



Persimmon Homes

Discharge of Condition 18, Fitzalan Link Road, North Littlehampton

Noise Assessment July 2016





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1.0 Introduction

1.1 Purpose of this Report

This report presents the findings of a noise assessment for the discharge of conditions 18 of planning permission ref LU/63/11 which state:

"18 No development shall take place until a scheme of noise mitigation measures to reduce the impacts of noise from the proposed highway affecting residential and commercial properties in the area has been submitted to and been approved in writing by the local planning authority. This shall include details of the height, specification and positioning of noise barriers"

A description of the existing noise environment in and around the site is provided. Noise surveys have been undertaken and the results used to verify predictions of the short-term and long-term effects of noise. The noise levels from the proposed development have been predicted at local representative receptors using CADNA noise modelling software which incorporates ISO 9613 and CRTN methodologies and calculations.

A list of acoustic terminology and abbreviations used in this report is provided in Appendix A and a set of location plans and noise contour plots relevant to the assessment are presented in Appendix B.



2.0 Assessment Criteria

2.1 Traffic Noise Assessment Criteria

The assessment compares the 'with development' scenario and the 'without development' scenario for a selection of residential receptors considered to be worst case in terms of their proximity to traffic changes. For the purposes of assessing the significance of any effects, the criteria in Table 2.1 has been used. The noise level criteria detailed below have been derived from standards and design guidance:

Table 3.2 of HD213/11 published in November 2011 (*Design Manual for Roads and Bridges*)

Table 2.1 Noise Level Criteria and Actions (Traffic Noise Assessment)

Effect Level	Assessment	Short Term Noise Level Criteria	Long Term Noise Level Criteria
Negligible	Change in Traffic Noise Levels	Change in Noise Levels $L_{A10\ 18hr}$ ≥ 0 dB and < 0.9 dB	Change in Noise Levels $L_{A10\ 18hr}$ ≥ 0 dB and < 3 dB
Slight Adverse	Change in Traffic Noise Levels	Change in Noise Levels $L_{A10\ 18hr}$ ≥ 1.0 dB and < 2.9 dB	Change in Noise Levels $L_{A10\ 18hr}$ ≥ 3 dB and < 5 dB
Moderate Adverse	Change in Traffic Noise Levels	Change in Noise Levels $L_{A10\ 18hr}$ ≥ 3.0 dB and < 4.9 dB	Change in Noise Levels $L_{A10\ 18hr}$ ≥ 5 dB and < 10 dB
Significant Adverse	Change in Traffic Noise Levels	Change in Noise Levels $L_{A10\ 18hr}$ ≥ 5 dB	Change in Noise Levels $L_{A10\ 18hr}$ ≥ 10 dB

2.2 Noise Insulation Regulations

The 1975 Noise Insulation Regulations and subsequent amendment Regulations [noise insulation (amendment) regulations 1988] provide criteria for assessing the eligibility for noise mitigation or properties based on variations in traffic noise due to a new or improved road scheme. Noise level criteria are given within the Regulations which, if satisfied, indicate whether properties in the vicinity may be entitled to the installation of additional noise insulation or to a grant to cover the cost of the noise insulation.

The entitlement conditions of the Noise Insulation Regulations are triggered when:

- 'the $L_{A10\ (18\ hour)}$ predicted figure is greater by at least 1 dB than the prevailing noise level'
- 'the $L_{A10\ (18\ hour)}$ predicted figure is not less than the specified level ($L_{A10\ (18\ hour)} = 68$ dB)'
- 'the noise caused, or expected to be caused, by traffic using or expected to use the new highway makes an effective contribution to the $L_{A10\ (18\ hour)}$ predicted figure of at least 1 dB'

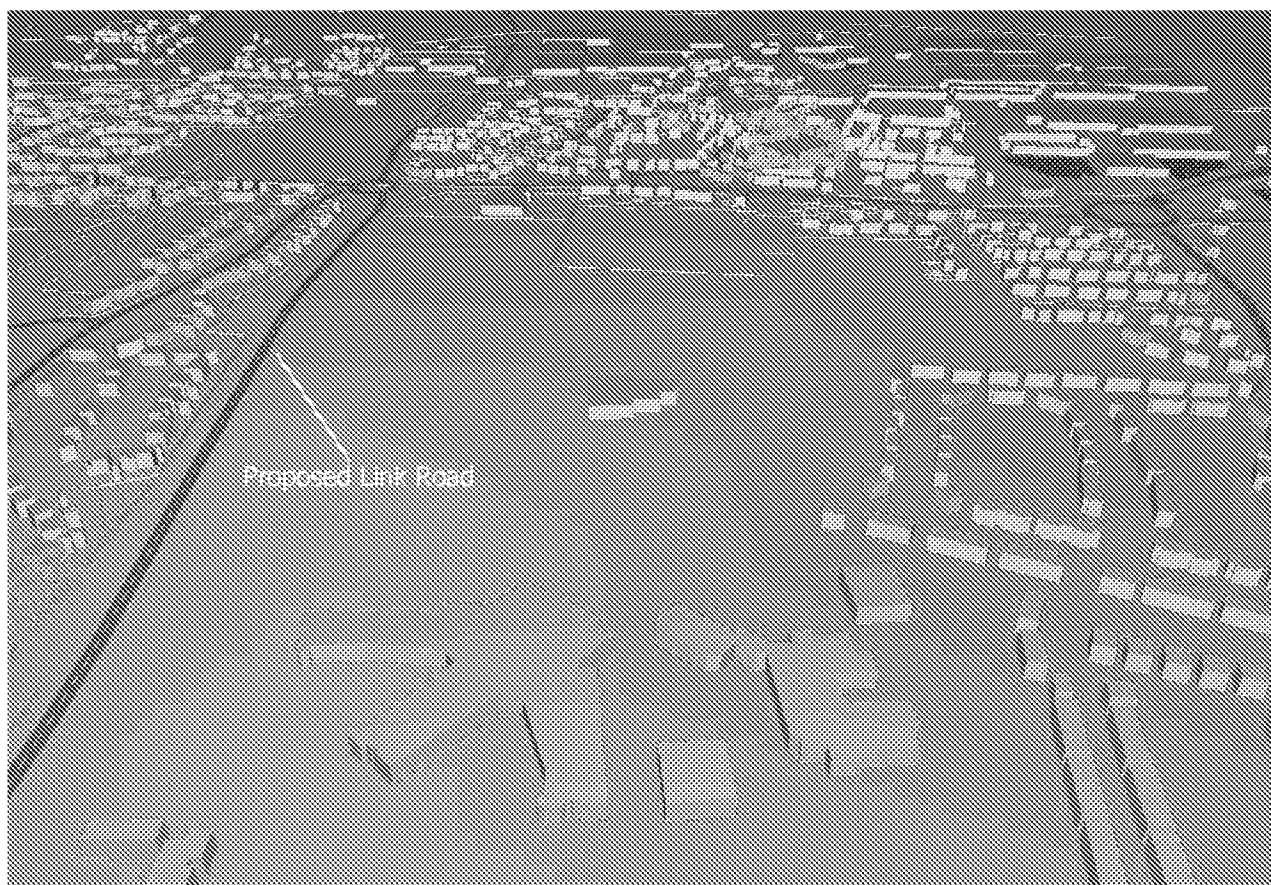


3.0 Assessment Methodology

3.1 Noise Modelling Methodology

Three dimensional noise modelling has been undertaken based on the monitoring data to predict L_{Aeq} and L_{Amax} noise levels at a large number of locations both horizontally and vertically. CADNA noise modelling software has been used (as shown in Figure 3.1). This model is based on the Department of Transport Calculation of Road Traffic Noise (CRTN) and ISO 9613 noise propagation methodology and allows for detailed prediction of noise levels to be undertaken for large numbers of receptor points and different noise emission scenarios both horizontally and vertically.

Figure 3.1 CADNA Noise Model





The modelling software calculates noise levels based on the emission parameters and spatial settings that are entered. Input data, assumptions and model settings as given in the table below have been used.

