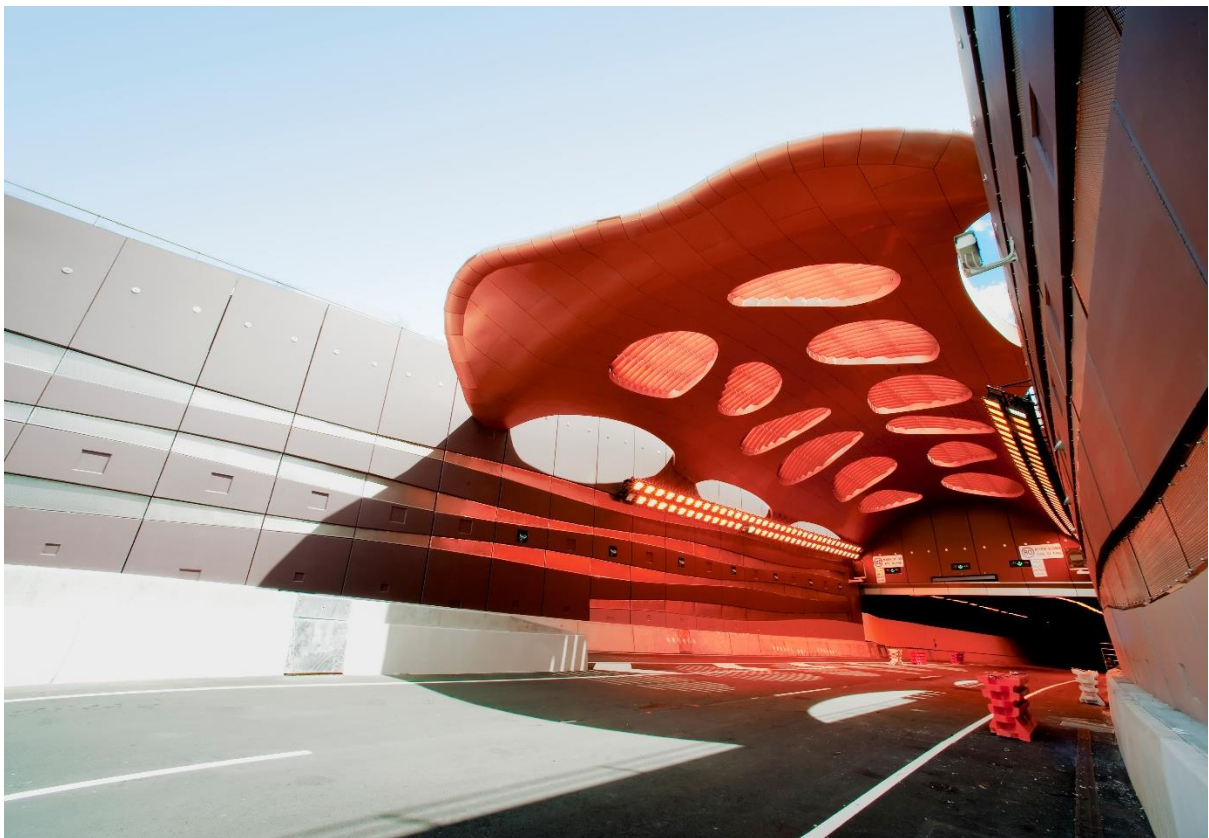


ST MARTIN'S CENTRE DEVELOPMENT, BLOCK A

NOISE IMPACT ASSESSMENT





ST MARTIN'S CENTRE DEVELOPMENT, BLOCK A NOISE IMPACT ASSESSMENT

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1 INTRODUCTION

This Noise Assessment has been prepared to inform the submission of a non-material amendment application (PP-06723552) pursuant to a series of alternations to Block A of planning permission 140997 associated with the regeneration of St Martin's Centre, Caversham.

The report should be reviewed alongside the Non-Material Amendment Brochure prepared by Latitude Architects. The Noise Assessment supports amendments to the scheme which include the incorporation of a plant room to meet the operational requirements of the proposed ground floor A3 unit which was omitted on the consented drawings and is required to ensure that the proposed development is deliverable.

Such amendments have been informed by a range of technical input which has evolved since planning permission was granted in 2015. This Report has also been prepared to discharge part i) of condition 31 of the extant permission in relation to Phase1A and has been submitted concurrently with the non-material amendment application.

This report is necessarily technical in nature and to assist the reader, a glossary of acoustic terminology is contained in Appendix A.

2 SITE DESCRIPTION

2.1 EXISTING SITE

The St Martin's Centre development is located within Caversham, Reading and is bound to the north by Church Street, to the east by Archway Road, and to the south and west by mixed use commercial and residential development.

The current site is mixed use with retail premises at ground floor level fronting Church Street, and residential apartments located above. There is a parking area located to the rear.

Block A to which this report relates is located in the northwest of the St Martins Centre. The site map and existing layout are shown in Appendix B.

2.2 PROPOSED DEVELOPMENT

The proposed development forms Block A of extant permission 140997 for the regeneration of St Martins Centre, Caversham which seeks to retain and extend the ground floor retail premises and provide new and refurbished residential units.

Block A is a new four storey building located in the north west corner of the site, with a ground floor restaurant and 17 residential units above.

Tenant plant items associated with the ground floor restaurant are proposed to be located externally on the fourth floor rooftop and internally on the ground floor level.

The proposed consolidated site plan of the St Martin's centre development is included in Appendix C.

3 ASSESSMENT METHODOLOGY

3.1 PLANNING CONDITION

Reading Borough Council (RBC) has granted planning consent for the development subject to a number of conditions, the following of which relates to the mechanical services scheme.

31. No air conditioning, refrigeration, or air extraction, plant shall be installed externally, or vented externally, until:

- i) a noise assessment to BS4142:2014 has been submitted to and approved in writing by the local planning authority demonstrating that the plant would not cause an exceedance of the 'good' internal noise level at the nearest residential premises, and detailing any noise attenuation measures necessary to achieve this.
- and
- ii) an odour control assessment in accordance with DEFRA Guidance on the Control of Odour and Noise from Commercial Kitchen Exhaust Systems (2005) has been submitted to and approved in writing by the local planning authority.

No plant shall be installed other than in accordance with the noise and odour control measures approved pursuant to this condition.

Reason: to minimise the effects of noise and odour arising from the development, in accordance with Policy CS34 of the Reading Borough LDF Core Strategy 2008 and Policy DM4 of the Sites and Detailed Policies Document 2012.

This report intends to discharge part (i) of this condition, and part (ii) will be discharged by a separate report to be prepared by an air quality specialist.

3.2 LOCAL AUTHORITY CONSULTATION

Further clarification was requested from the RBC with regards to the building services noise emission limits.

The Environmental Health Department confirmed that building services noise emissions should be designed such that the rating level does not exceed the measured background noise level (L_{A90}) at the nearest noise sensitive receptor.

This is in line with guidance within BS 4142: 2014 '*Methods for rating and assessing industrial and commercial sound*' which states that: '*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*'.

It was also confirmed that building services noise emissions should not exceed the 'good' internal noise levels for dwellings stated within BS 8233: 2014 '*Guidance on sound insulation and noise reduction for buildings*'. A summary of the criteria within BS 8233: 2014 is provided below.

