

KR05011

Residential Development Ranelagh Road



Noise Impact Assessment...

Standard: British Standard 8233: 2014

Site: Land south of Ranelagh Road

Address: (50.850778, -0.994156)

Ranelagh Road

Havant

Postcode: Hampshire

Customer: Foreman Homes Group

Address: Unit 1 Station Industrial Estate

Duncan Road

Park Gate

Postcode: SO31 1BX

Issue: V1.1

Date: 19 March 2016

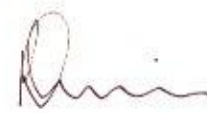
Status: Full Report

KR Associates (UK) Ltd

Quietly confident...



Revisions...

KR05011	Project	Residential development land south of Ranelagh Road			
	Title	Noise Impact Assessment			
	Standard	British Standard 8233: 2014			
Issue	Date	Details of Revision			
v1.0	19/03/2016	Description	Issue of report for submission to Local Authority		
		Roles	Prepared by	Checked by	Issued by
		Signature			
		Name	Miss I. Samphier	Miss N. Truman	Mr. R Scrivener
		Position	Consultant	Project Manager	Technical Director
		v1.1	12/04/2016	Description	Updated Drawing
Roles	Prepared by			Checked by	Issued by
Signature					
Name	Miss I. Samphier			Miss N. Truman	Mr. R Scrivener
Position	Consultant			Project Manager	Technical Director

Disclaimer...

This document is strictly confidential and is designed to meet the requirements of the customer. It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party. No Liability is accepted outside the scope of this report in strict accordance with the standard terms and conditions.

KR Associates...

KR Associates (UK) Ltd (Company No. 04813349) registered office at 56 Bassett Green Road, Southampton. SO16 3DX.

London: 0203 77 11 368 Manchester: 0161 30 20 593 Southampton: 02380 55 04 55

Table of Contents.....

1	Executive Summary.....	5
1.1	Instruction	5
1.2	Scope of Report.....	5
1.3	Executive Summary	5
1.3.1	Summary of Criterion.....	5
1.3.2	Measurements	5
1.3.3	Free Field Noise Levels.....	5
1.3.4	Mitigation Measures	6
1.4	Conclusions	6
2	Site Location.....	7
2.1	Position of Site in the Wider Area	7
2.2	Proposed Development.....	8
2.3	Background Measurement Positions	9
3	Background Noise Measurements.....	10
3.1	Position 1 (April 2014)	10
3.1.1	10:00 on Friday, 4 th April 2014 to 07:00 on Saturday 5 th April 2014.....	10
3.1.2	07:00 on Saturday, 5 th April 2014 to 07:00 Sunday, 6 th April 2014	11
3.2	Position 2 (April 2014)	12
3.2.1	10:00 on Friday, 4 th April 2014 to 07:00 on Saturday 5 th April 2014.....	12
3.2.2	07:00 on Saturday, 5 th April 2014 to 07:00 Sunday, 6 th April 2014	13
3.3	Position 3 (March 2016).....	14
3.3.1	15:00 on Tuesday 15 th March 2016 to 07:00 on Wednesday 16 th March 2016	14
3.3.2	07:00 on Wednesday 16 th March 2016 to 07:00 on Thursday 17 th March 2016.....	15
3.4	Spot Measurements	16
3.4.1	Spot Measurement Position 1 (Marples Way).....	16
3.4.2	Spot Measurement Position 2 (Marples Way).....	16
3.4.3	Spot Measurement Position 3 (Brockhampton Road).....	17
3.4.4	Spot Measurement Position 4 (Brockhampton Road).....	17
3.4.5	Spot Measurement Position 5 (Paulk Road)	17
3.5	Background Noise Climate	17
3.6	3D Noise Maps.....	18
3.6.1	Day Time (07:00 – 23:00).....	18
3.6.2	Night Time (07:00 – 23:00).....	19
4	Methodology and Criterion.....	20
4.1	British Standard 8233: 2014 ("BS8233").....	20
4.1.1	Internal Ambient Noise Levels for dwellings.....	20

4.1.2	External Amenity Space	20
4.2	Calculation Procedure	21
4.3	Transmission Loss Data	21
4.3.1	Ventilation (D_{ne}).....	21
4.3.2	Glazing (R_{gl})	21
4.3.3	Walls (R_{ew}).....	21
4.3.4	Ceiling (R_{ct}).....	22
4.4	Mitigation Measures	22
5	Assessments	23
5.1	Day Time (07:00 to 23:00) Internal Noise Levels.....	23
5.1.1	3D Noise Maps (Free Field Levels)	23
5.1.2	British Standard 8233: 2014 Assessment	24
5.1.3	Conclusion.....	24
5.2	Night Time (23:00 to 07:00) Internal Noise Levels	25
5.2.1	3D Noise Maps (Free Field Levels)	25
5.2.2	British Standard 8233: 2014 Assessment	26
5.2.3	Conclusion.....	26
5.3	Day Time (07:00 to 23:00) External Noise Levels (Gardens)	27
5.3.1	3D Noise Maps (Free Field Levels)	27
5.3.2	External Amenity Space	27
5.3.3	Conclusion.....	27
6	Conclusions.....	28
6.1	Summary of Criterion	28
6.2	Measurements	28
6.3	Free Field Noise Levels	28
6.4	Mitigation Measures	28
6.5	Conclusions	28

1 Executive Summary...

1.1 Instruction

KR Associates have been instructed by Foreman Homes Group to undertake a noise impact assessment to determine if the noise from the existing road and industrial noise sources will have an acceptable impact on the proposed residential development on the land south of Ranelagh Road in Havant.

1.2 Scope of Report

The report is prepared in general accordance with British Standard 8233: 2014. The report will aim to determine the existing background noise environment by measuring continuous background noise levels at several key positions and then creating a 3D noise map of the site and surrounding area. The free field noise levels generated by the noise map will then be used to undertake a noise assessment to determine compliance with the noise levels detailed in table 4 of section 7.7.2. of British Standard 8233: 2014 both in terms of internal noise levels and levels within the gardens.

1.3 Executive Summary

1.3.1 Summary of Criterion

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Room	$L_{Aeq, 16 \text{ hour}}$ 35 dB	--
Dining	Dining Room	$L_{Aeq, 16 \text{ hour}}$ 40 dB	--
Sleeping (Daytime Resting)	Bedroom	$L_{Aeq, 16 \text{ hour}}$ 35 dB	$L_{Aeq, 8 \text{ hour}}$ 30 dB
External Amenity Space	Gardens	$L_{Aeq, 1}$ 55 dB	--

1.3.2 Measurements

Background noise measurements were undertaken on two separate occasions between 4th and 6th April 2014 and 15th and 17th March 2016 at three different measurement positions.

Time Period	Position 1 (April 2014)	Position 2 (April 2014)	Position 3 (March 2016)
Day Time (07:00 to 23:00)	$L_{Aeq, 16 \text{ hour}}$ 64 dB	$L_{Aeq, 16 \text{ hour}}$ 61 dB	$L_{Aeq, 16 \text{ hour}}$ 59 dB
Night Time (23:00 to 07:00)	$L_{Aeq, 8 \text{ hour}}$ 58 dB	$L_{Aeq, 8 \text{ hour}}$ 54 dB	$L_{Aeq, 8 \text{ hour}}$ 53 dB

1.3.3 Free Field Noise Levels

The following are the maximum free field noise levels likely to impact on the residential dwellings (no mitigation).

Time Period	Maximum Free Field Levels Impacting on a Residential Facade
Day Time (07:00 to 23:00)	$L_{Aeq, ff 16 \text{ hour}}$ 62 dB
Night Time (23:00 to 07:00)	$L_{Aeq, ff 8 \text{ hour}}$ 55 dB

1.3.4 Mitigation Measures

It has been recommended that in order to meet the criterion defined within British Standard 8233: 2014 the following mitigation measures are included within the development.

