



Persimmon Homes

**Reserved Matters Application (Parcels A2
and B6) and Discharge of Conditions,
North Littlehampton**

Noise Assessment
November 2018

Executive Park, Avalon Way, Anstey, Leicester, LE7 7GR

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1.0 Introduction

1.1 Purpose of this Report

This report presents the findings of a noise assessment for a reserved matters application for parcels A2 and B6 of a residential development in north Littlehampton and the discharge of Conditions 37 and 38 of planning permission ref LU-47-11 which states:

"37 In addition to the measures described in Condition 36 above, any development on land within Noise Exposure Category C and D shall incorporate noise mitigation measures details of which are to be submitted to, and approved in writing by, the Local Planning Authority. These measures shall thereafter be permanently maintained."

"38 All ground level private amenity spaces shall have a predicted noise level of less than or equal to L_{Aeq} , 55dB (measured over a 1 hour period) within the first 5 metres from the building facade"

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.

1.2 Legislative Context (England)

PPG24 (from which Noise Exposure Categories were defined) was replaced by NPPF on 27 March 2012 and then updated on 24th July 2018. This report is intended to provide information relevant to the local planning authority and their consultees in support of a planning application for the above proposed development. Policy guidance with respect to noise is found in National Planning Policy Framework (NPPF), published on 24th July 2018. With regard to noise and planning, NPPF contains the following statement at paragraph 170:

"170. Planning policies and decisions should contribute to and enhance the natural and local environment by:

- e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions*



such as air and water quality, taking into account relevant information such as river basin management plans

A further 2 short statements are presented at paragraph 180, which state:

"180. Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

- a) "mitigate and reduce to a minimum potential adverse impact resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life*
- b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational an amenity value for this reason."*

Furthermore, paragraphs 182 and 183 state:

"182. Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.

183. The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities."

Practice Guidance (PPG): Noise provides further guidance with regard to the assessment of noise within the context of Planning Policy. The overall aim of this guidance is, tying in with the principles of the NPPF and the Explanatory Note of the Noise Policy Statement for England, is to, *'identify whether the overall effect of noise exposure is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation.'*

A summary of the effects of noise exposure associated with both noise generating developments and noise sensitive developments is presented within the PPG and repeated as follows:

**Table 1.1 Noise Exposure Hierarchy**

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not noticeable	No Effect	No Observed Effect	No Specific Measures Required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect (NOEL)	No Specific Measures Required
Lowest Observed Adverse Effect Level (LOAEL)			
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; closing windows for some of the time because of the noise. Potential for non-awakening sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level (SOAEL)			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. having to keep windows closed most of the time, avoiding certain activities during periods of intrusion. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Observed Adverse Effect	Prevent

The NPPF, NSPE and PPG do not, however, present absolute noise level criteria which define SOAEL, LOAEL and NOEL which is applicable to all sources of noise in all situations. Therefore, within the context of the Proposed Development, the extant planning permission, national planning policy and appropriate guidance documents including the 'World Health Organisation Community Noise Guidelines' (1999) and 'BS 8233 – Guidance on Sound Insulation and Noise Reduction for Buildings' (2014), Section 2.0 presents the noise level criteria used as a basis of this assessment.

1.3 ProPG Planning and Noise - New Residential Development

Professional Practice Guidance on Planning and Noise for new residential development (ProPG) was launched on 22nd June 2017 by the Chartered Institute of Environmental Health (CIEH), the Association of Noise



Consultants (ANC) and the Institute of Acoustics (IOA). The guidance has been published to provide practitioners with guidance on the management of noise within the planning system in England.

The guidance is specifically for 'new residential development that would be exposed predominantly to noise from existing transport sources' and reflects the Government's overarching Noise Policy Statement for England (NPSE), the National Planning Policy Framework (NPPF), and Planning Practice Guidance (including PPG-Noise), as well as other authoritative sources of guidance.

The guidance provides advice for Local Planning Authorities (LPAs) and developers, and their respective professional advisers which complements Government planning and noise policy and guidance and, in particular, aims to:

- Advocate full consideration of the acoustic environment from the earliest possible stage of the development control process;
- Encourage the process of good acoustic design in and around new residential developments;
- Outline what should be taken into account in deciding planning applications for new noise-sensitive developments;
- Promote appropriate noise exposure standards; and
- Assist the delivery of sustainable development.

There are two stages of the overall approach outlined in the ProPG:

- Stage 1 – an initial noise risk assessment of the proposed development site; and
- Stage 2 – a systematic consideration of 4 key elements which is underpinned by an Acoustic Design Statement.

With regards to Stage 1, ProPG provides guidance to produce an initial site risk assessment, pre-mitigation, with regards to noise based on the prevailing daytime and night time noise levels across the site, from which the site (or areas thereof) can be allocated a Noise Risk as shown in Figure 1.1 below, together with their corresponding sound levels as referred to in the ProPG.



Figure 1.1 ProPG Stage 1, Noise Risk Assessment

Noise Risk Assessment	Potential Effect Without Noise Mitigation	Pre-Planning Application Advice
Indicative Daytime Noise Levels $L_{Aeq,15hr}$ Indicative Night-Time Noise Levels $L_{Aeq,9hr}$ 70 dB 65 dB 60 dB 55 dB 50 dB 60 dB 55 dB 50 dB 45 dB 40 dB High Medium Low Negligible	Increasing risk of adverse effect No adverse effect	High noise levels indicate that there is an increased risk that development may be refused on noise grounds. The risk may be reduced by following a good acoustic design process that is demonstrated in a detailed ADS. Applicants are strongly advised to seek expert advice. As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigate and minimised, and which clearly demonstrates that a significant adverse noise impact will be avoided in the finished development. At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development. These noise levels indicate that the development site is likely to be acceptable from a noise perspective, and the application need not normally be delayed on noise grounds.