3.3 BS 8233: 2014

Section 7 of this British Standard includes internal ambient noise levels for a variety of spaces. Internal ambient noise levels for dwellings are presented in Table 3-1 below.

Table 3-1: BS 8233: 2014 Internal ambient noise levels for dwellings

ACTIVITY	LOCATION	DAYTIME	NIGHT-TIME
		(07:00 TO 23:00 HRS)	(23:00 TO 07:00 HRS)
Resting	Living room	35 dB $L_{Aeq,16hrs}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16hrs}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hrs}$	30 dB $L_{Aeq,8hrs}$

The above criteria have been adopted and are referred to in the following assessments.

4 ENVIRONMENTAL NOISE SURVEY

In order to inform the following noise impact assessment, it is necessary to obtain background noise levels representative of the nearest noise sensitive receptors. These are required to set appropriate building services noise emission limits relative to the background, in accordance the requirements of Reading Borough Council.

An environmental noise survey on the site was previously undertaken by Cundall to inform the planning application for the development.

The full details of the environmental noise survey are included within Cundall's 'Environmental Noise Report' ref. 1006081-RPT-00014, which is included in Appendix D of this report for reference. A summary of the survey and results are presented below.

4.1 CUNDALL ENVIRONMENTAL NOISE SURVEY

4.1.1 METHODOLOGY

Cundall undertook an environmental noise survey during the daytime on Thursday 7th November 2013, and during the night-time on Thursday 8th May 2014. The measurements are indicated on the site plan in Figure 4-1 below.

Figure 4-1: Cundall's environmental noise survey measurement positions



All measurements were made on a tripod, in free field locations, approximately 1.5 m above ground floor level. Weather conditions for the duration of the surveys were dry, with no precipitation and <3m/s wind speeds.

4.1.2 RESULTS

The following table has been extracted directly from Cundall's Environmental Noise Report.

Note 3 which relate to the measured background noise levels ($L_{A90,T}$) states that '*The typical background noise level is determined by taking the highest frequency density when plotted as a histogram. Where two distinct frequency ranges are evident [i.e. at positions 2 and 4, i.e. where daytime and evening background noise levels vary considerably], the lowest value is recorded.*'

It should be noted that the night-time measurements were conducted between approximately 01:00 and 04:00 hours.

Table 4-1: Cundall's environmental noise survey measurement results

Measurement Position / Period		Averaged ¹ $L_{Aeq,T}$	L_{AFmax} ²	$L_{A90,T}$ ³
1	Daytime	51.3	77.3 [53 - 77]	47
2	Daytime	68.8	92.3 [75-92]	60
	Night-time	54.3	77.5 [46-77]	37
3	Daytime	68.1	96.7 [74-96]	67
4	Daytime	59.5	80.3 [66-80]	49
	Night-time	46.6	71.3 [48-71]	42
5	Daytime	54.2	75.3 [61-75]	45
	Night-time	47.6	70.8 [45-70]	41

The background noise levels presented above have been used to determine the building services noise emission limits as discussed in Section 6.

5 PLANT DETAILS

The proposed tenant's plant items are detailed in Table 5-1 below.

Table 5-1: Details of the proposed tenant's plant items

LOCATION	NAME	REFERENCE	DESCRIPTION AND MODEL	QUANTITY
Fourth floor rooftop	AC VRF Condensers	VRF_CU01; VRF_CU02; VRF_CU03 and VRF_CU04.	Daikin Condensing outdoor unit model AZQS140B8V1	4
	Chiller Condenser	CH_CU01	Danfoss Optyma Plus Condenser model OP-MPHM015	1
	Freezer Condenser	FR_CU01	Danfoss Optyma Plus Condenser model OP-LPHM048	1
	Kitchen Extract Fan	KEF_01	Helios Gigabox Centrifugal fan 500mm ø GBW 500/4	1
Ground floor	Air Handling Unit	AHU_01	Unknown	1
	Toilet Extract Fan	TEF_01	Unknown	1

The proposed locations of the items above are indicated on the *Mechanical Services Ground Floor and Roof Level Duct Sketch* drawing by Building Services Design Consulting Engineers, which is included in Appendix E for reference.

All rooftop plant items are proposed to be surrounded by a standard non-acoustic weather louvre. AHU_01 and TEF_01 are both located internally within the ground floor, with external grilles ducted up to the south and west ground floor façades respectively.

Details of the case-radiated and in-duct sound power levels for the tenant's plant items have been provided by Workman LLP and the individual suppliers, and are reproduced in Table 5-2 and Table 5-3 below. Details of AHU_01 and TEF_01 were unavailable, so sound power level limits are provided for these items in Section 6.3.1.

Table 5-2: Case-radiated sound power levels for the tenant's plant items

REFERENCE	SOUND POWER LEVEL, L_w (dB) AT EACH OCTAVE BAND CENTRE FREQUENCY (Hz)							dB(A)
	125	250	500	1000	2000	4000	8000	
VRF_CU01, VRF_CU02, VRF_CU03 and VRF_CU04	56	63	67	64	64	61	48	69
KEF_01 ⁽¹⁾	75	71	60	56	46	40	34	65
CH_CU01	No spectrum data available							60
FR_CU01	No spectrum data available							69

Notes

(1) The sound power spectrum values provided for the kitchen extract fan were A-weighted. They have been corrected to linear values to be used in the following assessments.

Table 5-3: In-duct sound power levels of the kitchen extract fan exhaust

REFERENCE	SOUND POWER LEVEL, L_w (dB) AT EACH OCTAVE BAND CENTRE FREQUENCY (Hz)							dB(A)
	125	250	500	1000	2000	4000	8000	
KEF_01 ⁽¹⁾	77	82	77	74	72	68	61	80

Notes
(1) The sound power spectrum values provided for the kitchen extract fan were A-weighted. They have been corrected to linear values to be used in the following assessments.

5.1 OPERATIONAL PERIODS

It is understood that the opening hours of the ground floor restaurant could extend into the night-time period (which begins at 23:00 hrs), albeit for a short period at the beginning of the night until the restaurant closes.

The application is therefore being made based on a 24-hour operation, which all plant items operating simultaneously during the night-time periods.

6 PLANT NOISE ASSESSMENT

6.1 NEAREST NOISE SENSITIVE RECEPTORS

The nearest noise sensitive receptors and their associated windows closest to the proposed plant items have been identified to be:

- Noise Sensitive Receptor 1 (SR1): Fourth floor east-facing proposed apartment windows of Block A, directly below the rooftop plant items. These windows are approximately 4m from the proposed location of the VRF condensers, as shown below in Figure 6-1. There will be no line of sight between the windows and the plant items due to screening offered by the building itself.
- Noise Sensitive Receptor 2 (SR2): Fourth floor west-facing proposed apartment window of Block A, directly below the rooftop plant items. This window is approximately 7m from the proposed location of kitchen extract fan KEF_01, as shown below in Figure 6-1. There will be no line of sight between the window and the plant items due to screening offered by the building itself.
- Noise Sensitive Receptor 3 (SR3): Third floor north-facing existing windows of the residential premises on Abbottsmead Place. These windows are approximately 25m to the south-west of Block A, with a direct line of sight to the proposed rooftop plant items and external louvres of the ground floor plant items.
- Noise Sensitive Receptor 4 (SR4): First floor south-facing proposed apartment windows of Block A, within 5m of the external grilles of air handling unit AHU_01 and toilet extract fan TEF_01. As shown in Figure 6-2 overleaf.