Time Period	Maximum Free Field Levels Impacting on a Residential Facade
Glazing	High Quality Double Glazing (4mm laminated glass both sides with a 14mm airgap)
Trickle Vents	High quality acoustic trickle vents.
Upper Floor Ceiling	2 Layers of 12.5mm soundbloc plasterboard
Acoustic Fence	South and South East Corner: 4.0m high timber acoustic fence (surface density of 8 Kg ^m ⁻²) South West Corner: 2.0m high timber acoustic fence (surface density of 8 Kg ^m ⁻²)

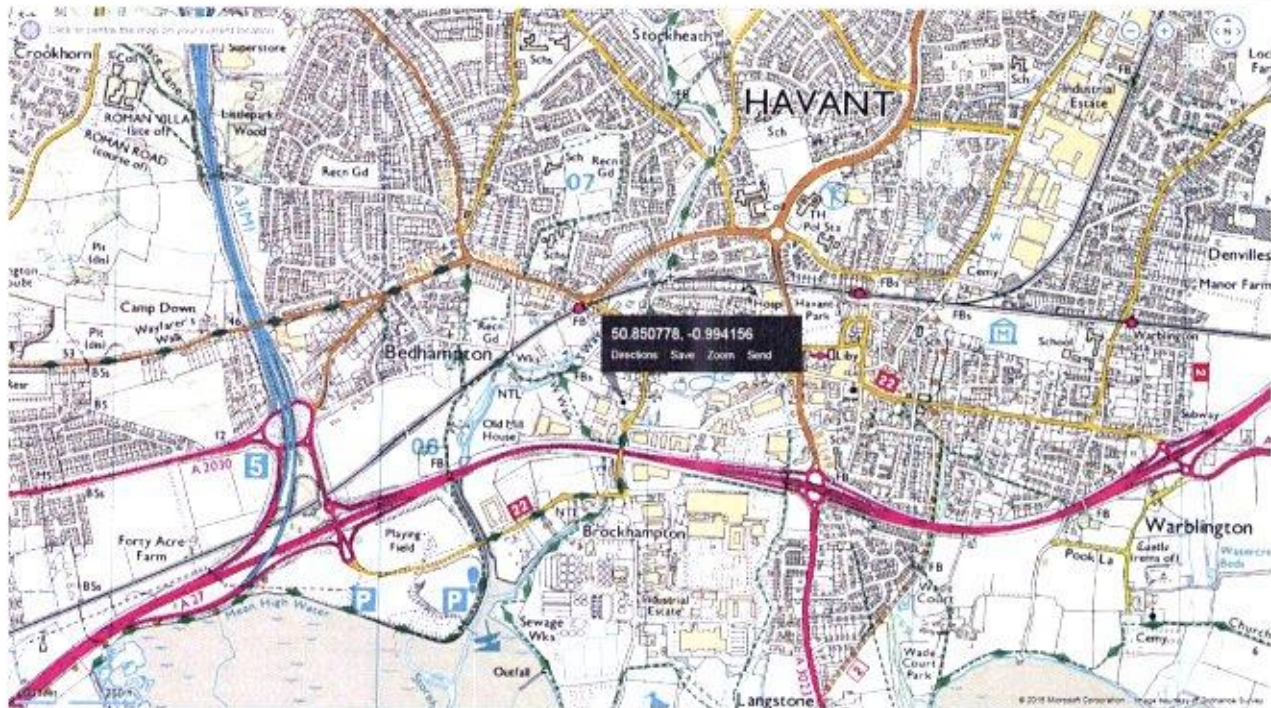
1.4 Conclusions

The assessments indicate that the internal noise levels within the dwellings and the external noise levels within the gardens will comply with the requirements of British Standard 8233: 2014.

2 Site Location...

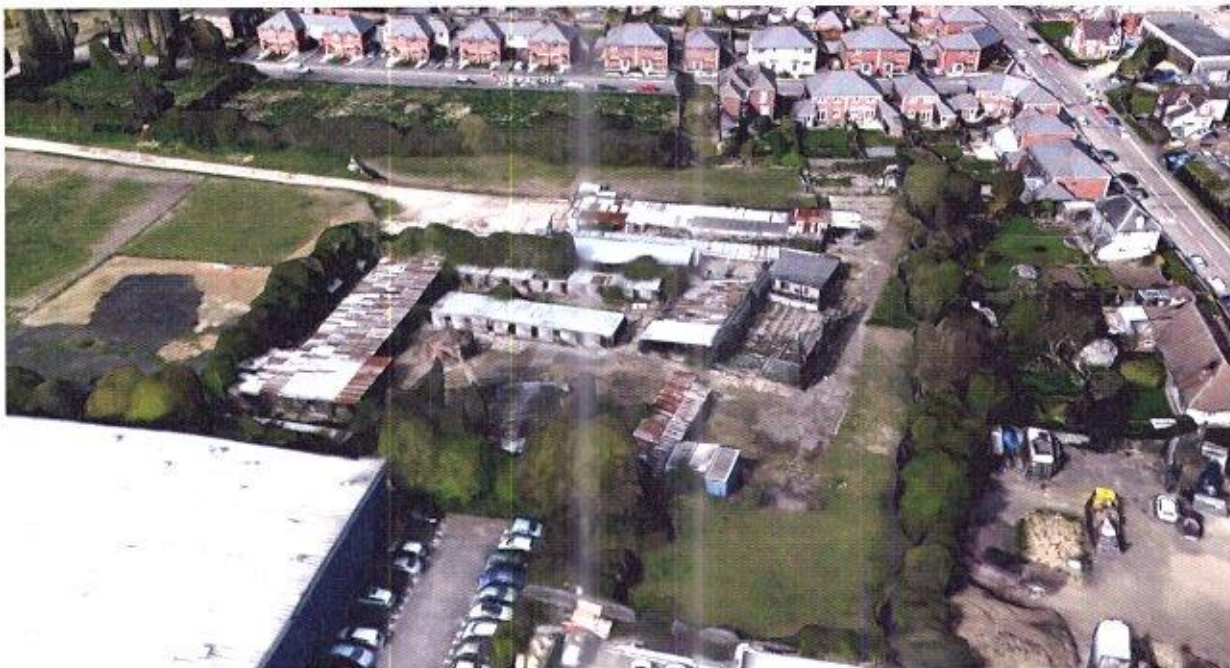
2.1 Position of Site in the Wider Area

The site is located on the South side of Ranelagh Road to the West of Brockhampton Road. The Marples Way Industrial Estate is to the South of the site with the A27 South Coast Road beyond that (approximately 250m from the site itself). Bedhampton Railway Station is approximately 250m to the North of the site.



2.2 Proposed Development

It is proposed develop a number of residential dwellings forming a small development on the vacant land south of Ranelagh Road in Havant. There are industrial units on the southern boundary, residential units on Brockhampton Road along the eastern boundary and open fields along the western boundary.