Table 3.1 Modelling Parameters Sources and Assumptions

Parameter	Source	Details
Horizontal distances – around site	Ordnance Survey	Ordnance Survey
Ground levels – around site	Ordnance Survey	Ordnance Survey
Ground levels – other areas	Site Observations and Ordnance Survey	OS 1:25,000 contours and OS 1:10,000 spot heights.
Traffic data, main surrounding roads	WYG	Traffic flows for local roads based on WYGE observations and experience.
Traffic data – local roads	WYG	Traffic flows for local roads based on WYGE observations and experience.
Building heights – around site	WYG Observations	8 m height for two storey residential properties, and 4 m for Bungalows
Barrier heights	WYG Observations	All existing barriers at 1.0 m with the exception of hedges and trees which are assumed to offer no noise protection.
Receptor positions	WYG	1 m from façade, height of 1.5 m for ground floor, 4 m for first floor properties with ground floor or bungalow dormer windows. 7 m for dormer windows on two storey properties. 1.5 m height for model grid and monitoring locations for validation.
Reflections	WYG	First order reflections have been applied based on mirror image sources
Absorbent Ground	CADNA	Frequency dependant ground absorption has been applied based on values specified in VDI 2714/16 clause 6.3.
Façade Correction	CADNA	Façade corrections have been incorporated into the modelling
Gradient	CADNA	Gradient for each road has been calculated from the height information using the 'calc slope of roads' tool

It is acknowledged that a number of these assumptions will affect the overall noise levels presented in this report. However it should be noted that certain assumptions made, as identified above, are worst case.



3.2 Model Input Data

3.2.1 Road Traffic Data (Development Related Traffic Noise Assessment)

All roads expected to make a significant contribution have been included within this assessment. Traffic flows have been based on traffic data provided. Three scenarios have been considered to represent traffic levels in the year 2017 with and without development scenarios, 2032 with and without development scenarios and base 2013 scenarios.

Table 3.1 Traffic Data (2017)

Road	18hr AAWT Baseline 2013	18hr AAWT Without Development 2017	18hr AAWT With Development 2017
Lyminster Road	11153	11590	17888
Lyminster Road	11153	11590	2463
Lyminster Road	10966	11397	162
Lyminster Road	9831	10217	0
Lyminster Road	10911	11339	1334
Lyminster Road	12025	12497	4798
Wick Street	9905	10294	9001
Wick Street	6627	6888	5268
Wick Street	6284	6531	4076
Arundel Road	6732	6996	3849
Arundel Road	7603	7901	5621
Arundel Road	8372	8700	6967
Northern Bypass	N/A	N/A	17699
Southern Bypass	N/A	N/A	25071
Fitzalan Link	N/A	N/A	9132
Fitzalan Link	N/A	N/A	8163
Fitzalan Link	1543	1603	7653
Littlehampton Bypass	15376	15979	21542
Worthing Road	19793	20570	30006
Worthing Road	21559	22405	29832
Worthing Road	24913	25891	31756
Rustington Bypass	21672	22522	27480
Arundel Road	12183	12661	15810
Franciscan Way	14394	14959	16960
Franciscan Way	13778	14319	16558
East Street	10783	11206	15723
East Street	10509	10922	13644
Horsham Road	9575	9951	9199
Horsham Road	9119	9477	8640
Horsham Road	10241	10643	10187
Horsham Road	12635	13131	12470
Horsham Road	12597	13091	12641
Worthing Road	9040	9395	11776
Mill Lane	3055	3175	162
Mill Lane / Toddington Lane	1776	1846	1712
Toddington Lane	1776	1846	4117
Hollist Chase	2949	3065	4284
Courtwick Lane	2462	2559	2782
Courtwick Road	4408	4581	5112
North Street	1132	1177	1855
Swanbourne Road	688	715	839
Wick Farm Road	349	363	442
Clun Road	929	966	1084
Clun Road	1820	1892	1884
Cornwall Rd & Blakehurst Way	1622	1685	2223



Road	18hr AAWT Baseline 2013	18hr AAWT Without Development 2017	18hr AAWT With Development 2017
Madehurst Way & Highdown Drive	1141	1186	955
Highdown Drive	1823	1895	1784
North Ham Road	925	961	884
East Ham Road	844	877	1360
East Ham Road	526	547	976
East Street	7246	7530	9515
Fitzalan Road	4231	4397	7060
St Flora's Road	1828	1899	2890
Southfields Road	4661	4844	5929
Southfields Road	3259	3387	4806
Peregrine Road	3311	3441	3666
N Littlehampton Access (W)	N/A	N/A	1384
N Littlehampton Access (E)	N/A	N/A	7981
Devt Link Road	N/A	N/A	5654

Table 3.1 Traffic Data (2032)

Road	18hr AAWT , Without Development 2032	18hr AAWT With Development 2032
Lyminster Road	12613	21249
Lyminster Road	12613	2960
Lyminster Road	12402	199
Lyminster Road	11118	0
Lyminster Road	12340	1607
Lyminster Road	13600	6296
Wick Street	11202	9836
Wick Street	7495	6001
Wick Street	7107	4707
Arundel Road	7613	4218
Arundel Road	8598	7029
Arundel Road	9468	8692
Northern Bypass	N/A	21115
Southern Bypass	N/A	28862
Fitzalan Link	N/A	11410
Fitzalan Link	N/A	10199
Fitzalan Link	1745	9703
Littlehampton Bypass	17389	24742
Worthing Road	22385	34951
Worthing Road	24382	33911
Worthing Road	28176	36218
Rustington Bypass	24510	32837
Arundel Road	13778	18862
Franciscan Way	16278	21120
Franciscan Way	15582	20652
East Street	12195	19200
East Street	11885	16888
Horsham Road	10829	11298
Horsham Road	10313	10612
Horsham Road	11582	12381
Horsham Road	14290	15053
Horsham Road	14247	15411
Worthing Road	10223	14453
Mill Lane	3455	159
Mill Lane / Toddington Lane	2009	2058
Toddington Lane	2009	4962
Hollist Chase	3336	5205
Courtwick Lane	2784	3869
Courtwick Road	4985	5923
North Street	1281	2657
Swanbourne Road	778	1462
Wick Farm Road	395	755



Road	18hr AAWT , Without Development 2032	18hr AAWT With Development 2032
Clun Road	1051	1869
Clun Road	2059	2621
Cornwall Rd & Blakehurst Way	1834	2754
Madehurst Way & Highdown Drive	1290	1191
Highdown Drive	2062	2640
North Ham Road	1046	925
East Ham Road	954	1893
East Ham Road	595	1480
East Street	8195	9892
Fitzalan Road	4785	9117
St Flora's Road	2067	3833
Southfields Road	5272	7351
Southfields Road	3686	6044
Peregrine Road	3744	4561
N Littlehampton Access (W)	N/A	1371
N Littlehampton Access (E)	N/A	7882
Devt Link Road	N/A	6848



3.2.2 Sensitive Receptors

Existing noise levels have been assessed at properties across the site with respect to direct noise from the Fitzalan Link Road. The locations of the proposed receptors are shown of SK02 of Appendix B.

Table 3.8 Proposed Residential Receptor Locations

Ref.	Description	Closest Source	Approximate Distance To Source (m)	Height (m)
TR01	Cornfield School	A259 Worthing Road	74.0	4.0
TR02	170 Highdown Drive	Highdown Drive	15.0	4.0
TR03	168 Highdown Drive	Highdown Drive	25.0	4.0
TR04	Caravan Park	Fitzalan Link	35.0	4.0
TR05	164 Highdown Drive	Fitzalan Link	35.0	4.0
TR06	162 Highdown Drive	Fitzalan Link	35.0	4.0
TR07	156 Highdown Drive	Fitzalan Link	35.0	4.0
TR08	150 Highdown Drive	Fitzalan Link	33.0	4.0
TR09	146 Highdown Drive	Fitzalan Link	35.0	4.0
TR10	144 Highdown Drive	Fitzalan Link	36.0	4.0
TR11	142 Highdown Drive	Fitzalan Link	40.0	4.0
TR12	138 Highdown Drive	Fitzalan Link	45.0	4.0
TR13	134 Highdown Drive	Fitzalan Link	50.0	4.0
TR14	128 Highdown Drive	Highdown Drive	30.0	4.0
TR15	126 Highdown Drive	Highdown Drive	45.0	4.0
TR16	122 Highdown Drive	Fitzalan Link	33.0	4.0
TR17	118 Highdown Drive	Fitzalan Link	23.0	4.0
TR18	116 Highdown Drive	Fitzalan Link	26.0	4.0
TR19	8 Amberley Close	Fitzalan Link	28.0	4.0
TR20	9 Amberley Close	Fitzalan Link	20.0	4.0
TR21	12 Amberley Close	Fitzalan Link	22.0	4.0
TR22	14 Amberley Close	Fitzalan Link	49.0	4.0
TR23	15 Amberley Close	Fitzalan Link	40.0	4.0
TR24	17 Amberley Close	Fitzalan Link	34.0	4.0
TR25	19 Amberley Close	Fitzalan Link	40.0	4.0
TR26	66 Highdown Drive	Highdown Drive	32.0	4.0
TR27	62 Highdown Drive	Highdown Drive	31.0	4.0
TR28	60 Highdown Drive	Highdown Drive	33.0	4.0
TR29	56 Highdown Drive	Highdown Drive	30.0	4.0
TR30	52 Highdown Drive	Highdown Drive	23.0	4.0
TR31	48 Highdown Drive	Highdown Drive	22.0	4.0
TR32	38 Highdown Drive	Fitzalan Link	36.0	4.0
TR33	36 Highdown Drive	Fitzalan Link	20.0	4.0
TR34	28 Highdown Drive	Fitzalan Link	22.0	4.0
TR35	20 Highdown Drive	Fitzalan Link	35.0	4.0
TR36	8 Highdown Drive	Fitzalan Link	31.0	4.0
TR37	4 Highdown Drive	Fitzalan Link	36.0	4.0
TR38	85 Cornwall Road	Fitzalan Link	27.0	4.0



