



Sainsbury's Supermarkets Limited

Plant Noise Assessment

Sainsbury's Store

Rustington,

West Sussex

Plant Noise Assessment

September 2013

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

Tel: +44 (0)116 234 8000

Email: nigel.mann@wyg.com



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Prepared by:	Graham Davis <i>Consultant</i>	Initialled:	GD
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Checked by:	Initialled:
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Verified by:	Nigel Mann <i>Director – Environmental Scientist</i>	Initialled:	NM
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Issue	Date	Status
1	29 th May 2013	First Issue
2	13 th June 2013	Minor Amendments
3	29 th July 2013	Inclusion of New Barrier around Plant Area
4	26 th September 2013	Revised Plant Locations and Specifications



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1.0 Introduction

1.1 Purpose of this Report

This report presents the findings of a plant noise assessment undertaken for a new foodstore in Rustington, West Sussex. This report considers the new building services plant at the store; following version 3 of this report, an engineering solution has been found to remove the need for external air handling units located on the roof of the store. All noise sources have been assessed (including sources not specifically covered by the revised planning application).

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.

1.2 Legislative Context (England)

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. With regard to noise and planning, NPPF contains the following short statements (section 123):

- A. Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;
- B. Mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;
- C. Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established;

Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.



2.0 Assessment Criteria

2.1 Building Services Plant Noise Assessment

The effect of noise from proposed external plant has been assessed in accordance with BS 4142:1997 '*Rating Industrial Noise Affecting Mixed Residential and Industrial Areas*'.

This standard sets down the following guidelines for assessing the likelihood of complaints based upon the difference between the measured background noise level and the rating level of the source under consideration, as shown in Table 2.1 below.

Table 2.1 BS 4142 Assessment Criteria

Difference between Rating Noise Level and Background Noise Levels	Likelihood of Complaints
Greater than +10 dB	Likely
+5 dB	Marginal significance
More than 10 dB below	Unlikely

In addition to noise levels the likelihood of complaints depends on the individuals affected and to the acoustic features present. Section 8 of BS 4142 recommends that a correction factor of +5dB be applied to the specific noise level if the noise contains certain acoustic features that can increase the likelihood of complaints. Such features of new or modified noise sources include:

- ✧ a distinguishable, discrete, continuous note (whine, hiss, screech, hum etc.)
- ✧ distinct impulses (bangs, clicks, clatters or thumps)
- ✧ irregular enough to attract attention



2.2 BREEAM 2011

Pol5 – Noise Attenuation (One credit)

One credit is awarded where the following compliance requirements are met:

