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Environmental Noise Survey

Prepared: 29th May 2020

Report No	20470-1
Client	Rigby and Rigby
Site	7 St Johns Wood Park Camden London

1. Quality Management

Report Number	20470 - 1
Issue	1
Prepared	29th May 2020
Prepared By	Bill Whitfield PhD, MSc, MIOA
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3. Executive Summary

3.1.1. An environmental noise assessment has been carried out for a proposed new mechanical services plant at 7 St Johns Wood Park, Camden, London ("Proposed Development").

3.2. Measurement, Assessment and Evaluation

3.2.1. The survey was carried out to BS7445-1:2003[1] and BS7445-2:1991[2] which are covered under our UKAS Accreditation.

3.2.2. The interpretation of the data and the specification of suitable mitigation or treatment are outside the scope of our UKAS accreditation but is covered in our 17025 Quality Management System and reporting procedure.

3.3. Scope

3.3.1. This report covers all aspects of the noise survey, including:

- the identification of acoustic design criteria;
- an objective sound pressure level survey of the existing site;
- analysis of the data;
- the design of any mitigation to meet the required internal noise criteria

3.4. Results Summary

3.4.1. Plant noise assessments have been undertaken for the proposed plant to be located at the flat roof level along the northern elevation of the house. The assessment indicates plant noise emissions that meet the local authority criteria of 10dB below the lowest typical measured background for day and night time periods.

3.4.2. As per guidance in BS4142:2014, the lower the rating level relative to the background level, the less likely it is that the specific sound will have an adverse impact. Where the rating level does not exceed the background level, this is an indication that the specific sound will have a low impact, depending on context

[1] BS7445-1:2003 "Description and measurement of environmental noise – Part 1: Description of quantities and procedures"
[2] BS7445-2:1991 "Description and measurement of environmental noise – Part 2: Guide to the acquisition of data pertinent to land use"

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5. Background

5.1. Noise Policy Statement for England

5.1.1. The Noise Policy Statement for England (NPSE), published in March 2010, states the long-term vision of Government noise policy is to *"promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development".*

5.1.2. This long-term vision is supported by the following aims; through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- Avoid significant adverse impacts on health and quality of life;
- Mitigate and minimise adverse impacts on health and quality of life;
- Where possible, contribute to the improvement of health and quality of life.

5.1.3. The intention is that the NPSE should apply to all types of noise apart from noise in the workplace (occupational noise).

5.2. National Planning Policy Framework

5.2.1. The National Planning Policy Framework (NPPF) was published on 19th June 2019 and sets out the Government's planning policies for England and how these are expected to be applied. The framework states that the planning system should contribute to and enhance the natural and local environment by:

> *"preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability".*

5.2.2. The NPPF requires that new developments be appropriate to their locations such that the effects of pollution on health have been taken into account. Planning policies and decisions should aim to:

1. avoid noise giving rise to significant adverse impacts on health and the quality of life;
2. mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development; and,
3. identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value.

5.2.3. Existing businesses near to proposed development 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.

5.3. National Planning Practice Guidance

5.3.1. The National Planning Practice Guidance (PPG) is a web-based resource, launched by the Department for Communities and Local Government (DCLG) which was updated on the 22nd July 2019 to reflect the changes made to the NPPF and make it more accessible.[3]

[3] http://planningguidance.communities.gov.uk/

5.3.2. It advises on how planning can manage potential noise impacts in new development. The guidance is regularly reviewed and updated and noise is listed as a specific category. A summary of the effects of noise exposure (in terms of health and quality of life) associated with both noise generating developments and noise sensitive developments is presented within the PPG and reproduced in Table 1.

Perception	Examples of outcomes	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 (NOAEL)	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; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported 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. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. 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 intrusive	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 Adverse Effect	Prevent

Table 1 – Noise exposure hierarchy

5.3.3. There are a number of factors that determine whether a noise could be a concern to a receptor. These include: the absolute level of the noise and when it occurs, whether it is existing or new to the area, temporal characteristics, spectral content and the acoustic absorption in the area.

5.3.4. It is emphasised in the PPG that the planning process should be used to mitigate and minimise the impact of noise. This could include: engineering the noise sources to be quiet, minimising the impact of noise through layout, using conditions/obligations to restrict activities, mitigating the impact in places where noise is likely to be experienced (e.g. using facade sound insulation).

6. Introduction

6.1.1. An environmental noise survey has been carried out for a proposed new mechanical services plant at 7 St Johns Wood Park, Camden, London.