The locations of all noise sensitive receptors are indicated on the proposed site plan within Appendix F.

Figure 6-1: Location of Sensitive Receptors 1 and 2 (fourth floor east- and west-facing windows of Block A)

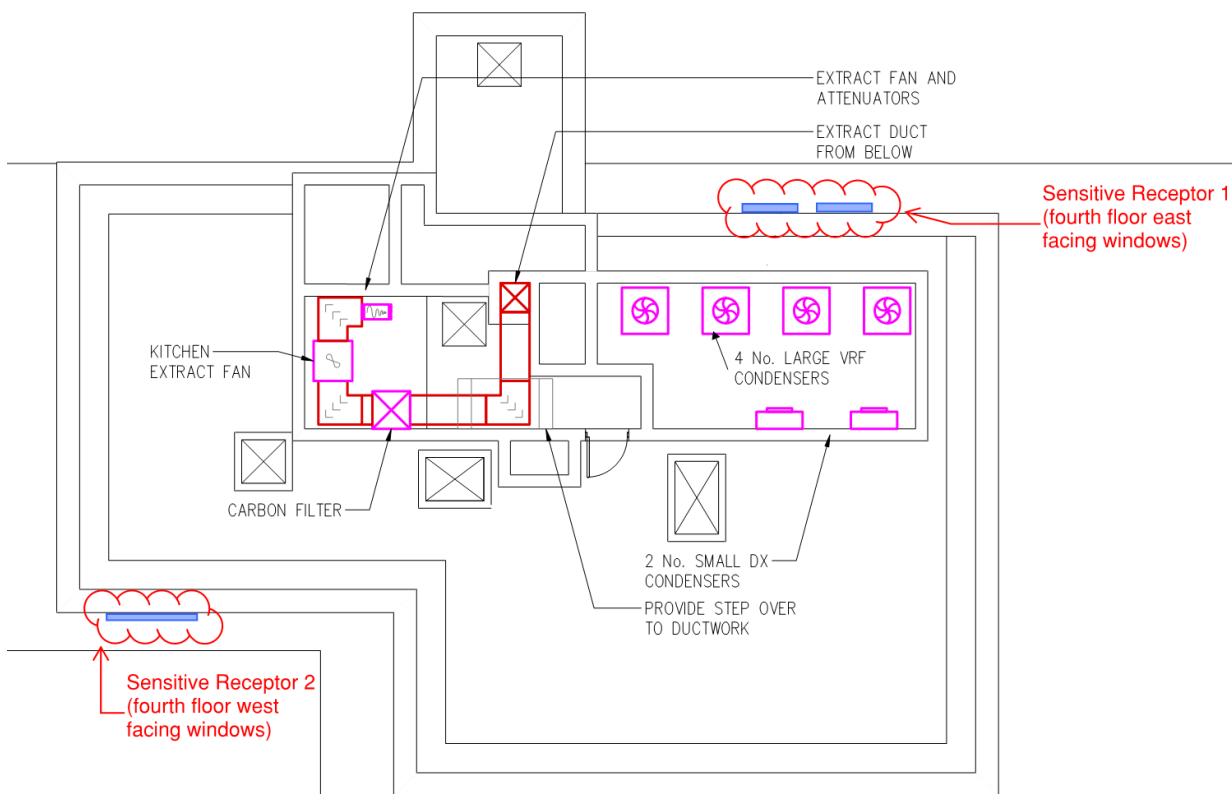
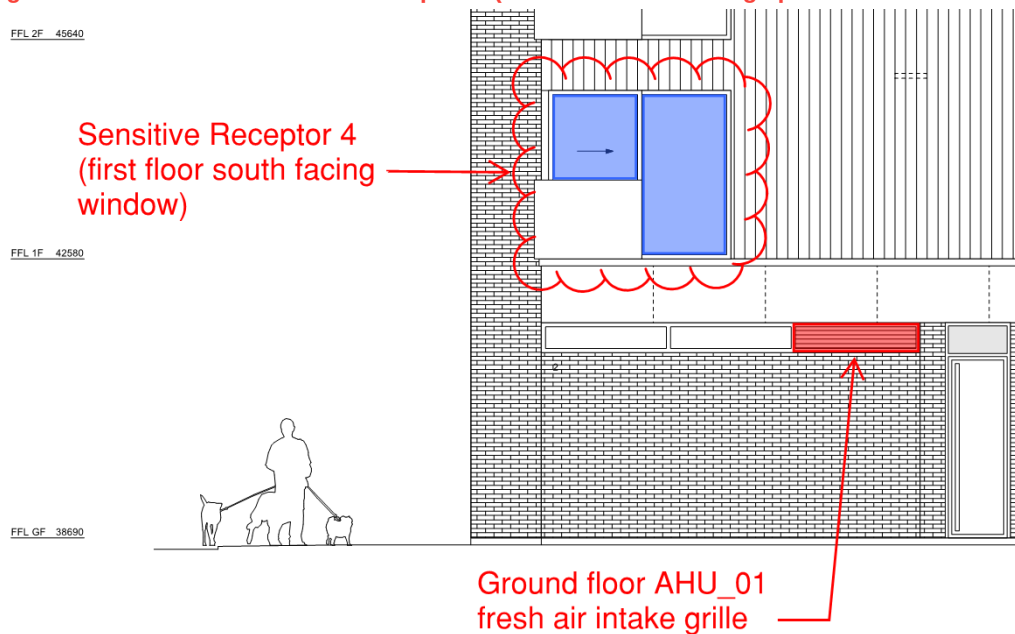


Figure 6-2: Location of Sensitive Receptor 4 (first floor south-facing apartment window of Block A)



6.2 NOISE EMISSION LIMITS

Noise emission limits for all new plant items are based on the requirements of Reading Borough Council, detailed in Section 3 of this report.

RBC requires the cumulative rating level ($L_{Ar,T}$) of all proposed plant to be equal to or lower than the measured background noise level at 1m from the nearest noise sensitive receptor.

This will be a combined noise level from all plant items associated with Block A, and should therefore include contributions from the tenant's plant items, as well as any plant associated with the residential accommodation.

It is therefore appropriate to set noise emission limits on the tenant's plant and on the residential accommodation plant to be 3 dB below the measured background noise level. This will ensure that if a nearby noise sensitive receptor is affected by plant noise from both the residential accommodation plant and the tenant's plant, the criteria set by RBC will still be achieved.

Based on the lowest measured daytime and night-time background noise levels (see Table 4-1), noise emission limits for the tenant's plant are presented below in Table 6-1.

Table 6-1: Tenant plant noise emission limits at 1m from the nearest noise sensitive receptors

PERIOD	LOWEST MEASURED BACKGROUND NOISE LEVELS	TENANT PLANT NOISE EMISSION LIMITS
Daytime (07:00 – 23:00 hrs)	45 dB L_{A90}	42 dB $L_{Ar,T}$
Night-time (23:00 – 07:00 hrs)	37 dB L_{A90}	34 dB $L_{Ar,T}$

Based on a typical sound level difference for an open window of 15 dB (in accordance with guidance in BS 8233), it can be seen that by designing to the above external rating levels at the nearest residential receptors, the resultant internal levels would be 27 dB(A) during the day and 19 dB(A) during the night. This is well below the BS 8233 internal ambient noise levels criteria for dwellings and therefore meets the additional requirement of RBC.