2.0 Assessment Criteria

2.1 Internal Noise Assessment Criteria

In order to enable the assessment of the proposed development in terms of LOAEL and SOAEL, Table 2.1 presents equivalent noise levels and associated actions with the target noise level criteria identified. For the purpose of this assessment, the target noise level criteria are noted in italics in the table below.

Table 2.1 Noise Level Criteria and Actions

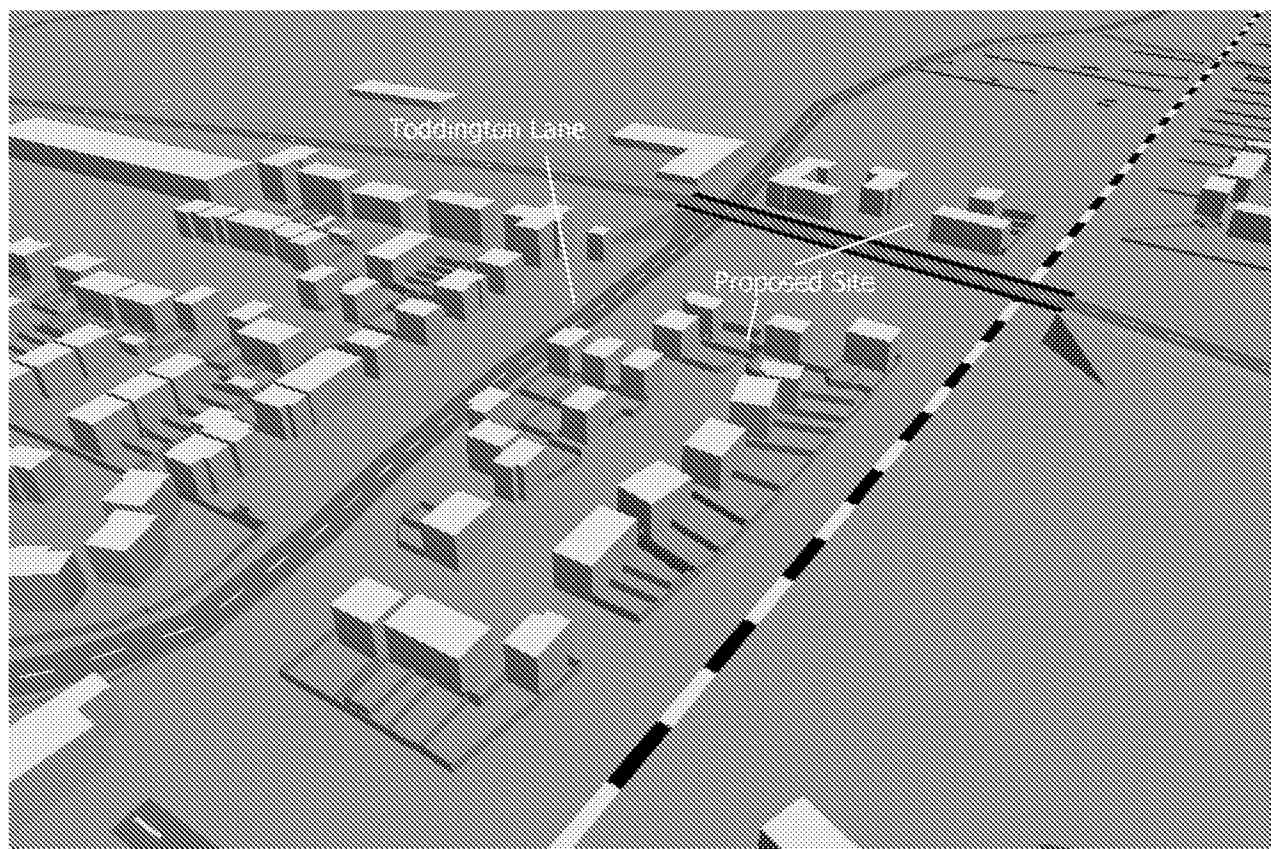
Noise Level Criteria	Effect Level	Action / Justification
Bedrooms – 30 dBL _{Aeq,8hours} / 45 dBL _{Amax} Living Rooms – 30 dBL _{Aeq,16hours} External Amenity Space – 50 dBL _{Aeq,16hours}	No Observed Adverse Effect Level	None Within BS8233 / WHO criteria
Noise levels exceed: Bedrooms – 30 dBL _{Aeq,8hours} / 45 dBL _{Amax} Living Rooms – 35 dBL _{Aeq,16hours} External Amenity Space – 55 dBL _{Aeq,16hours}	Lowest Observed Adverse Effect Level	Mitigate to achieve: <i>Bedrooms – 30 dBL_{Aeq,8hours} / 45 dBL_{Amax}</i> <i>Living Rooms – 35 dBL_{Aeq,16hours}</i> <i>External Amenity Space – 55 dBL_{Aeq,16hours}</i> Within BS8233 / WHO criteria
Noise levels exceed: Bedrooms – 30 dBL _{Aeq,8hours} Living Rooms – 35 dBL _{Aeq,16hours} External Amenity Space – 55 dBL _{Aeq,16hours}	Significant Observed Adverse Effect	Avoid However, if due to other design considerations noise criteria is not achievable or that the target criteria can be achieved for certain periods (e.g. when windows are closed), the following noise levels may be acceptable as an upper limit: Bedrooms – 35 dBL _{Aeq,8hours} Living Rooms – 40 dBL _{Aeq,16hours} External Amenity Space – 60 dBL _{Aeq,16hours} This is on the basis that the guideline noise values do not represent people's response to noise in all cases with the specified criteria only a marginal exceedance of the target criteria.
Noise levels with mitigation exceed: Bedrooms – 35 dBL _{Aeq,8hours} Living Rooms – 40 dBL _{Aeq,16hours} External Amenity Space – 60 dBL _{Aeq,16hours}	Unacceptable Observed Adverse Effect	Prevent