2.3 Background Measurement Positions



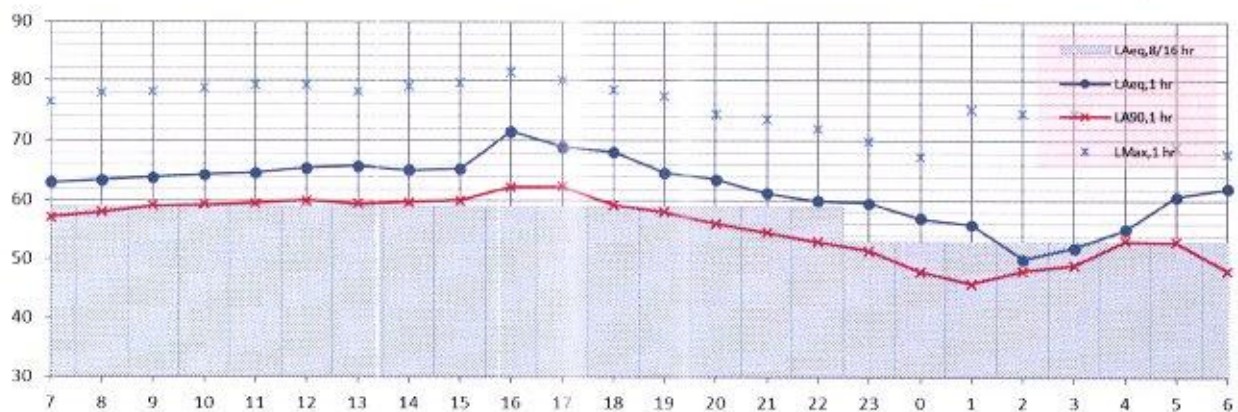
Background Position 1	Latitude:	50.851542°	Longitude:	-0.993019°	Elevation:	3.5m
Background Position 2	Latitude:	50.850456°	Longitude:	-0.995809°	Elevation:	3.5m
Background Position 3	Latitude:	50.852147°	Longitude:	-0.995252°	Elevation:	3.5m

3 Background Noise Measurements...

3.1 Continuous Background Levels - Position 1 (April 2014)

3.1.1 10:00 on Friday, 4th April 2014 to 07:00 on Saturday 5th April 2014

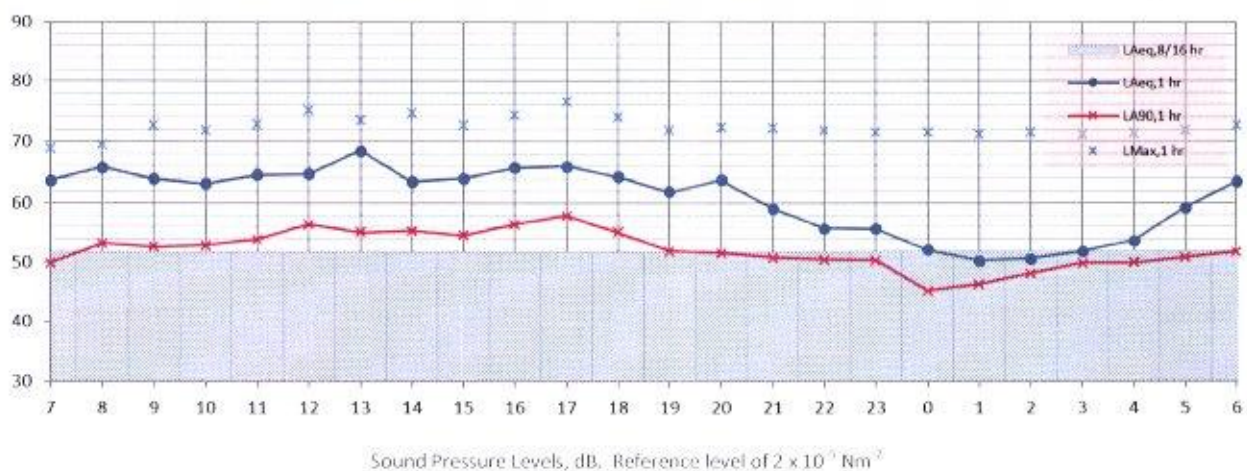
Time Period	L _{50,2}	Minimum 5 minute				1 Hour		Day and Night		
		L _{Aeq,5min}	L _{A(2),5min}	L _{A90,5min}	L _{Aeq,3hour}	L _{A(2),1hour}	L _{A90,1hour}	L _{Aeq,T}	L _{A(2),T}	L _{A90,10hours}
07:00 – 08:00	76.4	61.2	61.9	57.2	63.0	65.9	57.2			
08:00 – 09:00	78.0	61.4	62.7	58.6	63.4	66.1	58.1			
09:00 – 10:00	78.2	61.7	63.7	58.3	63.9	67.0	59.2			
10:00 – 11:00	78.8	62.4	64.0	58.6	64.4	67.1	59.4			
11:00 – 12:00	79.2	63.6	65.9	58.9	64.7	67.1	59.6			
12:00 – 13:00	79.2	64.2	66.9	59.2	65.5	68.0	60.1			
13:00 – 14:00	78.1	63.1	65.4	58.8	65.8	68.1	59.5			
14:00 – 15:00	79.1	64.1	66.7	59.4	65.1	67.7	59.8			
15:00 – 16:00	79.5	63.3	65.7	59.0	65.3	67.8	60.1	65	70	59
16:00 – 17:00	81.4	66.7	69.0	61.3	71.5	70.5	62.3			
17:00 – 18:00	80.1	66.2	68.5	61.4	69.0	71.8	62.4			
18:00 – 19:00	78.5	65.5	68.2	58.0	68.2	71.3	59.3			
19:00 – 20:00	77.3	62.5	63.1	57.4	64.7	67.2	58.1			
20:00 – 21:00	74.3	60.6	59.2	54.0	63.6	65.4	56.1			
21:00 – 22:00	73.6	57.0	56.7	52.6	61.3	60.2	54.6			
22:00 – 23:00	72.0	56.3	55.9	51.2	60.0	58.2	53.0			
23:00 – 00:00	69.9	54.7	53.6	49.7	59.6	57.8	51.5			
00:00 – 01:00	67.4	50.0	50.2	47.2	57.0	56.0	48.0			
01:00 – 02:00	75.1	50.5	54.6	53.6	56.0	55.4	46.0			
02:00 – 03:00	74.5	50.0	53.8	52.9	50.1	54.3	48.2			
03:00 – 04:00	74.3	50.0	53.4	52.8	52.0	54.3	49.1	57	61	53
04:00 – 05:00	74.2	50.0	54.0	52.7	55.1	55.1	53.2			
05:00 – 06:00	69.0	56.3	55.7	49.4	60.7	58.1	53.0			
06:00 – 07:00	67.9	56.5	57.7	47.4	62.1	62.4	48.2			