Ref.	Description	Closest Source	Approximate Distance To Source (m)	Height (m)
TR39	5 Paterson Wilson Road	Fitzalan Link	25.0	4.0
TR40	7 Paterson Wilson Road	Fitzalan Link	26.0	4.0
TR41	County Buildings	Fitzalan Link	17.0	4.0
TR42	Summerlea House	Fitzalan Link	27.0	4.0
TR43	15 Rosemead	Fitzalan Link	28.0	4.0
TR44	13 Rosemead	Fitzalan Link	50.0	4.0
TR45	16 Rosemead	East Street	108.0	4.0
TR46	43 Dorset Close	East Street	139.0	4.0
TR47	Littlehampton Academy	Fitzalan Link	108.0	4.0
TR48	21 Elm Grove Road	Horsham Road	158.0	4.0
TR49	45 Grove Crescent	Horsham Road	142.0	4.0
TR50	33 Grove Crescent	Horsham Road	149.0	4.0
TR51	49 Hill Road	Horsham Road	285.0	4.0
TR52	56 Thorncroft Road	Horsham Road	283.0	4.0
TR53	48 Thorncroft Road	Horsham Road	274.0	4.0
TR54	38 Thorncroft Road	Horsham Road	235.0	4.0
TR55	12a Oakcroft Gardens	Horsham Road	140.0	4.0
TR56	33 Oakcroft Gardens	A259 Worthing Road	170.0	4.0
TR57	37 Oakcroft Gardens	A259 Worthing Road	140.0	4.0
TR58	45 Oakcroft Gardens	A259 Worthing Road	88.0	4.0
TR59	49 Oakcroft Gardens	A259 Worthing Road	103.0	4.0
TR60	51 Oakcroft Gardens	A259 Worthing Road	75.0	4.0
TR61	54 Oakcroft Gardens	A259 Worthing Road	45.0	4.0
TR62	7 Cornfield Close	A259 Worthing Road	42.0	4.0



4.0 Noise Survey

4.1 Noise Survey Methodology

A monitoring survey was undertaken to characterise baseline ambient noise levels currently experienced on the site and to establish the relative local background and traffic noise levels.

Equipment used during the survey included:

B&K 2260	Environmental Noise Analyser (WYG1)	s/n	2361273
B&K 4231	Calibrator	s/n	2176211
Rion NL-52	Environmental Noise Analyser (WYG13)	s/n	620858
Rion NL-52	Environmental Noise Analyser (WYG14)	s/n	610212
Rion NL-52	Environmental Noise Analyser (WYG15)	s/n	1221575

The measurement equipment was checked against the appropriate calibrator at the beginning and end of the measurements, in accordance with recommended practice and no drift was observed. The accuracy of the calibrators can be traced to National Physical Laboratory Standards, calibration certificates for which are available on request.

A baseline monitoring survey was undertaken at nine locations (as specified in the following table and shown in SK01 of Appendix B) from Wednesday 8th October 2014 to Tuesday 14th October 2014. Attended short term measurements were undertaken at six locations during the day, evening and night-time periods with three additional locations being measured unattended over a 115 hour period. The raw data collected from the long term monitoring is available upon request.

Measurements were taken in general accordance with BS 7445-1:2003 *The Description and Measurement of Environmental Noise: Guide to quantities and procedures*. Weather conditions during the survey period were observed as being dry with scattered showers. Anemometer readings confirmed that wind speeds were less than 5 ms⁻¹ at all times during the survey with a predominant westerly wind direction.

Table 4.1 Noise Monitoring Locations

Ref	Description	Grid Reference	
		X	Y
LT1	Junction of Lyminster Road and Mill Lane	502721.4	104064.0
LT2	Land behind Empress Close along the rail line	502967.4	103855.4
LT3	Land north of Sunflower Close, along the rail line.	504450.3	103646.6
ST1	Junction of Lyminster Road and Mill Lane	502709.3	104046.0
ST2	On Fuller's Walk, next to play area.	502935.2	104092.9
ST3	Along Toddington Lane behind garden centre.	503043.6	103926.4
ST4	At the junction of Empress Close and Hearnfield Road.	502917.0	103871.9
ST5	At the junction of Worthing Road and Landsdowne Road.	502975.7	103420.4
ST6	Along Norway Lane adjacent to the A259.	503962.7	103483.7



4.2 Noise Survey Results

Existing ambient noise levels around the site are dominated by road traffic noise from the A259 (Worthing Road) and the West Coastway railway line.

Ambient and background noise levels are usually described using the L_{Aeq} index (a form of energy average) and the L_{A90} index (i.e. the level exceeded for 90% of the measurement period) respectively. Road traffic noise is generally described using the L_{A10} index (i.e. the level exceeded for 10% of the measurement period).

The results of the statistical measurements and frequency measurements conducted during the survey are summarised in the following table. All values are sound pressure levels in dB (re: 2×10^{-5} Pa).

Table 4.2 Results of Baseline Noise Monitoring Survey (Average Levels)

Period	Duration (T)	Monitoring Date and Times	Location	$L_{Aeq,T}$ (dB)	$L_{Ampa,T}$ (dB)	$L_{Amin,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)
Day 07:00 - 23:00	44 hours	08/10/2014 - 13/10/2014 07:00 - 23:00	LT1	68.0	101.7	36.3	71.2	53.0
Night 23:00 - 07:00	24 hours	08/10/2014 - 13/10/2014 23:00 - 07:00		62.7	84.5	28.9	60.5	43.9
Weekend Day 07:00 - 23:00	32 hours	11/10/2014 - 12/10/2014 07:00 - 23:00		67.1	103.6	36.1	70.6	49.7
Weekend Night 23:00 - 07:00	16 hours	11/10/2014 - 12/10/2014 23:00 - 07:00		60.0	84.3	25.6	58.3	36.6
Day 07:00 - 23:00	44 hours	08/10/2014 - 13/10/2014 07:00 - 23:00	LT2	60.9	96.5	34.7	55.7	47.3
Night 23:00 - 07:00	24 hours	08/10/2014 - 13/10/2014 23:00 - 07:00		56.8	85.0	26.5	51.2	42.9
Weekend Day 07:00 - 23:00	32 hours	11/10/2014 - 12/10/2014 07:00 - 23:00		60.3	89.4	33.7	53.0	45.0
Weekend Night 23:00 - 07:00	16 hours	11/10/2014 - 12/10/2014 23:00 - 07:00		55.8	89.3	23.4	43.9	34.8
Day 07:00 - 23:00	44 hours	08/10/2014 - 13/10/2014 07:00 - 23:00	LT3	66.0	108.9	36.0	62.4	55.4
Night 23:00 - 07:00	24 hours	08/10/2014 - 13/10/2014 23:00 - 07:00		59.8	92.9	28.3	55.7	44.8
Weekend Day 07:00 - 23:00	32 hours	11/10/2014 - 12/10/2014 07:00 - 23:00		65.9	102.2	35.6	60.9	53.1
Weekend Night 23:00 - 07:00	16 hours	11/10/2014 - 12/10/2014 23:00 - 07:00		59.8	90.6	24.5	53.5	37.9
Day 07:00 - 19:00	15 Mins	14/10/2014 11:28	ST1	70.7	91.8	42.6	73.9	52.5
	15 Mins	14/10/2014 11:48	ST2	53.1	74.2	38.6	54.6	42.1
	15 Mins	14/10/2014 12:07	ST3	62.9	84.2	39.0	63.0	41.8
	15 Mins	14/10/2014 12:26	ST4	55.7	74.0	40.3	55.3	42.7