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	WYGE	Traffic flows for local roads based on WYGE observations and experience.
Traffic data – local roads	WYGE	Traffic flows for local roads based on WYGE observations and experience.
Building heights – around site	WYGE Observations	8 m height for two storey residential properties, and 4 m for Bungalows
Barrier heights	WYGE 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	WYGE	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	WYGE	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
Plans	Persimmon	Drawing Title: Site Layout Drawing No.: 544_PL_100 Dated: July 2018

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 Model Verification

The model was verified by modelling the monitoring locations for the 'existing' weekday scenario. Daytime and night-time L_{Aeq} and night-time L_{Amax} scenarios have been verified. The comparison between the monitoring and modelling results (including contributions from local roads) are shown in the tables below.

Table 3.2 Modelled vs. Monitored Results L_{Aeq} ; daytime 07:00 – 23:00

Location	Monitored L_{Aeq}	Modelled L_{Aeq}	Difference between Monitored and Modelled Results
LT1	68.0	68.1	0.1
LT2	60.9	61.5	0.6
LT3	66.0	65.8	-0.2
ST1	70.7	70.7	0.0
ST2	53.1	54.3	1.2
ST3	62.9	63.4	0.5
ST4	55.7	56.1	0.4
ST5	77.0	76.7	-0.3
ST6	82.1	82.1	0.0

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

Table 3.3 Modelled vs. Monitored Results L_{Aeq} ; night-time 23:00– 07:00

Location	Monitored L_{Aeq}	Modelled L_{Aeq}	Difference between Monitored and Modelled Results
LT1	62.7	62.7	0.0
LT2	56.8	56.2	-0.6
LT3	59.8	61.3	1.5
ST1	64.2	65.2	1.0
ST2	38.9	42.8	3.9
ST3	39.0	56.3	17.3
ST4	45.4	54.8	9.4
ST5	71.1	71.6	0.5
ST6	77.4	77.6	0.2

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

Table 3.4 Modelled vs. Monitored Results L_{Amax} ; night-time 23:00– 07:00

Location	Monitored L_{Amax}	Modelled L_{Amax}	Difference between Monitored and Modelled Results
LT1	84.5	84.4	-0.1
LT2	89.4	89.2	-0.2
LT3	92.9	91.5	-1.4
ST1	81.0	86.5	5.5
ST2	50.2	62.7	12.5
ST3	84.2	83.3	-0.9
ST4	67.0	69.9	2.9



Location	Monitored L_{Amax}	Modelled L_{Amax}	Difference between Monitored and Modelled Results
ST5	90.5	88.7	-1.8
ST6	96.3	96.0	-0.3
LT1	84.5	84.4	-0.1

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

The verification points show a divergence between monitored and modelled results of no more than 3 dB with the exception of locations ST2 - ST4 during the night-time L_{Aeq} scenarios and ST1 and ST2 for the night-time L_{Amax} scenarios where the model is predicting a higher level than was recorded during short term measurements, probably due to the low number of cars passing during the short-term 15 minute measurements. Accordingly, Toddington Lane immediately south of the site has been modelled based upon the predicted traffic flows included in Table 3.5 below with a night-time correction applied.

3.2.2 Traffic Noise Data

All roads expected to make a significant contribution have been included within this assessment. Traffic flows and HGV percentages for the proposed Lyminster Bypass and Toddington Lane have been based on traffic data provided by Mayer Brown. Estimates of the vehicle speeds have been made based upon the speed restrictions currently in force in the area.

Table 3.5 Lyminster Bypass Traffic Data

Road	18hr AAWT	HGV %	Speed (kmph)
Lyminster Bypass	15092	05	48
Toddington Lane	10210	08	48
Development Link Road East	7882	05	48

A correction has been applied to convert the predicted 18 hour L_{A10} traffic noise levels to 16 hour L_{Aeq} noise levels using the following formula, as provided within PPG 24:

$$L_{Aeq}(16\text{hour}) = L_{A10}(18\text{hour}) - 2\text{dB}$$

During the night-time period, a correction of $0.9 \times L_{A10,18\text{hours}} - 3.77$ has been applied to each link within the $L_{A10,18\text{hours}}$ noise model to derive the $L_{Aeq,8\text{hours}}$ which follows the guidance provided within DMRB.

3.2.3 Sensitive Receptors

Existing noise levels have been assessed at properties across the site with respect to direct noise from the existing ambient noise climate surrounding the site. The locations of the proposed receptors are shown in SK02 of Appendix B.

**Table 3.6 Residential Receptor Locations**

Ref.	Description	Closest Source	Approximate Distance To Source (m)	Height (m)
R01	Southwest of Site	Railway	21.8	1.5/4.0
R02	Southwest of Site	Railway	21.5	1.5/4.0
R03	Southwest of Site	Railway	22.0	1.5/4.0
R04	Southwest of Site	Railway	22.3	1.5/4.0
R05	South of Site	Railway	20.6	1.5/4.0
R06	South of Site	Railway	22.0	1.5/4.0
R07	South of Site	Railway	21.7	1.5/4.0
R08	South of Site	Railway	16.0	1.5/4.0
R09	South of Site	Railway	16.6	1.5/4.0
R10	Southeast of Site	New Link Road	31.2	1.5/4.0
R11	Southeast of Site	Railway	16.5	1.5/4.0
R12	Southeast of Site	Railway	20.2	1.5/4.0
R13	East of site	Toddington Lane	39.7	1.5/4.0
R14	Northeast of Site	Toddington Lane	9.8	1.5/4.0
R15	East of Site	New Link Road	24.5	1.5/4.0
R16	Centre of Site	New Link Road	47.4	1.5/4.0
R17	North of Site	Toddington Lane	20.4	1.5/4.0
R18	Northwest of site	Toddington Lane	9.0	1.5/4.0
R19	West of Site	Toddington Lane	18.7	1.5/4.0
R20	West of Site	Toddington Lane	23.4	1.5/4.0
R21	West of Site	Toddington Lane	23.0	1.5/4.0
R22	Centre of Site	Railway	30.8	1.5/4.0

