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CUMBRAE PROPERTIES (1963) LTD

146-150 ROYAL COLLEGE STREET
LONDON, NW1 0TA

NOISE IMPACT ASSESSMENT

TECHNICAL REPORT: RFE-0271-20-03

DATE: APRIL 2021

PROJECT TITLE: 146-150 ROYAL COLLEGE STREET, LONDON

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For and on behalf of RF Environmental Ltd				

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146-150 ROYAL COLLEGE STREET, LONDON
NOISE IMPACT ASSESSMENT

CONTENTS

1 INTRODUCTION

RF Environmental Ltd (RFE) was commissioned by Cumbrae Properties (1963) Ltd in October 2019 to provide an acoustic report for the proposed development of 146-150 Royal College Street, London.

Planning permission is sought for a newly built commercial office building at the site.

The purpose of assessment is to undertake a noise assessment to consider the noise impact from the proposed external plant, at nearby residential receptors and use the information to determine an appropriate scheme of mitigation to ensure significant adverse noise effects are avoided. The findings of the assessment are reported herein.

The existing site and proposed development are described in the following section of this report, whilst the legislation and criteria used for the assessment are included within Section 3 of this report. The noise survey is presented in Section 4, whilst the external plant noise assessment is addressed in Section 5. Finally, the conclusions of this study are summarised in Section 6. A description of useful acoustic terms can be found in Appendix C.

The report has been produced by Richard Fenton (MIOA, MCIEH). Richard is experienced in the production of noise impact assessments. Richard has produced a significant number of noise assessments in consultancy roles and reviewed them in local authority roles.

2 SITE DESCRIPTION AND PROPOSED DEVELOPMENT

2.1 Site Description

The site is located at 146 -150 Royal College Street in the London Borough of Camden, approximately 170 metres south west of Camden Road railway station.

Located adjacent to Regents Canal in a mixed commercial and residential area, the site is located to the front of existing commercial accommodation and is adjacent to a terrace of existing residential properties which line Royal College Street.

A plan of the site and immediate area is presented in Figure A1 of Appendix A.

The ambient noise climate in the immediate vicinity of the site is dominated by local road traffic noise from Royal College Street, with some aircraft movements also noted during the baseline noise survey.

2.2 Proposed Development

The proposed development will consist of a single block of commercial space, set over four floors.

The proposed floor layouts are shown in Figure A2 to A6 of Appendix A.

2.3 Proposed Plant

The scheme will require the installation of the following external plant, which will be installed on the roof of the building:

- 4no. outdoor VRF heat pumps;
- 1no. air source heat pump; and
- 1no. constant pressure external twin fan.

In addition to the roof top plant, the extract and inlet points for the internal MVHR units, located on each floor, are also subject to this assessment.

Full details, including the sound power levels (L_w), of each individual plant item are presented in Section 5. The locations of the plant items are shown in Figures A2 to A6 of Appendix A.

3 ASSESSMENT CRITERIA

3.1 Noise Policy Statement for England (NPSE)

The Noise Policy Statement for England (March 2010)[1], sets out the long-term vision of Government noise policy.

The vision of the NPSE is to 'Promote good health and a good quality of life through the effective management and control of noise within the context of Government policy on sustainable development.' This vision is supported by three key aims:

- avoid significant adverse impacts on health and quality of life;
- mitigate and reduce to a minimum other adverse impacts on health and quality of life; and
- where possible, contribute to the improvement of health and quality of life.

The NPSE should apply to all forms of noise including environmental noise, neighbour noise and neighbourhood noise but does not apply to noise in the workplace (occupational noise).

The NPSE had adopted the following concepts, to help consider whether noise is likely to have 'significant adverse' or 'adverse' effects on health and quality of life:

NOEL – No Observed Effect Level

This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to noise.

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected.

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur.

However the NPSE goes on to state that:

'it is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available.'

[1] Department for Environment, Food and Rural Affairs (DEFRA). Noise Policy Statement for England (NPSE), 2010.

3.2 National Planning Policy Framework

The NPPF 2019[2], which refers to the "Explanatory Note in the in the NPSE, does not include specific noise criteria to be applied in planning decisions. It contains the following relevant guidance relating to noise and development:

"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...

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 impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and quality of life; and

(b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason...

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."

[2] Department of Communities and Local Government. National Planning Policy Framework, 2019

3.3 Planning Guidance

Planning Practice Guidance (PPG) on noise was issued in March 2014 and updated in July 2019[3]. This web-based guidance advises local planning authorities that *"Noise needs to be considered when new developments may create additional noise (including any anticipated changers to that environment from activities that are permitted but not yet commenced)..."*

According to the policy guidance noise can override other planning concerns *'although it is important to look at noise in the context of the wider characteristics of a development proposal, its likely users and its surroundings, as these can have an important effect on whether noise is likely to pose a concern"* (paragraph 002)

However, neither the Noise Policy Statement for England nor the National Planning Policy Framework (which reflects the NPSE) expects noise to be considered in isolation, separately from the economic social and other environmental dimensions of proposed development.

As regards planning decisions, the PPG advises that the decision taker *'need to take account the acoustic environment, and in doing so consider:*

- *whether or not a significant adverse effect is occurring or likely to occur;*
- *whether or not an adverse effect is occurring or likely to occur; and*
- *whether or not a good standard of amenity can be achieved.*

"In line with the explanatory note of the noise policy statement for England, this would include identifying whether the overall effect of the noise exposure (including the impact during the construction phase wherever applicable) is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation." (paragraph 003)

The PPG paragraph 004 refers to the NSPE 'observed effect level', while paragraph 005 sets out the noise exposure hierarchy which is based on the 'likely average response,' and gives example outcomes. The hierarchy table is presented in Table 3.1 below.

The hierarchy table provides guidance regarding how the concept of SOAELs and LOAELs, introduced through the NPSE, can be applied; and allows for informed subjective perceptions to be made in respect of the noticeability of noise in the context of potential effect levels. The PPG states that *"Although the word 'level' is used here, this does not mean that the effects can only be defined in terms of a single value of noise exposure. In some circumstances adverse effects are defined in terms of a combination of more that one factor such as noise exposure, the number of occurrences of the noise in a given time period, the duration of the noise and the time of the day the noise occurs".*

[3] Department for Communities and Local Government: Planning Practice Guidance – Noise paragraph 001 Ref. ID: 30-001-20190722. Revision date July 2019.

Response	Examples of Outcomes	Increasing Effect Level	Action
No Observed Effect Level			
Not Present	No Effect	No Observed Adverse Effect	No specific measures required
No Observed Adverse Effect Level			
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, 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 small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present of disruptive	The noise causes a material change in behaviour, attitude or other physiological response, 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
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

TABLE 3.1: PPG NOISE EXPOSURE HEIRARCHY
(Source – Planning Practice Guidance)

3.4 British Standard BS4142:2014

Guidance on the rating and assessing of sound of an industrial and/or commercial nature is contained in British Standard (BS) 4142: 2014 'Methods for rating and assessing industrial and commercial sound'[4]

The standard states that:

This standard is applicable to the determination of the following levels at outdoor locations

a) rating levels for sources of sound of an industrial and/or commercial nature; and

b) ambient, background and residual sound levels

[4] British Standard BS4142:2014: Methods for rating and assessing industrial and commercial sound.

for the purposes of:

1. *investigating complaints;*

2. *assessing sound from proposed, new, modified or additional source(s) of sound of an industrial nature and/or commercial nature; and*

3. *assessing sound at proposed new dwellings or premises used for residential purposes.*

The determination of noise amounting to a nuisance is beyond the scope of this British Standard.

The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs.

Typically, the greater the difference between rating level and background noise level, the greater the magnitude of the impact:

- a difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context;

- a difference of around +5 dB is likely to be an indication of an adverse impact depending on context; and

- the lower the rating level is relative to the measured background sound level, the less likely it is that the specific source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

Certain acoustic features can increase the significance of the impact of a specific sound source. These features include tonality and impulsivity, as well as additional characteristics and intermittency of the sound.

Where appropriate, a rating penalty for sound based on a subjective assessment of its characteristics should be established. In other circumstances an objective appraisal of tonal and/or impulsive characteristics may be appropriate.

It is also stated in the Standard that *'where a new noise sensitive receptor is introduced and there is extant industrial and/or commercial sound, it ought to be recognized that the industrial and/or commercial sound forms a component of the acoustic environment. In such circumstances other guidance and criteria in addition to or alternative to this standard can also inform the appropriateness of both introducing a new noise sensitive receptor and the extent of required mitigation'.*

3.5 Adopted London Plan (2021)[5]

The London Plan is a strategic planning Policy document which presents the overall strategy for planning in London, setting out an integrated economic, environmental, transport and social framework for the development of London over the next 20-25 years.

The policy relevant to this report is Policy D.14

Policy D14 – Noise states:

'In order to reduce, manage and mitigate noise to improve health and quality of life, residential and other non-aviation development proposals should manage noise by:

1) avoiding significant adverse noise impacts on health and quality of life

2) reflecting the Agent of Change principle as set out in Policy D13 Agent of Change

3) mitigating and minimising the existing and potential adverse impacts of noise on, from, within, as a result of, or in the vicinity of new development without placing unreasonable restrictions on existing noise-generating uses

4) improving and enhancing the acoustic environment and promoting appropriate soundscapes (including Quiet Areas and spaces of relative tranquillity)

3.6 Camden Local Plan 2017[6] – Policy A4 (Noise and Vibration)

Policy A4 seeks to ensure that noise and vibration is controlled and managed. The policy states that Camden will not grant planning permission for development sensitive to noise in locations which experience high levels of noise, unless appropriate attenuation measures can be provided. Full text of the Policy is provided below.

Policy A4 Noise and Vibration

The Council will seek to ensure that noise and vibration is controlled and managed.

Development should have regard to Camden's Noise and Vibration Thresholds (Appendix 3) We will not grant planning permission for:

a. *Development likely to generate unacceptable noise and vibration impacts; or*

b. *Development sensitive to noise in locations which experience high levels of noise, unless appropriate attenuation measures can be provided and will not harm the continued operation of existing uses.*

We will only grant permission for noise generating development, including any plant and machinery, if it can be operated without causing harm to amenity. We will also seek to

[5] The London Plan 2016.
[6] Camden Local Plan. 2017

minimise the impact on local amenity from deliveries and from demolition and construction phases of development.

Table C of Appendix 3 is reproduced below.

