

Burger King, Unit E, Reading Gateway

Planning Condition 62 - Acoustic Report

On behalf of **Kier Property Ltd.**

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	Name	Position	Signature	Date
Prepared by:	Matt Barlow	Senior Associate	MB	September 2018
Reviewed by:	Mubassir Malik	Principal Engineer	MM	September 2018
Approved by:	Jonathan Riggall	Environmental Director	JR	September 2018
For and on behalf of Peter Brett Associates LLP				

Revision	Date	Description	Prepared	Reviewed	Approved
1	31/10/18	Revised following EHO Comments	MB	MM	JR

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1 Introduction

1.1 Background

- 1.1.1 Peter Brett Associates LLP (PBA) has been commissioned by Kier Property Ltd to undertake a noise impact assessment to support the discharge of Planning Condition 62 pertaining to noise emission from proposed items of building services plant at Unit E, Reading Gateway.
- 1.1.2 The site lies within the Reading Borough Council administrative area. The planning application for the wider Reading Gateway site was granted permission subject to a number of planning conditions (Planning Reference No. 151944).
- 1.1.3 This report considers the noise levels at the nearest noise sensitive receptors as a result of the operation of the proposed building services plant associated with the Burger King, and comments on acceptability with respect to discharging Planning Condition 62.
- 1.1.4 Planning conditions 62 states:

62 – Air conditioning or refrigeration plant shall not be installed on any unit within the Detailed Element until an acoustic assessment for the plant for that unit has been submitted to and approved in writing by the local planning authority. The assessment shall demonstrate that the plant noise rating level will not cause an increase in the existing background noise level when measured / predicted in accordance with BS 4142: 1997 methodology. The noise levels shall be determined at the nearest noise-sensitive premises. The plant shall be installed and maintained thereafter in accordance with the approved assessment.

- 1.1.5 The assessment is based on the results of an environmental sound survey previously undertaken by PBA at the site.

1.2 Objectives

- 1.2.1 To undertake a plant noise impact assessment in accordance with BS4142:1997 based on the information provided and to comment on acceptability, in relation to discharging Planning Condition 62.

1.3 Acoustic Terminology

- 1.3.1 This report is technical in nature. A glossary of acoustic terminology used within this report is contained within **Appendix A**.

2 Assessment Standards

2.1 BS4142:1997 – Rating Industrial Noise Affecting Mixed Residential & Industrial Areas

- 2.1.1 The planning condition requires that an assessment should be undertaken in accordance with BS4142:1997. The following is a brief summary of the standard.
- 2.1.2 The standard determines the likelihood of complaints as indicated by the difference between the noise from the new development and the existing background noise. The noise from the new development is expressed in terms of a rating level, calculated from the specific noise source plus any 'acoustic feature corrections', and is specified as an $L_{Ar,Tr}$ noise level.
- 2.1.3 The 'acoustic feature correction' (+5dB) is applied in instances where the source emits noise of a tonal, impulsive or intermittent nature.
- 2.1.4 The assessment time interval (T), is 1-hour for operations during daytime hours (07:00-23:00 hours) and 5-minutes for operations during night-time hours (23:00-07:00 hours).
- 2.1.5 The existing background noise level is expressed in terms of an $L_{A90,T}$ noise level. The standard states that the greater the difference the greater the likelihood of complaints.
- A difference of around +10dB or more indicates that complaints are likely.
 - A difference of +5dB is of marginal significance.
 - If the rating level is more than 10dB below the measured L_{90} then this is a positive indication that complaints are unlikely.
- 2.1.6 It is recognised that BS4142:1997 has been superseded by more recent guidance BS4142:2014; however, it is not considered that this represents a material difference to the assessment methodology or results detailed herein.

3 Project Proposals

3.1 Site Description

- 3.1.1 The proposed retail unit is located within the Reading Gateway site.
- 3.1.2 A figure illustrating the layout of the site and the location of the proposed building services plant is shown in **Figure 1**.
- 3.1.3 The nearest noise sensitive receptor is highlighted on **Figure 1**. Receptor A (Hotel) lies approximately 62 m to the south-west of the plant area.