Table 3.7 Private External Amenity Area Receptor Locations

Ref.	Description	Closest Source	Approximate Distance To Source (m)	Height (m)
G01	West of Site	Toddington Lane	26.8	1.2
G02	Southwest of Site	Railway	19.8	1.2
G03	Southwest of Site	Railway	15.9	1.2
G04	South of Site	Railway	16.1	1.2
G05	South of Site	Railway	14.5	1.2
G06	South of Site	Railway	15.5	1.2
G07	Southeast of site	Railway	14.7	1.2
G08	Southeast of site	Railway	16.4	1.2
G09	Centre of Site	New Link Road	52.8	1.2
G10	Centre of Site	Toddington Lane	10.1	1.2
G11	West of Site	Toddington Lane	25.4	1.2
G12	West of Site	Toddington Lane	14.1	1.2



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
LT1	Junction of Lyminster Road and Mill Lane
LT2	Land behind Empress Close along the rail line
LT3	Land north of Sunflower Close, along the rail line.
ST1	Junction of Lyminster Road and Mill Lane
ST2	On Fuller's Walk, next to play area.
ST3	Along Toddington Lane behind garden centre.
ST4	At the junction of Empress Close and Hearnfield Road.
ST5	At the junction of Worthing Road and Landsdowne Road.
ST6	Along Norway Lane adjacent to the A259.



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)	$L_{Amax,T}$ (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	94.1	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
	15 Mins	14/10/2014 13:09	ST5	77.0	92.3	54.3	80.5	67.7



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)
	15 Mins	14/10/2014 10:38	ST6	82.1	93.6	59.7	86.8	68.6
Evening 19:00 - 23:00	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
	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
Night 23:00 - 07:00	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



5.0 Assessment of Key Effects

5.1 Noise Intrusion Assessment

Internal noise levels within potential dwellings have been assessed both with windows open, where a reduction from a partially open window of 10 dB has been used, and with windows closed where an assumption of glazing with specification R_w 30 dB (e.g 6/12/6mm double glazing or equivalent) has been used. These assessments include noise from existing roads, the proposed link roads, the railway line directly south.

The results presented in Tables 5.1 – 5.3 below show the predicted noise intrusion levels at properties across the site. The recommended WHO/BS 8233 internal noise levels are met across the site during the night-time, assuming a windows-closed scenario, however majority of façades are predicted to exceed the relevant criteria (L_{Aeq} , L_{Amax}) with windows open during the both daytime and night-time periods. In order to achieve the recommended internal noise criteria, a range of mitigation measures are outlined in Section 6.1 of this report; SK05 in Appendix B shows the glazing requirements for the proposed development. In order to meet both ventilation and internal noise criteria all habitable rooms on site require alternative ventilation, with some properties closest to the railway and link road requiring alternative ventilation for noise sensitive rooms such as bedrooms and living rooms.

Table 5.1 Daytime Noise Intrusion Levels L_{Aeq} 16 hour

Location	External L_{Aeq} at 1m from facade	Internal L_{Aeq} with windows open	Internal L_{Aeq} with windows closed	Criteria Internal L_{Aeq}
R01	50.2	40.2	20.2	35
R02	58.7	48.7	28.7	35
R03	53.0	43.0	23.0	35
R04	52.5	42.5	22.5	35
R05	54.1	44.1	24.1	35
R06	53.8	43.8	23.8	35
R07	54.6	44.6	24.6	35
R08	50.8	40.8	20.8	35
R09	61.1	51.1	31.1	35
R10	57.5	47.5	27.5	35
R11	60.5	50.5	30.5	35
R12	54.0	44.0	24.0	35
R13	57.6	47.6	27.6	35
R14	63.5	53.5	33.5	35
R15	60.0	50.0	30.0	35
R16	58.8	48.8	28.8	35
R17	61.0	51.0	31.0	35
R18	62.3	52.3	32.3	35
R19	52.1	42.1	22.1	35
R20	56.4	46.4	26.4	35



Location	External L_{Aeq} at 1m from facade	Internal L_{Aeq} with windows open	Internal L_{Aeq} with windows closed	Criteria Internal L_{Aeq}
R21	51.6	41.6	21.6	35
R22	50.2	40.2	20.2	35

Table 5.2 Night-time Noise Intrusion Levels L_{Aeq} 8 hour

Location	External L_{Aeq} at 1m from facade	Internal L_{Aeq} with windows open	Internal L_{Aeq} with windows closed	Criteria Internal L_{Aeq}
R01	48.1	38.1	18.1	30
R02	57.3	47.3	27.3	30
R03	49.6	39.6	19.6	30
R04	49.2	39.2	19.2	30
R05	50.0	40.0	20.0	30
R06	49.7	39.7	19.7	30
R07	50.0	40.0	20.0	30
R08	48.6	38.6	18.6	30
R09	58.3	48.3	28.3	30
R10	50.1	40.1	20.1	30
R11	58.1	48.1	28.1	30
R12	49.6	39.6	19.6	30
R13	52.8	42.8	22.8	30
R14	52.8	42.8	22.8	30
R15	52.0	42.0	22.0	30
R16	52.5	42.5	22.5	30
R17	49.4	39.4	19.4	30
R18	50.1	40.1	20.1	30
R19	47.6	37.6	17.6	30
R20	48.9	38.9	18.9	30
R21	48.4	38.4	18.4	30
R22	44.2	34.2	14.2	30