Existing Noise Sensitive Receptor	Assessment Location	Design Period	LOAEL (Green)	LOAEL to SOAEL (Amber)	SOAEL (Red)
Dwellings**	Garden used for main amenity (free field) and Outside living or dining or bedroom window (façade)	Day	Rating level' 10dB* below background	Rating level between 9dB below and 5dB above background	Rating level greater than 5dB above background
Dwellings*	Outside bedroom window (façade)	Night	Rating level' 10dB* below background and no events exceeding 57dB L_{Amax}	Rating level between 9dB below and 5dB above background or noise events between 57dB and 88dB L_{Amax}	Rating level' greater than 5dB above background and/or events exceeding 88dBL_{Amax}.

SOURCE – TABLE C OF APPENDIX 3 – CAMDEN LOCAL PLAN 2017
Notes:

**10dB should be increased to 15dB if the noise contains audible tonal elements. (day and night). However, if it can be demonstrated that there is no significant difference in the character of the residual background noise and the specific noise from the proposed development then this reduction may not be required.*

In addition, a frequency analysis (to include, the use of Noise Rating (NR) curves or other criteria curves) for the assessment of tonal or low frequency noise may be required.

***levels given are for dwellings, however, levels are use specific and different levels will apply dependent on the use of the premises.*

The periods in Table C correspond to 0700 hours to 2300 hours for the day and 2300 hours to 0700 hours for the night. The Council will take into account the likely times of occupation for types of development and will be amended according to the times of operation of the establishment under consideration.

There are certain smaller pieces of equipment on commercial premises, such as extract ventilation, air conditioning units and condensers, where achievement of the rating levels (ordinarily determined by a BS:4142 assessment) may not afford the necessary protection. In these cases, the Council will generally also require a NR curve specification of NR35 or below, dependant on the room (based upon measured or predicted Leq,5mins noise levels in octave bands) 1 metre from the façade of affected premises, where the noise sensitive premise is located in a quiet background area.

3.7 The Camden Planning Guidance

The Camden Planning Guidance – Amenity[7] sets out the LPA's expectations regarding noise impact from new developments. It confirms that noise from new plant should be assessed using the guidance presented in BS4142:2014. BS4142 indicates that *'The lower the rating*

[7] Camden Planning Guidance – Amenity Draft – November 2017

level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on context.'

The assessment reported herein, will follow the approach required by the Camden Planning Guidance and assess against the criteria set out in Table C of Appendix 3 of the Camden Local Plan 2017.

4 ENVIRONMENTAL NOISE SURVEY

4.1 Unattended Baseline Noise Survey

Unattended continuous monitoring of existing noise levels was undertaken at the monitoring location shown as LT1 on Figure A1 of Appendix A. The equipment used during the survey is presented in Table 4.1 below.

Manufacturer	Model No.	Description	Serial No.	Calibration Due Date
Larson Davis	LxT	Sound Level Meter	0004968	April 2022
Larson Davis	CAL200	Calibrator	12981	April 2021

TABLE 4.1: SOUND MONITORING EQUIPMENT

The sound level meter was powered by dry cell batteries and stored inside a weatherproof security box.

Measurements were obtained using the 'F' time weighting and A-weighting frequency network. The equipment was calibrated before and after the survey to generate a calibration level of 114.0 dB at 1 kHz. A photograph of the monitoring location is shown in Figure 4.1 below.

FIGURE 4.1: PHOTOGRAPH OF UNATTENDED MONITORING EQUIPMENT

15-minute measurements of $L_{Amax,F}$, L_{Aeq}, and L_{A90} noise levels were obtained at this monitoring location between 11:04 hrs Thursday 16th October 2019 and 09:53hrs Monday 21st October 2019, with the microphone set on a first floor flat roof area, at a height of approximately 5m above local ground level.

The dominant noise sources observed during site visits are discussed in section 2. Local traffic movements on Royal College Street were the dominant source of ambient noise.

4.2 Weather Conditions

Weather conditions during the site visits are presented below in Table 4.2.

Site Visit	Date and Time	Noted Weather
Setup	17/10/19 11:00am	No rain, 7/8 cloud cover, 14 °, windspeed <1m/s
Collection	21/10/19 09:00am	No rain, 8/8 cloud cover, 13°, windspeed <1m/s

TABLE 4.2: WEATHER CONDITIONS DURING SITE VISITS

A history of the weather conditions during the continuous survey period has been obtained from an internet source (Holloway ILONDON48 www.wunderground.com). Analysis of the data shows some periods of light rainfall, and these periods have been removed from the data set. The weather conditions obtained for the survey period are summarised in Figure A7 of Appendix A.

4.3 Continuous Noise Survey Results

Full results of the unattended noise measurement survey are presented graphically in Figure A8 of Appendix A, tabulated in Table B1 of Appendix B and summarised in Table 4.3 below.

Date	Measured Noise Levels, dB					
	Daytime (07:00 - 23:00)			Night-time (23:00 - 07:00)		
	$L_{Amax,F}$	$L_{Aeq,16hr}$	$L_{A90,16hr}$	$L_{Amax,F}$	$L_{Aeq,8hr}$	$L_{A90,8hr}$
Thu 17/10/19	68(60-86)*	53*	49*	62(54-74)	50	45
Fri 18/10/19	66(60-85)	53	49	63(55-77)	48	43
Sat 19/10/19	67(59-78)	51	47	62(51-76)	48	41
Sun 20/10/19	64(57-76)	52	45	60(50-73)	47	41
Mon 21/10/19	68(62-85)*	53*	48*			
Average	***67(66-68)***	***52***	***48***	***63(62-63)***	***49***	***44***

TABLE 4.3: SUMMARY OF UNATTENDED NOISE MEASUREMENTS, LT1

The results of the unattended noise measurement show that ambient day time $L_{Aeq,16hr}$ sound levels ranged from 51dB to 53 dB and produced an arithmetic average of 52 dB $L_{Aeq,16hr}$. The ambient night-time $L_{Aeq,8hr}$ sound levels ranged from 47dB to 50dB and produced an arithmetic average of 49 dB $L_{Aeq,\ 8hr}$.

5 ASSESSMENT OF EXTERNAL PLANT NOISE

5.1 BS4142 Assessment

The method for predicting the significance of sound of an industrial and/or commercial nature in accordance with the principles of BS 4142:2014 is based on a comparison of the rating level, defined as the specific sound level plus any adjustment for the characteristic features of the sound, with the background sound level, $L_{A90,T}$.

The standard is applicable for assessing sound at proposed new dwellings or premises used for residential purposes.

Closest Receptors

The closest residential receptors to the proposed external plant are located at 144 to 140 Royal College Street, which are terraced properties immediately adjacent to the site. The assessment location for these receptors are labelled as R1 to R3 in Figure A1 of Appendix A.

Background Sound Levels

The $L_{A90,T}$ background sound level is the sound level exceeded for 90% of the time in the absence of any sound from the specific source of interest.

'Typical' background sound levels observed over the period of interest, as described in BS4142:2014, are usually established for the purposes of a noise assessment of this kind, with BS4142 stating that a 'representative level ought to account for the range of background sound levels and ought not automatically to be assumed to be either the minimum or modal value'.

The external plant subject to this assessment are expected to operate during office hours only, and therefore only the daytime (07:00hrs to 23:00hrs) period has been assessed.

Free-field background sound levels of between 45dB and 52 dB $L_{A90,15min}$ have been recorded during the daytime between the hours of 07.00 and 23.00 during the monitoring period. The daytime background sound level adopted for the purposes of this survey is 49dB $L_{A90,15min}$ as this is considered a representative value for this time period and was the most regularly occurring at over 30% of the time, as shown in Figure A9 of Appendix A.

Plant Specific Sound Level

The individual sound power levels of the proposed roof top plant are presented in Table 5.1 below. The location of each plant item is shown in Figures A2 to A6 of Appendix A.

Manufacturer	Model	No.	Location	Sound Power Level, dB(A)
Mitsubishi	PUMY-P200YKM2	4	Roof	75
	PUHZ-HW140VHA2	1	Roof	71

Nuaire	External Twin Fan	1	Roof	76
Waterloo	MVHR Unit (Intake and Extract)	1	Ground Floor	54 [1]
Waterloo	MVHR Unit (Intake and Extract)	1	1st Floor	54 [1]
Waterloo	MVHR Unit (Intake and Extract)	1	2nd Floor	54 [1]
Waterloo	MVHR Unit (Intake and Extract)	1	3rd Floor	54 [1]

TABLE 5.1: EXTERNAL PLANT DATA

Note: 1. Based on sound pressure level of 36dB at 3m

Combined Specific Noise Level

A computer noise model of the site and plant, including all acoustically important surrounding buildings have been generated using SoundPlan Essential v5.0 to predict the specific noise level at the closest noise sensitive receptors. This proprietary software implements the noise propagation calculations specified in ISO 9613-2 as follows:

$$L_{ft}(DW) = L_w + D_c - A$$

where

$L_{ft}(DW)$	=	equivalent continuous downwind octave-band sound pressure level at a receiver location
L_w	=	sound power level of the noise source
D_c	=	directivity correction
A	=	attenuation that occurs during propagation from the point sound source to the receiver. $A = A_{div} + A_{atm} + A_{gr} + A_{bar} + A_{misc}$
A_{div}	=	attenuation due to geometrical divergence
A_{atm}	=	attenuation due to atmospheric absorption
A_{gr}	=	attenuation due to the ground effect
A_{bar}	=	attenuation due to a barrier
A_{misc}	=	attenuation due to miscellaneous other effects

A screenshot of the noise model, which has been used to predict the specific noise level for the plant at the nearest noise sensitive receptors is shown in Figure 5.1 below.

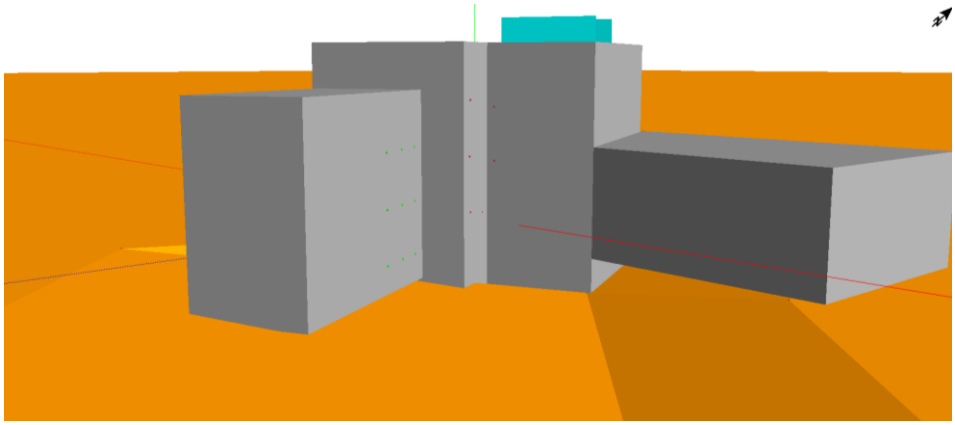

FIGURE 5.1: SCREENSHOT OF COMPUTER NOISE MODEL

The following assumptions have been made for the noise modelling exercise:

- All plant represented as point sources.
- Omnidirectional radiation assumed.
- For worst case assessment, all plant operating continuously and simultaneously.
- Ground absorption modelled as hard ground.
- Receptor positions one metre from façade.
- Only buildings and features which may affect the noise propagation to the nearest residential receptors are modelled.