6.3 PREDICTED NOISE LEVELS

The following assessment assumes a worst-case scenario of all plant items operating simultaneously and at full duty during the night-time. As the night-time plant noise emission limit is more onerous than the daytime limit, designing to the night-time limit will ensure that the daytime limit is also achieved.

The ground floor tenant plant items are considered separately to the rooftop plant items below; as there is no data available for the ground floor plant items, and the distance between the two will result in noise emissions affecting different noise sensitive receptors.

6.3.1 GROUND FLOOR TENANT PLANT ITEMS

As details of the ground floor air handling unit AHU_01 and toilet extract fan TEF_01 are currently unavailable, it is considered appropriate to set individual noise emission limits for the external grilles, in order that the limits are achieved at the closest noise sensitive receptor (SR4).

Taking into account the distance between the external grilles and the window of SR4, and a nominal directivity loss based on the grille dimensions, the following limits have been set to achieve the night-time limit of 34 dB $L_{A,r,T}$.

- Noise emissions associated with air handling unit AHU_01 must not exceed a sound pressure level of 45 dB(A) at 1m directly in front of the fresh-air inlet grille.
- Noise emissions associated with toilet extract fan TEF_01 must not exceed a sound pressure level of 45 dB(A) at 1m directly in front of the exhaust outlet grille.

The limits above assume that noise emissions from these plant items do not contain any tonal, intermittent or impulsive characteristics. If they do, these limits will need to be reduced in accordance with the penalties contained in BS 4142:2014.

It is likely that in-duct attenuators will be required in order to achieve the limits above, and attenuators are therefore recommended for these plant items within Section 5 of this report.

6.3.2 ROOFTOP TENANT PLANT ITEMS

The cumulative sound pressure level from all proposed tenant plant items has been predicted at noise sensitive receptors SR1, SR2 and SR3, which will be mainly affected by noise emissions from the rooftop plant items, due to their proximity. The predictions are based on the sound power data presented in Table 5-2 and Table 5-3, and take into account all ductwork systems, distance corrections and any screening from the existing and proposed buildings.

Prior to the recommendation of any mitigation measures such as in-duct acoustic attenuators or acoustic screens, a summary of the resultant noise levels are shown overleaf in Table 6-2.

Table 6-2: Calculated resultant noise level at each receptor prior to mitigation measures

RESULTANT NOISE LEVEL AT THE NEAREST NOISE SENSITIVE RECEPTORS			
PLANT ITEM REFERENCE	SR1 (4 th floor Block A east facing window)	SR2 (4 th floor Block A west facing window)	SR3 (3 rd floor window of residential premises on Abbottsmead Place)
VRF_CU01	34 dB	25 dB	29 dB
VRF_CU02	34 dB	24 dB	29 dB
VRF_CU03	34 dB	23 dB	28 dB
VRF_CU04	34 dB	22 dB	28 dB
KEF_01 case break-out	21 dB	29 dB	21 dB
KEF_01 exhaust	40 dB	43 dB	39 dB
CH_CU01	25 dB	15 dB	20 dB
FR_CU01	34 dB	24 dB	29 dB
AHU_01 fresh-air intake	1 dB	1 dB	21 dB
TEF_01 exhaust	1 dB	1 dB	18 dB
Cumulative Level	44 dB	44 dB	41 dB
Design Criterion	34 dB	34 dB	34 dB
Exceedance	10 dB	10 dB	7 dB

Comparison of the resultant cumulative sound pressure levels at the nearest noise sensitive windows to the plant noise emission limits indicates that the criteria would be exceeded at noise sensitive receptors SR1, SR2 and SR3.

The reasons for the exceedances are a predominantly a result of noise emissions from the kitchen extract fan and from the VRF condenser units at the SR1.

Mitigation measures will therefore be required to meet the criteria and satisfy the planning condition. All recommended mitigation measures are discussed in Section 7 of this report.

7 MITIGATION MEASURES

The detailed plant noise assessment undertaken in this report has demonstrated that mitigation measures are required to meet the plant noise criteria outlined in the planning conditions set by Reading Borough Council.

This section recommends appropriate mitigation measures to satisfy the planning condition.

7.1 ATTENUATOR SCHEDULE

In order to meet the plant noise emission limits at the nearest noise sensitive receptors, attenuators will be required on the following plant items:

- Kitchen extract fan KEF_01 exhaust ductwork;
- Air handling unit AHU_01 fresh air intake; and
- Toilet extract fan TEF_01 exhaust.

The specification of the attenuators for AHU_01 and TEF_01 will be required at a later date, when full details of these items are available.

The attenuator for the kitchen extract fan exhaust should achieve the following insertion losses.

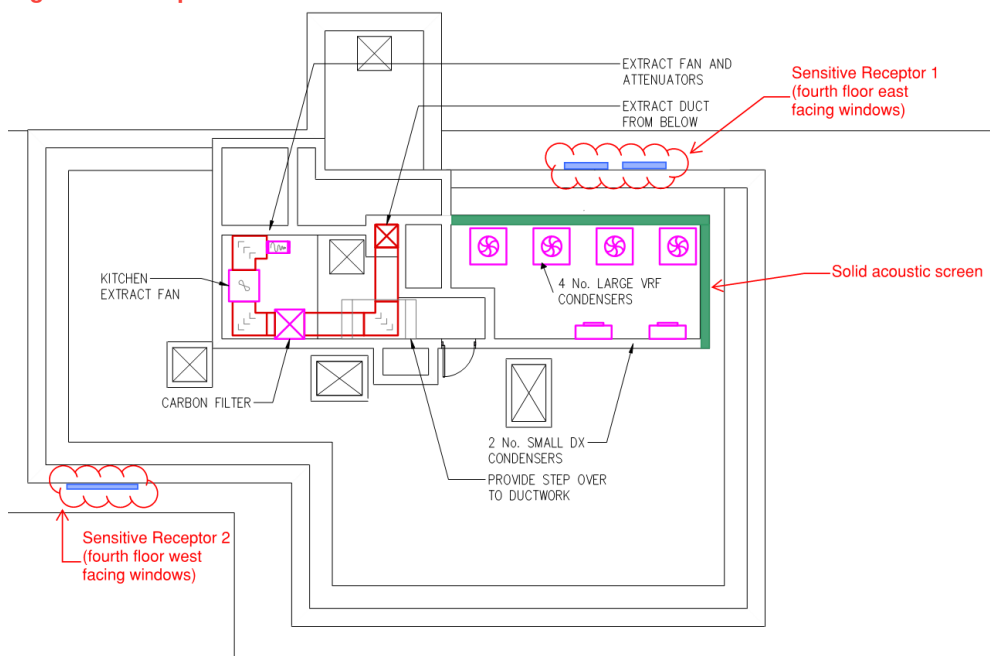
Table 7-1: Kitchen extract fan exhaust attenuator insertion loss requirements

REF.	MINIMUM DYNAMIC INSERTION LOSS (dB) AT EACH OCTAVE BAND (Hz)								APPROX. LENGTH (MM)
	63	125	250	500	1000	2000	4000	8000	
KEF_01 exhaust attenuator	5	11	19	29	36	37	28	18	1200

7.2 ACOUSTIC SCREEN DETAILS

It is recommended that a solid acoustic screen is installed to the east and south rooftop of the VRF condenser units, as shown in Figure 7-1 below. This screen will control noise emissions from these units to the location of SR1 and to the fourth floor south-facing proposed apartment windows of Block A, which are a similar distance to the rooftop condenser units.