6.2. Proposed Development

6.2.1. An image showing the location of the house and proposed plant is given in Figure 1.

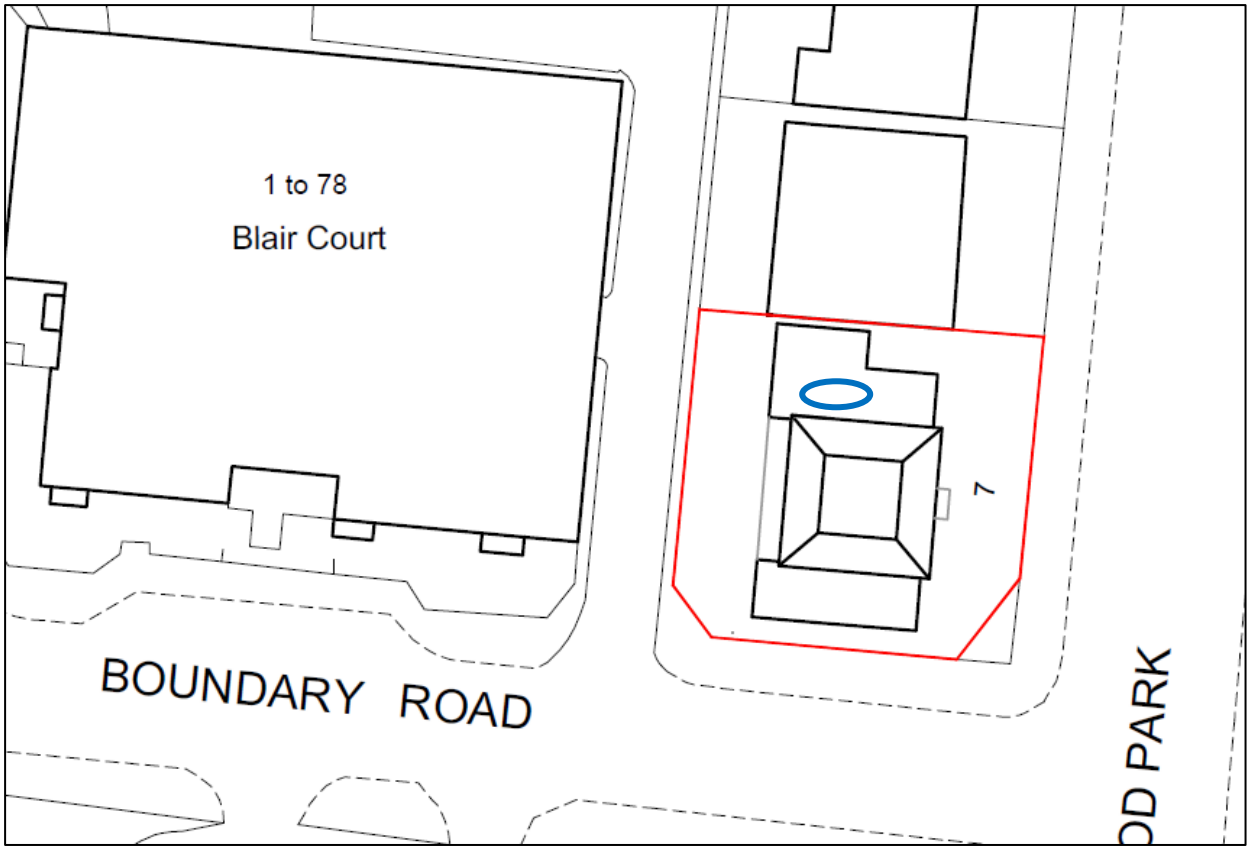

Figure 1 - Plan showing the location of the residential (red boundary) and new mechanical services plant (blue outline)

6.3. Noise Climate

6.3.1. At the time of the site visit, the survey technician noted that the site is predominantly affected by road traffic noise from St Johns Wood Park along the east and Finchley Road further to the north.

7. Assessment Criteria

7.1. BS4142:2014 Assessment of Commercial/Industrial Sound Sources

7.1.1. BS4142 provides methods for rating and assessing sound of an industrial and/or commercial nature, which includes sound from industrial and manufacturing processes, fixed services plant, sound generated by the loading/unloading of goods and sound from mobile plant/vehicles associated with industrial/commercial premises (e.g. fork-lift trucks).

7.1.2. The standard utilises various descriptors to assess complaints, the impact of sound associated with proposed industrial/commercial activities on existing noise-sensitive receivers, or the impact and likely suitability of siting new noise-sensitive receivers in the vicinity of existing industrial/commercial noise sources.

7.1.3. The standard is specifically precluded from being used to determine likely internal sound levels arising from external noise, or from the assessment of various sound sources for which other (more relevant) guidance exists, including music/entertainment noise, person noise and construction noise.

7.1.4. The magnitude of impact is assessed by subtracting the measured background sound level at a location representative of the nearest noise-sensitive receiver, from the 'rating level' (the specific sound source to be introduced into the locality, corrected for acoustically distinguishing characteristics which may make it more subjectively prominent).

7.1.5. Typically, the greater the difference between the background and rating level, the greater the magnitude of impact, although BS 4142 emphasises that this is highly context-specific.

7.1.6. As a guideline, BS4142 states that:

- A difference (between the background and rating level) of around +10 dB or more is likely to be indicative of significant adverse impact, depending on context
- A difference (between the background and rating level) of around +5 dB or more is likely to be indicative of adverse impact, depending on context
- The lower the rating level relative to the background level, the less likely it is that the specific sound will have an adverse impact
- Where the rating level does not exceed the background level, this is an indication that the specific sound will have a low impact, depending on context

7.1.7. It should be noted that BS 4142:2014 draws a clear distinction between the detailed and flexible assessment methods contained within, and the more limited versions contained in the previous (1997) edition.

Definitions

7.1.8. BS 4142 uses several specific terms to define the various levels used in assessments, as follows:

- Specific sound – the commercial/industrial noise source under consideration
- Residual sound – the sound level at the noise-sensitive receivers in the absence of the specific sound
- Ambient sound – the sound level at the noise-sensitive receivers in the presence of the specific sound (i.e. ambient = residual + specific)
- Background level - the sound pressure level which is exceeded by the residual sound for 90% of the measurement period
- Rating level – the specific sound, corrected for acoustically distinguishing characteristics

Background Sound Level

7.1.9. BS4142 emphasises that the background level ($L_{A90,T}$) is in fact a range of levels, not one absolute value. Whilst stating that the measurements of background sound should be normally not less than 15 minutes, the focus is on obtaining a level for use in assessment that is representative of typical conditions at the noise-sensitive receivers.

7.1.10. An example methodology by which this typical value may be obtained is given in the document. In this example, monitoring of $L_{A90,15mins}$ is undertaken during periods which represent when the specific noise will be operational. After obtaining a sequence of representative contiguous or disaggregated results, it is then proposed that the modal value is representative of the 'typical' background level.

Specific Sound

7.1.11. BS 4142 requires that the specific sound ($L_{Aeq,Tr}$) is obtained over a reference period of 1 hour (daytime) and 15 mins (at night). Ideally, measurements would be taken of the ambient sound and residual sound at the assessment location, with these measurements used to accurately calculate the specific sound (ambient – residual = specific).

7.1.12. Where the source (specific sound) is not yet operational, it is permissible to measure the specific sound elsewhere (or to use known manufacturers' or library data) and then model the impact of this against the known background level.

Rating level

7.1.13. Once the specific sound level has been determined, this must be corrected in terms of the need to consider the subjective prominence of the impact of the sound at noise-sensitive receivers, and the extent to which acoustically distinctive characteristics will attract attention.

7.1.14. BS4142 states that this is normally possible to carry out a subjective assessment of characteristics, based on the following correction guidelines:

- Tonality: +2dB for a 'just perceptible' tone, +4dB for 'clearly perceptible', and rising to +6dB for 'highly perceptible' tones.
- Impulsivity (rapidity of change and overall chance in level): +3 dB for 'just perceptible' impulsivity, +6dB for 'clearly perceptible', rising to +9 dB for 'highly perceptible' impulsivity.
- Intermittency: if the on/off-time of the specific sound is readily distinctive at the noise- sensitive receivers, +3dB.