Rating Level Assessment

Where appropriate, a rating penalty for noise based on a subjective assessment of its characteristics should be established and added to the specific sound level.

The new plant is not expected to be tonal or impulsive in nature however it may be discernible against the prevailing ambient noise and therefore a 3dB correction has been applied.

The assessment for the daytime period is set out in Table 5.2 below.

Results	Receptor			Commentary
	R1	R2	R3	
Specific sound level of plant ($L_{Aeq,T}$ dB)	34	35	35	Specific sound Level at closest receptor. Assumes 100% on-time for daytime 1 hr period.
Likely acoustic feature correction	3	3	3	The source not impulsive or tonal, rather broadband in nature however it might be discernible against the existing ambient noise.
Rating level at receptor (dB, $L_{Ar,Tr}$)	37	38	38	Specific sound level at sensitive receptor adjusted for acoustic feature correction.
Background sound level (dB $L_{A90,15min}$)	49	49	49	Measured at position LT1.
Excess of rating over background sound (dB)	-12	-11	-11	Assessment indicates low impact as described in BS4142:2014, depending on context

TABLE 5.2: ASSESSMENT OF PLANT RATING LEVELS AT NEAREST NOISE SENSITIVE RECEPTORS - DAYTIME

The assessment presented in Table 5.2 indicates that the rating noise level will be a minimum of 11dB below the existing background noise levels during the daytime period at the closest

sensitive receptor. According to BS4142:2014, this is an indication of low impact, depending on context.

In this instance, the assessment should be considered in the context that existing commercial developments are already present in the locality and that the existing ambient noise from road traffic is at a level which is likely to result in the plant being inaudible at the closest residential receptors.

The results also show that the estimated rating noise levels will fall below the LOAEL criteria set out in Appendix 3 of the Camden Local Plan.

5.2 Uncertainty

All reasonable skill and care have been taken to accurately measure the ambient sound levels at the assessment location.

The level of uncertainty in the ambient noise survey is minimised by measuring over a 5-day period.

The computer modelling package SoundPlan Essential 5 has a calculation methodology estimated accuracy of ± 3 dB.

Rounding has been used in the derivation of the ambient sound level and calculations, to avoid an impression of precision to decimal places. Rounding has been to integer values with 0.5 being rounded up on completion of the statistical analysis.

6 CONCLUSIONS

RF Environmental Ltd was appointed to undertake a noise impact assessment for the development site at 146-150 Royal College Street.

The existing noise environment has been established, which is considered representative of the development site, through unattended noise monitoring.

Computer noise modelling software has been used to predict the external plant noise levels across at the nearest noise sensitive receptors.

British Standard BS4142:2014 has been used to assess the likely adverse impact from the external plant noise.

The results indicate that the plant noise is likely to result in low impact and will fall below the LOAEL threshold set out in Appendix 3 of the Camden Local Plan. Therefore, no further mitigation options are deemed to be required.