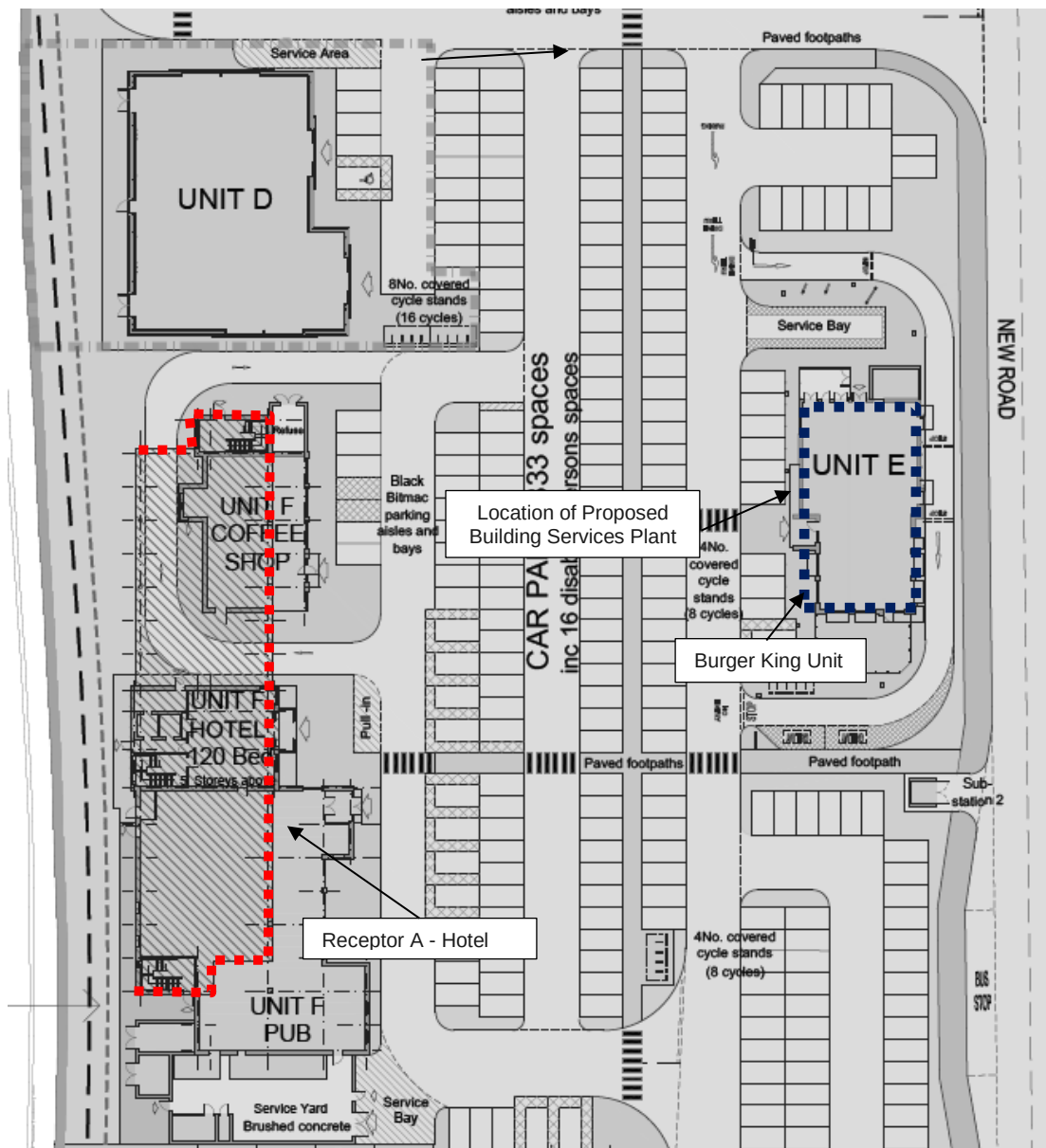


Figure 1: Site Location (courtesy of Saunders Architects)