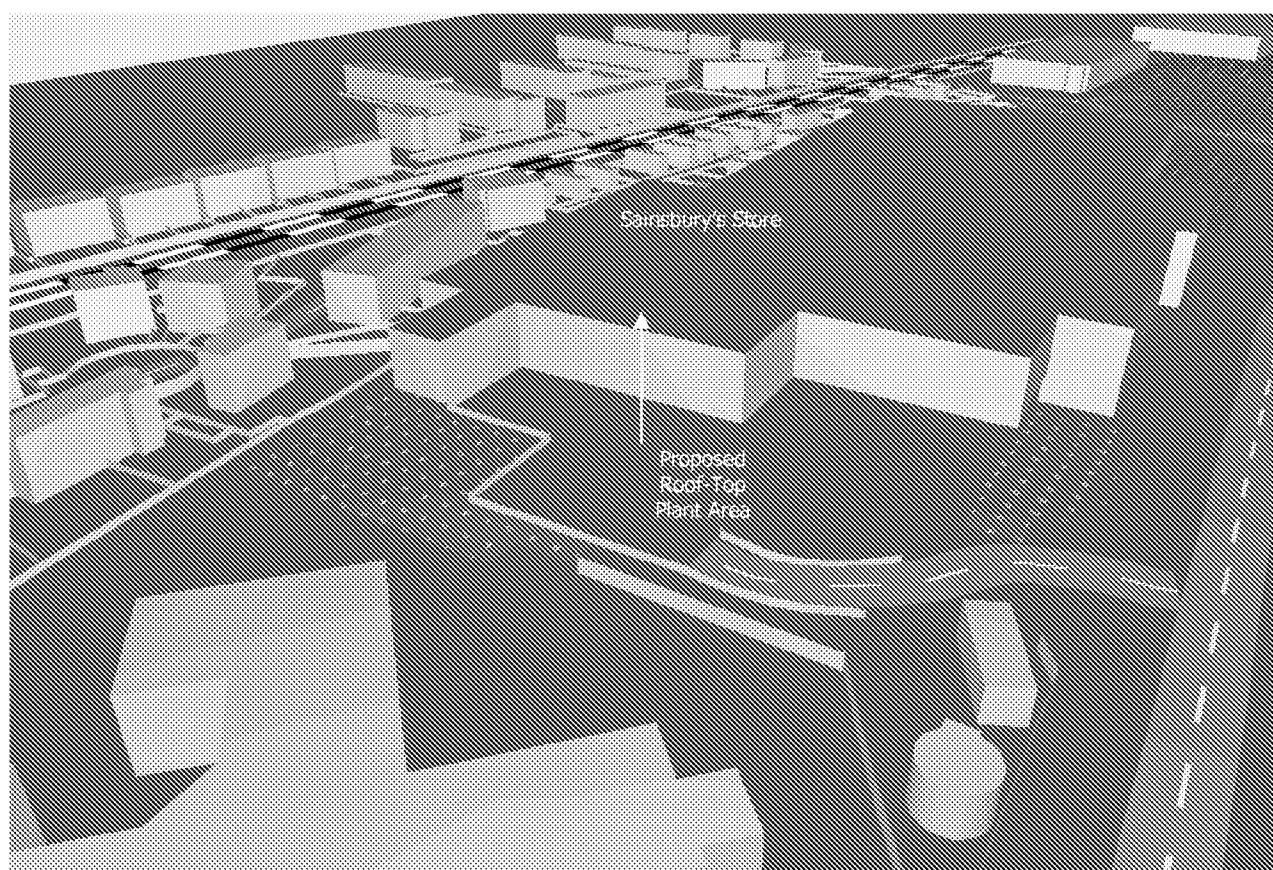
1. The credit can be awarded by default where there are, or will be, existing noise-sensitive areas or buildings within 800m radius of the assessed development.
2. Where there are or will be noise-sensitive areas or buildings within 800m radius of the assessed development a noise impact assessment in compliance with BS 7445:1991 has been carried out and the following noise levels measured/determined:
 - a. Existing background noise levels at the nearest or most exposed noise-sensitive development to the proposed development; or at a location where background conditions can be argued to be similar.
 - b. The rating noise level resulting from the proposed noise-source. This can be based upon reference to similar installations or sites, or determined by calculation.
3. The noise impact assessment must be carried out by a suitably qualified acoustic consultant holding a recognised acoustic qualification and membership of an appropriate professional body. The primary professional body for acoustics in the UK is the Institute of Acoustics.
4. The noise level from the proposed site/building, as measured in the locality of the nearest or most exposed noise-sensitive development, is a difference no greater than +5dB during the day (0700hrs to 2300hrs) and +3dB at night (2300hrs to 0700hrs) compared to the background noise level.
5. Where the noise source(s) from the site/building is greater than the levels described in criterion 4, measures have been installed to attenuate the noise at its source to a level where it will comply with criterion 4.