APPENDIX A: FIGURES

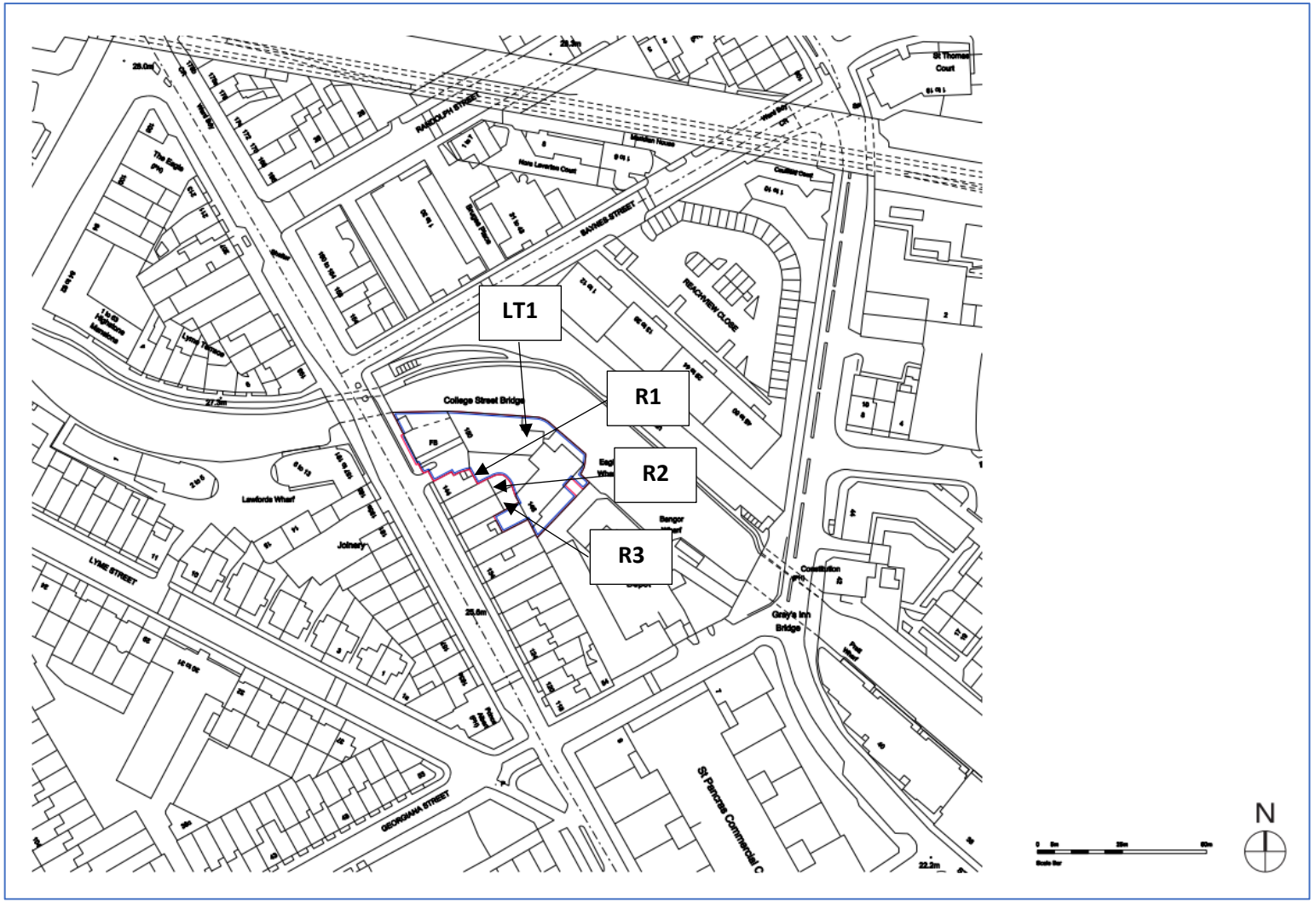

FIGURE A1: LOCATION OF PROPOSED DEVELOPMENT SITE

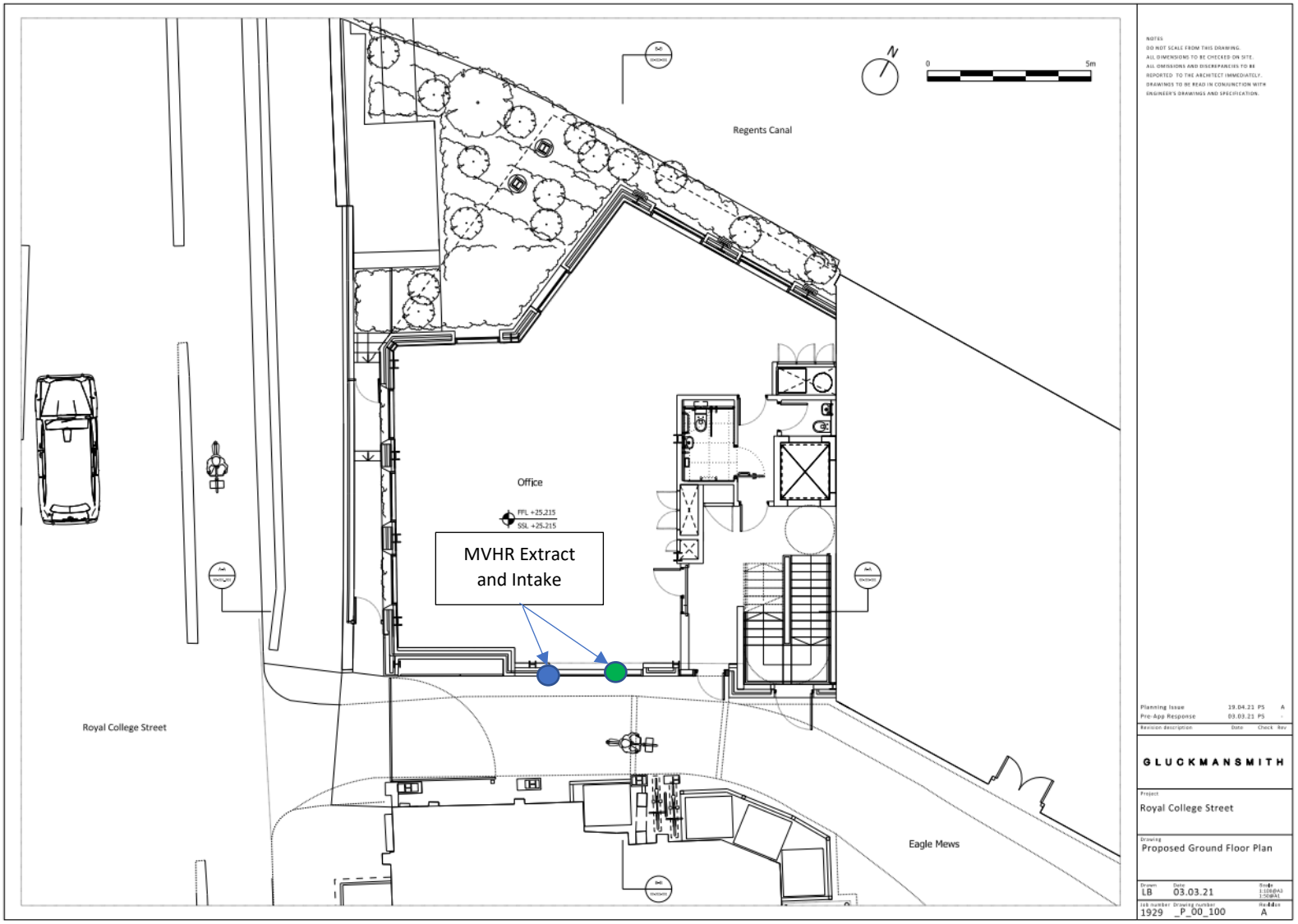

FIGURE A2: PROPOSED GROUND FLOOR PLAN

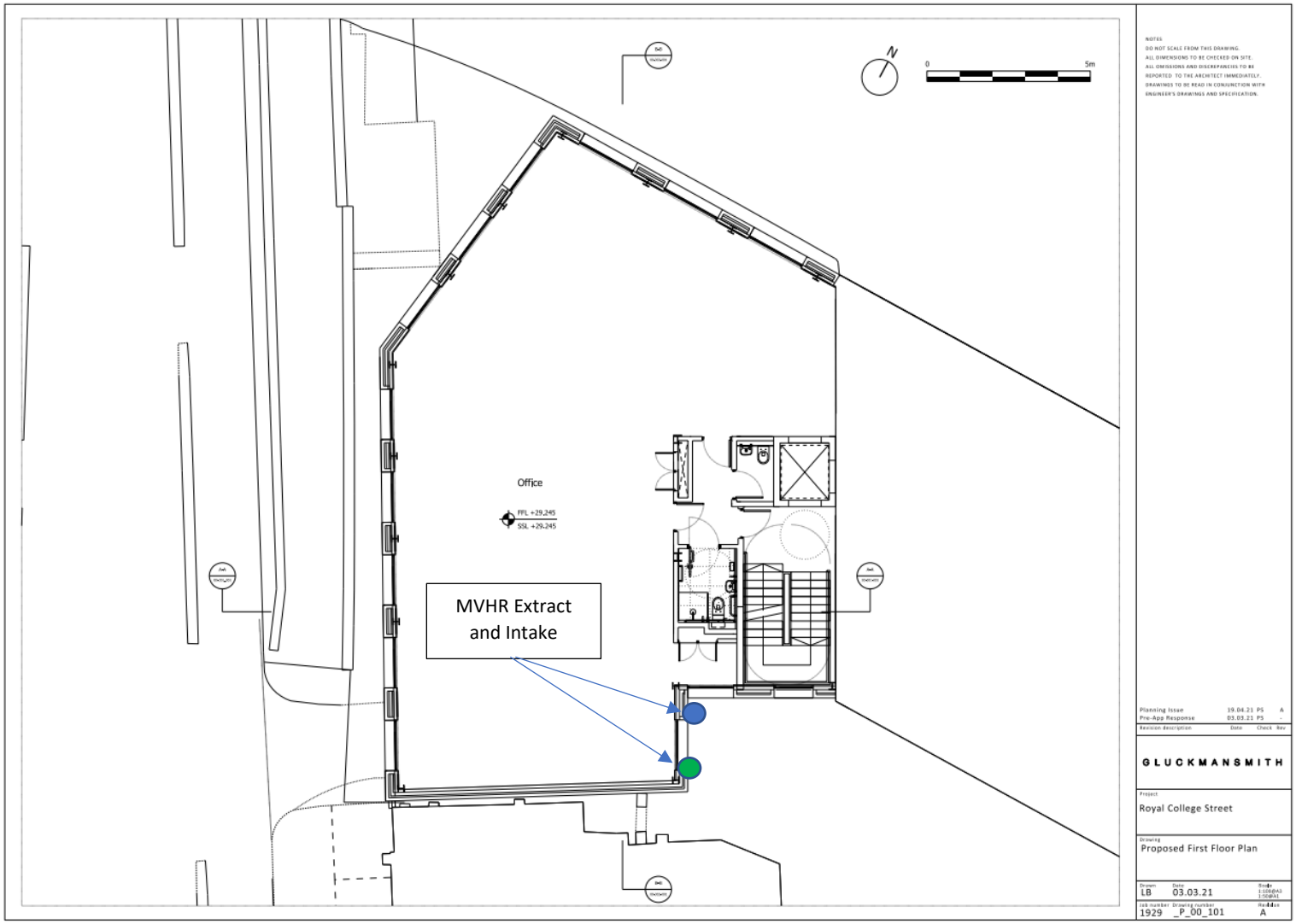

FIGURE A3: PROPOSED FIRST FLOOR PLAN

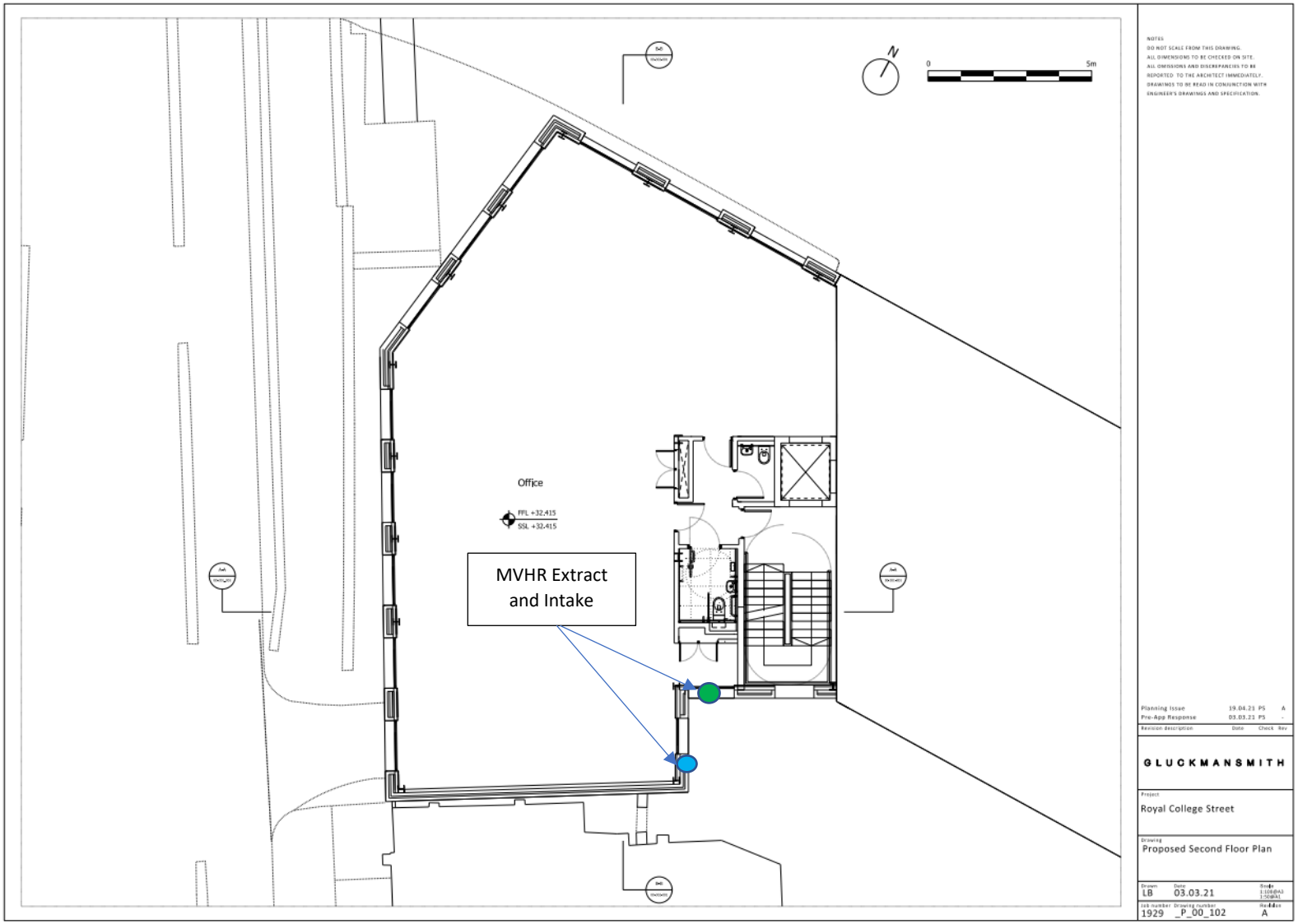

FIGURE A4: PROPOSED SECOND FLOOR PLAN

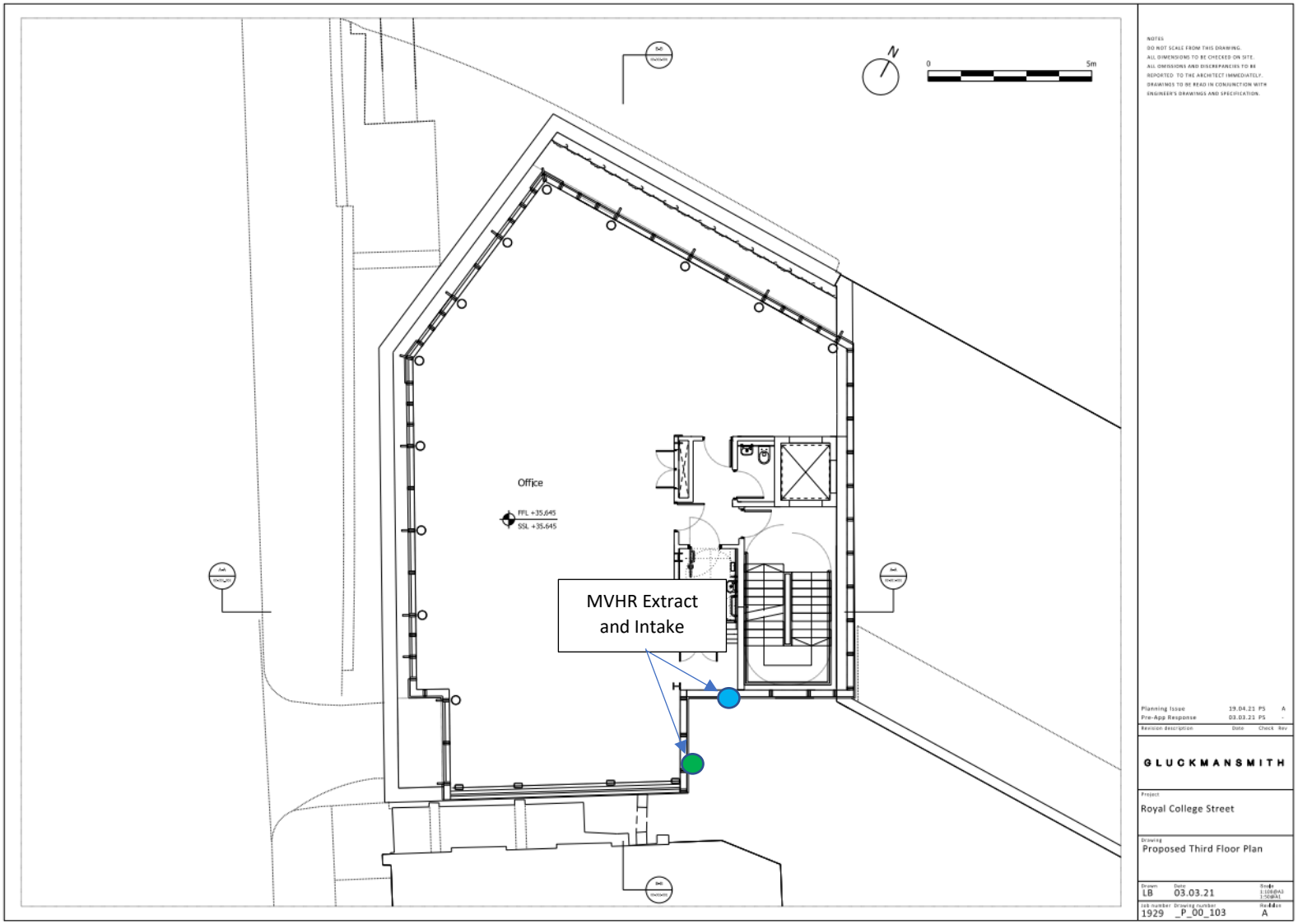

FIGURE A5: PROPOSED THIRD FLOOR PLAN

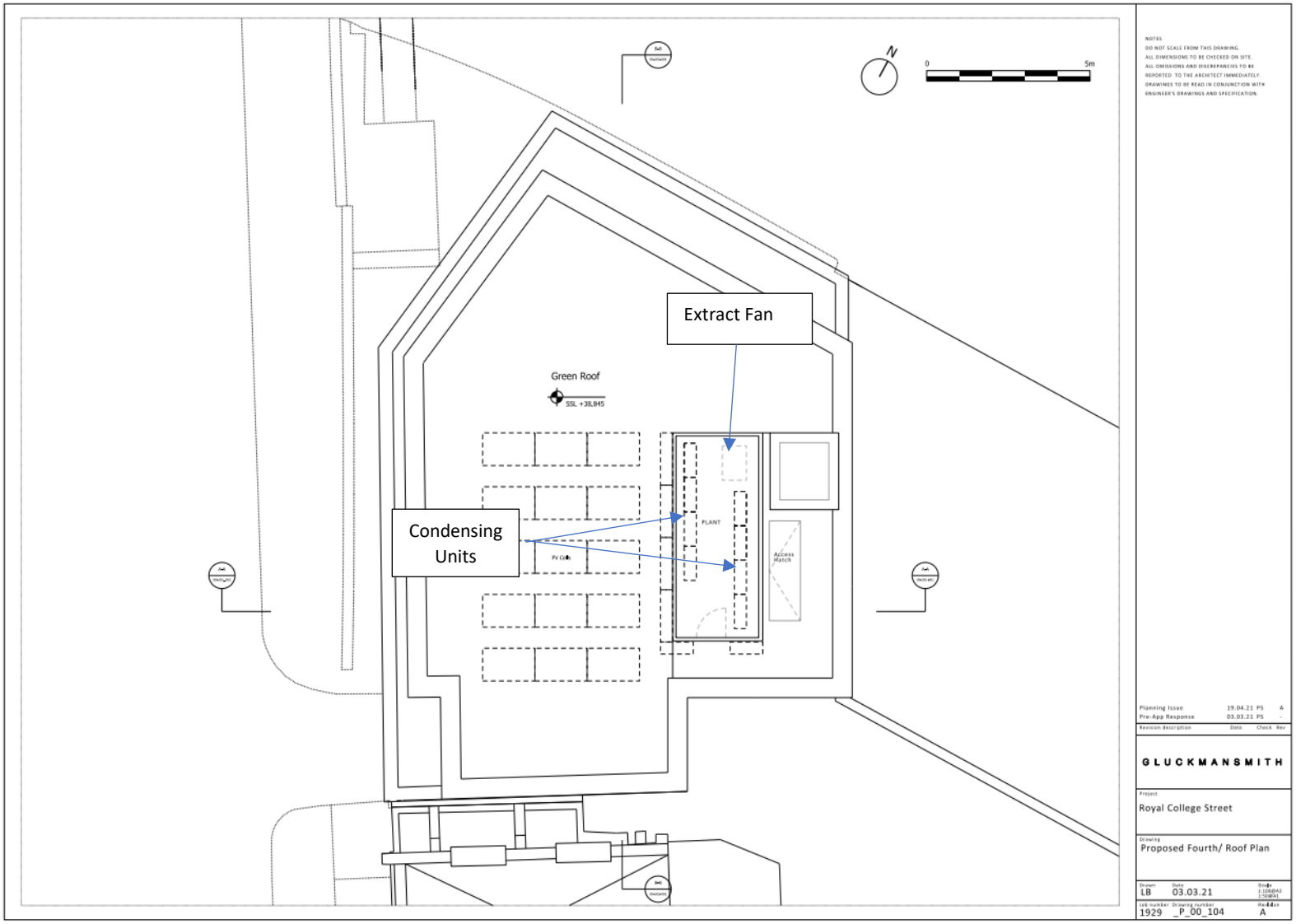

FIGURE A6: PROPOSED ROOF PLAN

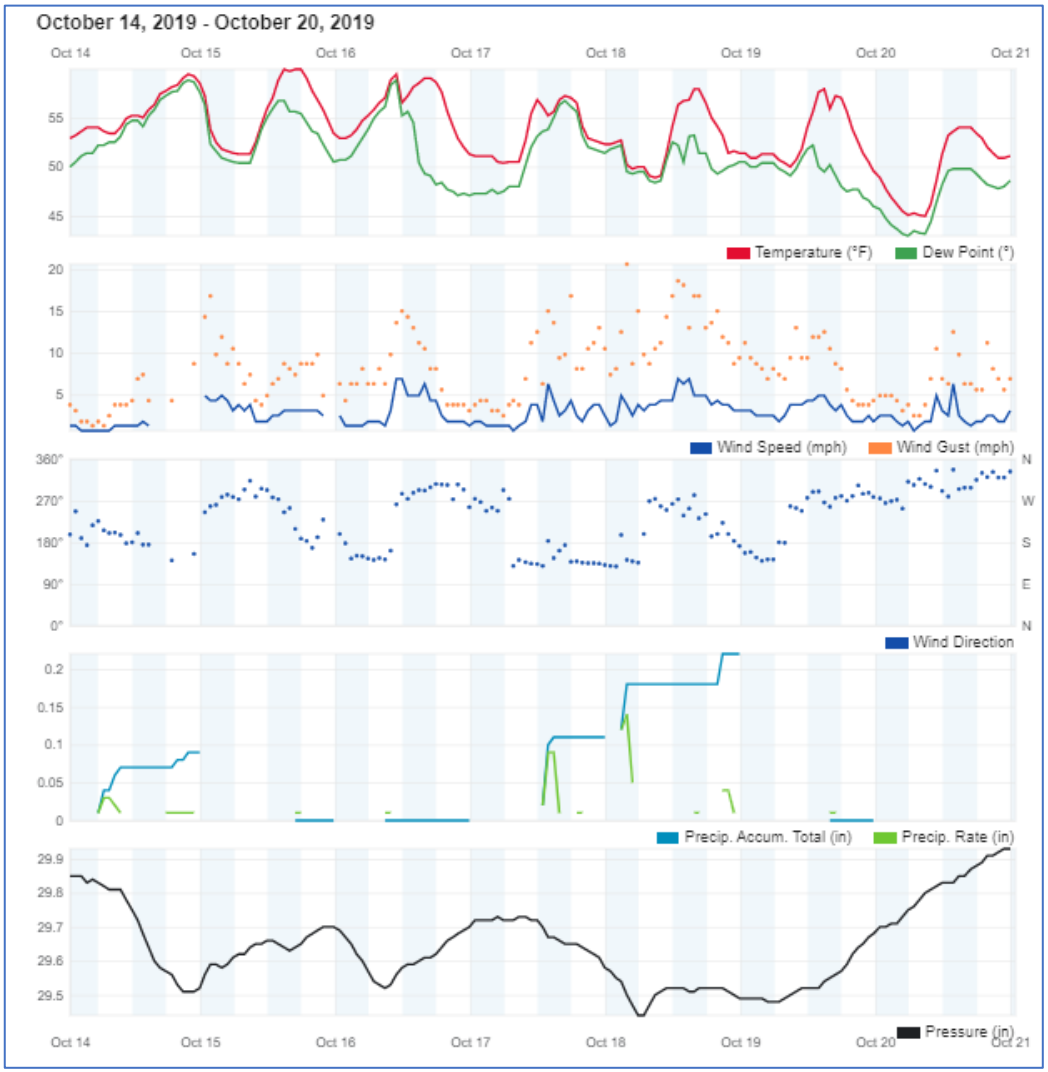

FIGURE A7: WEATHER DATA DURING MONITORING PERIOD

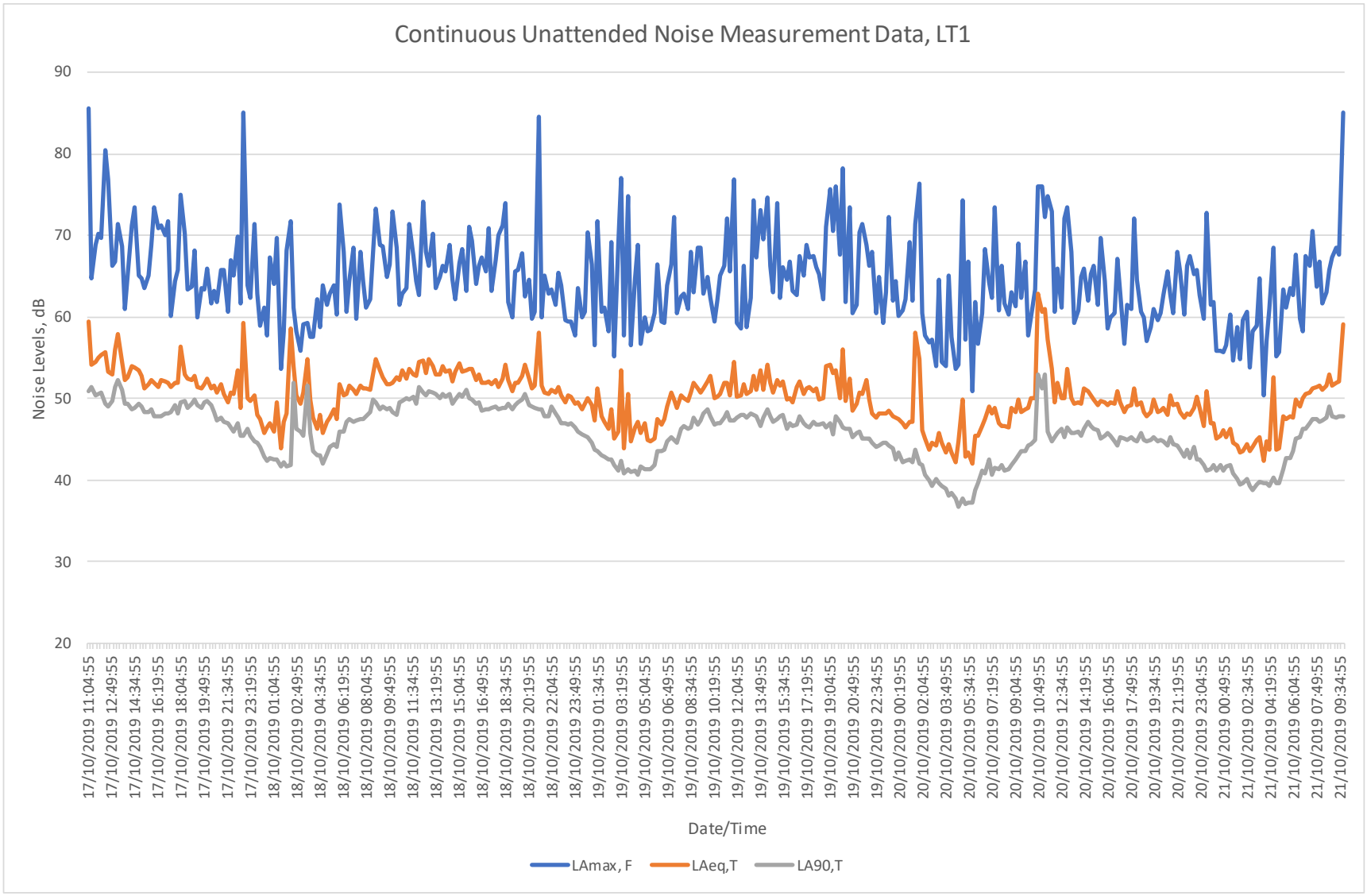

FIGURE A8: TIME HISTORY OF CONTINUOUS NOISE MONITORING DATA, LT1

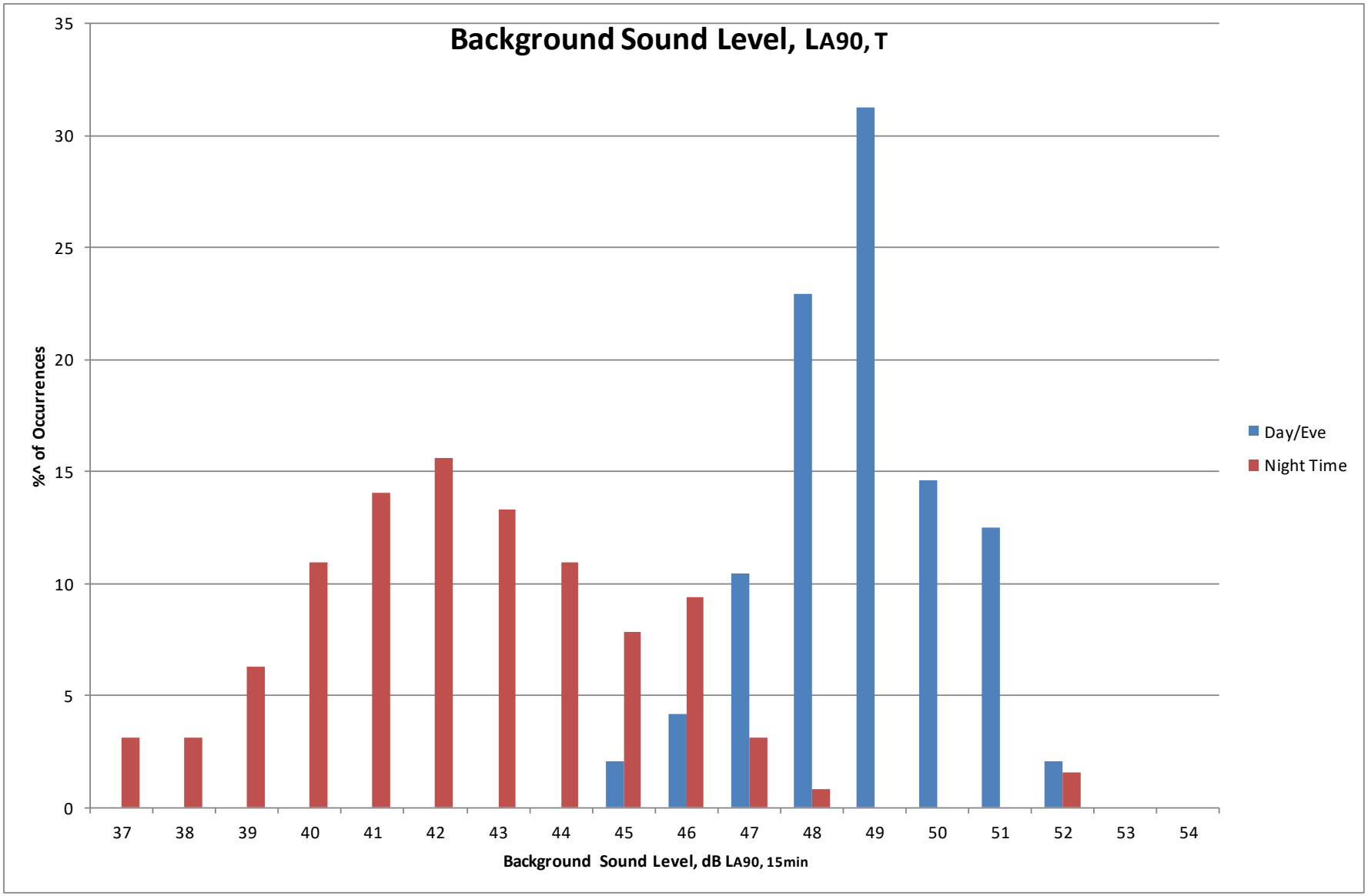