7.1.15. It should be noted that where one feature is clearly perceived as dominant, it may be applicable to correct for that feature only. Where multiple features are likely to affect perception and response, each should be added arithmetically.

7.2. Local Planning Authority Criteria

7.2.1. The local planning authority require any new plant installed in the area to meet an overall noise emission level not exceeding 10dB below the minimum measured background levels in the area during the relevant time-period.

8. Survey

8.1. Measurement Locations

8.1.1. Fixed position monitoring took place at 1 position to account for the likely dominant noise sources. The monitoring equipment was located 1.5m from the ground and at least 3m from the next nearest reflecting surface. The monitoring position is shown in Figure 2.

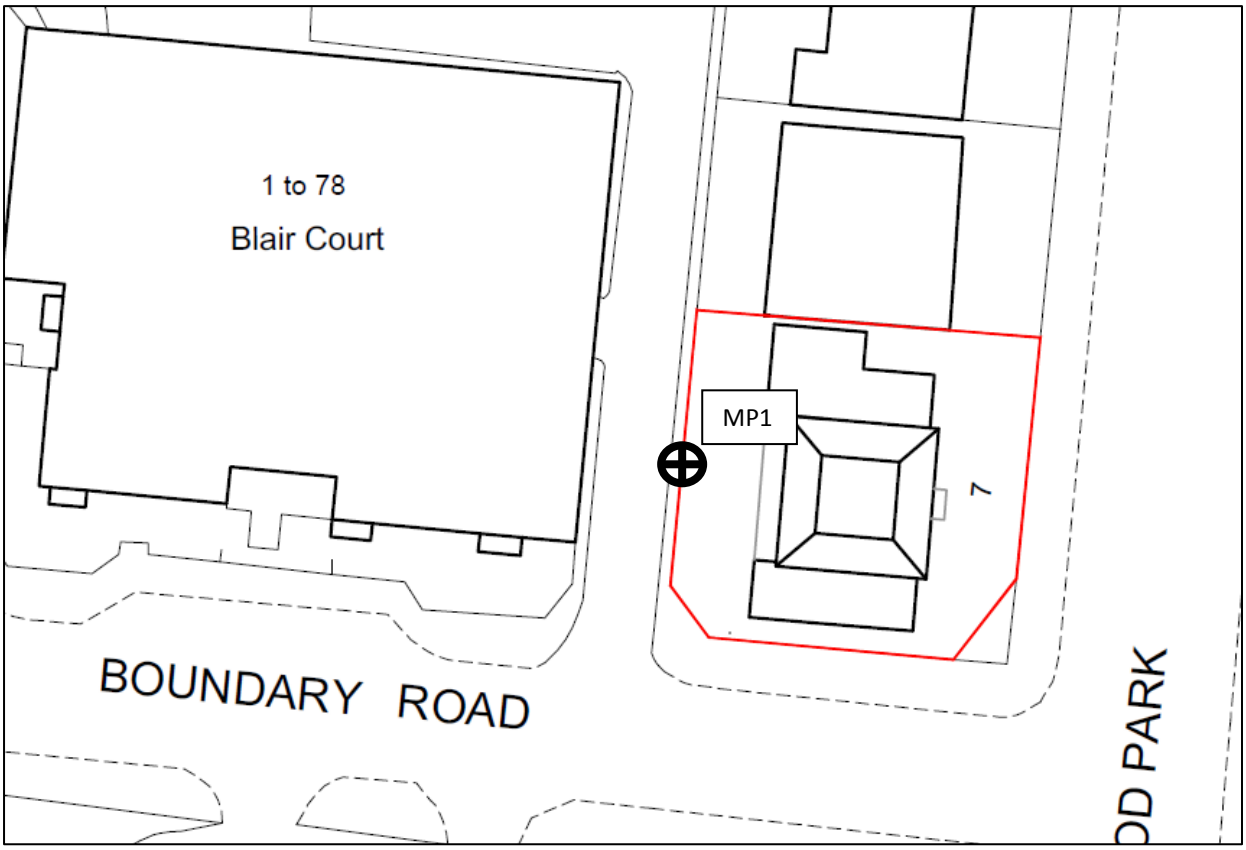

Figure 2 - Noise monitoring location on site

8.1.2. The measurement instrumentation used during the survey is detailed in the appendix. The acoustic equipment was calibrated to comply with Section 4.2 of BS7445-1:2003[4] before and after the surveys. The calibration details are also detailed in the appendix.

8.2. Meteorology

8.2.1. During the survey the weather information was noted. This is summarised in Table 2.

	5th March 2020	10th March 2020
Roads(Wet/Dry)	Dry	Dry
Wind Speed (ms^{-1})/Direction	4/SW	3/W

Table 2 - Meteorological data noted during the survey

[4] BS7445-1:2003 "Description and measurement of environmental noise – Part 1: Guide to quantities and procedures"

8.3. Measurement and Timescale

8.3.1. Unattended monitoring was carried out between 5th March 2020 and 10th March 2020. The measurements that have been made are summarised in Table 3.

Monitoring position	Date	Type	Quantity
MP1	5th March 2020 – 10th March 2020	Fixed/unattended	$L_{A90,15min}$

Table 3 – Measurements made at the site of the Proposed Development

8.3.2. Sound pressure measurements were subsequently averaged into hourly, daytime and night-time periods. The acoustic measurements and their interpretation have been in accordance with BS 7445: Parts 1, and 2[5]. All sound pressure levels are in dB (re 20μPa).

8.4. Typical background sound level

8.4.1. Figure 3 shows the typical background sound level. The modal value is chosen from each histogram for day and night.