3.0 Assessment Methodology

3.1 Noise Modelling Methodology

Three dimensional noise modelling has been undertaken based on the monitoring data to predict source noise levels at a large number of locations both horizontally and vertically. CADNA noise modelling software has been used (as shown in Figure 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 1 CADNA Noise Model – Proposed Scenario





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	Barriers on site from site visit data.
Reflections	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.
Absorbent Ground	CADNA	First order reflections have been applied based on mirror image sources
Façade Correction	CADNA	Frequency dependant ground absorption has been applied based on values specified in VDI 2714/16 clause 6.3.
Gradient	CADNA	Façade corrections have been incorporated into the modelling

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 Building Services Plant Noise Data

Point sources have been defined in the model to represent all proposed external plant associated with the proposed scheme. It is understood that the following plant will be installed at the store. The following noise levels have been used within the model. The makes and models of the the Condenser and Chiller Units, ground source heat pump, transformer and emergency generator associated with the revised scheme are shown in Tables 3.2 – 3.5. It should be noted that the standby generator will only operate in the event of a power failure, therefore the standby generator has not been included within the BS 4142 assessment.

Table 3.2 Roof Mounted Condensers – Noise Levels

Description	Sound Pressure Level dB(A) @ 10m distance
Roof Mounted Condenser Units (Pack IDs LT1/IT1, LT2/IT2, LT3/IT3 & 301/302/303) – SCM FRIGO JS8-DLXL-G-G	45

Table 3.3 Car Park Level Condenser Units – Noise Levels

Description	Octave Band Centre Frequency (Hz)								Single Figure dB(A)
	63	125	250	500	1000	2000	4000	8000	
CU01 – Mitsubishi SUZ-KA35VAH	33.8	44.9	50.4	51.8	56.0	51.2	45.0	42.9	59.4
CU02 – Mitsubishi PURY-P300YJM-A(BS)	49.8	58.4	63.4	63.8	64.0	60.7	57.0	52.4	69.9
CU03 – Mitsubishi PUHZ-RP60VHA-4	41.8	49.9	52.4	51.8	54.0	51.2	44.0	37.9	59.3
CU04 – Daikin RZQ250C	-	86.0	80.0	76.5	73.0	67.5	63.5	60.0	87.6
CU05 – Mitsubishi PUHZ-RP100VKA	42.8	53.9	53.4	55.8	57	53.2	46.0	38.9	62.1
CU06 – Mitsubishi PUHZ-Rp125VKA	45.8	50.9	56.4	56.8	57.0	54.2	48.0	38.9	62.8
CU07 – Mitsubishi PUHZ-P250YHA3	45.8	58.9	61.4	63.8	65.0	61.2	57.0	47.9	69.8

Table 3.4 Transformer and Emergency Generator Noise Levels

Description	Sound Pressure Level dB(A) @ 1m distance
FG Wilson Model P250H-2 with Coastal Spec Close Fit Canopy	80.0
Schneider Electric 1250 kVa Transformer	59.6



Geoscart Ground Source Heat Pump Noise Data

Noise sources have been defined in the model to represent the proposed ground source heat pump. The data presented in the following table is based on measurements taken in January 2012 at existing ground source heat pumps at Sainsbury's sites operating under full load operating conditions.

Table 3.5 Geoscart Ground Source Heat Pump Noise Data

Plant Details	Sound Pressure Level
Compressor end of building	64.8 dB(A) at 1 metre
Non compressor side 1	63.8 dB(A) at 1 metre
Non compressor side 2	62.6 dB(A) at 1 metre
Non compressor side 3	60.2 dB(A) at 1 metre
Non compressor side 4	57.1 dB(A) at 1 metre
Control End of building	59.1 dB(A) at 1 metre
Compressor side 4	59.9 dB(A) at 1 metre
Compressor side 3	61.8 dB(A) at 1 metre
Compressor side 2	67.0 dB(A) at 1 metre
Compressor side 1	68.0 dB(A) at 1 metre
Centre of roof	61.3 dB(A) at 1 metre
Roof above compressors	61.9 dB(A) at 1 metre



3.3 Sensitive Receptors

The closest sensitive receptors are residential premises located on Burmill Court and Dinsdale Field Caravan Park to the south of the store and on Darlington Court to the East of the site.