Period	Duration (T)	Monitoring Date and Times	Location	$L_{Aeq,T}$ (dB)	$L_{Amax,T}$ (dB)	$L_{Amin,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)
Evening 19:00 - 23:00	15 Mins	14/10/2014 13:09	ST5	77.0	92.3	54.3	80.5	67.7
	15 Mins	14/10/2014 10:38	ST6	82.1	93.6	59.7	86.8	68.6
	15 Mins	13/10/2014 21:05	ST1	70.0	85.7	35.4	74.2	42.2
	15 Mins	13/10/2014 21:26	ST2	45.4	62.7	36.8	46.6	40.7
	15 Mins	13/10/2014 21:48	ST3	63.2	83.5	37.1	57.5	39.6
	15 Mins	13/10/2014 22:09	ST4	52.4	75.6	37.7	47.4	40.6
	15 Mins	13/10/2014 20:44	ST5	74.4	89.5	43.7	78.8	53.1
Night 23:00 - 07:00	15 Mins	13/10/2014 20:21	ST6	77.5	94.2	46.4	80.8	55.7
	15 Mins	13/10/2014 23:52	ST1	64.2	81.0	35.5	67.9	41.6
	15 Mins	14/10/2014 00:12	ST2	38.9	50.2	32.1	41.3	34.8
	15 Mins	14/10/2014 00:31	ST3	39.0	53.7	31.7	41.4	35.1
	15 Mins	14/10/2014 00:50	ST4	45.4	67.0	34.7	43.7	36.9
	15 Mins	13/10/2014 23:30	ST5	71.1	90.5	35.9	74.0	41.5
	15 Mins	13/10/2014 23:05	ST6	77.4	96.3	41.7	80.2	46.6

All values are sound pressure levels in dB re: 2×10^{-5} Pa

Ref	Description	Grid Reference	
		X	Y
T1	At the end of Todington Park.	503126	103568
T2	Land behind Highdown Drive.	503134	103064
T3	Land behind Highdown Drive, adjacent to the Littlehampton Academy.	503129	102758
T4	Along Worthing Road, west of the junction with Highdown Drive.	503089	103391

Period	Duration (T)	Monitoring Date and Times	Location	$L_{Aeq,T}$ (dB)	$L_{Amax,T}$ (dB)	$L_{Amin,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)
Day 07:00 - 19:00	3 Hours	13/10/2014 - 14/10/2014 07:00 - 23:00	T1	49.5	80.7	12.1	37.1	34.3
	3 Hours	13/10/2014 - 14/10/2014 07:00 - 23:00	T2	48.9	83.0	39.7	48.2	46.8
	3 Hours	13/10/2014 - 14/10/2014 07:00 - 23:00	T3	51.3	94.4	35.5	47.7	44.2
	3 Hours	13/10/2014 15:32	T4	76.0	95.9	47.5	79.7	65.5
Night 23:00 - 07:00	15 Mins	13/10/2014 - 14/10/2014 23:00 - 07:00	T1	44.3	64.1	10.9	29.5	26.4
	15 Mins	13/10/2014 - 14/10/2014 23:00 - 07:00	T2	46.7	61.1	34.4	45.7	44.9
	15 Mins	13/10/2014 - 14/10/2014 23:00 - 07:00	T3	40.7	62.5	30.4	39.3	38.0



5.0 Assessment of Key Effects

5.1 Road Traffic Noise Assessment

The table below shows the results of the traffic noise assessment comparing the 'with' and 'without' development traffic noise levels for the years 2017 and 2032 on the Fitzalan Link Road and public highways around the site.

Table 5.1 Difference Between With and Without Bypass Scenarios (2017, 2032)

Location	Traffic Noise Without Development 2017 (LA10,18Hf dB(A))	Traffic Noise With Development Only 2017 (LA10,18Hf dB(A))	Difference between with and without development scenarios (dB(A))	Traffic Noise Without Development 2032 (LA10,18Hf dB(A))	Traffic Noise With Development Only 2032 (LA10,18Hf dB(A))	Difference between with and without development scenarios (dB(A))
TR01	54.8	56.8	2.0	56.4	57.0	0.6
TR02	55.9	63.3	7.4	58.5	63.8	5.3
TR03	51.9	61.3	9.4	55.6	62.0	6.4
TR04	51.5	54.7	3.2	51.8	55.3	3.5
TR05	50.8	58.8	8.0	54.7	59.7	5.0
TR06	50.4	56.7	6.3	51.5	57.5	6.0
TR07	49.7	59.0	9.3	51.8	59.8	8.0
TR08	48.6	57.4	8.8	50.6	58.4	7.8
TR09	47.7	58.2	10.5	48.8	59.2	10.4
TR10	47.6	57.2	9.6	48.8	58.1	9.3
TR11	47.3	55.8	8.5	48.4	56.7	8.3
TR12	46.8	55.8	9.0	47.8	56.8	9.0
TR13	46.5	55.3	8.8	47.6	56.2	8.6
TR14	50.6	55.8	5.2	51.1	56.8	5.7
TR15	46.0	57.0	11.0	47.0	57.9	10.9
TR16	45.8	56.4	10.6	47.1	57.3	10.2
TR17	45.5	54.2	8.7	46.5	55.1	8.6
TR18	43.5	50.0	6.5	44.8	50.9	6.1
TR19	47.1	57.1	10.0	48.0	58.0	10.0
TR20	45.8	55.2	9.4	46.8	56.1	9.3
TR21	45.8	59.4	13.6	46.8	60.4	13.6
TR22	44.4	57.0	12.6	45.2	58.0	12.8
TR23	44.1	57.3	13.2	45.1	58.3	13.2
TR24	44.7	55.6	10.9	45.5	56.6	11.1
TR25	45.2	60.2	15.0	45.3	61.2	15.9
TR26	43.8	51.4	7.6	44.2	52.4	8.2
TR27	43.9	55.5	11.6	44.3	56.5	12.2
TR28	44.6	59.2	14.6	45.1	60.2	15.1
TR29	42.8	55.0	12.2	43.5	56.0	12.5
TR30	42.6	54.1	11.5	43.4	55.1	11.7
TR31	42.8	54.3	11.5	43.5	55.3	11.8
TR32	49.3	58.8	9.5	49.8	59.8	10.0
TR33	46.2	54.9	8.7	46.9	55.8	8.9
TR34	46.5	54.1	7.6	47.0	55.0	8.0



Location	Traffic Noise Without Development 2017 ($L_{A10,150Hz}$ dB(A))	Traffic Noise With Development Only 2017 ($L_{A10,150Hz}$ dB(A))	Difference between with and without development scenarios (dB(A))	Traffic Noise Without Development 2032 ($L_{A10,150Hz}$ dB(A))	Traffic Noise With Development Only 2032 ($L_{A10,150Hz}$ dB(A))	Difference between with and without development scenarios (dB(A))
TR35	53.8	55.5	1.7	54.2	56.8	2.6
TR36	49.9	56.9	7.0	50.7	57.9	7.2
TR37	49.1	54.1	5.0	49.8	55.1	5.3
TR38	54.8	58.6	3.8	55.4	59.7	4.3
TR39	55.0	59.8	4.8	55.4	60.8	5.4
TR40	53.9	57.8	3.9	54.3	58.8	4.5
TR41	58.4	63.8	5.4	59.0	64.9	5.9
TR42	58.5	62.1	3.6	58.9	63.0	4.1
TR43	57.3	58.6	1.3	57.6	58.6	1.0
TR44	48.9	53.0	4.1	49.3	54.0	4.7
TR45	48.9	52.7	3.8	49.6	53.6	4.0
TR46	46.8	50.1	3.3	47.2	51.1	3.9
TR47	45.0	52.5	7.5	45.4	53.4	8.0
TR48	45.3	48.4	3.1	45.7	49.3	3.6
TR49	44.0	46.8	2.8	44.4	47.7	3.3
TR50	43.7	46.9	3.2	44.0	47.7	3.7
TR51	43.3	47.4	4.1	43.7	48.3	4.6
TR52	44.7	49.2	4.5	45.1	50.0	4.9
TR53	44.8	49.2	4.4	45.3	49.9	4.6
TR54	45.0	49.6	4.6	45.4	50.4	5.0
TR55	44.2	46.9	2.7	44.5	47.7	3.2
TR56	44.9	48.3	3.4	45.6	49.0	3.4
TR57	46.9	49.1	2.2	47.3	49.8	2.5
TR58	45.1	47.3	2.2	45.5	48.1	2.6
TR59	46.2	49.0	2.8	47.0	49.6	2.6
TR60	48.6	50.8	2.2	49.1	51.3	2.2
TR61	60.9	61.9	1.0	61.3	62.4	1.1
TR62	51.6	53.6	2.0	52.4	53.9	1.5

All values are sound pressure levels in dB re: 2×10^{-5} Pa.