Figure 7-1: Proposed location of solid acoustic screen



The solid acoustic screen must be as high as the current plant enclosure height, which is shown as 56790 AOD on the latest section drawings. This is based on the VRF condensers being 1.43m in height, if taller units are selected, the acoustic screen height must be increased in order that it is at least 0.3m above the height of the condensers.

The construction of the acoustic screen should have a minimum mass per unit surface area of 20 kg/m² and an acoustically absorbent inner face. Typically this could be achieved either with an acoustically absorbent builders work screen or with the use of proprietary acoustic panels. The acoustic screen shall comprise acoustically absorptive material, fixed in place with a non-obstructive fixing system. The absorptive treatment shall be a minimum of 50mm thick and be faced with an abrasion and fibre erosion protection layer such as a glass fibre scrim or glass fibre cloth and shall also be retained behind a perforated galvanised mild steel sheet with an open area of not less than 25%. The perforated face of the screen shall face towards the plant items. The absorptive face of the screen shall provide the following acoustic absorption co-efficients as a minimum.

Figure 7-2: Minimum acoustic absorption coefficients of the absorbent layer of the acoustic screen

MINIMUM ACOUSTIC ABSORPTION COEFFICIENTS (A) IN WHOLE OCTAVE BANDS (Hz)

125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
0.30	0.60	0.70	0.70	0.70	0.70

7.3 KITCHEN EXTRACT FAN NOISE CONTROL

To control case-radiated break-out noise from kitchen extract fan KEF_01 it is recommended that the unit and any flexible connectors are wrapped with a proprietary acoustic lagging product with a mass layer of surface mass of at least 5 kg/m².

If this proves impractical for maintenance or weather-proofing purposes an alternative design option would be to enclose the fan (and flexible connectors) with an acoustic enclosure, or to construct an acoustic screen between the location of the fan and sensitive receptor 2.

7.4 MITIGATED PLANT NOISE LEVELS

The resultant noise level from each plant item has been calculated at the nearest noise sensitive receptors, with the above mitigation measures in place. The contribution from each element of plant is presented below in Table 7-2 below for the night-time assessment, with the cumulative noise level compared against the design criterion.

Table 7-2: Resultant noise levels at the nearest sensitive receptors post mitigation measures

RESULTANT NOISE LEVEL AT THE NEAREST NOISE SENSITIVE RECEPTORS

PLANT ITEM REFERENCE	SR1 (4th floor Block A east facing window)	SR2 (4th floor Block A west facing window)	SR3 (3rd floor window of residential premises on Abbottsmead Place)
VRF_CU01	25 dB	25 dB	19 dB
VRF_CU02	25 dB	24 dB	19 dB
VRF_CU03	25 dB	23 dB	18 dB
VRF_CU04	25 dB	22 dB	18 dB
KEF_01 case break-out	16 dB	24 dB	16 dB
KEF_01 exhaust	14 dB	17 dB	8 dB
CH_CU01	16 dB	15 dB	10 dB
FR_CU01	25 dB	24 dB	19 dB
AHU_01 fresh-air intake	1 dB	1 dB	21 dB
TEF_01 exhaust	1 dB	1 dB	18 dB
Cumulative Level	33 dB	32 dB	28 dB
Design Criterion	34 dB	34 dB	34 dB
Exceedance	0 dB	0 dB	0 dB

The table above demonstrates that, with the mitigation measures in place, the cumulative noise levels at the noise sensitive receptors comply with the requirements of part (i) of planning conditions 31 set by Reading Borough Council.

8 CONCLUSION

WSP Acoustics has undertaken a noise impact assessment of the plant items proposed to be installed on Block A of the St Martin's Centre Development, which will serve the tenants of the ground floor restaurant of Block A.

The purpose of the noise impact assessment is to discharge part (i) of planning condition 31, set by Reading Borough Council (RBC), relating to mechanical plant noise.

An environmental noise survey previously undertaken by Cundall has been used to establish the background noise levels on site and set plant noise emission limits in accordance with RBC's requirements.

Details of the noise emission levels of all the proposed plant items have been provided by Workman LLP and have been used in a detailed assessment to calculate the resultant cumulative plant noise levels at the nearest noise sensitive receptors.

The assessments have demonstrated that mitigation measures are required to meet the plant noise criteria outlined in the planning conditions.

Section 7 of this report presents the recommended mitigation measures to meet the criteria and satisfy the planning conditions.

With these mitigation measures, plant noise levels are predicted to comply with the planning requirements.

Limitations to this report can be found in Appendix G.

APPENDIX

A ACOUSTIC GLOSSARY



ACOUSTIC TERMINOLOGY

Noise is defined as unwanted sound. Human ears are able to respond to sound in the frequency range 20 Hz (deep bass) to 20,000 Hz (high treble) and over the audible range of 0 dB (the threshold of perception) to 140 dB (the threshold of pain). The ear does not respond equally to different frequencies of the same magnitude, but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting mechanism is used. This reduces the importance of lower and higher frequencies, in a similar manner to the human ear.

Furthermore, the perception of noise may be determined by a number of other factors, which may not necessarily be acoustic. In general, the impact of noise depends upon its level, the margin by which it exceeds the background level, its character and its variation over a given period of time. In some cases, the time of day and other acoustic features such as tonality or impulsiveness may be important, as may the disposition of the affected individual. Any assessment of noise should give due consideration to all of these factors when assessing the significance of a noise source.

The most widely used weighting mechanism that best corresponds to the response of the human ear is the 'A'-weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or L_{Aeq} , L_{A90} etc., according to the parameter being measured.

The decibel scale is logarithmic rather than linear, and hence a 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective, but as a general guide a 10 dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB(A) is generally regarded as the minimum difference needed to perceive a change under normal listening conditions.

An indication of the range of sound levels commonly found in the environment is given in the following table.

Table A-1: Typical sound levels found in the environment

SOUND LEVEL	LOCATION
0 dB(A)	Threshold of hearing
20 to 30 dB(A)	Quiet bedroom at night
30 to 40 dB(A)	Living room during the day
40 to 50 dB(A)	Typical office
50 to 60 dB(A)	Inside a car
60 to 70 dB(A)	Typical high street
70 to 90 dB(A)	Inside factory
100 to 110 dB(A)	Burglar alarm at 1m away
110 to 130 dB(A)	Jet aircraft on take off
140 dB(A)	Threshold of pain

APPENDIX

Table A-2: Terminology relating to noise

TERMINOLOGY	DESCRIPTION
Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of $20\mu\text{Pa}$ (20×10^{-6} Pascals) on a decibel scale.
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 $20\mu\text{Pa}$.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level 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.
$L_{eq,T}$	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 during the 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.
$L_{90,T}$	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.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m.
Façade	At a distance of 1m in front of a large sound reflecting object such as a building façade.
Fast/Slow Time Weighting	Averaging times used in sound level meters.
Octave Band	A range of frequencies whose upper limit is twice the frequency of the lower limit.