Table 3.5 below summarises receptor locations that have been selected to represent worst-case residential receptors with respect to direct noise from the proposed store. Ground and first floor facades (facing the proposed development) of nearest properties have been represented. The locations of the receptors are shown on SK02 in Appendix A.

Table 3.5 Existing Receptor Locations

Ref.	Description	Co-ordinates		
		X	Y	Height (m)
R1	Darlington Court (North West)	506225.58	103129.10	4.0
R2	Darlington Court (South West)	506228.77	103092.89	4.0
R3	66 The Leas	506283.29	103139.94	4.0
R4	26 The Darlingtons	506286.80	103082.16	4.0
R5	30 Angnering Way	506196.58	103051.62	4.0
R6	3 Burmill Mews	506150.12	103040.46	4.0
R7	Dinsdale Field North-East	506108.24	103051.93	1.5
R8	Dinsdale Field North	506053.75	103056.12	1.5
R9	Dinsdale Field West	505949.46	103057.17	1.5
R10	44 Lawrence Avenue	505951.23	103010.87	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 2238	Environmental Noise Analyser (WYG9)	s/n	2684499
B&K 4231	Calibrator	s/n	2176211
Rion NL-52	Environmental Noise Analyser (WYG15)	s/n	710260
Norsonic 1251	Sound Calibrator	s/n	31043

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 seven locations (as specified in the following table and shown in SK01 of Appendix A from Monday 19th December 2011 to Tuesday 10th January 2012. Attended short term measurements were undertaken at five locations during the day, evening and night-time periods with two additional locations being measured unattended over a 211 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	Car park of the Sainsbury's site	506026.01	103054.83
LT2	Delivery area of the Sainsbury's site	506206.83	103095.7
ST1	Access road to the Dindale Field caravan site	505942.87	103073.31
ST2	The Leas road at the entrance to Darlington Court	506313.64	103094.72
ST3	Angmering Way Road	506199.01	103038.04
ST4	Northcourt Close	505965.44	102985.55
ST5	Access road to Sainsbury's delivery area	506175.67	103143.91

4.2 Noise Survey Results

Existing ambient noise levels around the site are dominated by road noise.

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	112 hours	03/01/2012 - 10/01/2012 14:36 - 14:41	LT1	61.5	89.6	36.1	63.5	58.4
Night 23:00 - 07:00	56 hours	03/01/2012 - 10/01/2012 23:00 - 07:00		55.5	93.9	27.2	57.8	49.7
Day 07:00 - 23:00	139 hours	19/12/2012 - 28/12/2012 16:34 - 11:44	LT2	61.2	90.2	34.8	63.0	54.2
Night 23:00 - 07:00	72 hours	19/12/2012 - 28/12/2012 23:00 - 07:00		56.5	89.3	31.6	58.7	45.3
Day 07:00 - 19:00	15 Mins	03/01/2012 16:38	ST1	61.3	82.2	53.6	60.4	55.9
	15 Mins	03/01/2012 17:08	ST2	59.7	73.7	53.9	61.6	57.0
	15 Mins	03/01/2012 17:29	ST3	55.1	78.5	49.0	55.5	51.9
	15 Mins	03/01/2012 17:57	ST4	52.4	82.7	45.8	51.8	47.8
	15 Mins	03/01/2012 16:14	ST5	68.3	93.9	53.1	65.7	57.4
Evening 19:00 - 23:00	15 Mins	03/01/2012 21:04	ST1	59.0	73.6	48.1	62.4	52.9
	15 Mins	03/01/2012 21:46	ST2	63.3	75.0	45.0	67.2	51.9
	15 Mins	03/01/2012 22:09	ST3	49.0	70.8	41.4	49.5	44.1