3.2 Plant Proposals

3.2.1 External building services plant is proposed on the roof of the building. The proposed plant is to comprise:

- Dining Area Supply Fan – 1x Elta Multiflow SMB450-4-3AC
- Dining Area Heat Pump – 2x Fujitsu AUYG-AOYG36
- Freezer Condenser – 1x JE Hall International JEHS-0300-B2-L3
- Fridge Condenser – 1x JE Hall International JEHR-0140-B2-M3
- Kitchen Area Heat Pump – 2x Fujitsu ARYC-AOYA72
- Kitchen Extract Fan – 1x RHF BW10 C6695018
- Toilet Extract Fan – 1x Vent Axia QPTW315C
- Toilet Lobby Transfer Fan – 1x Vent Axia SDX315C

3.2.2 **Table 3.1** details the manufacturer operational sound levels associated with the proposed plant.

Table 3.1: Source Sound Levels for Proposed Plant

Plant Item	Model	Data Type	Source Levels (dB) at Octave Band Centre Frequency (Hz)								dBA
			63	125	250	500	1k	2k	4k	8k	
Dining Area Supply Fan	Multiflow SMB450-4-3AC	In-duct Lw	81	78	76	73	70	67	62	56	-
		Breakout Lp at 3 m	60	55	52	45	37	30	25	19	47
Dining Area Heat Pump	AUYG-AOYG36	Lp at 1m	56	56	51	49	45	42	37	39	51
Freezer Condenser	JEHS-0300-B2-L3	Lp at 1m	55	50	54	52	46	42	35	35	52
Fridge Condenser	JEHR-0140-B2-M3	Lp at 1m	55	53	57	54	46	42	31	29	54
Kitchen Area Heat Pump	ARYC-AOYA72	Lp at 1m	62	62	57	55	51	48	43	45	57
Kitchen Extract Fan	BW10 C6695018	In-duct Lw	92	83	88	77	72	68	65	56	-
		Breakout Lp at 3 m	74	59	58	41	35	35	35	35	53
Toilet Extract Fan	QPTW315C	In-duct Lw	51	60	66	69	67	66	65	53	
		Breakout Lp at 3 m	13	18	25	28	27	25	23	12	32
Toilet Lobby Transfer Fan	SDX315C	In-duct Lw	67	75	77	71	69	62	56	49	-
		Breakout Lp at 3 m	34	50	43	33	27	21	15	14	38

3.2.3 Third octave band data is not available for the proposed plant however based on a review of the octave band data it is not considered that the plant items are likely to exhibit tonal characteristics.

3.2.4 Condenser units are inverter driven, ramping slowly up to the required duty as and when required. It is therefore considered that the condenser units are unlikely to exhibit impulsive features, or is sufficiently intermittent to warrant acoustic feature corrections. Similarly, air moving plant is unlikely to exhibit impulsive features and is likely to be operational

continuously throughout the assessment period. Acoustic feature corrections are therefore not considered to be required.

- 3.2.5 The sound levels quoted in **Table 3.1** are maximum sound levels. If equipment is reselected at a later stage, provided the sound levels are less than or equal to those detailed there is unlikely to be a requirement to modify any mitigation measures detailed in the following sections.
- 3.2.6 With the exception of the Fridge and Freezer condenser units (JEHS-0300-B2-L3 & JEHR-0140-B2-M3) which are to operate 24 hours a day it is understood that the plant is to operate during daytime (07:00 – 23:00) hours only.

4 Environmental Sound Survey

4.1 Methodology

- 4.1.1 An environmental sound survey was undertaken during a 24-hour period between 2 and 3 April 2014 to establish the sound climate at the site. Measurements were undertaken to inform a planning application for the Worton Grange/Reading Gateway site.
- 4.1.2 Measurements were undertaken at three positions and described in **Table 4.1** and illustrated on **Figure 2**. The measurement positions are considered to be representative of the nearest noise sensitive receptors. The indicative site boundary noted on the plan is the representative of the wider Reading Gateway site.