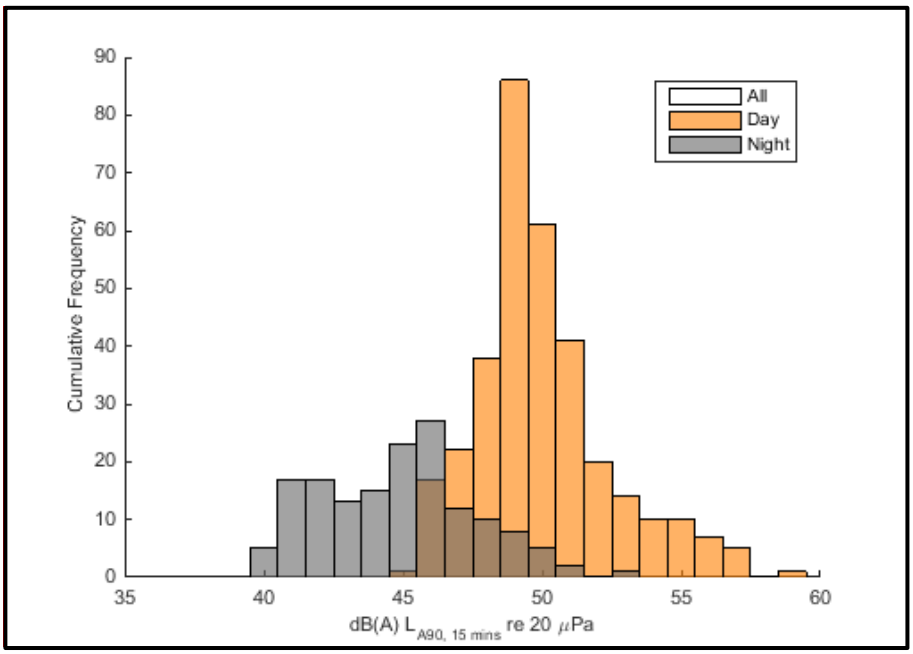

Figure 3: Background sound histogram

8.4.2. Based on the measured levels, a background sound level of 49 dB $L_{A90,T}$ has been chosen for the daytime and 36 dB $L_{A90,T}$ has been chosen for the night time periods. The plant noise limits are therefore 10dB below these levels and they correspond to 39dB L_P during the daytime and 36dB L_P during the night time.

[5] BS7445-2:1991 "Description and measurement of environmental noise – Part 2: Guide to the acquisition of data pertinent to land use"

9. BS4142 Assessment

9.1. Specific Sound Source

9.1.1. At this stage, full details of the mechanical services have been provided. The proposed outdoor equipment consists of 2xVRV condensing units to be located on the side of the house on the flat room along the northern elevation. Manufacturer's sound power data has been provided for the units.

9.1.2. The resulting levels at the nearest noise sensitive receptors are derived using the calculation method from ISO9613-1:1996[6] to account for the distance between the source and receiver and any screening provided by the surrounding buildings. In addition to the environmental corrections, BS4142:2014 also sets out detailed assessment criteria for the different characteristics of the plant. This is discussed in the next section where the calculation of the rating level is set out.

9.2. Rating level

9.2.1. The items of fixed plant have not been specified or installed; it is, therefore, not possible to make a subjective judgment of the character of the specific sound. Character corrections have been applied based on experience of typical items of plant.

Tonality

9.2.2. Most items of heating, ventilation and air conditioning plant have rotating components that would be likely to produce modest tones. Based on the supplied data however, the equipment is not deemed to be tonal.

Impulsivity

9.2.3. The items of plant would be expected to emit continuous sound. No correction has been made for impulsivity.

Intermittency

9.2.4. It is possible that the fixed plant will not operate 100% of the time. However, in any 1-hour daytime or 15-min night-time reference period the plant would not be expected to switch on and off more than once. Therefore, no correction for intermittency has been made.

[6] ISO9613-1:1996 "Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation"

9.3. Proposed Plant Items

9.3.1. Details of the proposed VRV condensing units to be located externally have been provided. These units are understood to be located on the flat roof along the north of the existing building. Figure 4 below illustrates the proposed location:

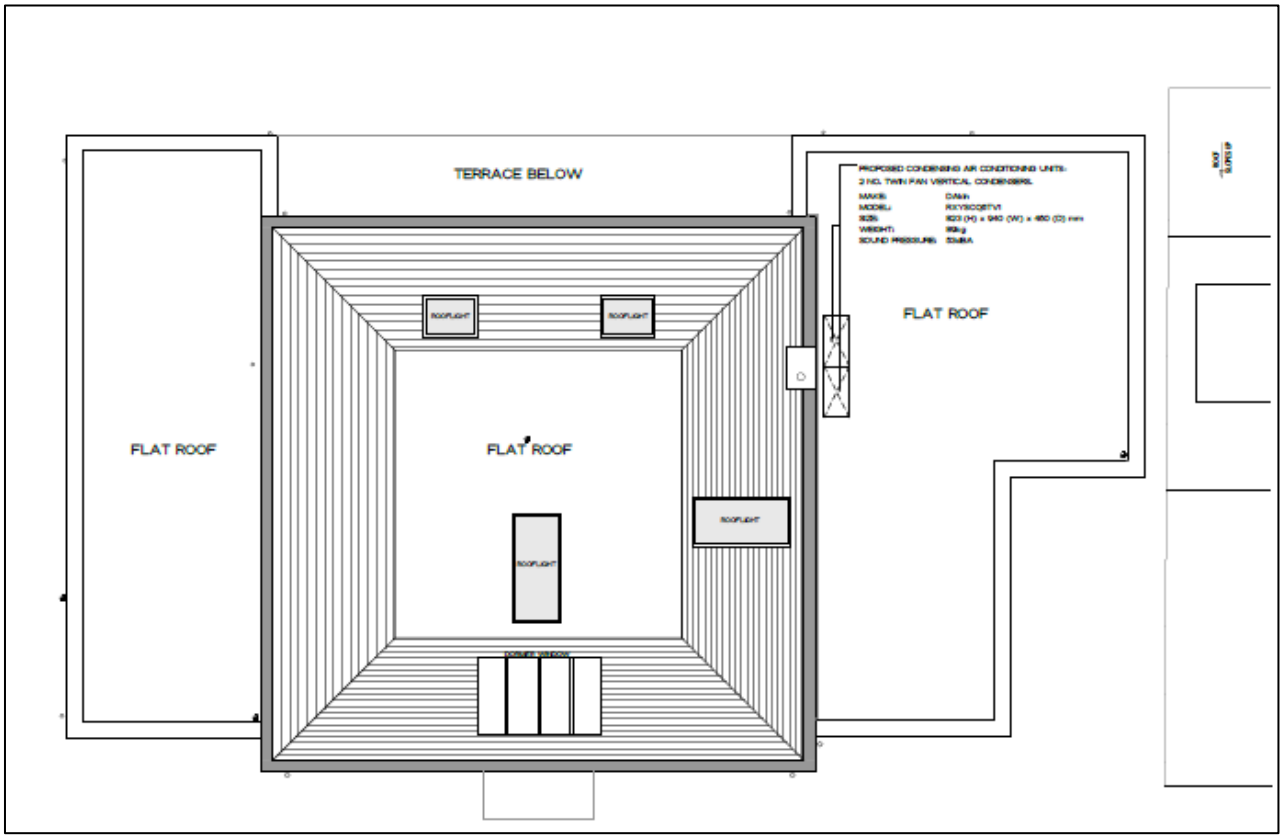

Figure 4: Roof plan indicating location of proposed VRV units

9.3.2. The proposed units are indicated in the drawing above as:

2 NO. TWIN FAN VERTICAL CONDENSERS.
MAKE: Dakin'
MODEL: RXYSCQ6TV1
SIZE: 823 (H) x 940 (W) x 460 (D) mm
WEIGHT: 89kg
SOUND PRESSURE: 53dBA

9.3.3. The following table sets out the manufacturer's reported sound power levels for the fans:

Plant Reference	Sound power levels (dB) @ octave band centre frequency (Hz)							
	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	dBA
Condensing Units (L_W)	72	69	68	66	59	53	48	70

Table 4 - Summary of the manufacturer sound power levels

9.4. Nearest Sensitive Receptor

9.4.1. The area is predominantly residential with several residences in the immediate vicinity. No.6 St John's Wood Park is noted to be the nearest property as indicated in the Figure 5 below:

Figure 5: satellite view illustrating location of NSR

9.4.2. Based on measurements taken of the OS drawings and satellite view, the window on the top floor of 6, St Johns Wood Park is noted to be the nearest noise sensitive receptor, approximately 8m from the proposed location of the condensing unit.

9.4.3. The units' location is however screened from view of the window since there are no windows along the gable end of 6, St Johns Wood Park. The overall path difference measured using satellite images and roof plans, is approximately 0.5m. This measure has been used to calculate the screening correction as per Maekawa's screening calculation[7]. The following image Figure 6 indicates the distance and the screened position as viewed from satellite imagery:

[7] B J Smith, R J Peters and S Owen, 'Acoustics and Noise Control', 2nd Edition, Section 5.3, page 64

Figure 6: Distance and screening from the nearest noise sensitive receptor

9.5. Assessment

9.5.1. Calculations have been based on the ISO9613-1:1996. The following table sets out the calculation used for the assessment:

Plant Reference	Sound levels (dB) @ octave band centre frequency (Hz)							
	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	dBA
Proposed Condensing Unit (L_W)	72	69	68	66	59	53	48	70
Number of units (2 no.)	+3	+3	+3	+3	+3	+3	+3	
Distance loss (point source) 8m	-18	-18	-18	-18	-18	-18	-18	
Screening Loss (0.5m Delta)	-9.8	-12	-14.6	-17.7	-20.7	-23.7	-26.7	
Radiation loss (quarter spherical propagation)	-5	-5	-5	-5	-5	-5	-5	
Character Corrections -Tonality -Impulsivity -Intermittency	0	0	0	0	0	0	0	
Resultant Level (L_p)	42.2	37.0	33.4	28.3	18.3	9.3	1.3	35

Table 5 – BS4142 assessment for proposed condensing units

9.5.2. Based on the calculation above, it is noted that noise emissions from the 2 condensing units is 35dBA L_p. This is below the night time limit of 36dBA, thereby minimising the impact from the units and meeting the necessary compliance criteria as required by the LPA.

10. Conclusions

10.1.1. An environmental noise survey has been carried out at the site of an existing residential property at 7 St Johns Wood Park, Camden, London to determine typical ambient sound levels. The sound levels have been used to calculate the noise emissions from proposed new condensing units to be located on the flat roof along the northern elevation of the house.

10.1.2. An assessment in accordance with BS4142:2014 has been undertaken and it is noted that resultant noise emissions at the nearest sensitive property (6 St Johns Wood Park) are at least 10dB below the recommended noise limit in accordance with the LPA criteria.

10.1.3. We strongly recommend that this report be passed to the local planning authority for approval prior to any works being carried out.

11. Appendix

APPENDIX A: Summary Information

Required ISO Test Report Information (cross referenced where required)			
		Measurements carried out to:	Analysed to:
A	Standards	BS 7445-1: 2003 BS 7445-2: 1991	BS 4142:2014
B	Organisation performed the measurements	noise.co.uk Ltd, The Haybarn, Newnham Grounds, Kings Newnham Lane, Bretford, Coventry, CV23 0JU.	
C	Name of Client	Rigby and Rigby	
D	Full site address	7 St Johns Wood Park Camden London	
E	Date of surveys	Survey Date: 5th March 2020 - 10th March 2020	
F	Description & identification of Proposed Development	It is proposed to install new condensers at an existing residential property	
G	Brief Description of details of Procedure & equipment	See Section 5 of this report.	

APPENDIX B: Technical Appendix

11.1.1. Measurements were made using the following equipment:

Monitoring Position	Sound Level Meter (Serial Number)	Calibrator (Serial Number)
1	Norsonic 140 (1405560)	Norsonic 1251 (33824)

11.1.2. The equipment has traceable calibration. The sound level meter was calibrated immediately prior to and immediately after the measurements were carried out.

Sound Level Meter	Before	After
Norsonic 140 (1405560)	114.0 dB	114.0 dB

11.1.3. There was no adverse deviation.

APPENDIX C: Measured $L_{A90,15min}$ (dB)

Date	Time	$L_{A90,15in}$
		Position 1
05/03/2020	10:00:00	51
05/03/2020	10:15:00	53
05/03/2020	10:30:00	53.5
05/03/2020	10:45:00	54
05/03/2020	11:00:00	54
05/03/2020	11:15:00	54
05/03/2020	11:30:00	53.5
05/03/2020	11:45:00	54
05/03/2020	12:00:00	55
05/03/2020	12:15:00	54.5
05/03/2020	12:30:00	55.5
05/03/2020	12:45:00	54.5
05/03/2020	13:00:00	55
05/03/2020	13:15:00	55
05/03/2020	13:30:00	55.5
05/03/2020	13:45:00	57
05/03/2020	14:00:00	56
05/03/2020	14:15:00	56
05/03/2020	14:30:00	56
05/03/2020	14:45:00	55.5
05/03/2020	15:00:00	55.5
05/03/2020	15:15:00	56
05/03/2020	15:30:00	54.5
05/03/2020	15:45:00	55
05/03/2020	16:00:00	54
05/03/2020	16:15:00	53
05/03/2020	16:30:00	53
05/03/2020	16:45:00	53.5
05/03/2020	17:00:00	52.5
05/03/2020	17:15:00	53
05/03/2020	17:30:00	53
05/03/2020	17:45:00	53
05/03/2020	18:00:00	53
05/03/2020	18:15:00	53.5
05/03/2020	18:30:00	53