Period	Duration (T)	Monitoring Date and Times	Location	L _{max,T} (dB)	L _{max,T} (dB)	L _{max,T} (dB)	L _{max,T} (dB)	L _{max,T} (dB)
Night 23:00 - 07:00	15 Mins	03/01/2012 22:36	ST4	46.4	69.4	38.2	47.6	43.2
	15 Mins	03/01/2012 21:23	ST5	70.1	82.7	55.1	74.8	58.9
	15 Mins	03/01/2012 23:01	ST1	57.3	75.7	47.0	60.9	50.0
	15 Mins	04/01/2012 01:03	ST2	57.6	78.5	41.7	59.2	44.7
	15 Mins	04/01/2012 01:22	ST3	46.5	65.6	35.1	49.2	41.1
	15 Mins	04/01/2012 01:42	ST4	42.3	65.2	36.0	43.1	40.1
	15 Mins	04/01/2012 00:47	ST5	59.2	77.6	43.0	62.3	46.3

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



5.0 Assessment of Key Effects

5.1 Plant Noise Assessment

This assessment has been undertaken in order to establish the effect of noise from proposed plant (including all chiller and condenser units at ground floor and roof level, and electrical transformer) at the new foodstore. The calculations are based on the location of the plant as shown on SK02 of Appendix A. The assessment compares the predicted average noise levels from proposed plant with the modelled daytime and night-time background noise L_{A90} at the surrounding existing residential receptors (worst case façade direction and floors were selected).

In order to account for any potential acoustic features of the new plant, a +5 dB correction (see section 2.1 of this report) has been applied to the predicted noise levels at receptor before comparison with background levels.

Table 5.1 BS 4142 Assessment for Proposed Plant

Location	Measured Background L_{A90}		Noise rating level from plant (with +5 dB Correction)		BS 4142 Score	
	Daytime	Night-time	Daytime	Night-time	Daytime	Night-time
R1	54.2	45.3	36.2	36.2	-18.0	-9.1
R2	54.2	45.3	37.7	37.7	-16.5	-7.6
R3	54.2	45.3	28.0	28.0	-26.2	-17.3
R4	54.2	45.3	31.0	31.0	-23.2	-14.3
R5	54.2	45.3	36.9	36.9	-17.3	-8.4
R6	54.2	45.3	32.9	32.9	-21.3	-12.4
R7	58.4	49.7	32.1	32.1	-26.3	-17.6
R8	58.4	49.7	43.3	43.3	-15.1	-6.4
R9	58.4	49.7	31.0	31.0	-27.4	-18.7
R10	58.4	49.7	27.4	27.4	-31.0	-22.3

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

The assessment above shows that the rating noise levels from new plant at the store are predicted to be at least 15.1 dB below existing daytime and at least 6.4 dB below night-time background noise levels.

As the predicted noise levels from combined plant at the store are predicted to be below existing daytime and night-time background noise levels, the BREEAM 2011 credit Pol 5 Noise Attenuation could be awarded.



5.2 Ground Source Heat Pump Noise Assessment

The assessment compares the predicted worst case rating noise levels from the ground source heat pump with the measured average background noise L_{A90} at a location representative of surrounding existing residential receptors. Noise from the proposed ground source heat pump is not considered to be tonal, contain distinct impulses, or be irregular enough to attract attention and therefore a +5 dB acoustic feature correction has not been applied to the specific noise level before comparison with background noise levels.

Table 5.2 BS 4142 Assessment for Ground Source Heat Pump

Ref	Measured Average Existing Background L_{A90}		Noise rating level from plant		BS 4142 Score	
	Daytime	Night-time	Daytime	Night-time	Daytime	Night-time
R1	54.2	45.3	36.6	36.6	-17.6	-8.7
R2	54.2	45.3	23.5	23.5	-30.7	-21.8
R3	54.2	45.3	26.0	26.0	-28.2	-19.3
R4	54.2	45.3	18.0	18.0	-36.2	-27.3
R5	54.2	45.3	23.6	23.6	-30.6	-21.7
R6	54.2	45.3	21.0	21.0	-33.2	-24.3
R7	58.4	49.7	16.4	16.4	-42.0	-33.3
R8	58.4	49.7	15.7	15.7	-42.7	-34.0
R9	58.4	49.7	14.4	14.4	-44.0	-35.3
R10	58.4	49.7	13.7	13.7	-44.7	-36.0

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

The assessment above shows that the rating noise levels from new ground source heat pump at the store are predicted to be at least 17.6 dB below existing daytime and at least 8.7 dB below night-time background noise levels.