Figure 2: Measurement Positions (Contains Ordnance Survey data © Crown copyright and database right 2018)

Table 4.1: Measurement Positions

Position	Description	Dominant Source
1	The microphone was located at an approximate height of 1.5 m above ground level in a free field position, approximately 4.8 m from the eastern site boundary.	Vehicular movements on the A33, Basingstoke Road and Imperial Way
2	The microphone was located at an approximate height of 1.5 m above ground level in a free field position, approximately 14 m to the north of the A33 carriageway. The measurements were taken during a 3 hour period on 1 April 2014.	Vehicular movements on the A33, Basingstoke Road and Imperial Way
3	The microphone was located at an approximate height of 1.4 m in a free field position, approximately 6 m to the south of Imperial Way. Measurements were taken during a 3 hour period on 1 April 2014.	Vehicular movements on the A33, Basingstoke Road and Imperial Way

- 4.1.3 During the survey, the weather conditions were fine with no precipitation. Wind speeds were observed to be less than 5 m/s. These conditions are therefore considered suitable for obtaining representative sound levels around the site.
- 4.1.4 The A-weighted $L_{eq,T}$, $L_{10,T}$, $L_{90,T}$ and L_{FMax} were measured over full 10 minute periods.
- 4.1.5 The instrumentation used in the survey is listed in **Table 4.2**. Field calibrations were performed before and after the measurements with no significant fluctuation recorded (<0.5dB). Calibration certificates are available upon request.

Table 4.2: Instrumentation

Description	Manufacturer	Type	Serial Number	Laboratory Calibration Date
Sound Level Meter	Bruel & Kjaer	2250	2626232	30/08/2013
Pre-amplifier		ZC0032	19625	
½" Pre-polarised microphone		4189	2621211	
Sound Level Meter	Bruel & Kjaer	2250	2626233	15/01/2014
Pre-amplifier		ZC0032	11992	
½" Pre-Polarised microphone		4189	2621212	
Calibrator	Bruel & Kjaer	4231	2619375	21/01/2015

4.2 Environmental Sound Climate

- 4.2.1 At the time of the survey, it was noted that on-site sound levels are dominated by vehicular movements on the A3, Basingstoke Road and Imperial Way. Traffic noise from the M4 motorway was also audible at all measurement positions. Noise from the M4 motorway was more prominent during the night-time period.

4.3 Assumptions/Limitations

- 4.3.1 The site engineer noticed nothing unusual in terms of the noise climate at the time of the survey. This report refers, within the limitations stated, to the environment of the site in the context of the surrounding area at the time of the inspections. Environmental conditions can vary and no warranty is given as to the possibility of changes in the environment of the site and surrounding area at differing times.

4.4 Environmental Sound Survey Results

- 4.4.1 A summary of the sound survey results is presented in **Table 4.3**. Time history graphs detailing the full results of the 24 hour, unmanned noise survey are presented in **Appendix B**.

Table 4.3: Summary of Environmental Sound Survey Results

Position	Period	$L_{Aeq,T}$ dB	Typical L_{AFmax} dB	Typical $L_{A90,10mins}$ dB
1	Daytime (07:00 – 23:00 hours)	67	83	51
	Night-time (23:00 – 07:00 hours)	62	81	43
2	Daytime (07:00 – 23:00 hours)	62	73	56
3	Daytime (07:00 – 23:00 hours)	70	81	52

- 4.4.2 The above sound levels measured at position 1 are considered representative of sound levels at the noise sensitive receptor detailed in Section 3.1.

5 Plant Noise Impact Assessment

5.1 Assessment Methodology

- 5.1.1 In accordance with the requirements of the planning condition, the assessment methodology has been undertaken in accordance with BS4142:1997.