FIGURE A9: DERIVATION OF BACKGROUND SOUND LEVELS

APPENDIX B: TABLES

Date	Time	Measured Noise Levels, dB re. 2 x 10-5 Pa.			
		$L_{Amax, F}$	$L_{A10, 15min}$	$L_{Aeq, 15min}$	$L_{A90, 15min}$
Thursday 17th October 2019	11:04:55	85.5	60.3	59.4	50.9
	11:19:55	64.8	56.6	54.2	51.4
	11:34:55	68.9	57	54.4	50.4
	11:49:55	70.2	56.3	55	50.6
	12:04:55	69.6	58.1	55.4	50.8
	12:19:55	80.5	56.3	55.6	49.3
	12:34:55	76.8	55.3	53.3	49
	12:49:55	66.2	55.2	52.9	49.7
	13:04:55	66.7	59.5	56	51.4
	13:19:55	71.3	61.4	57.9	52.2
	13:34:55	68.7	56.5	54.5	51
	13:49:55	61	54.6	52.2	49.3
	14:04:55	65.1	55	52.6	49.3
	14:19:55	71.2	55.8	53.9	48.6
	14:34:55	73.4	55.1	53.8	48.8
	14:49:55	65.1	56.2	53.5	49.3
	15:04:55	64.8	55.1	52.7	49
	15:19:55	63.6	53.2	51.2	48.3
