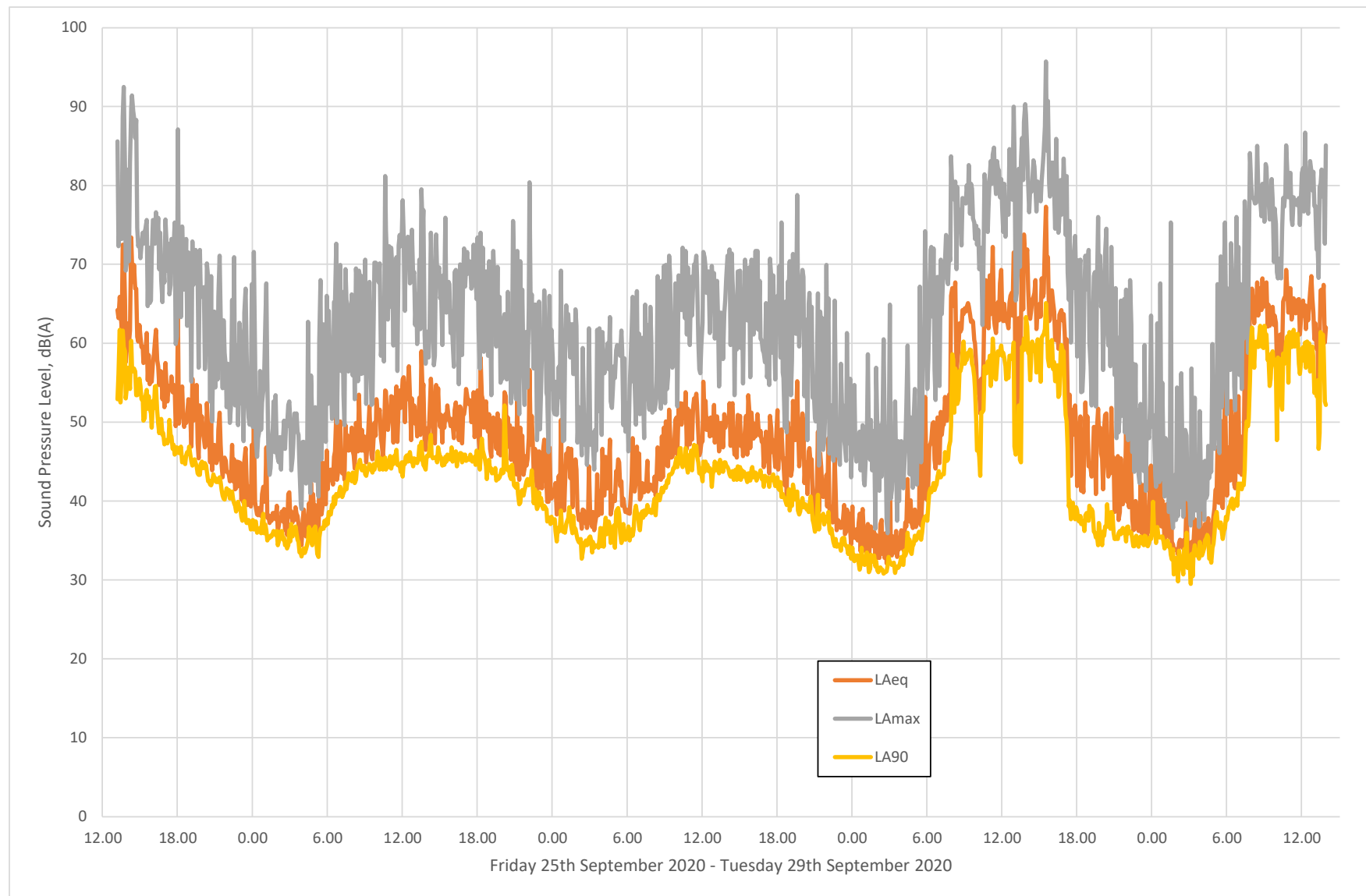
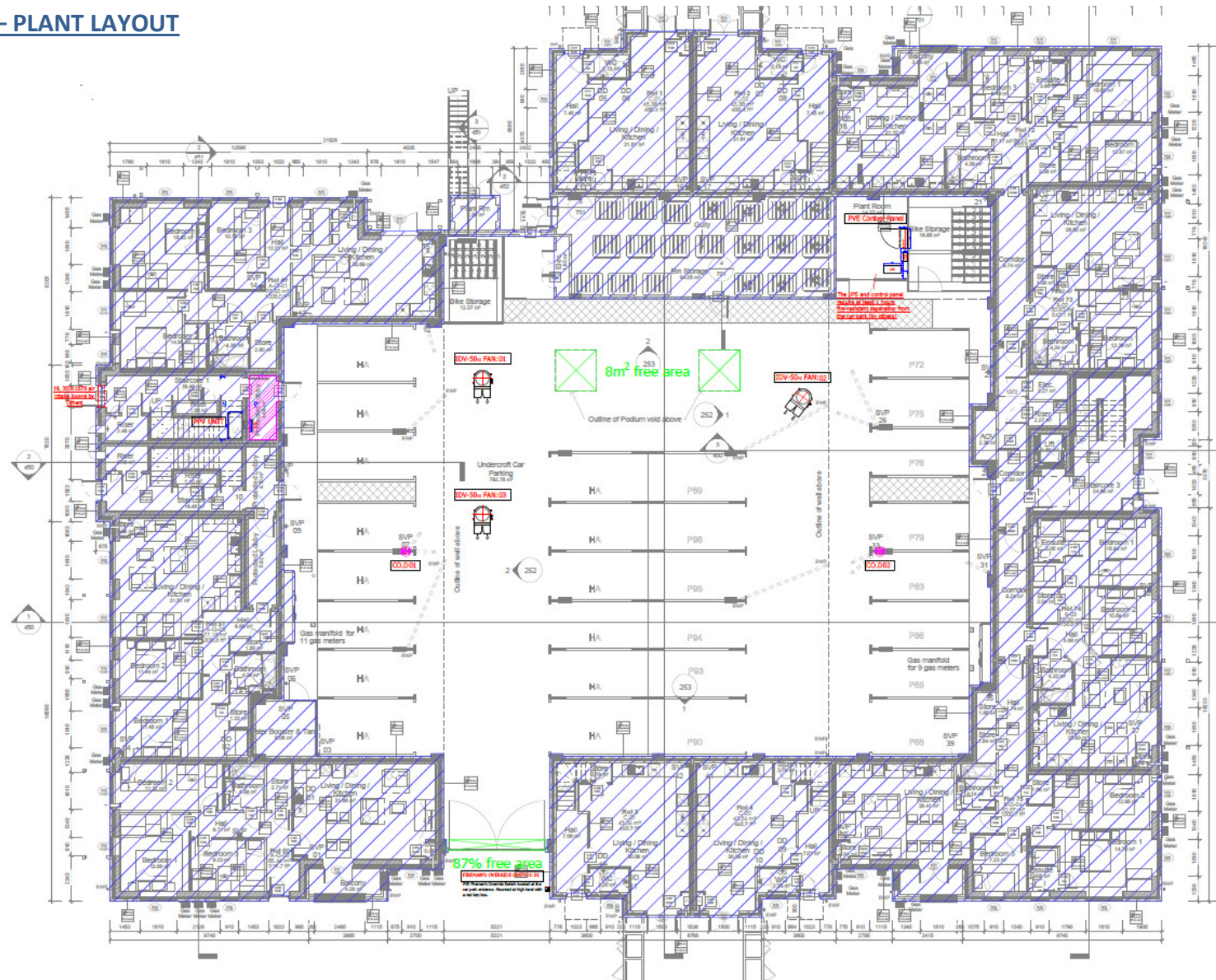


FIGURE 5 – PLANT LAYOUT



APPENDIX 1 – CALCULATIONS OF NOISE RADIATION

Frequency	Hz	63	125	250	500	1000	2000	4000	8000	dB(A)
Day Time Operation										
Induction Fans										
SPL@3m	dB	59	55	58	55	53	46	41	34	57
SWL	dB	77	73	76	73	71	64	59	52	75
No. of Fans (3)	dB	5	5	5	5	5	5	5	5	
Reduction of 40% operating speed	dB	-4	-4	-4	-4	-4	-4	-4	-4	
Total SWL From Induction Fans	dB	78	74	77	74	72	65	60	53	76
UPS										
SPL@1m	dB	59	48	40	35	31	28	25	23	40
SWL	dB	69	58	50	45	41	38	35	33	50
Total SWL into car park	dB	78	74	77	74	72	65	60	53	76
Dimensions of Car Park	W	L	H							
	18.5	21	2.6							
Surface Area	982.4									
Typ Abs Coefficient	0.1									
Absorption	98.24									
Room Constant	109.1556									
Reverberant Correction		-14	-14	-14	-14	-14	-14	-14	-14	
Rev SPL in Car Park		64	59	62	59	57	50	45	38	61
Transmission to Houses Immediately adjacent to Entrance										
SRI Open Car Park Entrance	dB	0	0	0	0	0	0	0	0	
Door Opening, 4.5 x 2.5	dB	11	11	11	11	11	11	11	11	