APPENDIX

B EXISTING SITE PLAN



APPENDIX

C PROPOSED CONSOLIDATED SITE PLAN

A large, white, stylized chevron graphic pointing downwards, located in the bottom left corner of the page. It is composed of two overlapping triangular shapes.

- | | | | | | | | | | | | | | | | | | | |
|---|---|-------------------------------|--|---|---|---|---|--|---|---|--|--|---|----------------------------|----------------|--------------|--------------------------|-----------------|
| RETAIL PARKING AT GRADE: 179
CONSISTING OF:
15 STANDARD
162 STANDARD | RETAIL CAR PARKING ON DECK:
129 STD BAYS | RESIDENTIAL/STAFF PARKING: 16 | PROPOSED RESTAURANT/ GROUND FLOOR
FOR AREAS PLEASE REFER TO PLANS AND
ELEVATIONS | PROPOSED RESIDENTIAL FLOORS (17 UNITS)
FOR AREAS PLEASE REFER TO PLANS AND
ELEVATIONS | EXISTING RETAIL GROUND FLOOR
FOR AREAS PLEASE REFER TO PLANS AND
ELEVATIONS | PROPOSED RESIDENTIAL FLOOR (4 UNITS)
FOR AREAS PLEASE REFER TO PLANS AND
ELEVATIONS | EXISTING RETAIL GROUND FLOOR
FOR AREAS PLEASE REFER TO PLANS AND
ELEVATIONS | PROPOSED RESTAURANT & CINEMA FLOORS
FOR AREAS PLEASE REFER TO PLANS AND
ELEVATIONS | EXISTING RETAIL GROUND FLOOR :
FOR AREAS PLEASE REFER TO PLANS
AND ELEVATIONS | PROPOSED RESIDENTIAL FLOORS (19 UNITS)
FOR AREAS PLEASE REFER TO PLANS AND
ELEVATIONS | EXISTING WAITROSE
FOR AREAS PLEASE REFER TO PLANS AND
ELEVATIONS | PROPOSED WAITROSE
FOR AREAS PLEASE REFER TO PLANS AND
ELEVATIONS | UNITS TO BE DEMOLISHED:
316 SQ M/3,401 SQ FT | LISTED BUILDINGS - LIBRARY | EXISTING TREES | SERVICE YARD | RETAIL ACCESS AND KIOSKS | RECYCLING POINT |
|---|---|-------------------------------|--|---|---|---|---|--|---|---|--|--|---|----------------------------|----------------|--------------|--------------------------|-----------------|

PLANNING

Project:
St Martin's Centre, Church Street
Caversham

Proposed Consolidated Site Plan
& Car Park

Drawn by: 15000/BA1
Date: 2013
Project No: 18511
Drawing No: PP-APP-02
Revision: P2

Drawings based on survey information provided by Encompass Surveys, completed 15/10/2013 and Ordnance Survey data.

Layout for illustrative purposes only. All area figures to be checked on site or against full building survey.

Site boundary taken from Information supplied by client. It is approximate with and register records from client.

All existing structure assumed and subject to structural engineers survey.

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APPENDIX

D CUNDALL ENVIRONMENTAL NOISE REPORT



Hermes Property Limited Trust

St Martin's Centre Caversham

Environmental Noise Report

Job No: 1006081

Doc No: 1006081-RPT-00014

Latest Revision: A

Date: 17/06/2014

Project name	St Martin's Centre, Caversham	Job Number
Report Name	Environmental Noise Report	1006081

Document Revision History

Revision Ref	Issue Date	Purpose of issue / description of revision
-	23/05/2014	Client comments

Document Validation (latest issue)

Revision A	Issue Date 17/06/2014	Purpose of issue / description of revision / version			
		Outline Planning			
			Prepared by	Checked by	Verified by
		Initials	JW	MRE	MRE
		Signature			

Executive Summary

Reading Borough Council have requested a noise assessment be carried out as part of the proposed regeneration of the St Martin's Centre in Caversham.

The assessment has been made to address issues raised by Jodie Wilson, Senior Environmental Health Office at Reading Borough Council. This included an assessment of the potential noise impact that the development may have on existing noise sensitive premises, in addition to an assessment for mitigation measures required for proposed residential dwellings.

A 3D noise model of the site has been created to accurately predict noise propagation across the site. Using the model, a comparison of traffic flows for the years 2014 and 2019, with and without the development has been made. Both the natural increase in traffic flow and the anticipated increase due to the development result in either 'No change' or 'Negligible' significance criteria, when compared to the classification of magnitude of noise impact set out in the DMRB.

Based on measured noise data, recommended limiting noise levels for breakout noise for A1/A3 units and the cinema have been set, in addition to limiting noise levels for any new items of services plant.

Using the 3D model, and the 2019 With Development scenario, the noise impact on proposed residential dwellings has been assessed. Recommended mitigation measures for glazing and ventilation have been made. On the most exposed façade, overlooking Church Street, the glazing attenuation requirements to achieve an internal noise level of 30 dBA $L_{Aeq,T}$ are 40 dB $R_w + C_{tr}$, with fresh air requirements to be met through mechanical ventilation.

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1. Introduction

Cundall has been instructed by Hermes Property Limited Trust to carry out an assessment of the potential noise issues that may arise from the proposed re-development of the St Martin's Centre in Caversham.

The development site is split into five separate blocks as follows:

- Block A – comprising ground floor restaurant with 17 residential units above
- Block B – comprising existing retail at ground floor with 4 residential units above existing residential
- Block C – comprising existing retail at ground floor with proposals for restaurant and cinema above
- Block D – comprising existing retail at ground floor with 19 residential units above
- Block E – proposed extension to existing Waitrose Store

In addition to the above, proposals are to redevelop the existing car parking to the rear of the site, to include a single deck car park.

The following Figure [extract from Barton Willmore drawing PA-102 shows the extent of the proposed development and location of each block]:

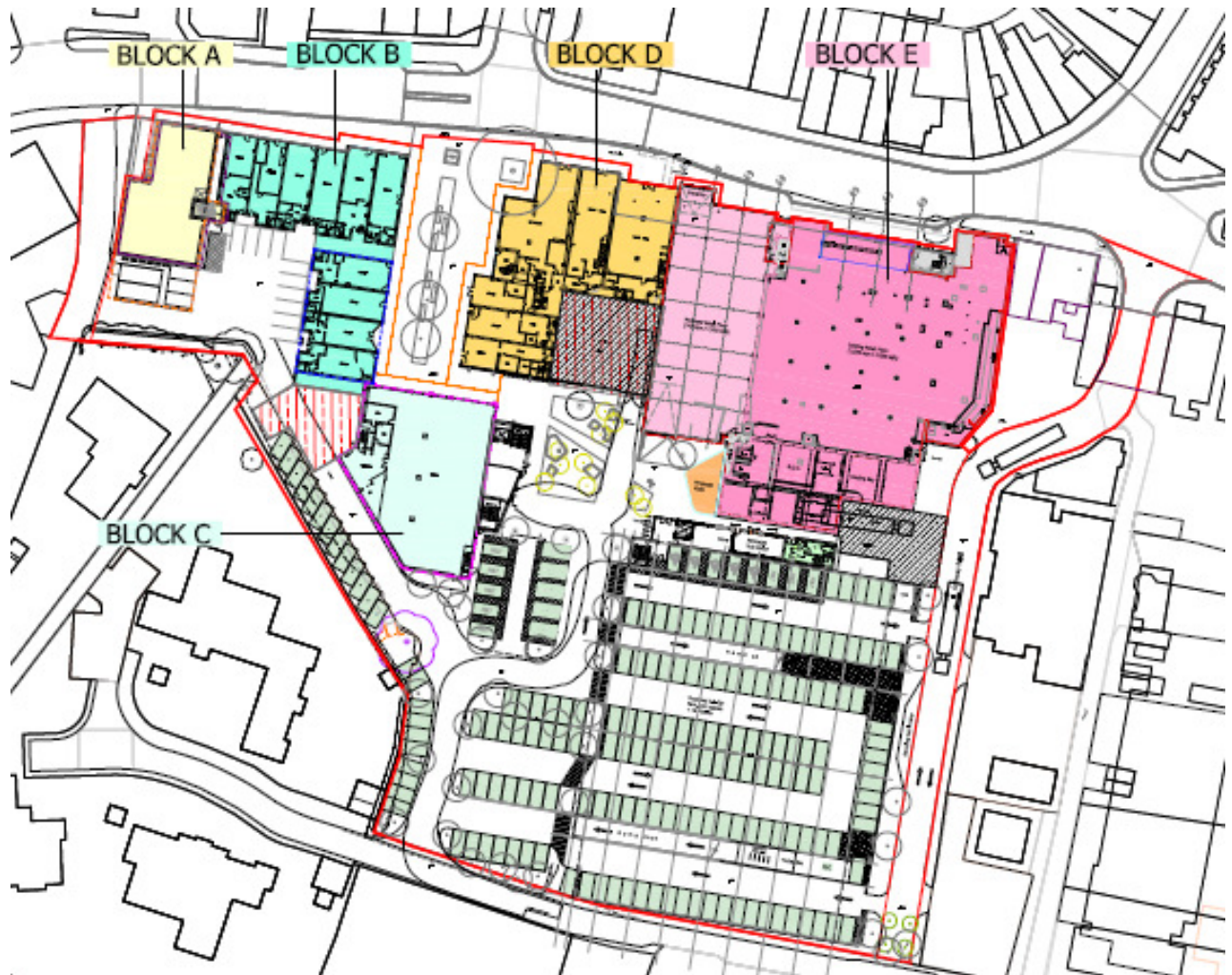


Figure 1 - Proposed layout showing each Block

The purpose of this Report is to as follows:

- to document existing ambient and background noise levels around the site;
- to provide a summary of good practice measures for the control of construction noise
- to assess the potential noise impact from the proposed development on existing noise sensitive premises
- to assess the noise impact on proposed residential dwellings from existing noise sources
- to set limiting noise levels for new items of services plant associated with the development.

2. Design Criteria

2.1 Local Authority Planning Requirements

The requirements of Reading Borough Council [RBC] for the noise assessment are set out in an internal memo from Jodie Wilson, Senior Environmental Health Office, to Stephen Vigar, dated 24th December 2013 [appended to this Report in Section 9]. In addition, the noise impact assessment requirements were discussed with Jodie on 23rd May 2014 and set out in an email [copy appended to this report in Section 9] from the author to Jodie on 27th May 2014.

2.1.1 Noise impact on residential development

Reading Borough Council's noise policy for new build residential development is for internal ambient noise levels to be designed to meet the 'good' criteria within the 1999 version of British Standard 8233 [BS 8233]. These are summarised in the following Table:

Room	Design criteria ['good']
Bedrooms	$\leq 30 \text{ dB } L_{Aeq,T}$
Living rooms	$\leq 30 \text{ dB } L_{Aeq,T}$
Gardens and balconies	$\leq 50 \text{ dB } L_{Aeq,T}$

Table 1 - Internal noise criteria for new build residential development

Received correspondence from RBC confirms that the above requirements are based on British Standard 8233:1999 and the World Health Organisation Community Guidelines. BS 8233: 1999 has been superseded in February 2014. The 2014 version retains the 'good' criteria for residential developments, but removes the upper 'reasonable' range. There is also no reference to a maximum criteria is either RBCs correspondence or the new BS 8233: 2014.

Glazing will be specified to provide appropriate sound insulation properties to see that the above internal noise levels can be achieved, in addition to comments made on the anticipated maximum noise impact [in line with BS 8233:1999].

With regards ventilation, it is understood that "*Ventilation measures should be selected which do not allow unacceptable noise ingress and should provide sufficient ventilation to avoid the need to open windows in hot weather, however non-openable windows are not considered an acceptable solution due to the impact on living standards.*"

2.1.2 Noise arising from commercial / industrial development

Any new items of services plant associated with the development should be designed and installed such that the rating level is no greater than 10 dB below the existing background $[L_{A90,T}]$ noise level. The assessment is based on the methodology set out in BS 4142: 1977.

2.1.3 Noise arising from ‘other’ sources

No specific guidance is given in respect of specific noise sources, such as from the car park or service yards. However, it is considered that the principles set out above [Sections 2.1.1 & 0] can be used. ‘Typical’ noise data for services yards and anticipated car park usage will be input into a 3D noise model to provide the average noise impact from such activities.

Similarly, no specific guidance has been provided for noise from the proposed cinema / restaurants, and therefore best practice measures have been included for within this report. It was noted by Jodie Wilson that opposite the site, there is an existing restaurant which opens its frontage during hot weather and at the time of writing no complaints of noise have been received.

3. Noise climate

Noise surveys have been carried out to establish the existing ambient and background noise levels around the site and to determine the noise impact on proposed residential dwellings. The measured noise levels have also been used to calibrate and verify a 3D noise map of the site that can more accurately assess noise propagation from multiple existing and proposed noise sources. The following sub-sections provide details on the noise surveys and 3D noise modelling.

3.1 Noise surveys

The following noise surveys were carried out:

- Daytime noise surveys were carried out between approximately 14:10 and 20:00 hours on 7th November 2013
- Night-time noise surveys were carried out between approximately 01:00 and 04:00 hours on 8th May 2014

Measurements were made with two CEL 633 Class 1 sound level meters [serial numbers 1211404 and 1211405]. Meters were field calibrated prior to, and immediately following measurements with no significant drift noted. Copies of relevant calibration certification can be supplied upon request.

All measurements were made on a tripod, in free field locations, approximately 1.5 m above ground floor level. Weather conditions for the duration of the surveys were dry, with no precipitation and <3m/s wind speeds.

Measurements were made concurrently of numerous noise descriptors, but the key factors used in this assessment are as follows:

- $L_{Aeq,T}$ – the average A-weighted noise level exposure over a given time period, T;
- $L_{A90,T}$ – the A-weighted noise level exceeded for 90% of the measurement period, T, commonly accepted as being the 'background' noise level;
- L_{Amax} – the maximum A-weighted noise level within a particular measurement period.