Sound Pressure Levels, dB. Reference level of $2 \times 10^{-5} \text{ Nm}^{-2}$

3.1.2 07:00 on Saturday, 5th April 2014 to 07:00 Sunday, 6th April 2014

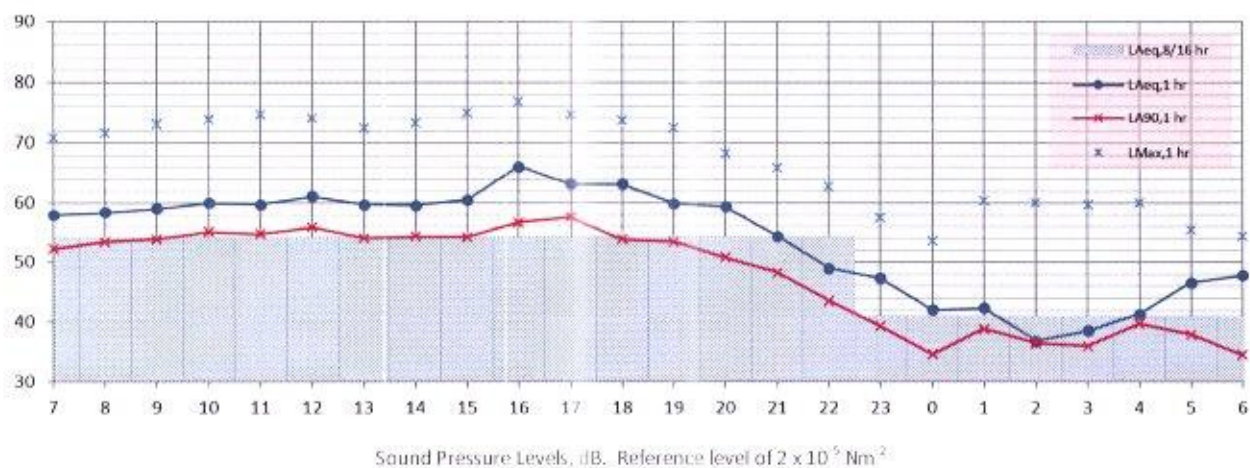
Time Period	L _{den}	Minimum 5 minute				1 Hour		Day and Night		
		L _{eq,5min}	L _{eq,5min}	L _{eq,5min}	L _{eq,5min}	L _{eq,1hour}	L _{eq,1hour}	L _{eq,d}	L _{eq,n}	L _{eq,tonight}
07:00 – 08:00	69.0	61.7	63.7	48.6	63.7	66.9	49.9			
08:00 – 09:00	69.5	62.9	65.4	50.0	65.8	68.5	53.3			
09:00 – 10:00	72.8	61.5	64.8	52.1	64.0	67.0	52.7			
10:00 – 11:00	71.9	60.6	63.6	51.5	63.2	66.4	52.9			
11:00 – 12:00	72.9	61.5	64.7	52.5	64.6	67.1	53.9			
12:00 – 13:00	75.2	64.0	66.5	55.6	64.8	67.3	56.4			
13:00 – 14:00	73.6	62.7	65.0	53.4	68.5	66.6	55.1			
14:00 – 15:00	74.6	62.5	64.6	54.4	63.5	66.1	55.3	64	67	52
15:00 – 16:00	72.7	61.7	64.8	52.5	64.1	66.7	54.6			
16:00 – 17:00	74.3	64.2	66.8	55.4	65.7	68.0	56.4			
17:00 – 18:00	76.6	64.9	67.9	56.6	66.0	69.2	57.9			
18:00 – 19:00	74.1	62.5	63.4	53.5	64.3	67.1	55.1			
19:00 – 20:00	72.0	57.3	56.9	51.4	61.9	64.6	52.0			
20:00 – 21:00	72.4	56.6	57.1	51.2	63.8	63.8	51.7			
21:00 – 22:00	72.3	50.1	51.9	50.8	59.1	58.5	50.9			
22:00 – 23:00	71.9	50.0	51.3	50.4	55.8	52.9	50.6			
23:00 – 00:00	71.6	50.0	51.0	50.2	55.7	51.6	50.4			
00:00 – 01:00	71.7	50.0	50.8	50.2	52.2	51.2	45.2			
01:00 – 02:00	71.4	50.0	50.3	49.8	50.4	50.8	46.3			
02:00 – 03:00	71.6	50.0	50.4	49.9	50.7	50.6	48.2	55	62	52
03:00 – 04:00	71.3	50.0	50.3	49.7	52.0	50.5	49.9			
04:00 – 05:00	71.5	50.0	50.5	49.9	53.7	51.6	50.0			
05:00 – 06:00	72.0	53.9	53.4	50.5	59.3	57.8	50.9			
06:00 – 07:00	72.7	59.4	59.0	51.5	63.6	63.6	51.8			



3.2 Continuous Background Levels - Position 2 (April 2014)

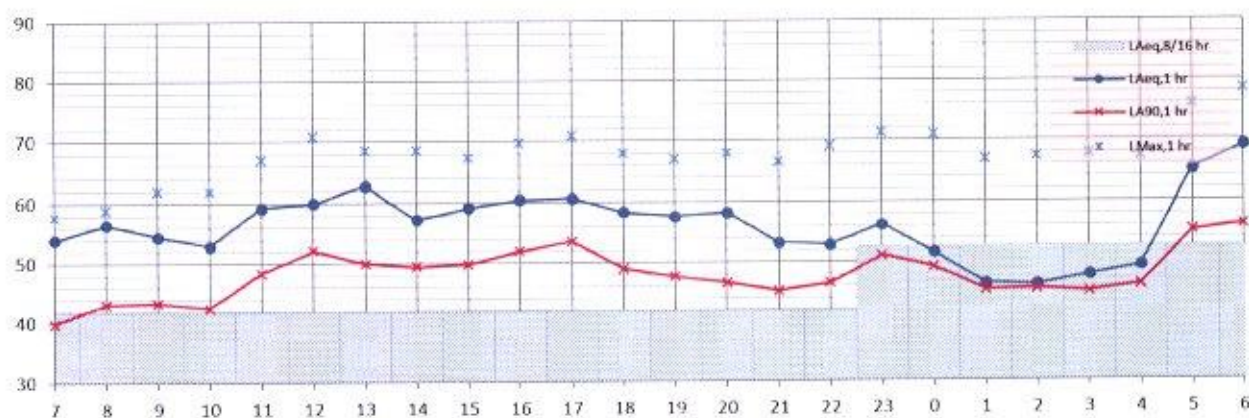
3.2.1 10:00 on Friday, 4th April 2014 to 07:00 on Saturday 5th April 2014

Time Period	L _{10,30}	Minimum 5 minute			1 Hour			Day and Night		
		L _{Aeq,5 min}	L _{A(10,5 min)}	L _{A90,5 min}	L _{Aeq,1 hr}	L _{A(10,1 hr)}	L _{A90,1 hr}	L _{Aeq,1}	L _{A(10,1)}	L _{A90,10+hours}
07:00 – 08:00	70.8	55.0	54.6	50.5	57.9	58.1	52.3			
08:00 – 09:00	71.7	56.0	55.6	51.1	58.4	59.4	53.4			
09:00 – 10:00	73.0	57.1	57.3	52.0	59.1	60.1	53.9			
10:00 – 11:00	73.9	58.0	58.4	53.3	60.0	60.9	55.1			
11:00 – 12:00	74.6	59.3	61.0	54.5	59.8	61.2	54.8			
12:00 – 13:00	74.1	59.9	62.0	54.7	61.1	62.5	55.9			
13:00 – 14:00	72.5	57.8	60.9	53.5	59.8	62.7	54.1			
14:00 – 15:00	73.2	58.0	61.3	55.2	59.6	61.5	54.3			
15:00 – 16:00	75.0	58.1	61.3	54.4	60.6	62.2	54.2	59	64	54
16:00 – 17:00	76.8	61.7	63.0	56.3	66.1	65.2	56.8			
17:00 – 18:00	74.6	61.8	62.4	55.6	63.2	65.7	57.6			
18:00 – 19:00	73.7	59.9	63.5	52.6	63.2	65.8	53.8			
19:00 – 20:00	72.5	56.5	58.9	51.7	59.9	62.1	53.4			
20:00 – 21:00	68.3	56.2	53.4	48.1	59.4	59.6	50.8			
21:00 – 22:00	66.0	49.7	49.5	46.0	54.4	53.1	48.3			
22:00 – 23:00	62.7	46.8	45.4	40.6	49.0	47.7	43.6			
23:00 – 00:00	57.5	41.7	42.4	37.3	47.3	44.7	39.4			
00:00 – 01:00	53.5	36.5	36.4	32.0	42.1	40.8	34.8			
01:00 – 02:00	60.4	36.0	41.1	38.8	42.4	41.6	39.0			
02:00 – 03:00	60.1	35.1	39.6	39.0	36.9	40.6	36.6			
03:00 – 04:00	59.8	36.2	40.1	39.1	38.6	41.0	36.1	43	45	41
04:00 – 05:00	60.1	34.9	40.3	38.1	41.4	41.2	39.8			
05:00 – 06:00	55.5	41.6	41.4	35.4	46.6	43.7	38.0			
06:00 – 07:00	54.4	43.0	44.0	33.4	47.8	47.2	34.6			