Date	Time	$L_{A90,15in}$
		Position 1
05/03/2020	18:45:00	52.5
05/03/2020	19:00:00	53
05/03/2020	19:15:00	52.5
05/03/2020	19:30:00	52
05/03/2020	19:45:00	52
05/03/2020	20:00:00	51.5
05/03/2020	20:15:00	51
05/03/2020	20:30:00	51
05/03/2020	20:45:00	50.5
05/03/2020	21:00:00	49
05/03/2020	21:15:00	50
05/03/2020	21:30:00	49.5
05/03/2020	21:45:00	49.5
05/03/2020	22:00:00	48.5
05/03/2020	22:15:00	48.5
05/03/2020	22:30:00	48
05/03/2020	22:45:00	47.5
05/03/2020	23:00:00	47.5
05/03/2020	23:15:00	47.5
05/03/2020	23:30:00	46.5
05/03/2020	23:45:00	47
06/03/2020	00:00:00	46
06/03/2020	00:15:00	45
06/03/2020	00:30:00	45.5
06/03/2020	00:45:00	44.5
06/03/2020	01:00:00	44
06/03/2020	01:15:00	42.5
06/03/2020	01:30:00	42
06/03/2020	01:45:00	42.5
06/03/2020	02:00:00	42
06/03/2020	02:15:00	41
06/03/2020	02:30:00	40.5
06/03/2020	02:45:00	40.5
06/03/2020	03:00:00	41
06/03/2020	03:15:00	40.5
06/03/2020	03:30:00	41
06/03/2020	03:45:00	41.5

Date	Time	$L_{A90,15in}$
		Position 1
06/03/2020	04:00:00	41
06/03/2020	04:15:00	41.5
06/03/2020	04:30:00	41.5
06/03/2020	04:45:00	41
06/03/2020	05:00:00	41
06/03/2020	05:15:00	43
06/03/2020	05:30:00	44
06/03/2020	05:45:00	44.5
06/03/2020	06:00:00	46
06/03/2020	06:15:00	47
06/03/2020	06:30:00	47.5
06/03/2020	06:45:00	47.5
06/03/2020	07:00:00	49
06/03/2020	07:15:00	49
06/03/2020	07:30:00	49
06/03/2020	07:45:00	49
06/03/2020	08:00:00	50.5
06/03/2020	08:15:00	52
06/03/2020	08:30:00	52.5
06/03/2020	08:45:00	51
06/03/2020	09:00:00	51
06/03/2020	09:15:00	49.5
06/03/2020	09:30:00	50.5
06/03/2020	09:45:00	50.5
06/03/2020	10:00:00	50.5
06/03/2020	10:15:00	49
06/03/2020	10:30:00	49
06/03/2020	10:45:00	49.5
06/03/2020	11:00:00	49
06/03/2020	11:15:00	49
06/03/2020	11:30:00	49.5
06/03/2020	11:45:00	49
06/03/2020	12:00:00	48.5
06/03/2020	12:15:00	48.5
06/03/2020	12:30:00	49.5
06/03/2020	12:45:00	49.5
06/03/2020	13:00:00	49

Date	Time	$L_{A90,15in}$
		Position 1
06/03/2020	13:15:00	49
06/03/2020	13:30:00	48.5
06/03/2020	13:45:00	49
06/03/2020	14:00:00	49.5
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06/03/2020	14:30:00	49.5
06/03/2020	14:45:00	49
06/03/2020	15:00:00	48.5
06/03/2020	15:15:00	48.5
06/03/2020	15:30:00	49
06/03/2020	15:45:00	48
06/03/2020	16:00:00	47
06/03/2020	16:15:00	47.5
06/03/2020	16:30:00	47.5
06/03/2020	16:45:00	48.5
06/03/2020	17:00:00	47.5
06/03/2020	17:15:00	47.5
06/03/2020	17:30:00	47.5
06/03/2020	17:45:00	48
06/03/2020	18:00:00	47.5
06/03/2020	18:15:00	48.5
06/03/2020	18:30:00	47
06/03/2020	18:45:00	47
06/03/2020	19:00:00	48
06/03/2020	19:15:00	47.5
06/03/2020	19:30:00	47
06/03/2020	19:45:00	46.5
06/03/2020	20:00:00	46.5
06/03/2020	20:15:00	47
06/03/2020	20:30:00	46
06/03/2020	20:45:00	46.5
06/03/2020	21:00:00	46.5
06/03/2020	21:15:00	46
06/03/2020	21:30:00	46.5
06/03/2020	21:45:00	46
06/03/2020	22:00:00	46
06/03/2020	22:15:00	46

Date	Time	$L_{A90,15in}$
		Position 1
06/03/2020	22:30:00	45.5
06/03/2020	22:45:00	46
06/03/2020	23:00:00	46
06/03/2020	23:15:00	46.5
06/03/2020	23:30:00	46
06/03/2020	23:45:00	46
07/03/2020	00:00:00	45.5
07/03/2020	00:15:00	45.5
07/03/2020	00:30:00	44.5
07/03/2020	00:45:00	44.5
07/03/2020	01:00:00	44
07/03/2020	01:15:00	43.5
07/03/2020	01:30:00	43.5
07/03/2020	01:45:00	42.5
07/03/2020	02:00:00	43
07/03/2020	02:15:00	43
07/03/2020	02:30:00	43
07/03/2020	02:45:00	42
07/03/2020	03:00:00	42
07/03/2020	03:15:00	42.5
07/03/2020	03:30:00	43
07/03/2020	03:45:00	43
07/03/2020	04:00:00	41.5
07/03/2020	04:15:00	42.5
07/03/2020	04:30:00	42
07/03/2020	04:45:00	41.5
07/03/2020	05:00:00	42.5
07/03/2020	05:15:00	43
07/03/2020	05:30:00	43
07/03/2020	05:45:00	43.5
07/03/2020	06:00:00	45.5
07/03/2020	06:15:00	45
07/03/2020	06:30:00	45
07/03/2020	06:45:00	45.5
07/03/2020	07:00:00	47.5
07/03/2020	07:15:00	47.5
07/03/2020	07:30:00	48