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

Table 5.3 Night-time Noise Intrusion Levels L_{Amax}

Location	External L_{Amax} at 1m from facade	Internal L_{Amax} with windows open	Internal L_{Amax} with windows closed	Criteria Internal L_{Amax}
R01	74.7	64.7	44.7	45
R02	85.2	75.2	55.2	45
R03	75.6	65.6	45.6	45
R04	75.1	65.1	45.1	45
R05	75.8	65.8	45.8	45
R06	75.6	65.6	45.6	45
R07	76.0	66.0	46.0	45
R08	75.4	65.4	45.4	45
R09	86.1	76.1	56.1	45
R10	75.3	65.3	45.3	45
R11	86.2	76.2	56.2	45
R12	74.4	64.4	44.4	45
R13	80.0	70.0	50.0	45



Location	External L_{Amax} at 1m from facade	Internal L_{Amax} with windows open	Internal L_{Amax} with windows closed	Criteria Internal L_{Amax}
R14	83.2	73.2	53.2	45
R15	81.1	71.1	51.1	45
R16	79.4	69.4	49.4	45
R17	80.4	70.4	50.4	45
R18	82.4	72.4	52.4	45
R19	71.8	61.8	41.8	45
R20	77.5	67.5	47.5	45
R21	73.1	63.1	43.1	45
R22	68.9	58.9	38.9	45

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

5.1.1 Private External Amenity Area Noise Levels

Daytime noise levels in gardens and private external spaces of the proposed development have been assessed in the table below. The location of the 'garden' receptor locations are shown on SK02 in Appendix B. The scheme proposals include the construction of barriers in the form of 1.8m high fences across the majority of the site, with 2.0-2.5m high garden fences along the southern boundary with the railway and 2.5m fences with gardens adjacent to the new link road. Full location details for garden fences are shown in SK05.

Table 5.4 Private External Amenity Area Noise Levels $L_{Aeq,16hr}$

Ref	External $L_{Aeq,16hr}$ Daytime	BS 8233 Upper Limit Criteria L_{Aeq}
G01	51.7	55.0
G02	51.5	55.0
G03	53.0	55.0
G04	53.7	55.0
G05	54.5	55.0
G06	53.8	55.0
G07	53.8	55.0
G08	53.9	55.0
G09	53.9	55.0
G10	53.7	55.0
G11	50.2	55.0
G12	52.7	55.0

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

The results in the table above show that daytime L_{Aeq} noise levels within private external amenity areas are predicted to be within the BS 8233 Upper limit (55 dB) and therefore Condition 38 planning permission reference LU-47-11 can be discharged.



6.0 Noise Mitigation

6.1 Glazing and Ventilation Strategy

The mitigation measures below are sufficient to reduce the effects of any noticeable and disruptive noise from the surrounding environment by helping to prevent noise levels exceeding BS 8233 criteria for L_{Aeq} and L_{Amax} within all areas of the proposed development.

In accordance with the requirements of Condition 37 of planning permission ref LU-47-11, the glazing strategy provided in SK05 has been designed to achieve internal daytime L_{Aeq} of 35 dB, an internal night-time L_{Aeq} of 30 dB and an internal night-time L_{Amax} of 45 dB in habitable rooms of the proposed development. Throughout the proposed development, all façades would require alternative ventilation for noise sensitive rooms (bedrooms and living rooms) due to the proximity of the railway and proposed new link road running through the site. Alternative ventilation can be provided in several ways from acoustic trickle vents (which need to have a minimum sound reduction equal to or greater than the glazing) or other passive ventilation systems.

Glazing with a sound reduction between R_w 30 – R_w 42 will need to be provided for most facades within the proposed development, particularly those with facades facing the railway, the proposed link road and Toddington Lane. Facades which require glazing with a sound reduction of R_w 35 – R_w 42 will also require alternative ventilation for noise sensitive rooms (bedrooms and living rooms). The full glazing and ventilation strategy is detailed in SK05 and Appendix B and in Table C1 of Appendix C.

Care will be taken to minimise the potential impact of noise via careful design of building layout with consideration being made to the appropriate positioning of living rooms and bedrooms with respect to the access road and railway. Within the buildings themselves, living rooms and bedrooms will ideally be located on shielded façades with non-sensitive spaces such as corridors, bathrooms, en-suite, utility rooms, window-less gable ends and kitchens should ideally be located on the road facing façades of residential properties.

Fences will be constructed from brick or solid timber panels with no gaps of a ship-lapped design and shall have a surface weight of no less than 15kg/m² and be a minimum of 1.8 metres high, with 2.0 – 2.5m fences required for those which lie adjacent to the railway and new link road to provide further protection to external private amenity spaces.



7.0 Conclusions

Conditions 37 and 38

In accordance with the requirements of Conditions 37 and 38 of planning permission ref LU-47-11, a glazing and ventilation strategy has been provided which achieves both ventilation and internal ambient noise level requirements of L_{Aeq} daytime 35 dB, L_{Aeq} night-time of 30 dB and L_{Amax} night-time of 45 dB in all residential bedroom and living spaces of the proposed development. The suggested glazing specifications are achievable. Standard double glazing is sufficient across the majority of the site in order to achieve the target internal noise levels when windows are closed, however alternative ventilation will be required for habitable areas (living rooms and bedrooms) of all properties across the site and enhanced glazing is required for most buildings within the site, in order to meet internal targets for noise levels.