5.2 Assessment Criteria

- 5.2.1 Background sound levels are detailed in **Table 4.3**.
- 5.2.2 Based on the planning condition and the results of the environmental sound surveys, **Table 5.1** details the proposed plant noise emission limits.
- 5.2.3 The proposed limits are intended to account for both existing and future plant on the Reading Gateway site. To ensure that the overall cumulative sound pressure levels associated with the operation of all plant on the Reading Gateway site do not exceed the background sound level the proposed limits have been specified to be 10dB below the typical background sound level.

Table 5.1: Plant Noise Emission Limits

Location	Assessment Location	Plant Noise Rating Limit (dB) Combined Plant	
		Daytime (07:00 – 23:00 hours)	Night-time (23:00 – 07:00 hours)
Residential / Hotel	1m outside any openable, noise sensitive window	41	33

5.3 Plant Noise Impact Assessment

- 5.3.1 Based on the proposed noise emission limits outlined in **Table 5.1** and the data provided, **Appendix C** details the results of the plant noise impact assessment at the stated receptor (A - Hotel) during both daytime and night-time periods.
- 5.3.2 **Table 5.2** presents a summary of the calculated sound levels at the noise sensitive receptor for comparison with the plant noise emission limits detailed in **Table 5.1**.

Table 5.2: Plant Noise Impact Assessment Summary of Results

Location	Assessment Location	Calculated Sound Level (dB $L_{Aeq,T}$) at Receptor	
		Daytime (07:00 – 23:00 hours)	Night-time (23:00 – 07:00 hours)
Residential / Hotel	1m outside any openable, noise sensitive window	40	20

- 5.3.3 Calculations indicate that sound levels associated with the proposed plant are likely to achieve the proposed plant noise emission criteria at the nearest noise sensitive receptor and therefore comply with the requirements of Planning Condition 62.
- 5.3.4 It is therefore considered that Planning Condition 62 can be discharged with respect to the building services plant detailed herein without any further mitigation measures.