5.3 Emergency Generator Noise Assessment

Internal noise levels, at nearby sensitive receptors, from the emergency standby generator operating have been assessed both with windows open, where a reduction from a partially open window of 15 dB has been used, and with windows closed where an assumption of single glazing with a sound reduction of 30 dB has been used.

Table 5.3 Noise Intrusion Levels L_{Aeq}

Location	External $L_{Aeq}(dB)$ at 1m from facade	Internal $L_{Aeq}(dB)$ with windows open	Internal $L_{Aeq}(dB)$ with windows closed	BS 8233 / WHO Criteria - Internal L_{Aeq}
R1	40.5	25.5	10.5	30-40
R2	46.2	31.2	16.2	30-40
R3	25.4	10.4	0.0	30-40
R4	36.6	21.6	6.6	30-40
R5	50.2	35.2	20.2	30-40
R6	38.3	23.3	8.3	30-40
R7	19.3	4.3	0.0	30-40
R8	17.2	2.2	0.0	30-40
R9	13.2	0.0	0.0	30-40
R10	16.7	1.7	0.0	30-40

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

The assessment shown in Table 5.7 shows internal noise levels with open and closed windows would be at or within the BS 8233 'reasonable' target level (35 dB) at all receptors.



6.0 Conclusions of Noise Assessment

This report presents the findings of a plant noise assessment undertaken for a new foodstore at Rustington, West Sussex. Existing background noise levels have been measured. All noise sources have been assessed (including sources not specifically covered by the revised planning application).

Building Service Plant Noise Assessment

A building service plant assessment has found that the rating noise level from new roof-mounted plant at the store is predicted to be below existing daytime and night-time background noise levels. Hence, it is demonstrated that the BREEAM 2011 credit Pol 5 Noise Attenuation could be awarded.

External noise rating levels from proposed building services plant are predicted to be at least 15.1 dB(A) below the lowest existing L_{A90} background noise level during the daytime and at least 6.4 dB(A) below the lowest existing L_{A90} background noise level during the night-time.

External noise levels from the ground source heat pump are predicted to be at least 17.6 dB(A) below the lowest existing L_{A90} background noise level during the daytime and at least 8.7 dB(A) below the lowest existing L_{A90} background noise level during the night-time as such, in accordance with BS4142 complaints are not considered to be likely.

Section 123 of the NPPF gives four test points relating to noise. Considering these the following conclusions can be drawn:

- ✧ *avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development*
- ✧ *mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions*

A noise intrusion assessment of the proposed emergency generator has shown that noise levels are predicted to be around or within the BS 8233 'reasonable' criteria at nearby sensitive receptor locations. The proposal is therefore not expected to have an 'adverse impact' on health or quality of life.

- ✧ *recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established*

Although new noise sources are created these have been mitigated where practical.