All private external amenity areas receptors are below BS 8233 Upper Limit Criteria levels for L_{Aeq} with fences constructed from brick or solid timber panels with no gaps and be a minimum of 1.8 metres high, with fence lines adjacent to the railway and new link road between 2.0 – 2.5 metres high (as specified in SK05).

The requirements of Conditions 37 & 38 of planning permission ref LU-47-11 are met and can therefore be discharged.

NPPF 180 A

The proposed development is not expected to have an 'adverse impact' on health or quality of life. Similarly, it is considered that all 'adverse impacts on health and quality of life' (relating to noise) are mitigated by the use of an appropriate glazing and ventilation strategy.

NPPF 180 B

Given that nearby the site is surrounded by similarly residential properties to the south and north of the site, it is not considered that any existing businesses wanting to develop would be particularly restricted by the introduction of the new sensitive use of the proposed development. The development is situated in a CPRE Zone 3 area of tranquillity (Zone 1 being the least tranquil and Zone 10 being the most tranquil), as such is not considered to be an area of tranquillity. The site currently doesn't have any public access and given that there are no public footpaths nearby then the tranquillity of the area and access to other areas of greater tranquillity is not expected to be negatively impacted by the development.

Planning Practice Guidance: Noise

It is considered that the noise mitigation in Section 6.1 of this report is sufficient to reduce the effects of any noticeable and disruptive noise being currently emitted from the surrounding environment by helping to prevent noise levels exceeding BS 8233 criteria for L_{Aeq} and L_{Amax} within all areas of the proposed development.

Appendices



Appendix A – Acoustic Terminology and Abbreviations

Acoustic Terminology

- dB** Sound levels from any source can be measured in frequency bands in order to provide detailed information about the spectral content of the noise, i.e. whether it is high-pitched, low-pitched, or with no distinct tonal character. These measurements are usually undertaken in octave or third octave frequency bands. If these values are summed logarithmically, a single dB figure is obtained. This is usually not very helpful as it simply describes the total amount of acoustic energy measured and does not take any account of the ear's ability to hear certain frequencies more readily than others.
- dB(A)** Instead, the dBA figure is used, as this is found to relate better to the loudness of the sound heard. The dBA figure is obtained by subtracting an appropriate correction, which represents the variation in the ear's ability to hear different frequencies, from the individual octave or third octave band values, before summing them logarithmically. As a result the single dBA value provides a good representation of how loud a sound is.
- L_{Aeq}** Since almost all sounds vary or fluctuate with time it is helpful, instead of having an instantaneous value to describe the noise event, to have an average of the total acoustic energy experienced over its duration. The L_{Aeq, 07:00 – 23:00} for example, describes the equivalent continuous noise level over the 12 hour period between 7 am and 11 pm. During this time period the L_{pA} at any particular time is likely to have been either greater or lower than the L_{Aeq, 07:00 – 23:00}.
- L_{Amin}** The L_{Amin} is the quietest instantaneous noise level. This is usually the quietest 125 milliseconds measured during any given period of time.
- L_{Amax}** The L_{Amax} is the loudest instantaneous noise level. This is usually the loudest 125 milliseconds measured during any given period of time.
- L_n** Another method of describing, with a single value, a noise level which varies over a given time period is, instead of considering the average amount of acoustic energy, to consider the length of time for which a particular noise level is exceeded. If a level of x dBA is exceeded for say 6 minutes within one hour, then that level can be described as being exceeded for 10% of the total measurement period. This is denoted as the L_{A10, 1 hr} = x dB.
- The L_{A10} index is often used in the description of road traffic noise, whilst the L_{A90}, the noise level exceeded for 90% of the measurement period, is the usual descriptor for underlying background noise. L_{A1} and L_{Amax} are common descriptors of construction noise.
- R_w** The *weighted sound reduction index* determined using the above *measurement* procedure, but weighted in accordance with the procedures set down in BS EN ISO 717-1. Partitioning and building board manufacturers commonly use this index to describe the inherent sound insulation performance of their products.