	15:34:55	65.1	54.1	51.8	48.4
	15:49:55	68.8	54.8	52.3	48.6
	16:04:55	73.5	53.6	52	47.9
	16:19:55	70.9	53	51.4	47.8
	16:34:55	71.2	53.4	52.2	47.9
	16:49:55	70	53.7	52.1	48.1
	17:04:55	71.7	54.1	51.9	48.1
	17:19:55	60.1	53.5	51.4	48.3
	17:34:55	64.4	54	52	49.2
	17:49:55	65.8	54.6	52	48.2
	18:04:55	75	56.8	56.4	49.5
	18:19:55	70.2	55.1	52.9	49.7
	18:34:55	63.4	55	52.5	48.8
	18:49:55	63.7	54.4	52.2	49.3
	19:04:55	68.1	54	52.8	49.9
	19:19:55	60	53.1	51.4	49.2
	19:34:55	63.6	53	51.2	48.8
	19:49:55	63.3	53.8	51.8	49.5
	20:04:55	66	54.6	52.4	49.7
	20:19:55	61.6	53	51.2	49.1
	20:34:55	63.2	54.2	51.6	48.3
	20:49:55	61.9	52.9	50.7	47.3
	21:04:55	65.8	54.5	51.7	47.7
	21:19:55	65.8	52.7	50.5	47.1
	21:34:55	60.7	51.5	49.5	47
	21:49:55	67	52.9	50.7	46.5