3.2.2 07:00 on Saturday, 5th April 2014 to 07:00 Sunday, 6th April 2014

Time Period	L _{date}	Minimum 5 minute				1 Hour		Day and Night		
		L _{Aeq,5min}	L _{Ain,5min}	L _{W,5min}	L _{W,5min}	L _{Aeq,1hr}	L _{W,1hr}	L _{den}	L _{night}	L _{evening}
07:00 – 08:00	57.8	50.8	53.8	39.3	54.0	57.6	39.8			
08:00 – 09:00	59.0	52.2	54.7	40.0	56.5	58.8	43.1			
09:00 – 10:00	62.0	51.1	53.8	41.7	54.5	55.8	43.3			
10:00 – 11:00	61.9	50.7	54.0	40.6	52.9	56.3	42.5			
11:00 – 12:00	67.1	56.9	59.1	47.1	59.3	61.1	48.3			
12:00 – 13:00	70.9	58.9	62.4	50.9	60.0	61.7	52.1			
13:00 – 14:00	68.7	58.4	60.6	49.1	62.8	62.0	49.9			
14:00 – 15:00	68.6	56.9	59.3	50.1	57.3	61.7	49.4			
15:00 – 16:00	67.3	56.2	60.0	46.8	59.2	62.4	49.8	57	62	42
16:00 – 17:00	69.8	58.8	62.1	49.8	60.5	62.6	51.9			
17:00 – 18:00	70.9	60.0	63.4	52.4	60.7	64.4	53.6			
18:00 – 19:00	68.0	56.9	57.2	49.0	58.4	61.0	49.0			
19:00 – 20:00	67.0	52.3	52.6	47.0	57.7	60.0	47.6			
20:00 – 21:00	68.0	50.8	52.5	45.2	58.3	59.5	46.6			
21:00 – 22:00	66.6	44.4	46.5	45.9	53.3	52.4	45.2			
22:00 – 23:00	69.1	47.2	48.8	46.5	52.9	49.1	46.5			
23:00 – 00:00	71.2	50.6	51.5	50.2	56.3	51.0	51.0			
00:00 – 01:00	70.9	49.5	50.2	50.8	51.6	51.5	49.1			
01:00 – 02:00	66.9	44.9	45.4	44.7	46.4	45.8	45.3			
02:00 – 03:00	67.3	45.1	45.7	45.8	46.2	47.4	45.5			
03:00 – 04:00	67.8	46.5	45.2	44.6	47.8	45.6	45.0	57	57	53
04:00 – 05:00	67.3	45.2	46.1	45.1	49.4	46.7	46.1			
05:00 – 06:00	75.9	59.1	57.5	54.5	65.2	62.6	55.1			
06:00 – 07:00	78.5	65.2	64.2	55.6	69.1	68.7	56.1			



Sound Pressure Levels, dB. Reference level of $2 \times 10^{-5} \text{ Nm}^{-2}$

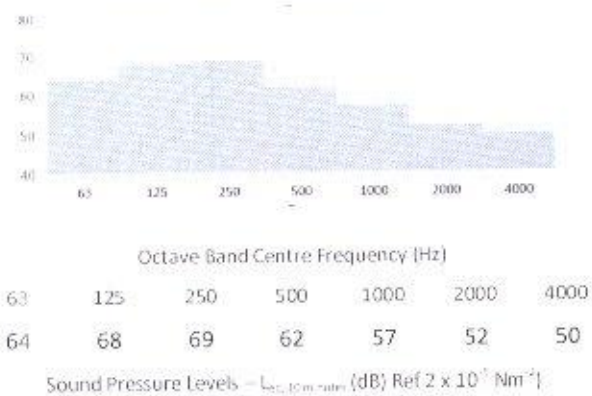
3.4 Spot Measurements (March 2016)



3.4.1 Spot Measurement Position 1 (Marples Way)



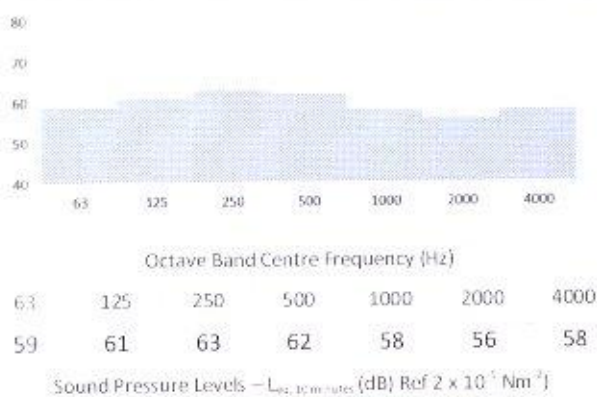
Large Warehouse at End of Marples Way



3.4.2 Spot Measurement Position 2 (Marples Way)



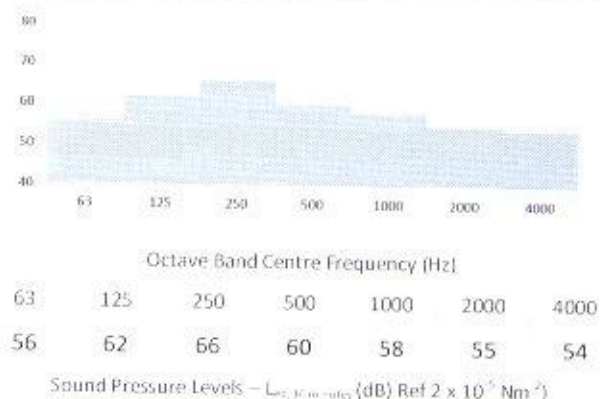
Wartsila (Left) and Spectrum (Right) – Light Industrial