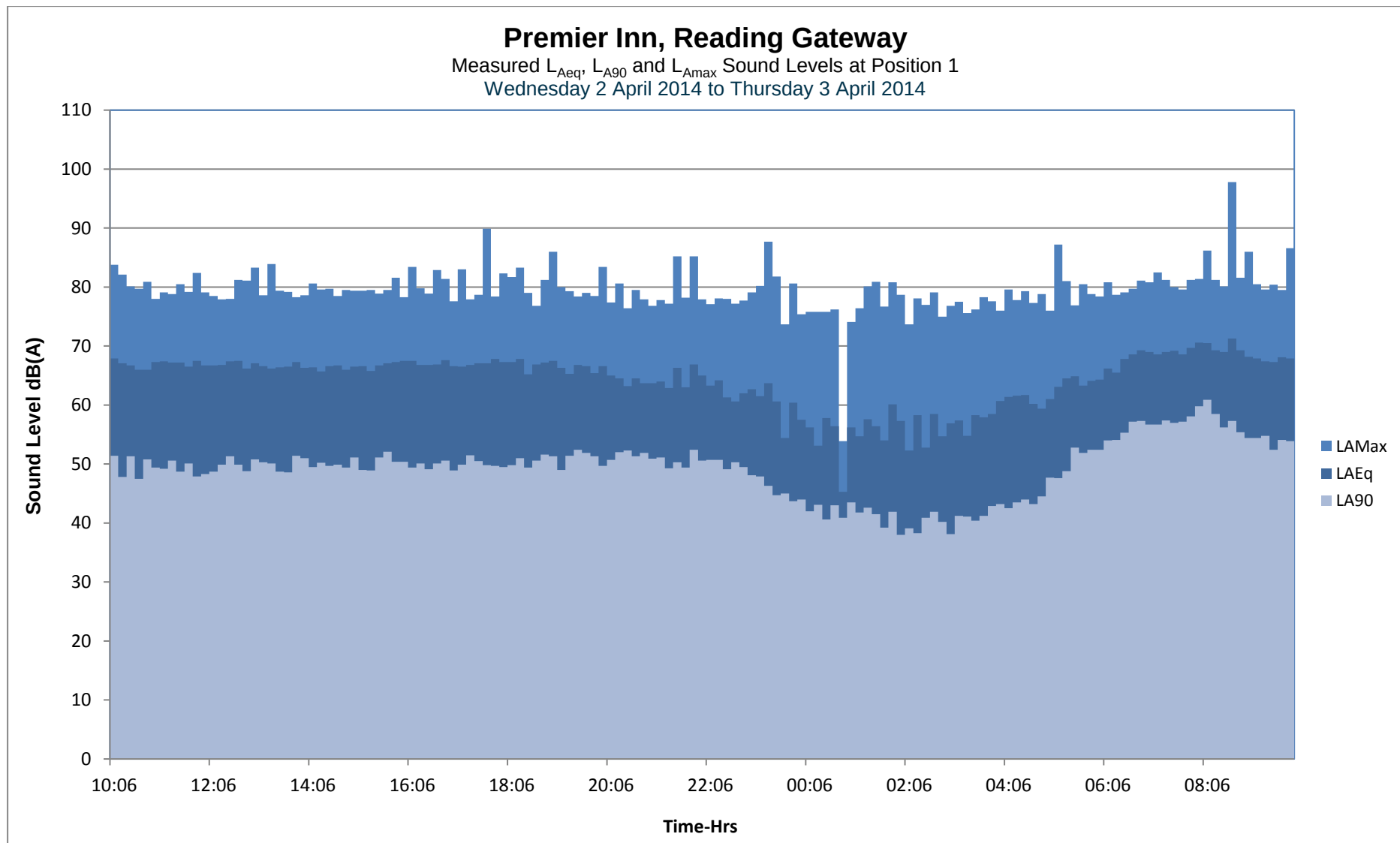
6 Conclusions

- 6.1.1 Peter Brett Associates LLP has been commissioned by Kier Property Ltd to provide a noise impact assessment to support the discharge of Planning Condition 62 relating to Unit E of the Reading Gateway site.
- 6.1.2 An environmental sound survey has been undertaken over a 24-hour period between 2 and 3 April 2014 in order to determine the typical background sound levels at the nearby noise sensitive receptors.
- 6.1.3 An assessment has been undertaken of the potential noise impact of the proposed plant.
- 6.1.4 Calculations indicate that sound levels associated with the proposed plant are likely to achieve the proposed plant noise emission criteria at the nearest noise sensitive receptor and therefore comply with the requirements of Planning Condition 62.
- 6.1.5 It is therefore considered that Planning Condition 62 can be discharged with respect to the building services plant detailed herein without any further mitigation measures.

Appendix A Glossary of Acoustic Terminology

Parameter	Description
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near ($L_{Aeq,T}$).
Daytime	The period 07:00-23:00 hours.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s_1 and s_2 is given by $20 \log_{10} (s_1/s_2)$. The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is $20 \mu\text{Pa}$. The threshold of normal hearing is in the region of 0 dB and 140 dB is the threshold of pain. A change of 1 dB is only perceptible under controlled conditions.
dB(A), L_{Ax}	Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound.
Fast Time Weighting	Setting on sound level meter, denoted by a subscript F, that determines the speed at which the instrument responds to changes in the amplitude of any measured signal. The fast time weighting can lead to higher values than the slow time weighting when rapidly changing signals are measured. The average time constant for the fast response setting is 0.125 (1/8) seconds.
ree-field	Sound pressure level measured outside, far away from reflecting surfaces (except the ground), usually taken to mean at least 3.5 metres
Façade	Sound pressure level measured at a distance of 1 metre in front of a large sound reflecting object such as a building façade.
Insertion Loss	Insertion loss is the difference in sound pressure level at a single fixed position before and after a noise control element (e.g. enclosure, barrier etc) is installed.
L_{AE} or SEL	A noise level which, if maintained for a period of 1 second, would cause the same A-weighted sound energy to be received as is actually received from a given noise event.
$L_{Aeq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level recorded during a noise event with a period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{90,T}$ or Background Noise Level	A noise level index. The noise level exceeded for 90% of the time over the period T. L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise.
Night-time	The period 23:00-07:00 hours.
Noise Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level, L_p	The sound pressure level, L_p is the sound pressure relative to a standard reference pressure of $20 \mu\text{Pa}$ (20×10^{-6} Pascals) on a decibel scale.
Specific Noise Level	The noise source under investigation for assessing the indication of impact, measured as and $L_{Aeq,T}$
Rating Noise Level	The specific noise source plus any adjustment for the characteristic features of the noise, denoted by $L_{Ar,T}$.