	22:04:55	65.1	53	50.6	46
	22:19:55	69.9	53.7	53.4	47
	22:34:55	61.6	51.4	48.9	45.5
	22:49:55	85.1	50.6	59.2	45.4
	23:04:55	63.9	52.8	50	46.3
	23:19:55	62.3	52	49.7	45.5
	23:34:55	71.4	51.5	50.3	44.7
	23:49:55	62.8	50.2	48	44.5
Friday 18th October 2019	00:04:55	58.9	49.9	47.5	44
	00:19:55	61.2	48.2	45.7	42.9
	00:34:55	57.7	49.2	46.5	42.3
	00:49:55	67.2	49.1	47	42.7
	01:04:55	64	48.1	45.9	42.5
	01:19:55	69.6	52.6	49.6	42.5
	01:34:55	53.7	45.9	43.9	41.6
	01:49:55	58.2	50.8	47.2	42.1
	02:04:55	68.2	48.9	48.1	41.7
	02:19:55	71.8	64.3	58.5	41.8
	02:34:55	61.2	55.3	54	52
	02:49:55	58.3	53.3	50.4	46.3
	03:04:55	55.9	51.3	49.4	46
	03:19:55	59.1	53.6	50.8	45.4
	03:34:55	59.3	56.4	54.9	51.6
	03:49:55	57.6	52.2	49.8	45.8
	04:04:55	57.6	50.7	47.6	43.6
	04:19:55	62.2	48.5	46.3	43.1
	04:34:55	58.8	50.9	48	43.1
	04:49:55	63.9	48.1	45.7	42
	05:04:55	61.5	49.7	47.1	43.2
	05:19:55	62.8	49.8	47.6	44
	05:34:55	63.8	51	48.6	44.4
	05:49:55	60.3	50.1	47.5	44
	06:04:55	73.8	54.3	51.7	45.9
	06:19:55	67.9	52.7	50.3	45.9
	06:34:55	60.7	53.5	50.5	47.1
	06:49:55	64.3	54	51.5	47.5
	07:04:55	68.5	53.3	51	47.2
	07:19:55	59.8	53	50.6	47.3
	07:34:55	67.9	53.7	51.5	47.4
	07:49:55	64.2	53.9	51.2	47.5
	08:04:55	61.1	53.7	51.2	47.8
	08:19:55	62.2	53.4	51.1	48.4
	08:34:55	67.8	55.2	53	49.8
	08:49:55	73.3	55.8	54.8	49.6
	09:04:55	68.9	55.2	53.4	48.6
	09:19:55	68.7	54.7	52.6	49

	09:34:55	64.9	54.1	51.8	48.7
	09:49:55	66.5	53.7	51.7	48.8
	10:04:55	72.9	53.9	52	48.3
	10:19:55	68.4	54.8	52.6	48
	10:34:55	61.5	54.7	52.2	49.5
	10:49:55	62.9	55.5	53.4	49.7
	11:04:55	63.6	54	52.4	50
	11:19:55	71.3	55.7	53.6	49.9
	11:34:55	67.5	55.2	53	50.2
	11:49:55	64.4	54.7	52.7	49.3
	12:04:55	62.7	56.6	54.5	51.4
	12:19:55	74.1	56.3	54.7	50.7
	12:34:55	67.9	55.3	53.1	50.3
	12:49:55	66.3	57.7	54.8	50.9
	13:04:55	70.2	55.9	53.9	50.8
	13:19:55	63.5	54.6	53	50.6
	13:34:55	64.9	55.4	53	50.1
	13:49:55	66.3	56.8	53.9	50.6
	14:04:55	65.6	55.7	53.3	50.2
	14:19:55	68.9	55	53.4	50.6
	14:34:55	64.5	54.1	52.1	49.4
	14:49:55	62.1	55.7	53.2	49.8
	15:04:55	66.6	57.5	54.3	50.6
	15:19:55	68.3	55.1	53.2	50.2
	15:34:55	63.2	55.2	53.4	51
	15:49:55	71.1	55.4	53.7	50
	16:04:55	69.3	56.1	53.7	49.9
	16:19:55	64.1	54.6	52.3	49.4
	16:34:55	66.2	55.3	53	49.6
	16:49:55	67.3	54.2	51.9	48.5
	17:04:55	65.5	54.1	52	48.7
	17:19:55	70.9	53.6	52.1	48.7
	17:34:55	63.2	53.7	51.7	48.9
	17:49:55	66.9	54.1	52.3	49
	18:04:55	70.1	53.3	51.4	48.7
	18:19:55	71.2	54.8	52.5	48.8
	18:34:55	73.9	54.7	54.1	48.9
	18:49:55	61.8	54	52.2	49.4
	19:04:55	60	52.7	50.9	48.6
	19:19:55	65.5	54.1	51.9	49.1
	19:34:55	65.7	53.9	52	49.5
	19:49:55	67.8	54.9	52.7	49.9
	20:04:55	62.5	56.7	54.2	50.6
	20:19:55	64.5	54.7	52.5	49.2
	20:34:55	59.7	53.1	51.3	49
	20:49:55	60.7	53.7	51.6	48.9

	21:04:55	84.5	54.2	58.1	48.7
	21:19:55	60	53.3	51.5	48.7
	21:34:55	65.1	52.8	50.7	47.9
	21:49:55	62.9	52.9	50.6	47.8
	22:04:55	63.4	52.9	51.1	49
	22:19:55	61.5	52.9	50.8	48.1
	22:34:55	65.4	53.3	51.4	47.6
	22:49:55	63.9	52.3	50.3	47
	23:04:55	59.6	51.3	49.6	46.9
	23:19:55	59.4	53.2	50.3	46.8
	23:34:55	59.4	52.3	50.2	47
	23:49:55	57.8	51.2	49.4	46.4
Saturday 19th October 2019	00:04:55	63.6	51.6	49.5	46
	00:19:55	60	51.5	48.7	45.6
	00:34:55	60.7	51.9	49.3	45.5
	00:49:55	70.3	51.8	50.1	45.2
	01:04:55	66.5	51.9	49.1	44.6
	01:19:55	56.6	50.6	47.3	43.7
	01:34:55	71.7	50.4	51.2	43.5
	01:49:55	60.6	51.2	47.8	43
	02:04:55	61.2	50	47.2	42.9
	02:19:55	58.3	48.8	46.3	42.6
	02:34:55	69.1	49.7	48.6	42.6
	02:49:55	55.2	47.5	45.1	41.8
	03:04:55	69	46.4	45.9	41.2
	03:19:55	77	49.9	53.4	42.3
	03:34:55	57.8	46.2	43.9	40.8
	03:49:55	74.8	50.4	50.6	41.3
	04:04:55	56.6	48.1	44.7	41
	04:19:55	64.8	49.9	46.5	41.1
	04:34:55	68.9	49.4	47.1	40.7
	04:49:55	56.7	49	45.7	41.7
	05:04:55	59.9	50.6	46.9	41.4
	05:19:55	58.2	47.2	44.9	41.4
	05:34:55	58.4	46.9	44.8	41.3
	05:49:55	60.5	47.4	45.1	41.9
	06:04:55	66.4	50.2	47.5	43.5
	06:19:55	59.5	49.3	46.8	43.5
	06:34:55	59.3	50.3	47.5	43.8
	06:49:55	63.9	51.9	49	44.7
	07:04:55	66.5	54.3	50.7	45.2
	07:19:55	72.3	51.4	49.8	44.9
	07:34:55	60.5	51.5	48.8	44.6
	07:49:55	62.5	53	50.4	46.3
	08:04:55	62.9	52.4	50.1	46.6
	08:19:55	60.9	51.9	49.7	46.3

	08:34:55	68	53.7	50.7	46.4
	08:49:55	63.1	54.5	52	47.7
	09:04:55	68.5	53.7	51.2	46.8
	09:19:55	68.5	53	50.8	47.3
	09:34:55	62.8	53.4	51.3	48.1
	09:49:55	64.9	54.2	52.1	48.6
	10:04:55	62.3	55.6	52.8	47.9
	10:19:55	59.5	52.3	50	46.8
	10:34:55	62	52.6	50.2	46.9
	10:49:55	65.1	52.9	50.6	46.9
	11:04:55	66.3	54.5	52	47.7
	11:19:55	72	54.5	51.9	48.3
	11:34:55	65.5	52.5	50.4	47.3
	11:49:55	76.8	54.2	54.5	47.3
	12:04:55	59.2	52.3	50.2	47.6
	12:19:55	58.6	52.3	50.4	48
	12:34:55	66.3	53.6	51.7	48
	12:49:55	58.7	52.7	50.5	47.6
	13:04:55	62.4	53	50.9	48.2
	13:19:55	74.2	54.1	52.8	48
	13:34:55	67.2	52.5	51.1	47.9
	13:49:55	73.1	54	53.5	46.7
	14:04:55	69.5	52.7	51	47.7
	14:19:55	74.7	56.5	54.2	48.6
	14:34:55	66.2	54	52	47.8
	14:49:55	63.1	53	50.8	47.2
	15:04:55	74	53.9	52.3	47.4
	15:19:55	62.3	53.3	51.5	47.8
	15:34:55	66.1	54.5	52.1	48
	15:49:55	64.6	51.9	49.8	46.2
	16:04:55	66.7	52	50.1	46.9
	16:19:55	63.2	51.6	49.5	46.7
	16:34:55	62.7	54.6	51.4	46.8
	16:49:55	67.5	54.4	52.1	47.8
	17:04:55	65.1	52.8	50.6	47
	17:19:55	68.8	52.8	51.3	46.6
	17:34:55	67.3	52.5	51.4	46.5
	17:49:55	67.5	53.3	50.9	47.2
	18:04:55	66.1	53.9	51.3	46.8
	18:19:55	65.3	51.9	49.9	46.8
	18:34:55	62.2	52.2	50.1	46.9
	18:49:55	71	55.6	53.9	46.5
	19:04:55	75.7	55.1	54.1	46.9
	19:19:55	70.5	53	53.1	45.6
	19:34:55	76	55.3	53.5	47.8
	19:49:55	67.7	52.2	50.1	47.2