3.4.3 Spot Measurement Position 3 (Brockhampton Road)



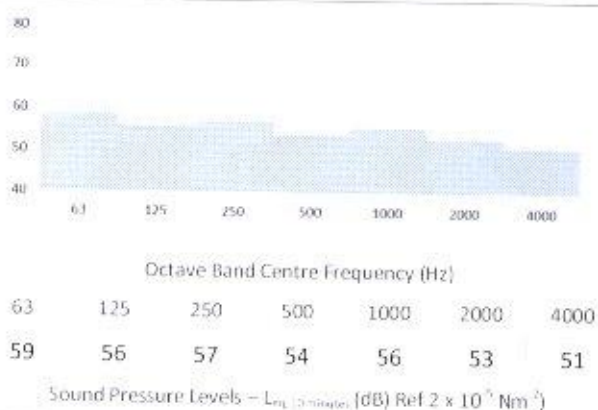
Plant Hire Adjacent to Site



3.4.4 Spot Measurement Position 4 (Brockhampton Road)



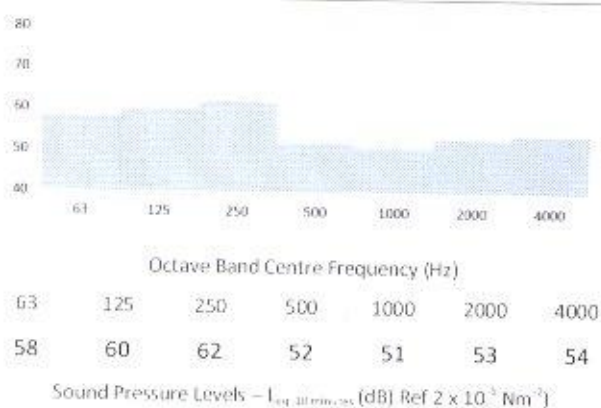
School and Storage Yard



3.4.5 Spot Measurement Position 5 (Paulk Road)



JDP Storage Yard



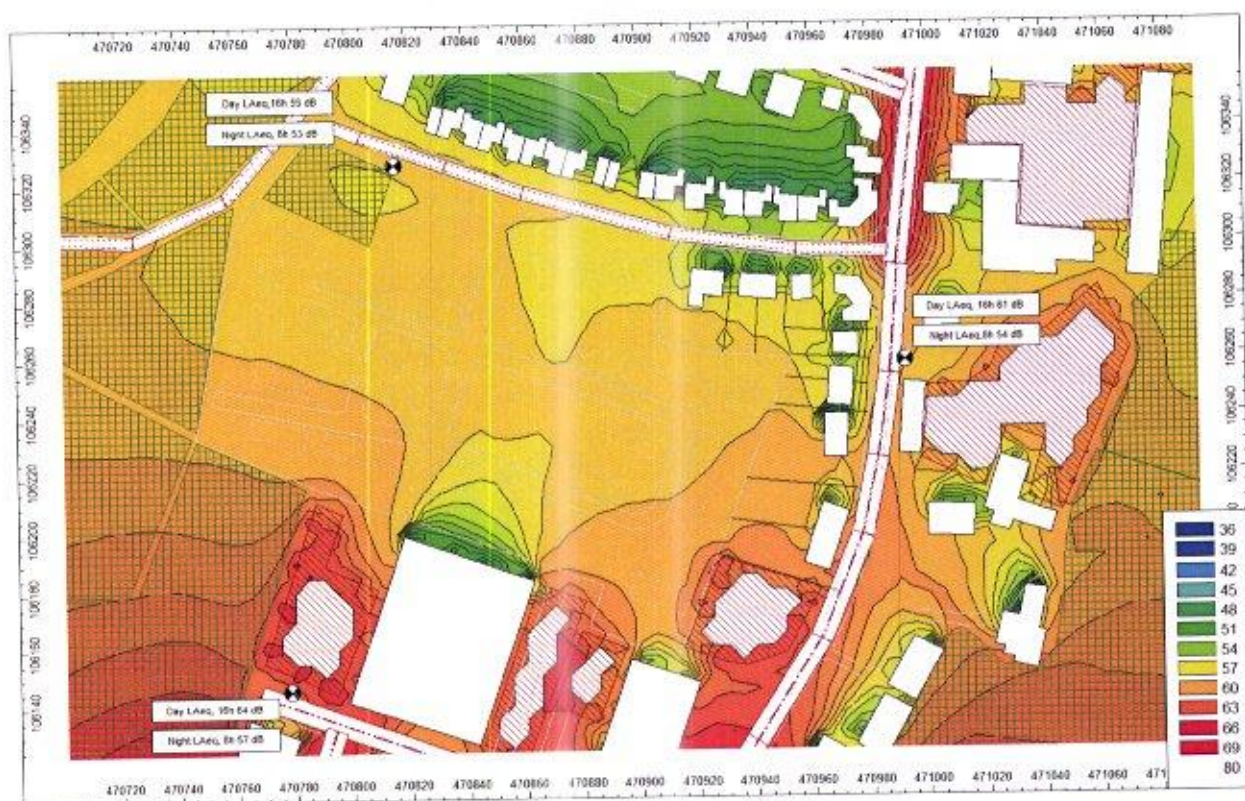
3.5 Background Noise Climate

The site is dominated by the traffic noise from the A27 to south and to some extent the local traffic along Marples Road and Brockhampton Road. The light industrial units along Marples Road to the south of the site and the small plant hire facility off Brockhampton Road on the south east corner of the site also impact the overall noise levels.

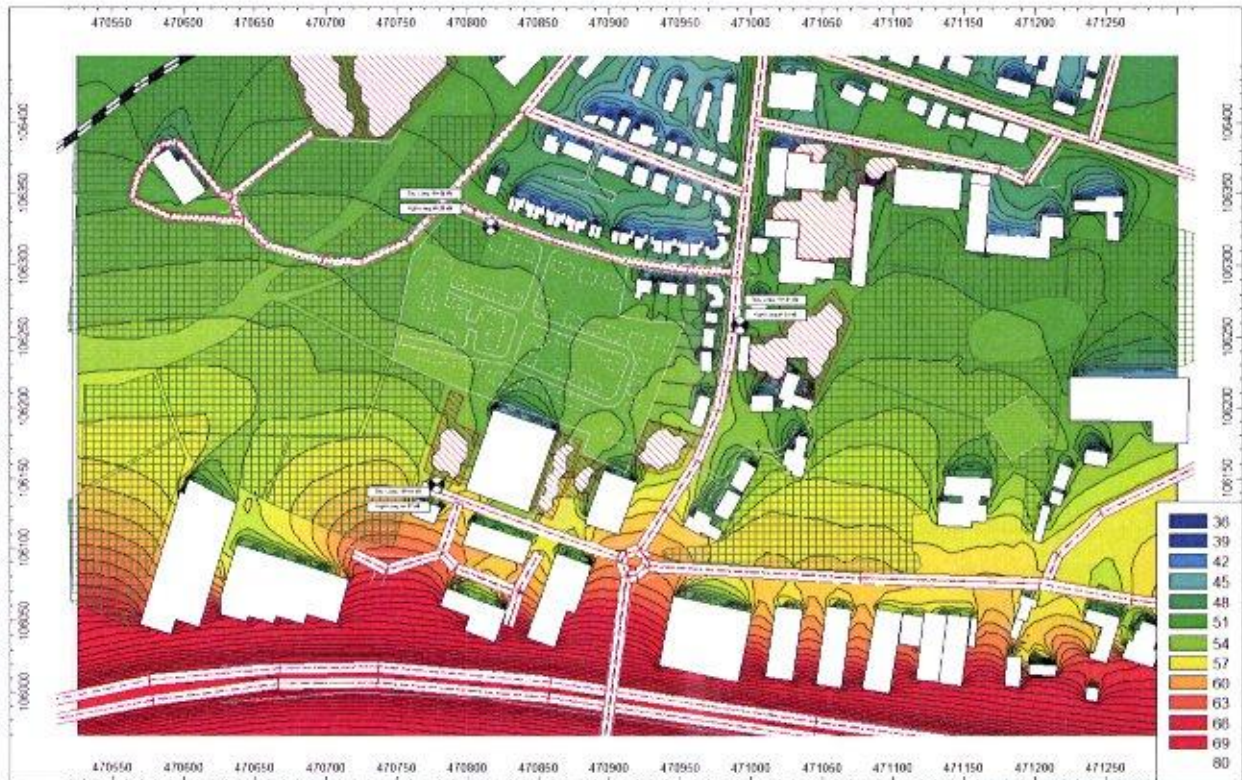
The proposed timber acoustic fence will control the noise from the existing industrial uses to the south and south east of the site.

3.6 3D Noise Maps @ 3.8m High

3.6.1 Day Time (07:00 – 23:00)



3.6.2 Night Time (07:00 – 23:00)



4.3.4 Ceiling (R_w)

Octave Band Frequency	63	125	250	500	1000	2000	4000
2 x 15mm Plasterboard	33	37	42	50	69	70	70

4.4 Mitigation Measures

It has been proposed to install a timber acoustic fence along the southern boundary of the site with a small return on the south eastern corner to mainly control the noise within the residential gardens. The fence will have a minimum surface density of 8 Kg m^{-2} and will be 4.0m high on the south and south east corner of the site and 2.0m high on the south west corner of the site. The following sketch shows the location of the proposed fence.