Figure 2 shows the red line site boundary with the indicative measurement locations marked.

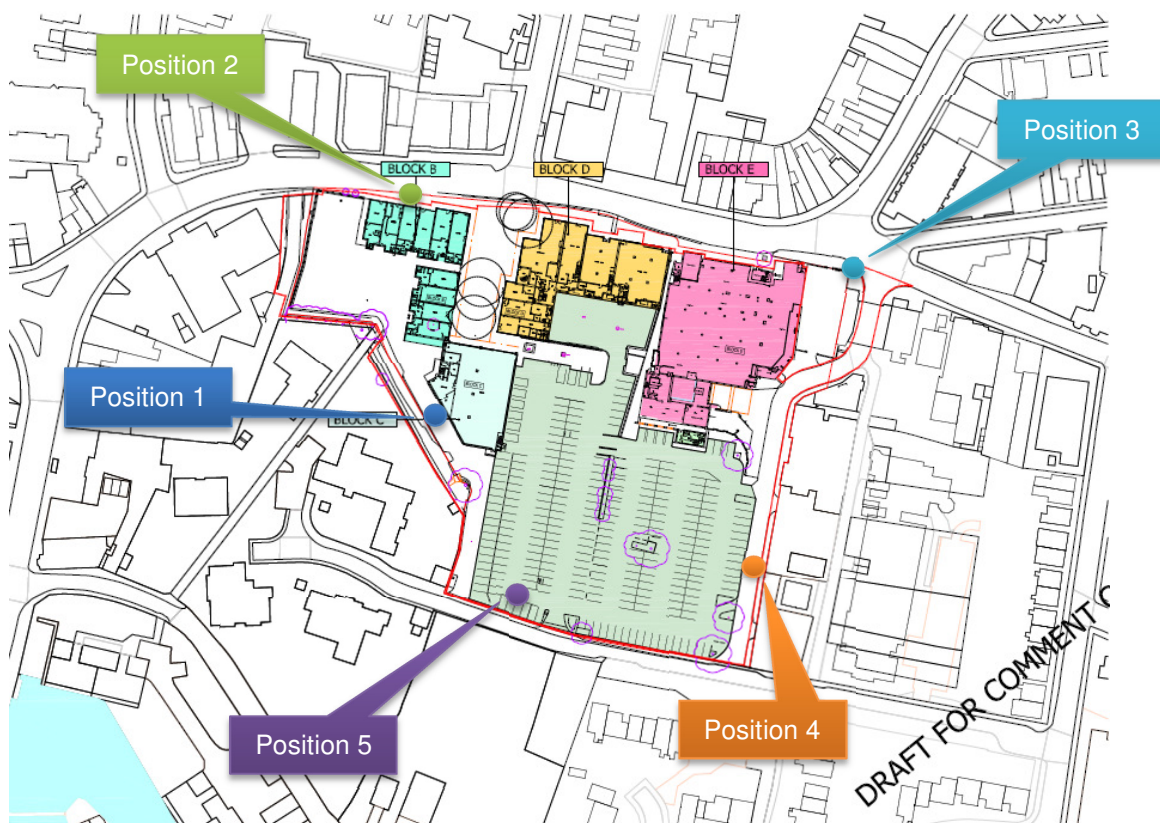


Figure 2 - Site plan showing indicative location of measurement positions

The following Table shows a summary of measurement results for each position. All values are in dBA. Detailed measurement results are shown in Section 8 below. All values shown are in dBA.

Measurement Position / Period		Averaged ¹ $L_{Aeq,T}$	L_{AFmax} ²	$L_{A90,T}$ ³
1	Daytime	51.3	77.3 [53 - 77]	47
2	Daytime	68.8	92.3 [75-92]	60
	Night-time	54.3	77.5 [46-77]	37
3	Daytime	68.1	96.7 [74-96]	67
4	Daytime	59.5	80.3 [66-80]	49
	Night-time	46.6	71.3 [48-71]	42
5	Daytime	54.2	75.3 [61-75]	45
	Night-time	47.6	70.8 [45-70]	41

Table 2 - Summary of measured noise levels

3.2 3D noise model

In order to accurately assess noise propagation across the site, a 3D noise model has been created, using SoundPlan [version 7.2]. The model has been calibrated using measured noise data around the site and also road traffic data provided by WYG. For service yards and car parks, typical activity noise levels have been used in the assessment.

Road traffic data has been provided by WYG in the form of Annual Average Daily Traffic figures for the following scenarios:

- 2014 Base – existing traffic levels around the site
- 2019 Base – projected traffic levels around the site with no development
- 2019 With development – projected traffic levels around the site with the development

¹ The logarithmically averaged noise measured during the period

² Highest L_{Amax} is shown with the range in brackets below

³ The typical background noise level is determined by taking the highest frequency density when plotted as a histogram. Where two distinct frequency ranges are evident [i.e. at positions 2 and 4, i.e. where daytime and evening background noise levels vary considerably], the lowest value is recorded.

4. Construction noise

During the construction period, some disturbance to noise sensitive properties is inevitable. The level of disturbance is however likely to reduce, particularly towards the end of the construction phase as internal works and fit-out would inherently be less obtrusive.

The contractor will be required to comply with the requirements of BS 5228-1:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites – Part 1: Noise' and provide Reading Borough Council with a Construction Management Plan.

The following is good practice guidance for the management of construction noise and vibration, in addition to the guidance given and required by Reading Borough Council:

- Effective communication between the main contractor and nearby noise sensitive receptors (residential and commercial) outlining current and forthcoming activities, including timescales. For a development of this scale, a 'point of contact' with dedicated phone number and email address should be made available for queries and complaints. Effective communication is important in controlling adverse community reaction to noise
- Appropriate hours of noisy work adjacent to residential dwellings should be restricted to 08:00 to 18:00 hours Monday to Friday and 08:00 to 13:00 hours on Saturday, with no noise activities taking place on Sundays or Bank Holidays. Maximum permitted noise levels are 72 dBA $L_{Aeq,10hr}$ Monday to Friday and 72 dBA $L_{Aeq,5hr}$ Saturdays adjacent to residential dwellings
- Site vehicles should not be left idling, particularly when in close proximity to residential dwellings. This is also applicable to other site machinery, such as pumps, generators etc, which, if not in use, should be shut down
- Over-revving of works vehicles should be avoided and site access should be configured to minimise disruption
- Site hoarding should be installed to provide barrier attenuation against noise. To be effective, the barrier should block the line of sight between the noise source and receptor, and screens are more effective closer to the noise source. Site hoarding can also be used as an effective communication tool if details of the construction programme and activities are placed on the hoarding. Transparent screens can be used to allow a visual appreciation of on-going works
- Careful selection of plant and machinery should be made to minimise noise impact and all items of plant and machinery should be well maintained in accordance with the manufacturer's instructions. Where feasible, appropriate silencers should be used to reduce noise levels at source
- Constant monitoring of activities and noise levels around the site will be required to identify areas where any additional mitigation measures could be employed.

- Careful consideration will be required for the use of heavy equipment, particularly piling equipment to reduce vibration impact on nearby persons, such as auger driven piling as opposed to impact piling, where feasible