Inside-to-outside Correction	dB	-6	-6	-6	-6	-6	-6	-6	-6	
Directivity	dB	-8	-8	-8	-8	-8	-8	-8	-8	
Distance correction to 5m	dB	-14	-14	-14	-14	-14	-14	-14	-14	
Screening Loss to South Facing Windows	dB	-7	-9	-11	-14	-16	-19	-22	-25	
Façade Correction	dB	3	3	3	3	3	3	3	3	
Net SPL @ Façade	dB	41	35	36	31	26	16	8	-2	32
Transmission to Houses Immediately Opposite										
SRI Open Car Park Entrance	dB	0	0	0	0	0	0	0	0	
Door Opening, 4.5 x 2.5	dB	11	11	11	11	11	11	11	11	
Inside-to-outside Correction	dB	-6	-6	-6	-6	-6	-6	-6	-6	
Directivity	dB	-8	-8	-8	-8	-8	-8	-8	-8	
Distance correction to 30m	dB	-30	-30	-30	-30	-30	-30	-30	-30	
Façade Correction	dB	3	3	3	3	3	3	3	3	
Net SPL @ Façade	dB	33	29	32	29	27	20	15	8	31

Frequency	Hz	63	125	250	500	1000	2000	4000	8000	dB(A)
Night Time Operation										
UPS										
SPL@1m	dB	59	48	40	35	31	28	25	23	40
SWL	dB	69	58	50	45	41	38	35	33	50
Total SWL into car park	dB	69	58	50	45	41	38	35	33	50
Dimensions of Car Park	W	L	H							
	18.5	21	2.6							
Surface Area	982.4									
Typ Abs Coefficient	0.1									