When the differences between the 2017 and 2032 'with' and 'without' development traffic noise contributions are compared with the short term noise change criteria given in Table 2.2 of this report, the majority of the representative receptors would be considered to be within and above the moderate adverse effect criteria leading to a potential significant impact. None of the sensitive receptors are above 68 dB and therefore are not eligible for any additional noise insulation under the Noise Insulation Regulations 1975. Mitigation measures are shown in section 6.0 below.

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**Table 5.2 Difference Between Baseline Traffic Flows (2013) and With Bypass Scenarios (2032)**

Location	Traffic Noise Baseline Traffic Flows 2013 ($L_{A10,18hr}$ dB(A))	Traffic Noise With Development Only 2032 ($L_{A10,18hr}$ dB(A))	Difference between with development 2032 and baseline scenarios (dB(A))
TR01	53.8	57.0	3.2
TR02	56.4	63.8	7.4
TR03	54.9	62.0	7.1
TR04	51.4	55.3	3.9
TR05	51.5	59.7	8.2
TR06	51.0	57.5	6.5
TR07	51.3	59.8	8.5
TR08	49.8	58.4	8.6
TR09	48.3	59.2	10.9
TR10	48.3	58.1	9.8
TR11	47.9	56.7	8.8
TR12	47.3	56.8	9.5
TR13	47.0	56.2	9.2
TR14	51.1	56.8	5.7
TR15	46.5	57.9	11.4
TR16	46.6	57.3	10.7
TR17	46.0	55.1	9.1
TR18	44.3	50.9	6.6
TR19	47.5	58.0	10.5
TR20	44.8	56.1	11.3
TR21	46.3	60.4	14.1
TR22	44.7	58.0	13.3
TR23	44.6	58.3	13.7
TR24	43.6	56.6	13.0
TR25	45.1	61.2	16.1
TR26	43.7	52.4	8.7
TR27	43.8	56.5	12.7
TR28	44.4	60.2	15.8
TR29	43.0	56.0	13.0
TR30	42.9	55.1	12.2
TR31	43.0	55.3	12.3
TR32	49.8	59.8	10.0
TR33	43.2	55.8	12.6
TR34	43.0	55.0	12.0
TR35	54.2	56.8	2.6
TR36	50.4	57.9	7.5
TR37	49.5	55.1	5.6
TR38	55.4	59.7	4.3
TR39	55.2	60.8	5.6
TR40	54.1	58.8	4.7
TR41	58.7	64.9	6.2
TR42	58.8	63.0	4.2
TR43	53.7	58.6	4.9
TR44	49.0	54.0	5.0
TR45	49.2	53.6	4.4



Location	Traffic Noise Baseline Traffic Flows 2013 ($L_{A10,12hr}$ dB(A))	Traffic Noise With Development Only 2032 ($L_{A10,12hr}$ dB(A))	Difference between with development 2032 and baseline scenarios (dB(A))
TR46	46.8	51.1	4.3
TR47	45.8	53.4	7.6
TR48	45.3	49.3	4.0
TR49	43.9	47.7	3.8
TR50	43.6	47.7	4.1
TR51	43.2	48.3	5.1
TR52	44.6	50.0	5.4
TR53	44.7	49.9	5.2
TR54	44.9	50.4	5.5
TR55	44.0	47.7	3.7
TR56	45.0	49.0	4.0
TR57	46.8	49.8	3.0
TR58	44.9	48.1	3.2
TR59	46.5	49.6	3.1
TR60	48.6	51.3	2.7
TR61	60.7	62.4	1.7
TR62	51.9	53.9	2.0

Table 5.2 shows that when the differences between the baseline 2013 flows and the 2032 'with' development scenario are compared with the long term noise change criteria given in Table 2.2 of this report, the majority (TR01-TR41) of the representative receptors would be considered to have a moderate to significant adverse impact. None of the representative receptors are predicted to have levels above 68 dB and therefore are not eligible for any additional insulation as specified in the Noise Regulations 1975. Mitigation measures are shown in section 6.0 below.



6.0 Noise Mitigation

6.1 Proposed Link Road

The following assessments incorporate the beneficial effects of erecting 3.5 metre high acoustic barriers along the west of Fitzalan Link Road. In accordance with condition 18 location and details of these barriers are found in SK02 (Appendix B) and Appendix C of this report.

The tables below shows the results of the traffic noise assessment comparing the 'with' and 'without' development traffic noise levels for the year 2017 and 2032 on the public highways around the site inclusive of the 3.5 metre high acoustic barriers.

Table 5.3 Difference Between With and Without Bypass Scenarios with 3.5m Acoustic Barrier (2017, 2032)

Location	Traffic Noise Without Development 2017 (L _{A10,18hr} dB(A))	Traffic Noise With Development Only 2017 (L _{A10,18hr} dB(A))	Difference between with and without development scenarios (dB(A))	Traffic Noise Without Development 2032 (L _{A10,18hr} dB(A))	Traffic Noise With Development Only 2032 (L _{A10,18hr} dB(A))	Difference between with and without development scenarios (dB(A))
TR01	54.8	56.1	1.3	56.4	56.3	-0.1
TR02	55.9	57.1	1.2	58.5	59.4	0.9
TR03	51.9	55.5	3.6	55.6	57.1	1.5
TR04	51.5	54.7	3.2	51.8	55.2	3.4
TR05	50.8	53.6	2.8	54.7	55.1	0.4
TR06	50.4	50.9	0.5	51.5	52.3	0.8
TR07	49.7	53.4	3.7	51.8	54.7	2.9
TR08	48.6	51.2	2.6	50.6	52.8	2.2
TR09	47.7	51.8	4.1	48.8	53.4	4.6
TR10	47.6	51.5	3.9	48.8	52.9	4.1
TR11	47.3	50.2	2.9	48.4	51.6	3.2
TR12	46.8	50.2	3.4	47.8	51.5	3.7
TR13	46.5	49.7	3.2	47.6	51.0	3.4
TR14	50.6	52.5	1.9	51.1	53.6	2.5
TR15	46.0	51.5	5.5	47.0	52.7	5.7
TR16	45.8	50.7	4.9	47.1	52.5	5.4
TR17	45.5	49.0	3.5	46.5	50.5	4.0
TR18	43.5	46.9	3.4	44.8	48.0	3.2
TR19	47.1	51.5	4.4	48.0	53.0	5.0
TR20	45.8	49.2	3.4	46.8	51.2	4.4
TR21	45.8	51.9	6.1	46.8	53.7	6.9
TR22	44.4	50.1	5.7	45.2	51.6	6.4
TR23	44.1	50.1	6.0	45.1	51.6	6.5
TR24	44.7	48.9	4.2	45.5	51.2	5.7
TR25	45.2	52.6	7.4	45.3	53.9	8.6
TR26	43.8	47.8	4.0	44.2	48.7	4.5
TR27	43.9	49.8	5.9	44.3	50.7	6.4
TR28	44.6	52.6	8.0	45.1	53.5	8.4