	20:04:55	78.2	53.5	56	46.4
	20:19:55	61.8	51.8	49.7	46.2
	20:34:55	73.4	53	52.4	46.2
	20:49:55	60.4	50.7	48.5	45.3
	21:04:55	61.4	51.9	49.4	45.7
	21:19:55	70.3	52.4	50.7	45.9
	21:34:55	71.4	50.8	50.5	45.1
	21:49:55	68.8	52.2	52.3	45.1
	22:04:55	66.3	52.3	49.9	45.1
	22:19:55	68	50.6	48.2	44.6
	22:34:55	60.5	49.9	47.6	44
	22:49:55	64.9	50.8	48.2	44.2
	23:04:55	59.2	50.8	48.2	44.5
	23:19:55	63	50.8	48.2	44.5
	23:34:55	72.3	50	48.5	44.3
	23:49:55	62	49.9	47.9	43.9
Sunday 20th October 2019	00:04:55	64.4	49.5	47.6	42.6
	00:19:55	60.1	50.3	47.4	43.3
	00:34:55	60.8	49.7	46.9	42.2
	00:49:55	62.2	48.7	46.5	42.3
	01:04:55	69.1	49.2	47.2	42.5
	01:19:55	62	49.7	47.2	42.1
	01:34:55	71.3	63.2	58	43.7
	01:49:55	76.4	56.5	54.8	42
	02:04:55	60.4	48.7	46.1	41.9
	02:19:55	57.7	47.6	45.1	40.6
	02:34:55	56.9	46.2	43.8	39.9
	02:49:55	57.2	47.1	44.6	39.3
	03:04:55	53.9	47.3	44.2	40.1
	03:19:55	64.5	47.8	45.8	39.6
	03:34:55	54.4	47.9	44.6	39.2
	03:49:55	54	46.3	43.3	39
	04:04:55	65.1	47	44.4	38.1
	04:19:55	57.5	45.9	43.3	38.4
	04:34:55	53.6	45.6	42.2	37.7
	04:49:55	54.2	47.7	44.7	36.7
	05:04:55	74.2	47.8	49.9	37.7
	05:19:55	57.2	46.1	42.9	37
	05:34:55	66.7	46.3	43.3	37.3
	05:49:55	50.9	44.6	42	37.3
	06:04:55	61.8	48.8	45.4	38.7
	06:19:55	56.7	49.1	45.5	39.7
	06:34:55	60.5	49.9	46.7	41.2
	06:49:55	68.3	50.6	47.4	40.8
	07:04:55	64.2	52.7	49	42.5
	07:19:55	62.3	51.8	48.1	40.6

	07:34:55	73.5	50.1	48.9	41.5
	07:49:55	60.8	49.9	47	41.4
	08:04:55	66.2	49.3	46.6	41.8
	08:19:55	61.6	49.7	46.7	41.1
	08:34:55	60.2	49.1	46.5	41.3
	08:49:55	63	52	48.9	41.9
	09:04:55	61.3	51.4	48.3	42.5
	09:19:55	69	52.2	49.8	43
	09:34:55	62.3	51.3	48.4	43.6
	09:49:55	66.7	52	48.6	43.5
	10:04:55	57.8	51.7	48.8	44.3
	10:19:55	59.9	53.1	50	44.4
	10:34:55	63.3	52.9	50	45
	10:49:55	76	66.6	62.8	53
	11:04:55	76	64.8	60.7	51.2
	11:19:55	72.3	65	60.9	52.9
	11:34:55	74.8	61.7	57.2	46
	11:49:55	72.9	54.8	53.7	44.7
	12:04:55	60.6	52.3	49.6	45.3
	12:19:55	66	55	51.9	45.7
	12:34:55	61.2	52.6	50	46.2
	12:49:55	72	51.7	50.1	45.2
	13:04:55	73.4	53.3	53.6	46.4
	13:19:55	68	51.9	50.1	45.7
	13:34:55	59.3	52.1	49.4	45.7
	13:49:55	60.8	52.1	49.6	45.9
	14:04:55	64.9	51.8	49.3	45.4
	14:19:55	65.9	53.6	51.2	46.2
	14:34:55	62	53.4	50.9	47.1
	14:49:55	65.2	52.9	50.3	46.7
	15:04:55	66.2	51.8	49.9	46.2
	15:19:55	61.4	51.7	49.2	46.1
	15:34:55	69.7	51.8	49.7	45.1
	15:49:55	64.3	52.4	49.6	45.5
	16:04:55	58.6	51.5	49.1	45.8
	16:19:55	59.9	52.5	49.6	45.5
	16:34:55	60.5	52.1	49.4	44.8
	16:49:55	67.1	53.1	50.9	44.2
	17:04:55	63.1	51.8	49.5	45.2
	17:19:55	56.7	51.1	48.4	45.1
	17:34:55	61.4	51.7	49	44.9
	17:49:55	61	51.9	49.1	45.2
	18:04:55	72	51.9	51.2	44.9
	18:19:55	64.6	51.6	49.1	44.8
	18:34:55	60.7	52.6	49.5	45.7
	18:49:55	60	51	48.4	44.9

	19:04:55	57.1	50.4	47.9	44.8
	19:19:55	58.8	50.9	48.4	45
	19:34:55	60.9	52.2	49.8	45.2
	19:49:55	59.6	50.6	48.3	44.7
	20:04:55	60.5	50.9	48.5	44.9
	20:19:55	62.7	51.5	48.9	44.7
	20:34:55	65.6	50.6	48	44.3
	20:49:55	62.7	53.5	50.3	45.3
	21:04:55	60.5	52.3	49.2	44.4
	21:19:55	67.9	51	49.4	44.2
	21:34:55	65.6	51	48.3	43.8
	21:49:55	60.2	50.9	47.7	42.8
	22:04:55	66.3	49.8	48.2	43.8
	22:19:55	67.5	50.1	48	42.7
	22:34:55	65.3	51.4	48.8	44.1
	22:49:55	65.7	53.5	50.2	42.5
	23:04:55	62.7	52.1	48.9	42.6
	23:19:55	59.8	50.1	46.7	41.8
	23:34:55	72.7	49.9	50.9	41.1
	23:49:55	61.4	49.5	46.9	41.4
Monday 21st October 2019	00:04:55	61.8	49.7	46.9	41.9
	00:19:55	55.9	47.9	45.1	41.2
	00:34:55	55.9	48.1	45.4	41.8
	00:49:55	55.6	49.6	46.1	41.2
	01:04:55	56.5	47.8	45.2	41.7
	01:19:55	60.3	49.2	46.3	41.8
	01:34:55	54.6	47.3	44.5	40.9
	01:49:55	58.7	46.7	44.2	40.1
	02:04:55	54.9	45.9	43.3	39.4
	02:19:55	59.6	45.9	43.5	39.6
	02:34:55	60.7	47	44.4	40.1
	02:49:55	53.8	46.4	43.5	39.2
	03:04:55	58.2	46.9	44	38.7
	03:19:55	58.9	47.2	44.9	39.5
	03:34:55	64.8	48.4	45.2	39.8
	03:49:55	50.4	44.5	42.4	39.7
	04:04:55	57.1	48	44.8	39.6
	04:19:55	61	45.7	43.8	39.2
	04:34:55	68.5	56.7	52.6	40.3
	04:49:55	55.2	46.1	43.7	39.6
	05:04:55	55.7	46.9	43.9	39.7
	05:19:55	63.3	51.2	47.8	41.3
	05:34:55	61.2	50.3	47.5	42.7
	05:49:55	63.5	50.3	47.9	42.7
	06:04:55	62.7	50.8	47.7	43.6
	06:19:55	67.6	51.4	49.8	45.1

	06:34:55	59.8	51.6	49	45.2
	06:49:55	58.3	52.8	50.1	46.3
	07:04:55	67.5	52.9	50.6	46.3
	07:19:55	66.2	53.4	50.8	47
	07:34:55	70.5	54	51.3	47.5
	07:49:55	63.7	53.7	51.4	47.5
	08:04:55	66.8	54.4	51.5	47.2
	08:19:55	61.7	53	51	47.3
	08:34:55	63.1	53.9	51.5	47.7
	08:49:55	65.7	55.4	53	49
	09:04:55	67.3	53.7	51.5	47.9
	09:19:55	68.5	54.2	51.9	47.7
	09:34:55	67.7	54.5	52.1	47.8
	09:49:55	85	56.9	59.1	47.9

TABLE B1: UNATTENDED NOISE DATA - 17TH OCTOBER TO 21ST OCTOBER 2019

APPENDIX C: GLOSSARY OF ACOUSTIC TERMS

Noise

Noise is defined as unwanted sound. The range of audible sound is from 0 to 140 dB. The frequency response of the ear is usually taken to be around 18 Hz (number of oscillations per second) to 18000 Hz. The ear does not respond equally to different frequencies at the same level. It is more sensitive in the mid-frequency range than the lower and higher frequencies and because of this, the low and high frequency components of a sound are reduced in importance by applying a weighting (filtering) circuit to the noise measuring instrument. The weighting which is most widely used and which correlates best with subjective response to noise is the dBA weighting. This is an internationally accepted standard for noise measurements.

For variable sources, such as traffic, a difference of 3 dBA is just distinguishable. In addition, a doubling of traffic flow will increase the overall noise by 3 dBA. The 'loudness' of a noise is a purely subjective parameter, but it is generally accepted that an increase/ decrease of 10 dBA corresponds to a doubling/ halving in perceived loudness. Noise is measured on a logarithmic scale in decibels (dB) because of the ears' sensitivity to a wide range of pressure changes. The sound pressure level (SPL) of a signal is denoted by the symbol Lp and defined by the equation Lp = 10 log (p/po)2 where p is the root mean square pressure of the signal and po is the reference sound pressure (2 x 10-5 Pa).

An indication of the range of sound pressure levels commonly found in the environment is given below:

Location	$L_{pAdB}(A)$
Normal threshold of hearing	-10 to 20
Music halls and theatres	20 to 30
Living rooms and offices	30 to 50
Inside motor vehicles	50 to 70
Industrial premises	70 to 100
Burglar alarms at 1 m	100 to 110
Jet aircraft on take-off	110 to 130
Threshold of pain	130 to 140

External noise levels are rarely steady, but rise and fall according to activities within an area. In attempt to produce a figure that relates this variable noise level to subjective response, a number of noise indices have been developed. These include:

i) The L_{Amax} noise level

This is the maximum noise level recorded over the measurement period.

ii) The L_{Aeq} noise level

This is “equivalent continuous A-weighted sound pressure level, in decibels” and is defined in British Standard BS 7445 as the “ value of the A-weighted sound pressure level of a continuous, steady sound that, within a specified time internal, T, has the same mean square sound pressure as a sound under consideration whose level varies with time”.

It is a unit commonly used to describe construction noise and noise from industrial premises and is the most suitable unit for the description of other forms of environmental noise. In more straightforward terms, it is a measure of energy within the varying noise.

iii) The L_{A10} noise level

This is the noise level that is exceeded for 10% of the measurement period and gives an indication of the noisier levels. It is a unit that has been used over many years for the measurement and assessment of road traffic noise.

iv) The L_{A90} noise level

This is the noise level that is exceeded for 90% of the measurement period and gives an indication of the noise level during the quieter periods. It is often referred to as the background noise level and is used in the assessment of disturbance from industrial noise.

Community response to environmental noise sources is dependent on both acoustic and non-acoustic factors. The acoustic factors include absolute noise level, changes or exceedances of background and ambient levels as well as the characteristics, time, duration and frequency of noise.