Date	Time	$L_{A90,15in}$
		Position 1
07/03/2020	07:45:00	48
07/03/2020	08:00:00	48.5
07/03/2020	08:15:00	49
07/03/2020	08:30:00	49.5
07/03/2020	08:45:00	50
07/03/2020	09:00:00	50.5
07/03/2020	09:15:00	49.5
07/03/2020	09:30:00	50
07/03/2020	09:45:00	50.5
07/03/2020	10:00:00	49.5
07/03/2020	10:15:00	50
07/03/2020	10:30:00	50
07/03/2020	10:45:00	49.5
07/03/2020	11:00:00	49.5
07/03/2020	11:15:00	49.5
07/03/2020	11:30:00	49
07/03/2020	11:45:00	49
07/03/2020	12:00:00	49.5
07/03/2020	12:15:00	49.5
07/03/2020	12:30:00	50
07/03/2020	12:45:00	50
07/03/2020	13:00:00	50.5
07/03/2020	13:15:00	50.5
07/03/2020	13:30:00	49.5
07/03/2020	13:45:00	49
07/03/2020	14:00:00	49.5
07/03/2020	14:15:00	48.5
07/03/2020	14:30:00	49.5
07/03/2020	14:45:00	49
07/03/2020	15:00:00	49
07/03/2020	15:15:00	48
07/03/2020	15:30:00	48.5
07/03/2020	15:45:00	49
07/03/2020	16:00:00	50
07/03/2020	16:15:00	49.5
07/03/2020	16:30:00	49
07/03/2020	16:45:00	49

Date	Time	$L_{A90,15in}$
		Position 1
07/03/2020	17:00:00	48.5
07/03/2020	17:15:00	48.5
07/03/2020	17:30:00	49.5
07/03/2020	17:45:00	48.5
07/03/2020	18:00:00	49
07/03/2020	18:15:00	49
07/03/2020	18:30:00	48.5
07/03/2020	18:45:00	49.5
07/03/2020	19:00:00	48.5
07/03/2020	19:15:00	48
07/03/2020	19:30:00	49
07/03/2020	19:45:00	49.5
07/03/2020	20:00:00	49.5
07/03/2020	20:15:00	51
07/03/2020	20:30:00	49.5
07/03/2020	20:45:00	50
07/03/2020	21:00:00	49.5
07/03/2020	21:15:00	49.5
07/03/2020	21:30:00	49.5
07/03/2020	21:45:00	49
07/03/2020	22:00:00	49
07/03/2020	22:15:00	49
07/03/2020	22:30:00	49.5
07/03/2020	22:45:00	50
07/03/2020	23:00:00	49.5
07/03/2020	23:15:00	50
07/03/2020	23:30:00	49.5
07/03/2020	23:45:00	49
08/03/2020	00:00:00	48.5
08/03/2020	00:15:00	48.5
08/03/2020	00:30:00	49
08/03/2020	00:45:00	48.5
08/03/2020	01:00:00	48
08/03/2020	01:15:00	47.5
08/03/2020	01:30:00	48.5
08/03/2020	01:45:00	46.5
08/03/2020	02:00:00	46.5

Date	Time	$L_{A90,15in}$
		Position 1
08/03/2020	02:15:00	46
08/03/2020	02:30:00	46.5
08/03/2020	02:45:00	47
08/03/2020	03:00:00	46.5
08/03/2020	03:15:00	46
08/03/2020	03:30:00	46.5
08/03/2020	03:45:00	46
08/03/2020	04:00:00	46.5
08/03/2020	04:15:00	46
08/03/2020	04:30:00	46.5
08/03/2020	04:45:00	47.5
08/03/2020	05:00:00	47.5
08/03/2020	05:15:00	46.5
08/03/2020	05:30:00	46.5
08/03/2020	05:45:00	47
08/03/2020	06:00:00	45.5
08/03/2020	06:15:00	46
08/03/2020	06:30:00	46.5
08/03/2020	06:45:00	45.5
08/03/2020	07:00:00	46
08/03/2020	07:15:00	46.5
08/03/2020	07:30:00	46
08/03/2020	07:45:00	47
08/03/2020	08:00:00	46.5
08/03/2020	08:15:00	49.5
08/03/2020	08:30:00	48
08/03/2020	08:45:00	49
08/03/2020	09:00:00	48.5
08/03/2020	09:15:00	49.5
08/03/2020	09:30:00	50
08/03/2020	09:45:00	49.5
08/03/2020	10:00:00	49.5
08/03/2020	10:15:00	49.5
08/03/2020	10:30:00	49.5
08/03/2020	10:45:00	49
08/03/2020	11:00:00	49.5
08/03/2020	11:15:00	49.5

Date	Time	$L_{A90,15in}$
		Position 1
08/03/2020	11:30:00	49.5
08/03/2020	11:45:00	51.5
08/03/2020	12:00:00	49.5
08/03/2020	12:15:00	50.5
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08/03/2020	12:45:00	50
08/03/2020	13:00:00	51
08/03/2020	13:15:00	50.5
08/03/2020	13:30:00	50
08/03/2020	13:45:00	49.5
08/03/2020	14:00:00	50
08/03/2020	14:15:00	51
08/03/2020	14:30:00	49.5
08/03/2020	14:45:00	49.5
08/03/2020	15:00:00	49
08/03/2020	15:15:00	49.5
08/03/2020	15:30:00	50.5
08/03/2020	15:45:00	50.5
08/03/2020	16:00:00	50.5
08/03/2020	16:15:00	50
08/03/2020	16:30:00	50
08/03/2020	16:45:00	50
08/03/2020	17:00:00	50.5
08/03/2020	17:15:00	49.5
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08/03/2020	17:45:00	48.5
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08/03/2020	18:30:00	49
08/03/2020	18:45:00	49.5
08/03/2020	19:00:00	50
08/03/2020	19:15:00	50
08/03/2020	19:30:00	48.5
08/03/2020	19:45:00	48
08/03/2020	20:00:00	48.5
08/03/2020	20:15:00	48.5
08/03/2020	20:30:00	48