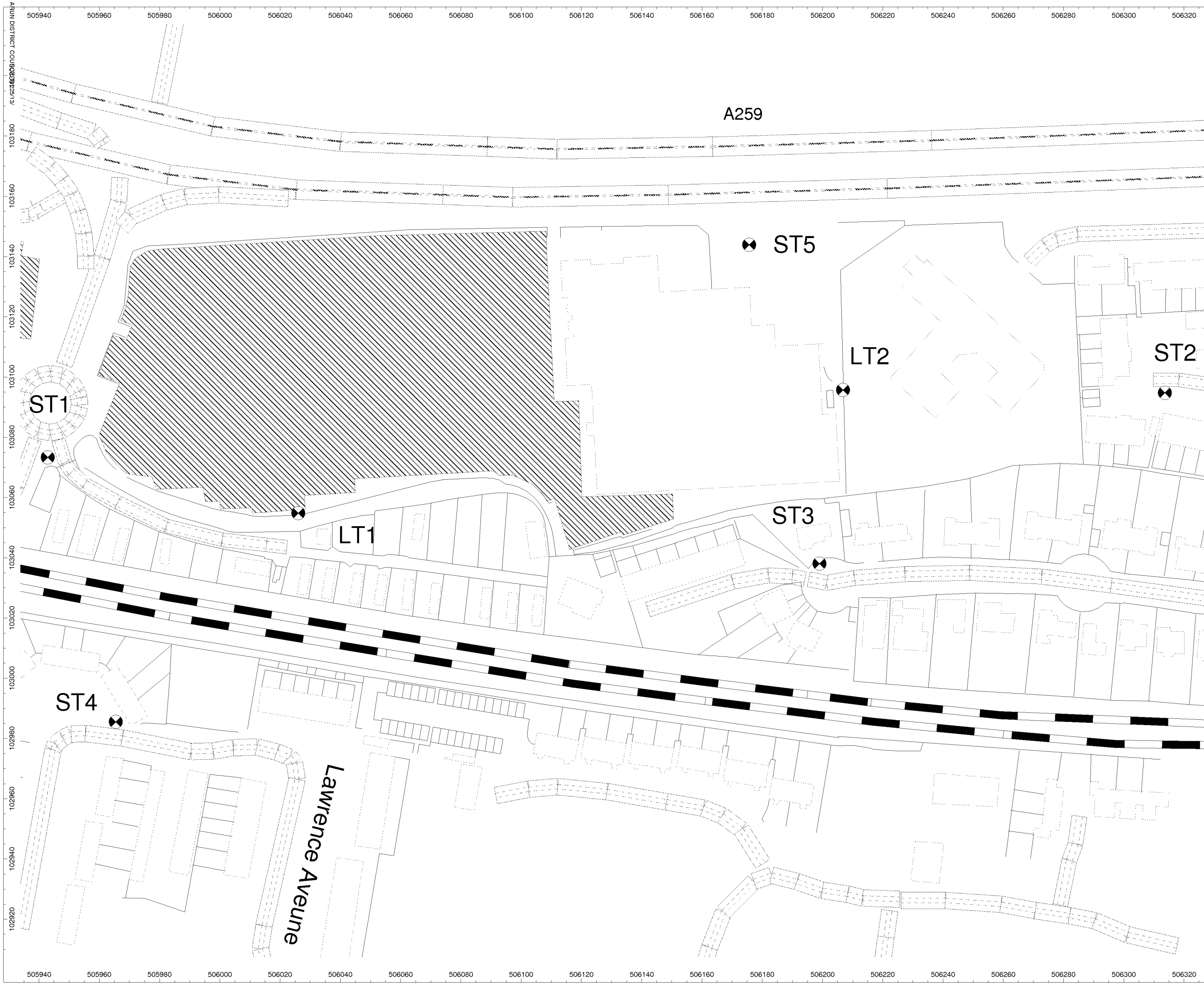
Appendices



Appendix A – Sketches

SK01 Monitoring Locations with Existing Scenario

SK02 Existing Receptor Locations with Proposed Scenario



Client:
Sainsbury's
Supermarkets Ltd.