Appendix B Sound Time History Graph



Appendix C Calculation Summary

Table C.1: Calculation Summary - Daytime

	Sound Level (dB) at Octave Band Centre Frequency (Hz)								
	63	125	250	500	1k	2k	4k	8k	dBA
Fujitsu AUYG-AOYG36									
Sound Pressure Level at 1m	56	56	51	49	45	42	37	39	51
Number of units correction (2 units)	3	3	3	3	3	3	3	3	
Distance Loss (65 m)	-36	-36	-36	-36	-36	-36	-36	-36	
Acoustic Feature Correction	0	0	0	0	0	0	0	0	
Sound Pressure Level at Receptor	23	23	18	16	12	9	4	6	18
Fujitsu ARYC-AOYA72									
Sound Pressure Level at 1m	62	62	57	55	51	48	43	45	57
Number of units correction (2 units)	3	3	3	3	3	3	3	3	
Distance Loss (65 m)	-36	-36	-36	-36	-36	-36	-36	-36	
Acoustic Feature Correction	0	0	0	0	0	0	0	0	
Sound Pressure Level at Receptor	29	29	24	22	18	15	10	12	24
Elta Multiflow SMB450-4-3AC									
Sound Pressure Level (Breakout) at 3m	60	55	52	45	37	30	25	19	47
Distance Loss (65 m)	-27	-27	-27	-27	-27	-27	-27	-27	
Acoustic Feature Correction	0	0	0	0	0	0	0	0	
Sound Pressure Level at Receptor	33	28	25	18	10	3	-2	-8	21
Elta Multiflow SMB450-4-3AC									
Sound Power Level (In Duct)	81	78	76	73	70	67	62	56	
Grille Loss	-9	-4	-2	0	0	0	0	0	
Filter Loss	-4	-5	-6	-6	-6	-6	-6	-6	
Divergence (65m)	-44	-44	-44	-44	-44	-44	-44	-44	
Directivity Correction	0	1	2	2	3	3	3	3	
Acoustic Feature Correction	0	0	0	0	0	0	0	0	
Sound Pressure Level at Receptor	24	26	26	25	23	20	15	9	28
Toilet Extract Fan Vent Axia QPTW315C									
Sound Pressure Level (Breakout) at 3m	34	50	43	33	27	21	15	14	38
Distance Loss (62 m)	-26	-26	-26	-26	-26	-26	-26	-26	
Acoustic Feature Correction	0	0	0	0	0	0	0	0	
Sound Pressure Level at Receptor	8	24	17	7	1	-5	-11	-12	12