Location	Traffic Noise Without Development 2017 ($L_{A10,18hr}$ dB(A))	Traffic Noise With Development Only 2017 ($L_{A10,18hr}$ dB(A))	Difference between with and without development scenarios (dB(A))	Traffic Noise Without Development 2032 ($L_{A10,18hr}$ dB(A))	Traffic Noise With Development Only 2032 ($L_{A10,18hr}$ dB(A))	Difference between with and without development scenarios (dB(A))
TR29	42.8	49.3	6.5	43.5	50.2	6.7
TR30	42.6	48.7	6.1	43.4	49.6	6.2
TR31	42.8	48.5	5.7	43.5	49.5	6.0
TR32	49.3	53.0	3.7	49.8	55.2	5.4
TR33	46.2	49.6	3.4	46.9	51.0	4.1
TR34	46.5	49.3	2.8	47.0	50.9	3.9
TR35	53.8	54.6	0.8	54.2	55.9	1.7
TR36	49.9	53.6	3.7	50.7	54.9	4.2
TR37	49.1	49.5	0.4	49.8	50.4	0.6
TR38	54.8	57.0	2.2	55.4	58.3	2.9

With the inclusion of the 3.5m barriers, when the differences between the 2017 and 2032 'with' development scenarios are compared with the noise change criteria given in Table 2.2 of this report, more than half of the representative receptors would be considered to experience a 'slight' effect. Due to the presence of a new noise source where previously there wasn't one, ten receptors are marginally over the 'moderate' effect level in the short term assessment 2017. However noise levels at these properties during the long term assessment are all predicted to be at the or less than 'moderate' effect level.

The assessment indicates that as a result of the scheme and mitigation, only three properties will exceed 55dB the BS 8233:2014 recommended upper limit for private external amenity areas, where they did not do so before.

Table 5.4 Difference Between Baseline Traffic Flows (2013) and With Bypass Scenarios (2032)

Location	Traffic Noise Without Development 2013 ($L_{A10,18hr}$ dB(A))	Traffic Noise With Development Only 2032 ($L_{A10,18hr}$ dB(A))	Difference between with and without development scenarios (dB(A))
TR01	55.6	56.3	0.7
TR02	57.8	59.4	1.6
TR03	55.0	57.1	2.1
TR04	51.3	55.2	3.9
TR05	53.0	55.1	2.1
TR06	50.9	52.3	1.4
TR07	51.2	54.7	3.5
TR08	49.9	52.8	2.9
TR09	48.0	53.4	5.4
TR10	48.0	52.9	4.9
TR11	47.7	51.6	3.9
TR12	47.1	51.5	4.4
TR13	46.7	51.0	4.3
TR14	50.6	53.6	3.0
TR15	46.4	52.7	6.3
TR16	46.3	52.5	6.2



Location	Traffic Noise Without Development 2013 ($L_{A10,18hr}$ dB(A))	Traffic Noise With Development Only 2032 ($L_{A10,18hr}$ dB(A))	Difference between with and without development scenarios (dB(A))
TR17	45.9	50.5	4.6
TR18	43.3	48.0	4.7
TR19	47.4	53.0	5.6
TR20	46.2	51.2	5.0
TR21	46.0	53.7	7.7
TR22	44.7	51.6	6.9
TR23	44.4	51.6	7.2
TR24	45.1	51.2	6.1
TR25	45.4	53.9	8.5
TR26	43.7	48.7	5.0
TR27	43.7	50.7	7.0
TR28	45.1	53.5	8.4
TR29	43.1	50.2	7.1
TR30	42.7	49.6	6.9
TR31	42.7	49.5	6.8
TR32	49.3	55.2	5.9
TR33	47.8	51.0	3.2
TR34	48.7	50.9	2.2
TR35	54.6	55.9	1.3
TR36	52.9	54.9	2.0
TR37	51.4	50.4	-1.0
TR38	54.9	58.3	3.4

Table 5.4 shows that with the inclusion of the when the differences between the baseline 2013 flows and the 2032 'with' development scenario are compared with the long term noise change criteria given in Table 2.2 of this report, all of the representative receptors would be considered to have a slight or moderate adverse impact.

Due to the presence of a new noise source where previously there wasn't one, 17 receptors are marginally within the 'moderate' effect level however noise levels at all of these properties are predicted to be less than 55 dB, the BS 8233:2014 recommended upper limit for private external amenity areas.

Table 5.5 Difference Between the With Development 2032 scenario with and without the 3.5m High Barrier

Location	Traffic Noise Without Barrier D52032 ($L_{A10,18hr}$ dB(A))	Traffic Noise With Barrier D52032 ($L_{A10,18hr}$ dB(A))	Difference between with and without barrier (dB(A))
TR01	57.0	56.3	-0.7
TR02	63.8	59.4	-4.4
TR03	62.0	57.1	-4.9
TR04	55.3	55.2	-0.1
TR05	59.7	55.1	-4.6
TR06	57.5	52.3	-5.2
TR07	59.8	54.7	-5.1



Location	Traffic Noise Without Barrier D52032 ($L_{A10,150m}$ dB(A))	Traffic Noise With Barrier D52032 ($L_{A10,150m}$ dB(A))	Difference between with and without barrier (dB(A))
TR08	58.4	52.8	-5.6
TR09	59.2	53.4	-5.8
TR10	58.1	52.9	-5.2
TR11	56.7	51.6	-5.1
TR12	56.7	51.5	-5.2
TR13	56.2	51.0	-5.2
TR14	56.8	53.6	-3.2
TR15	57.9	52.7	-5.2
TR16	57.3	52.5	-4.8
TR17	55.0	50.5	-4.5
TR18	50.9	48.0	-2.9
TR19	57.9	53.0	-4.9
TR20	56.1	51.2	-4.9
TR21	60.4	53.7	-6.7
TR22	58.0	51.6	-6.4
TR23	58.3	51.6	-6.7
TR24	56.6	51.2	-5.4
TR25	61.2	53.9	-7.3
TR26	52.4	48.7	-3.7
TR27	56.5	50.7	-5.8
TR28	60.2	53.5	-6.7
TR29	56.0	50.2	-5.8
TR30	55.1	49.6	-5.5
TR31	55.3	49.5	-5.8
TR32	59.8	55.2	-4.6
TR33	55.8	51.0	-4.8
TR34	55.0	50.9	-4.1
TR35	56.8	55.9	-0.9
TR36	57.9	54.9	-3.0
TR37	55.1	50.4	-4.7
TR38	59.7	58.3	-1.4

Table 5.5 shows that the provision of the 3.5m high acoustic barrier adjacent to the carriageway is predicted to significantly reduce traffic noise levels by up to 7.3 dB.



7.0 Conclusions

In accordance with condition 18 of planning permission LU/63/11 it is considered that the noise mitigation in Section 6.0 of this report is sufficient to reduce the effects of any noticeable and disruptive noise predicted to be emitted from the Fitzalan Link Road by reducing traffic noise levels by up to 7.3dB. Details of the 3.5m acoustic barrier have been provided within the SK02b and in Appendix C of this report.

The requirements of Condition 18 of planning permission ref LU/63/11 are met and can therefore be discharged.