Absorption	98.24									
Room Constant	109.1556									
Reverberant Correction		-14	-14	-14	-14	-14	-14	-14	-14	
Rev SPL in Car Park		55	44	36	31	27	24	21	19	35
Transmission to Houses Immediately adjacent to Entrance										
SRI Open Car Park Entrance	dB	0	0	0	0	0	0	0	0	
Door Opening, 4.5 x 2.5	dB	11	11	11	11	11	11	11	11	
Inside-to-outside Correction	dB	-6	-6	-6	-6	-6	-6	-6	-6	
Directivity	dB	-8	-8	-8	-8	-8	-8	-8	-8	
Distance correction to 5m	dB	-14	-14	-14	-14	-14	-14	-14	-14	
Screening Loss to South Facing Windows	dB	-7	-9	-11	-14	-16	-19	-22	-25	
Façade Correction	dB	3	3	3	3	3	3	3	3	
Net SPL @ Façade	dB	32	20	10	2	-5	-10	-16	-21	10
Transmission to Houses Immediately Opposite										
SRI Open Car Park Entrance	dB	0	0	0	0	0	0	0	0	
Door Opening, 4.5 x 2.5	dB	11	11	11	11	11	11	11	11	
Inside-to-outside Correction	dB	-6	-6	-6	-6	-6	-6	-6	-6	
Directivity	dB	-8	-8	-8	-8	-8	-8	-8	-8	
Distance correction to 30m	dB	-30	-30	-30	-30	-30	-30	-30	-30	
Façade Correction	dB	3	3	3	3	3	3	3	3	
Net SPL @ Façade	dB	24	13	5	0	-4	-7	-10	-12	5