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



Appendix B – Sketches

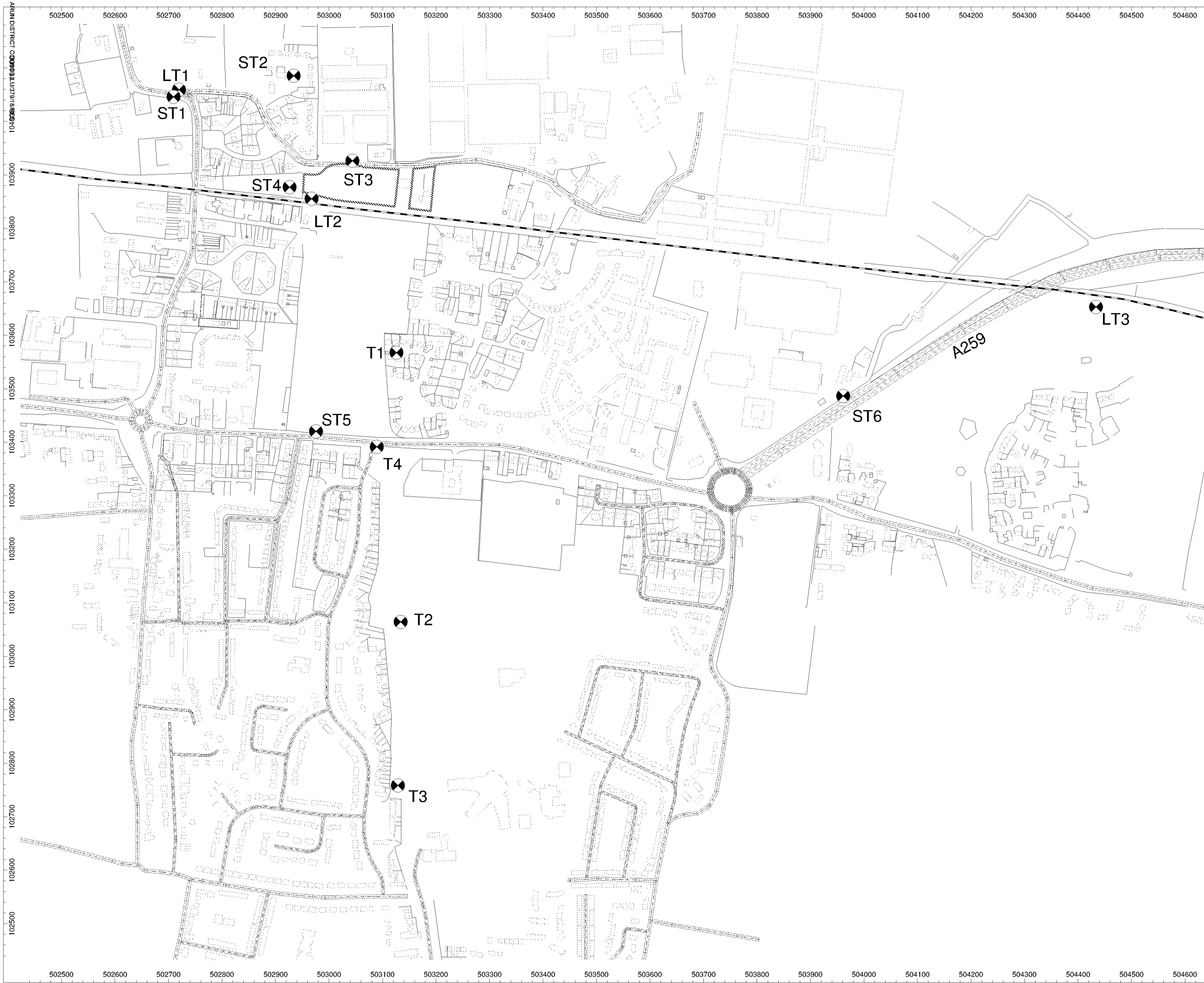
SK01 Noise Monitoring Locations

SK02 Site Layout and Receptor Locations

SK03 Daytime $L_{Aeq,16hr}$

SK04 Night-time $L_{Aeq,8hr}$

SK05 Glazing and Ventilation Strategy



Client:
Persimmon Homes

Project:
Parcel A2 and B6
North Littlehampton

Project Number:
A100896

Drawing Title / Scenario:
Noise & Vibration
Monitoring Locations

Drawing Number:
SK01

Key:
Site Boundary: 

Scale : Not to scale

WYGE Leicester 07.03.18

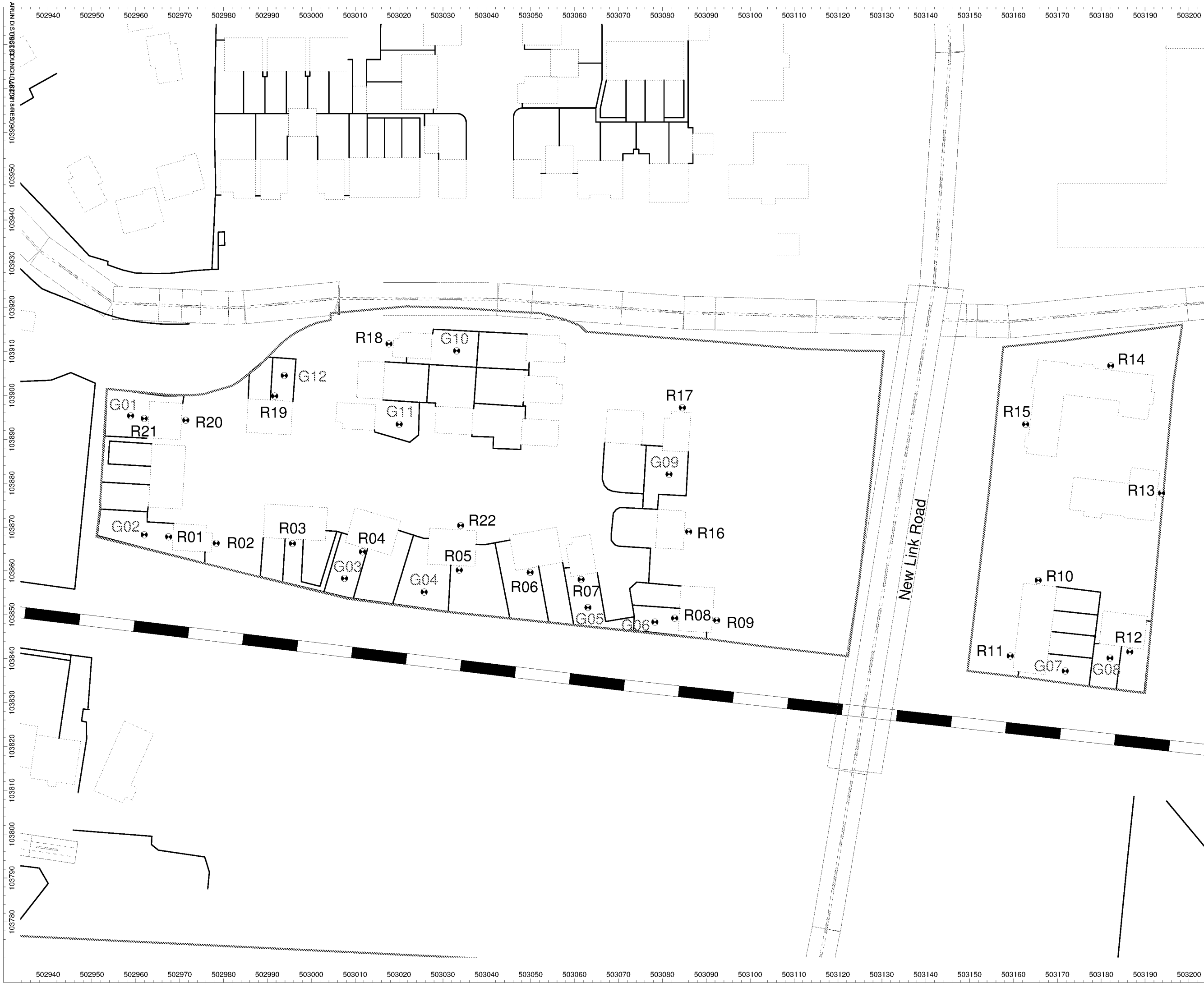
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Project:
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North Littlehampton