Appendices



Abbreviations

CADNA – Computer Aided Noise Abatement

DMRB – Design Manual for Roads and Bridges

HGV – Heavy Goods Vehicle

PPG – Planning Practice Guidance

UDP – Unitary Development Plan

UKAS – United Kingdom Accreditation Service

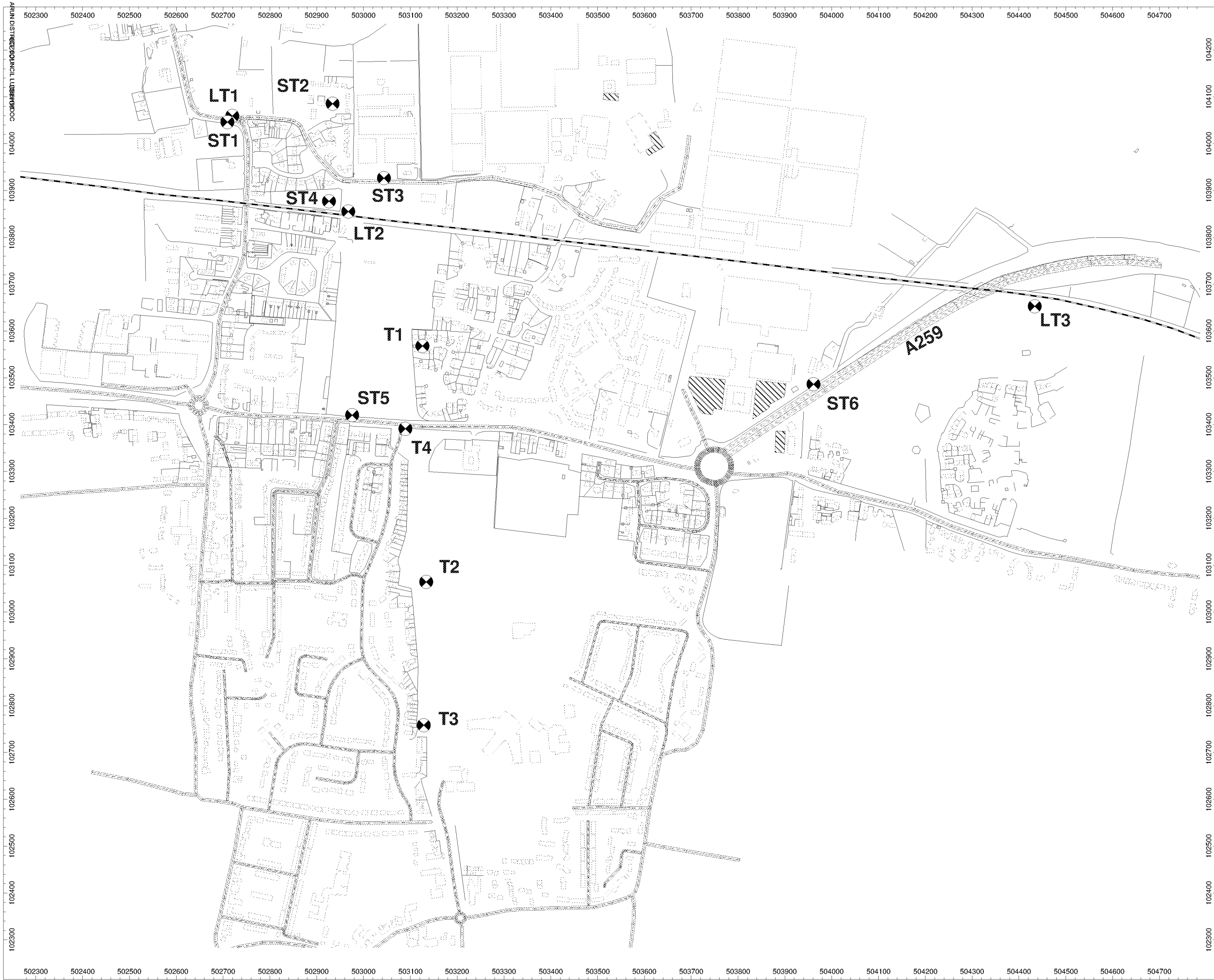
WYGE – WYG Environment

SK01 Noise Monitoring Locations

SK02b Proposed 3.5m Barrier Locations

SK04 DS2032 with the Barrier

SK05 Difference plot between with and without Barrier Scenario



Client:
Persimmon Homes

Project:
Fitzalan Link Road,
North Littlehampton

Project Number:
A095004

Drawing Title / Scenario:
Noise Monitoring Locations

Drawing Number:
SK01

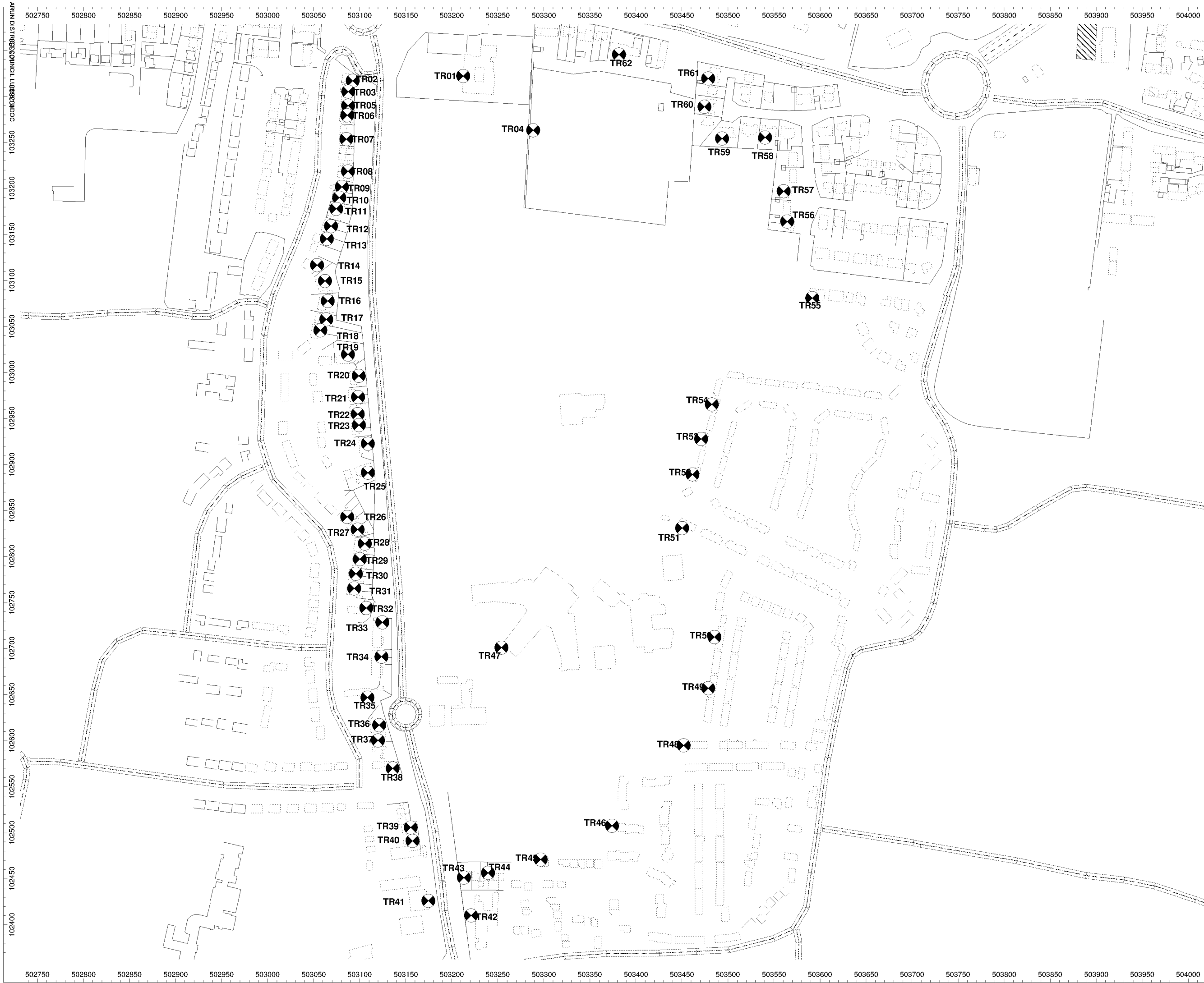
Scale : Not to scale

WYGE Leicester 08.02.16



Executive Park
Avon Way
Anlaby
Leicestershire
LE7 7GR
Tel 0116 234 8000

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Client:
Persimmon Homes

Project:
Fitzalan Link Road,
North Littlehampton

Project Number:
A095004

Drawing Title / Scenario:
Receptor Locations

Drawing Number:
SK02a

Scale : Not to scale
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Client:
Persimmon Homes

Project:
Fitzalan Link Road,
North Littlehampton

Project Number:
A095004

Drawing Title / Scenario:
Proposed 2.5m
Barrier Locations

Drawing Number:
SK02b

Key:

Proposed 2.5m Barrier : - - - - -

Scale : Not to scale

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Leicestershire
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Client:
Persimmon Homes

Project:
Fitzalan Link Road,
North Littlehampton

Project Number:
A095004

Drawing Title / Scenario:
DS 2032 LA10, 18Hour
Without Acoustic Barriers

Drawing Number:
SK03

Key:

0.0 - 50.0 dB
50.0 - 60.0 dB
60.0 - 70.0 dB
>70.0 dB

Scale : Not to scale

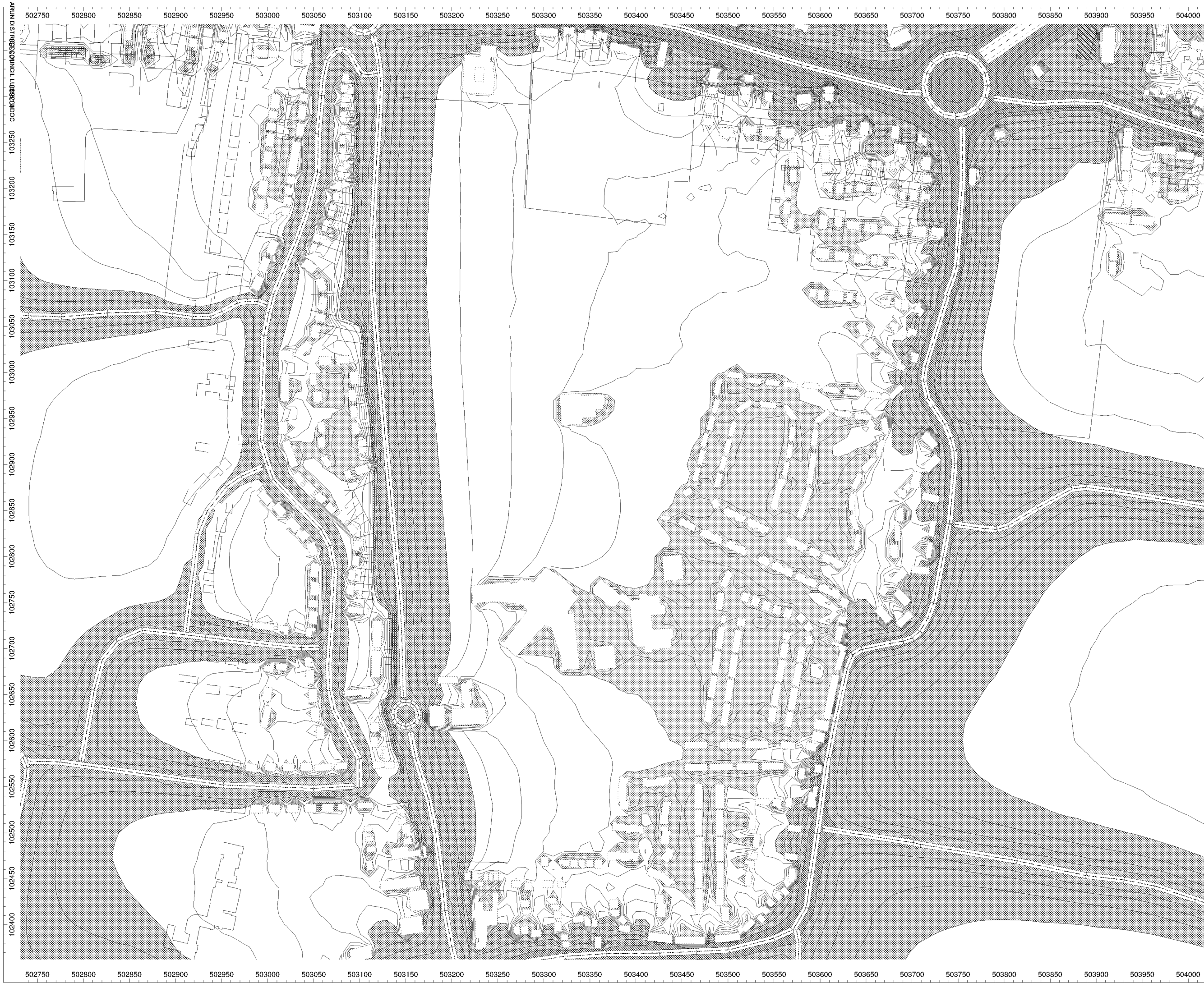
Please note: Noise contour
plots are for illustrative
purposes only

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Tel 0116 234 8000

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Client:
Persimmon Homes

Project:
Fitzalan Link Road,
North Littlehampton

Project Number:
A095004

Drawing Title / Scenario:
DS 2032 LA10, 18Hour
With Acoustic Barriers

Drawing Number:
SK04

Key:

[Lightest Gray Box]	0.0 - 50.0 dB
[Medium Gray Box]	50.0 - 60.0 dB
[Dark Gray Box]	60.0 - 70.0 dB
[Darkest Gray Box]	>70.0 dB

Scale : Not to scale

Please note: Noise contour
plots are for illustrative
purposes only

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Client:
Persimmon Homes

Project:
Fitzalan Link Road,
North Littlehampton

Project Number:
A095004

Drawing Title / Scenario:
Predicted Effects of
Proposed Barrier

Drawing Number:
SK05

Key:

- 5
- 3
- 1
- 0
- 1
- 3
- 5

Scale : Not to scale

Please note: Noise contour
plots are for illustrative
purposes only

Appendix C – Barrier Details

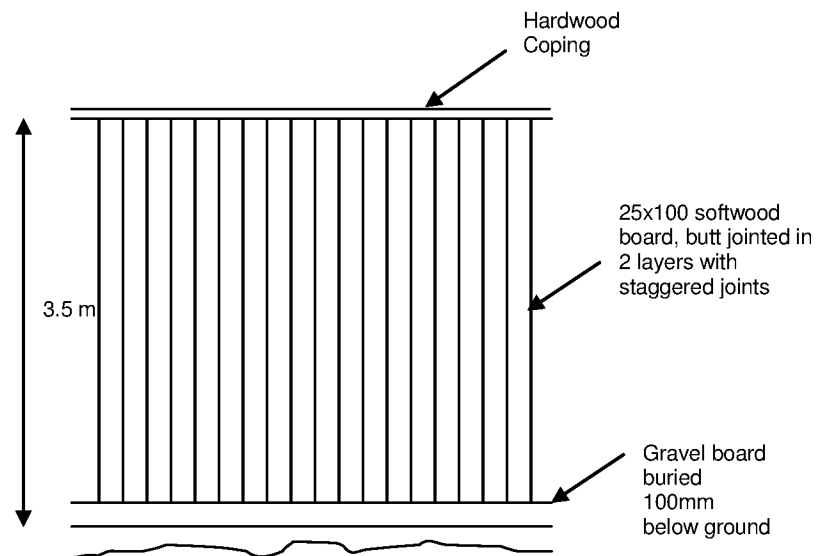
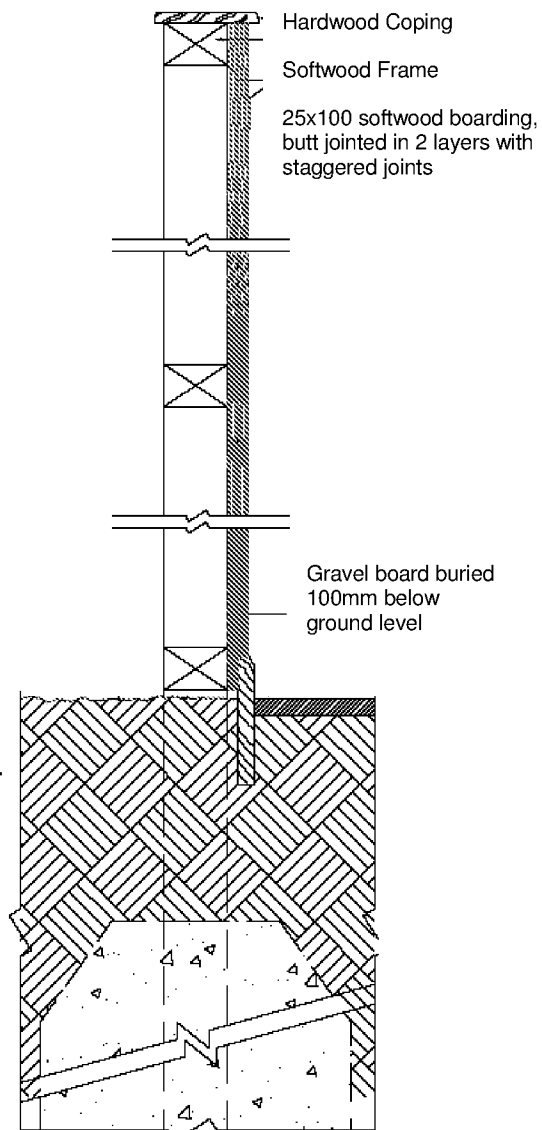
Client: Persimmon Homes

**Project: Fitzalan Link Road,
North Littlehampton**

Project Number: A095004

**Drawing Title / Scenario:
Acoustic Fence Detail**

Scale: Not to Scale



WYG Leicester

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