Project:
New Road, Rustington

Project Number:
A080808

Drawing Title:
Noise Monitoring Locations

Drawing Number:
SK01

Scale : Not to scale

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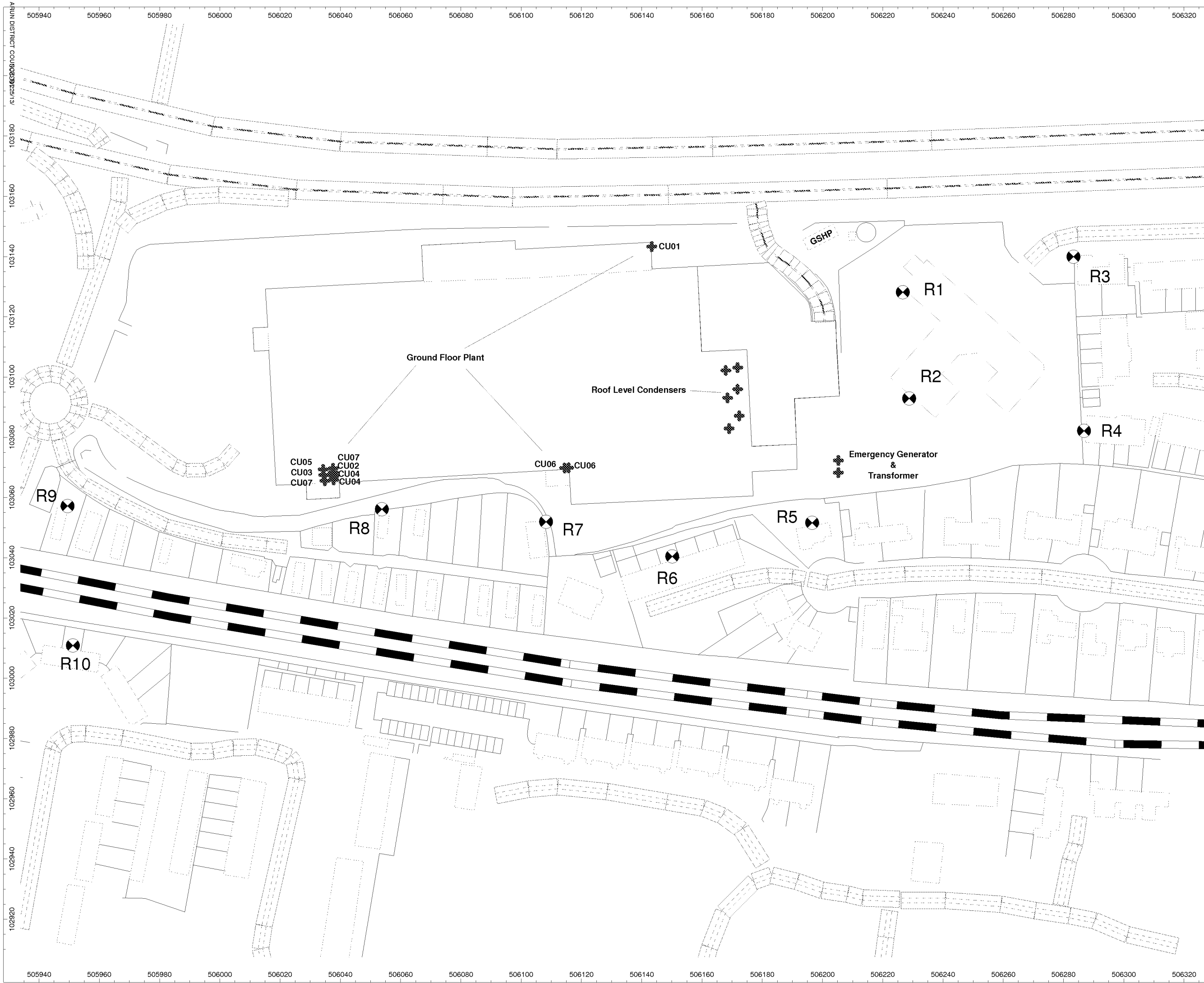
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Client:
Sainsbury's
Supermarkets Ltd

Project:
New Road, Rustington

Project Number:
A080808

Drawing Title / Scenario:
Receptor Locations
with Proposed Scenario

Drawing Number:
SK02

Scale : Not to scale

WYGE Leicester 26.09.13

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Appendix B - Abbreviations

CADNA – Computer Aided Noise Abatement

DMRB – Design Manual for Roads and Bridges

HGV – Heavy Goods Vehicle

UDP – Unitary Development Plan

UKAS – United Kingdom Accreditation Service

WYGE – WYG Environment