Project Number:
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Drawing Title / Scenario:
Site Layout and
Receptor Locations

Drawing Number:
SK02

Key:
Site Boundary: 

Scale : Not to scale

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North Littlehampton

Project Number:
A100896

Drawing Title / Scenario:
Daytime LAeq, 16hr
Noise Levels

Drawing Number:
SK03

Key:
Site Boundary: - - - - -

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

Scale : Not to scale

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Drawing Title / Scenario:
Night-time LAeq, 8hr
Noise Levels

Drawing Number:
SK04

Key:
Site Boundary: -----

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

Scale : Not to scale

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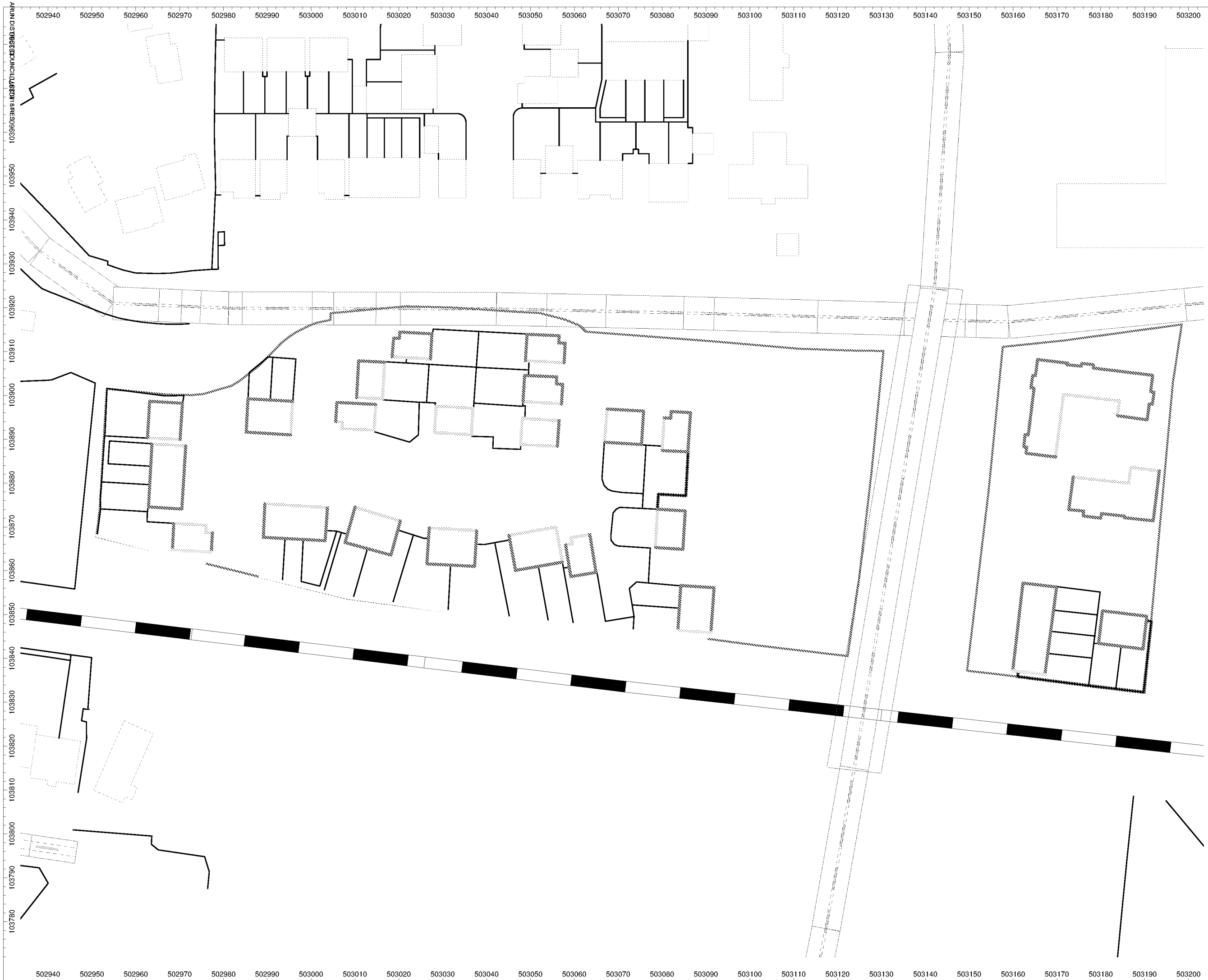
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North Littlehampton

Project Number:
A100896

Drawing Title / Scenario:
Mitigation Strategy

Drawing Number:
SK05

Key:

Site Boundary: ~~~~~

Enhanced Glazing &
Alternative Ventilation
Rw + Ctr 31 - 42 dB: 

Enhanced Glazing & Alternative Ventilation
Rw + Ctr 30: 

2m Fence:

2.5m Fence:

Windowless Facade:

Scale : Not to scale

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