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Toilet Extract Fan Vent Axia QPTW315C	63	125	250	500	1k	2k	4k	8k	dBA
Sound Power Level (In Duct)	67	75	77	71	69	62	56	49	
Grille Loss	-12	-8	-4	0	0	0	0	0	
Attenuator	0	-2	-4	-10	-22	-9	-6	-7	
Divergence (62m)	-44	-44	-44	-44	-44	-44	-44	-44	
Directivity Correction	0	1	2	2	3	3	3	3	
Acoustic Feature Correction	0	0	0	0	0	0	0	0	
Sound Pressure Level at Receptor	11	22	27	19	6	12	9	1	22
RHF Kitchen Extract	63	125	250	500	1k	2k	4k	8k	dBA
Sound Pressure Level (Breakout) at 3m	74	59	58	41	35	35	35	35	53
Distance Loss	-36	-36	-36	-36	-36	-36	-36	-36	
Acoustic Feature Correction	0	0	0	0	0	0	0	0	
Sound Pressure Level at Receptor	38	23	21	5	-1	-1	-1	-1	16
RHF Kitchen Extract	63	125	250	500	1k	2k	4k	8k	dBA
Sound Power Level (In Duct)	92	83	88	77	72	68	65	56	
Grille Loss	-10	-6	-3	0	0	0	0	0	
Divergence (65m)	-44	-44	-44	-44	-44	-44	-44	-44	
Directivity Correction	0	1	2	2	3	3	3	3	
Acoustic Feature Correction	0	0	0	0	0	0	0	0	
Sound Pressure Level at Receptor	38	34	43	35	31	27	24	15	38
Toilet Extract Fan Vent Axia SDX315C	63	125	250	500	1k	2k	4k	8k	dBA
Sound Pressure Level (Breakout) at 3m	13	18	25	28	27	25	23	12	32
Distance Loss	-27	-27	-27	-27	-27	-27	-27	-27	
Acoustic Feature Correction	0	0	0	0	0	0	0	0	
Sound Pressure Level at Receptor	-14	-9	-2	1	0	-2	-4	-15	5
Toilet Extract Fan Vent Axia SDX315C	63	125	250	500	1k	2k	4k	8k	dBA
Sound Power Level (In Duct)	51	60	66	69	67	66	65	53	
Grille Loss	-12	-8	-4	0	0	0	0	0	
Divergence (65m)	-44	-44	-44	-44	-44	-44	-44	-44	
Directivity	0	1	2	2	3	3	3	3	
Acoustic Feature Correction	0	0	0	0	0	0	0	0	
Sound Pressure Level at Receptor	-5	9	20	27	26	25	24	12	32
Freezer Condenser	63	125	250	500	1k	2k	4k	8k	dBA
Sound Pressure Level at 1m	55	50	54	52	46	42	35	35	52
Distance Loss	-36	-36	-36	-36	-36	-36	-36	-36	

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Acoustic Feature Correction	0	0	0	0	0	0	0	0	
Sound Pressure Level at Receptor	19	14	17	15	10	5	-1	-1	16
Fridge Condenser	63	125	250	500	1k	2k	4k	8k	dBa
Sound Pressure Level at 1m	55	53	57	54	46	42	31	29	54
Distance Loss	-36	-36	-36	-36	-36	-36	-36	-36	
Acoustic Feature Correction	0	0	0	0	0	0	0	0	
Sound Pressure Level at Receptor	19	17	21	18	9	6	-5	-7	18
Total Rating Level (L_{Ar,T}) at Receptor (Daytime)									40

Table C.2: Calculation Summary – Night-time

	Sound Level (dB) at Octave Band Centre Frequency (Hz)								
Freezer Condenser	63	125	250	500	1k	2k	4k	8k	dBa
Sound Pressure Level at 1m	55	50	54	52	46	42	35	35	52
Distance Loss	-36	-36	-36	-36	-36	-36	-36	-36	
Acoustic Feature Correction	0	0	0	0	0	0	0	0	
Sound Pressure Level at Receptor	19	14	17	15	10	5	-1	-1	16
Fridge Condenser	63	125	250	500	1k	2k	4k	8k	dBa
Sound Pressure Level at 1m	55	53	57	54	46	42	31	29	54
Distance Loss	-36	-36	-36	-36	-36	-36	-36	-36	
Acoustic Feature Correction	0	0	0	0	0	0	0	0	
Sound Pressure Level at Receptor	19	17	21	18	9	6	-5	-7	18
Total Rating Level (L_{Ar,T}) at Receptor (Night-time)									20