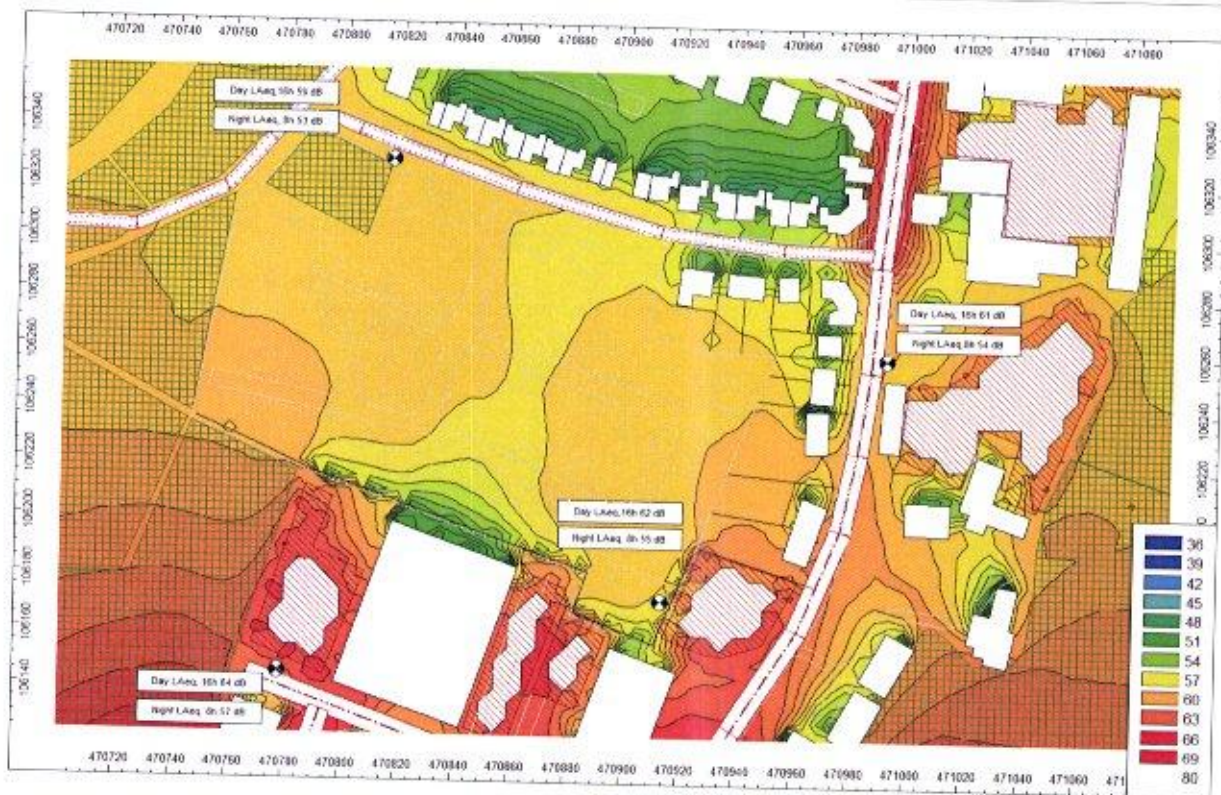


Note: Blue dotted line shows 2.0m high fence in south west corner, red dotted line shows 4.0m high fence which has been included within the assessments within the following sections.

5 Assessments...

5.1 Day Time (07:00 to 23:00) Internal Noise Levels

5.1.1 3D Noise Maps (Free Field Levels @ 1.5m high)



Octave Band Centre Frequency (Hz)

63	125	250	500	1000	2000	4000	Sum (A)
61	63	56	57	58	58	56	62

Resultant Maximum Sound Pressure Level at Façade - $L_{eq, 125m, 50}$ (dB) Reference $2 \times 10^{-5} \text{ Nm}^{-2}$

British Standard 8233: 2014 Assessment

Day Time – 07:00 to 23:00 Hours

Internal Noise Level from External Noise Sources



Quietly confident

Location of Measurements		Entire Development						
Construction of Walls	External Brick, 75mm cavity and 100mm internal concrete block					Area (S ₁):	4.5 m ²	
Construction of Ceiling	2 layers of 15mm plasterboard					Area (S ₂):	8.0 m ²	
Construction of Windows	4mm out pane, sealed 12mm airgap, 4mm inner pane					Area (S ₃):	1.5 m ²	
Construction of Trickle Vents		Normal Trickle Vent						
Octave Band Frequency	63	125	250	500	1000	2000	4000	
A = L _{ext} (L _{ext} + 2 dB)	61	63	56	57	58	58	56	
B = Ventilation (D _{ext})	16	23	26	28	30	31	30	
	0.01978	0.00395	0.00198	0.00125	0.00079	0.00063	0.00079	
C = Window (R _w)	18	21	26	34	38	41	40	
	0.00150	0.00075	0.00024	0.00004	0.00001	0.00001	0.00001	
D = Walls (R _{wa})	40	43	42	45	53	55	55	
	0.00004	0.00002	0.00003	0.00001	0.00000	0.00000	0.00000	
E = Ceiling (R _c)	33	37	42	50	69	70	70	
	0.00024	0.00009	0.00003	0.00000	0.00000	0.00000	0.00000	
F = 10.Log ₁₀ (B + C + D + E)	-16.7	-23.2	-26.4	-28.8	-30.9	-32.0	-31.0	
Absorption (A)	7	14	16	16	15	14	13	
G = 10.Log ₁₀ (S/A)	2.6	-0.4	-1.0	-1.0	-0.7	-0.4	-0.1	
Resultant Level	49.9	42.4	31.6	30.1	29.3	28.6	27.9	
A-Weighting	-26	-16	-9	-3	0	1	1	
A-Weighted	24	26	23	27	29	30	29	
Resultant Internal Noise Level		L _{Aeq,16 hours} 35 dB						
British Standard 8233:2014		Sleeping (Daytime Resting) L _{Aeq,16 hours} 35 dB – Levels Meet the Requirements						

5.1.3 Conclusion

With the proposed glazing and timber acoustic fence along the southern boundary the resultant internal noise levels from the existing traffic and industrial sources in the area will meet the minimum requirements of British Standard 8233: 2014 i.e. L_{Aeq,16 hours} 35 dB or less.

5.2 Night Time (23:00 to 07:00) Internal Noise Levels

5.2.1 3D Noise Maps (Free Field Levels @ 1.5m High)



Octave Band Centre Frequency (Hz)

63	125	250	500	1000	2000	4000	Sum (A)
54	56	49	50	51	51	49	55

Resultant Maximum Sound Pressure Level at Façade – $L_{Aeq, 16h, 8h}$ (dB) Reference $2 \times 10^{-5} \text{ Nm}^{-2}$

British Standard 8233: 2014 Assessment

Night Time – 23:00 to 07:00 Hours

Internal Noise Level from External Noise Sources



Quietly confident

Location of Measurements		Entire Development						
Construction of Walls	External Brick, 75mm cavity and 100mm internal concrete block					Area (S _w):	4.5 m ²	
Construction of Ceiling	2 layers of 15mm plasterboard					Area (S _c):	8.0 m ²	
Construction of Windows	4mm out pane, sealed 12mm airgap, 4mm inner pane					Area (S _w):	1.5 m ²	
Construction of Trickle Vents	Normal Trickle Vent							
Octave Band Frequency	63	125	250	500	1000	2000	4000	
A = L _{eq,T} (L _{eq,T} + 2 dB)	54	56	49	50	51	51	49	
B = Ventilation (D _v)	16	23	26	28	30	31	30	
	0.01978	0.00395	0.00198	0.00125	0.00079	0.00063	0.00079	
C = Window (R _w)	18	21	26	34	38	41	40	
	0.00150	0.00075	0.00024	0.00004	0.00001	0.00001	0.00001	
D = Walls (R _w)	40	43	42	45	53	55	55	
	0.00004	0.00002	0.00003	0.00001	0.00000	0.00000	0.00000	
E = Ceiling (R _c)	33	37	42	50	69	70	70	
	0.00024	0.00009	0.00003	0.00000	0.00000	0.00000	0.00000	
F = 10 · Log ₁₀ {B + C + D + E}	-16.7	-23.2	-26.4	-28.8	-30.9	-32.0	-31.0	
Absorption {A}	10	10	10	10	10	10	10	
G = 10 · Log ₁₀ (S/A)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
Resultant Level	41.4	36.9	26.6	25.2	24.1	23.1	22.1	
A-Weighting	-26	-16	-9	-3	0	1	1	
A-Weighted	15	21	18	22	24	24	23	
Resultant Internal Noise Level	L _{Aeq,16 hours} 29dB							
British Standard 8233:2014	Sleeping (Night Time) L _{Aeq,16 hours} 30 dB – Levels Meet the Requirements							

5.2.3 Conclusion

With the proposed glazing and timber acoustic fence along the southern boundary the resultant internal noise levels from the existing traffic and industrial sources in the area will meet the minimum requirements of British Standard 8233: 2014 i.e. L_{Aeq, 8 hour} 30 dB or less.