Date	Time	$L_{A90,15in}$
		Position 1
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08/03/2020	21:00:00	47.5
08/03/2020	21:15:00	47.5
08/03/2020	21:30:00	48.5
08/03/2020	21:45:00	48.5
08/03/2020	22:00:00	48.5
08/03/2020	22:15:00	47
08/03/2020	22:30:00	47
08/03/2020	22:45:00	47
08/03/2020	23:00:00	46.5
08/03/2020	23:15:00	47.5
08/03/2020	23:30:00	46
08/03/2020	23:45:00	45.5
09/03/2020	00:00:00	45
09/03/2020	00:15:00	44.5
09/03/2020	00:30:00	44.5
09/03/2020	00:45:00	45
09/03/2020	01:00:00	43.5
09/03/2020	01:15:00	42.5
09/03/2020	01:30:00	42.5
09/03/2020	01:45:00	41.5
09/03/2020	02:00:00	42
09/03/2020	02:15:00	41.5
09/03/2020	02:30:00	41
09/03/2020	02:45:00	40
09/03/2020	03:00:00	40.5
09/03/2020	03:15:00	41
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09/03/2020	04:00:00	42.5
09/03/2020	04:15:00	42
09/03/2020	04:30:00	42.5
09/03/2020	04:45:00	43
09/03/2020	05:00:00	44
09/03/2020	05:15:00	44
09/03/2020	05:30:00	45.5
09/03/2020	05:45:00	46.5

Date	Time	$L_{A90,15in}$
		Position 1
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09/03/2020	06:15:00	48.5
09/03/2020	06:30:00	48.5
09/03/2020	06:45:00	49.5
09/03/2020	07:00:00	53.5
09/03/2020	07:15:00	50.5
09/03/2020	07:30:00	50.5
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09/03/2020	08:00:00	51
09/03/2020	08:15:00	51.5
09/03/2020	08:30:00	52.5
09/03/2020	08:45:00	51.5
09/03/2020	09:00:00	51.5
09/03/2020	09:15:00	50.5
09/03/2020	09:30:00	50.5
09/03/2020	09:45:00	50.5
09/03/2020	10:00:00	52.5
09/03/2020	10:15:00	50.5
09/03/2020	10:30:00	50.5
09/03/2020	10:45:00	50
09/03/2020	11:00:00	51
09/03/2020	11:15:00	51.5
09/03/2020	11:30:00	51
09/03/2020	11:45:00	50.5
09/03/2020	12:00:00	50.5
09/03/2020	12:15:00	50
09/03/2020	12:30:00	50
09/03/2020	12:45:00	50
09/03/2020	13:00:00	50.5
09/03/2020	13:15:00	50
09/03/2020	13:30:00	50.5
09/03/2020	13:45:00	50
09/03/2020	14:00:00	51.5
09/03/2020	14:15:00	51
09/03/2020	14:30:00	51
09/03/2020	14:45:00	51
09/03/2020	15:00:00	51

Date	Time	$L_{A90,15in}$
		Position 1
09/03/2020	15:15:00	51.5
09/03/2020	15:30:00	51
09/03/2020	15:45:00	50
09/03/2020	16:00:00	50.5
09/03/2020	16:15:00	50.5
09/03/2020	16:30:00	51.5
09/03/2020	16:45:00	51
09/03/2020	17:00:00	51
09/03/2020	17:15:00	51.5
09/03/2020	17:30:00	51.5
09/03/2020	17:45:00	51.5
09/03/2020	18:00:00	52
09/03/2020	18:15:00	52
09/03/2020	18:30:00	52
09/03/2020	18:45:00	52.5
09/03/2020	19:00:00	51.5
09/03/2020	19:15:00	51.5
09/03/2020	19:30:00	52.5
09/03/2020	19:45:00	52
09/03/2020	20:00:00	52
09/03/2020	20:15:00	52
09/03/2020	20:30:00	52
09/03/2020	20:45:00	51.5
09/03/2020	21:00:00	51.5
09/03/2020	21:15:00	51.5
09/03/2020	21:30:00	50.5
09/03/2020	21:45:00	50
09/03/2020	22:00:00	50.5
09/03/2020	22:15:00	50
09/03/2020	22:30:00	49.5
09/03/2020	22:45:00	50
09/03/2020	23:00:00	51
09/03/2020	23:15:00	51
09/03/2020	23:30:00	53
09/03/2020	23:45:00	51.5
10/03/2020	00:00:00	50
10/03/2020	00:15:00	49

Date	Time	$L_{A90,15in}$
		Position 1
10/03/2020	00:30:00	49
10/03/2020	00:45:00	49.5
10/03/2020	01:00:00	48.5
10/03/2020	01:15:00	48
10/03/2020	01:30:00	46
10/03/2020	01:45:00	46
10/03/2020	02:00:00	45.5
10/03/2020	02:15:00	45.5
10/03/2020	02:30:00	44
10/03/2020	02:45:00	45
10/03/2020	03:00:00	45.5
10/03/2020	03:15:00	46.5
10/03/2020	03:30:00	44.5
10/03/2020	03:45:00	45.5
10/03/2020	04:00:00	44.5
10/03/2020	04:15:00	45
10/03/2020	04:30:00	44.5
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10/03/2020	05:00:00	45
10/03/2020	05:15:00	45.5
10/03/2020	05:30:00	46.5
10/03/2020	05:45:00	47.5
10/03/2020	06:00:00	50
10/03/2020	06:15:00	49.5
10/03/2020	06:30:00	50.5
10/03/2020	06:45:00	50.5
10/03/2020	07:00:00	51
10/03/2020	07:15:00	49.5
10/03/2020	07:30:00	50.5
10/03/2020	07:45:00	51
10/03/2020	08:00:00	52.5
10/03/2020	08:15:00	52
10/03/2020	08:30:00	51.5
10/03/2020	08:45:00	55.5
10/03/2020	09:00:00	55
10/03/2020	09:15:00	56
10/03/2020	09:30:00	57

Date	Time	$L_{A90,15in}$
		Position 1
10/03/2020	09:45:00	54
10/03/2020	10:00:00	54.5