5.3 Day Time (07:00 to 23:00) External Noise Levels (Gardens)

5.3.1 3D Noise Maps (Garden Amenity Levels @ 1.5m High)



5.3.2 External Amenity Space

British Standard 8233: 2014 Assessment

Day Time – 07:00 to 23:00 Hours

External Amenity Space



Quietly confident

Location of Measurements

Rear gardens

Resultant External Noise Level

$L_{Aeq,16\text{ hours}}$ 55 dB

British Standard 8233:2014

External Amenity Space (Day Time) $L_{Aeq,16\text{ hours}}$ 50 – 55 dB

Criteria

Levels Meet the Requirements of the Criteria

5.3.3 Conclusion

With the proposed timber acoustic fence along the southern boundary the resultant external noise levels from the existing traffic and industrial sources in the area within the residential gardens will meet the minimum requirements of British Standard 8233: 2014 i.e. $L_{Aeq,16\text{ hour}}$ 55 dB or less. The criterion assumes that in line with section 7.7.3.2. of British Standard 8233: 2014 this site is considered to be in an area that is “urban areas adjoining the strategic transport network...”

6 Conclusions...

6.1 Summary of Criterion

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Room	$L_{Aeq, 16 \text{ hour}}$ 35 dB	--
Dining	Dining Room	$L_{Aeq, 16 \text{ hour}}$ 40 dB	--
Sleeping (Daytime Resting)	Bedroom	$L_{Aeq, 16 \text{ hour}}$ 35 dB	$L_{Aeq, 8 \text{ hour}}$ 30 dB
External Amenity Space	Gardens	$L_{Aeq, T}$ 55 dB	--

6.2 Measurements

Time Period	Position 1 (April 2014)	Position 2 (April 2014)	Position 3 (March 2016)
Day Time (07:00 to 23:00)	$L_{Aeq, 16 \text{ hour}}$ 64 dB	$L_{Aeq, 16 \text{ hour}}$ 61 dB	$L_{Aeq, 16 \text{ hour}}$ 59 dB
Night Time (23:00 to 07:00)	$L_{Aeq, 8 \text{ hour}}$ 58 dB	$L_{Aeq, 8 \text{ hour}}$ 54 dB	$L_{Aeq, 8 \text{ hour}}$ 53 dB

6.3 Free Field Noise Levels

Time Period	Maximum Free Field Levels Impacting on a Residential Facade
Day Time (07:00 to 23:00)	$L_{Aeq, ff 16 \text{ hour}}$ 62 dB
Night Time (23:00 to 07:00)	$L_{Aeq, ff 8 \text{ hour}}$ 55 dB

6.4 Mitigation Measures

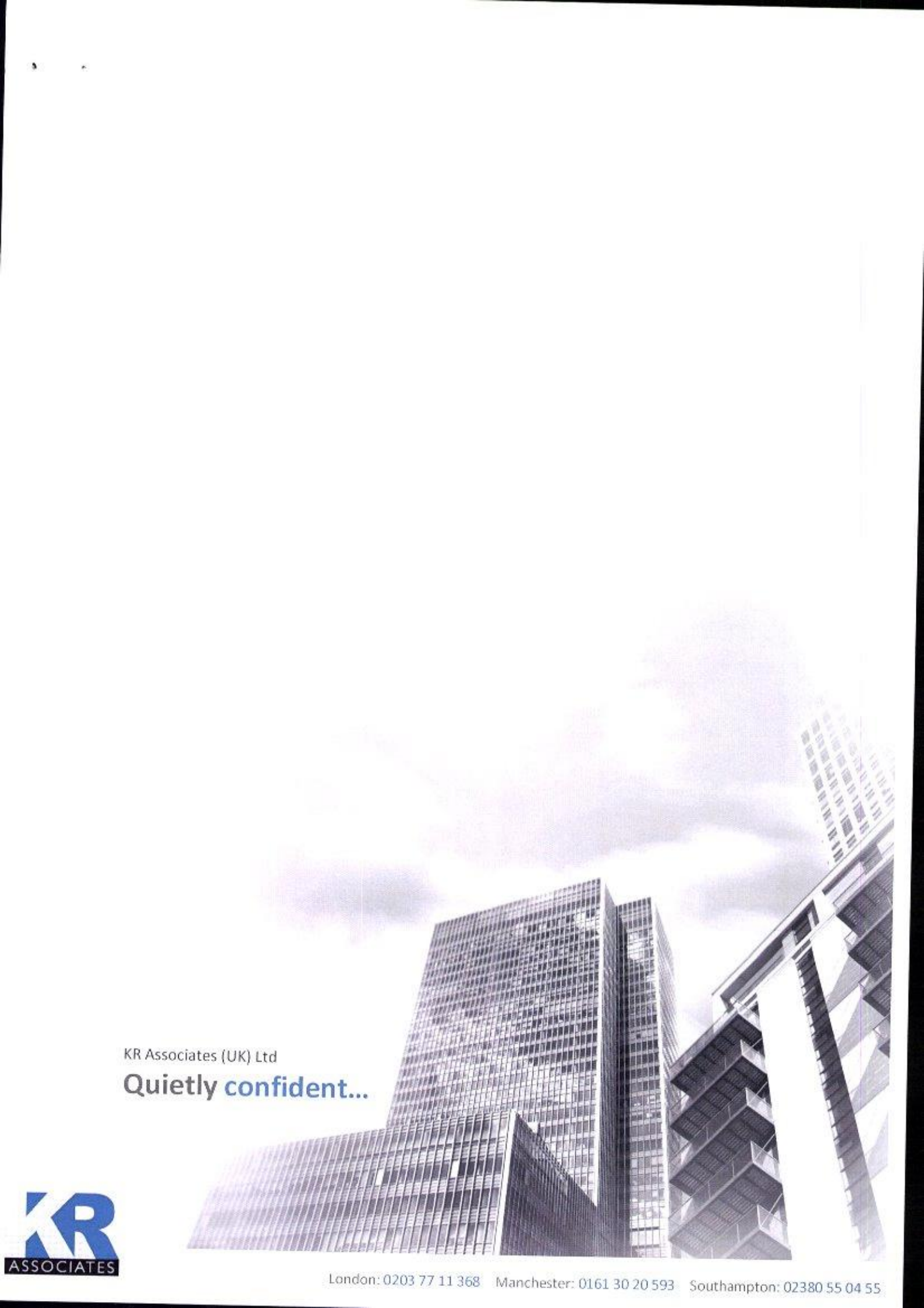
It has been recommended that in order to meet the criterion defined within British Standard 8233: 2014 the following mitigation measures are included within the development:

Time Period	Maximum Free Field Levels Impacting on a Residential Facade
Glazing	High Quality Double Glazing (4mm laminated glass both sides with a 14mm airgap)
Trickle Vents	High quality acoustic trickle vents.
Upper Floor Ceiling	2 Layers of 12.5mm soundbloc plasterboard
Acoustic Fence	South and South East Corner: 4.0m high timber acoustic fence (surface density of 8 Kg m^{-2}) South West Corner: 2.0m high timber acoustic fence (surface density of 8 Kg m^{-2})

6.5 Conclusions

The assessments indicate that the internal noise levels within the dwellings and the external noise levels within the gardens will comply with the requirements of British Standard 8233: 2014.

END OF REPORT ## (Front and back cover page numbers not shown but included in the page count)



KR Associates (UK) Ltd

Quietly confident...



London: 0203 77 11 368 Manchester: 0161 30 20 593 Southampton: 02380 55 04 55