The Co-operative
29 Belsize Lane
Hampstead
Camden
NW3 5AS

Plant Noise Impact Assessment

On behalf of

Tyburn management llp

Project Reference: 87403| Revision: 01 | Date: 28th March 2018

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For and on behalf of Noise Solutions Ltd				

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01	27 Jul 2018	Plant and enclosure location amended	NAC	JS
02	10 Aug 2018	Plant drawing updated; references to NPPF updated	NAC	JS

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Executive Summary

Noise Solutions Limited has carried out a noise survey on Belsize Lane, Camden and undertaken a noise impact assessment of new plant to be installed at the proposed Co-operative food store at 29 Belsize Lane, Hampstead.

The assessment shows that noise from the new plant complies with London Borough of Camden's typical requirements at the nearest noise-sensitive receptor.

1.0 Introduction

1.1. Noise Solutions Ltd (NSL) has been commissioned by Tyburn Management LLP to undertake a noise impact assessment of proposed new plant serving the proposed Co-operative store located at 29 Belsize Lane in Hampstead.

1.2. An environmental sound survey has been undertaken to establish the prevailing background sound pressure levels at a location representative of the sound levels outside the nearest noise sensitive receptors to the site.

1.3. To assist with the understanding of this report a glossary of acoustic terms can be found in **Appendix A**. An in-depth glossary of acoustic terms can be viewed online at www.acoustic-glossary.co.uk.

2.0 Details of development proposals

2.1. The planned Co-operative store is to be located on the corner of Belsize Lane and Belsize Mews. The Co-operative sales area will be located on the ground floor with the back of house area within the basement below. The upper floors are residential apartments.

2.2. External plant is to be located on the roof of the ground floor at the rear of the building along the south-eastern elevation and is to comprise two air conditioning (AC) units and a refrigeration condenser. Manufacturers' noise data is given in **Appendix D**. The plant layout is shown in **Appendix F**.

2.3. The proposed refrigeration plant will potentially operate 24 hours a day, although it should be noted that these units operate as required to meet demand and that store demands for cooling are generally reduced at night. The AC units will operate only during store opening hours.

3.0 Nearest noise sensitive receptors

3.1. The area surrounding the site is mix of commercial and residential in use. The nearest noise sensitive property to the plant area will be the flat located above the proposed store on the first floor (Receptor R1), with windows approximately 4m away from the nearest plant. The proposed louvred enclosure around the plant area prevents direct view of the plant from the nearest windows.

3.2. **Appendix B** contains an aerial photograph showing the site and surrounding area.

4.0 Existing noise climate

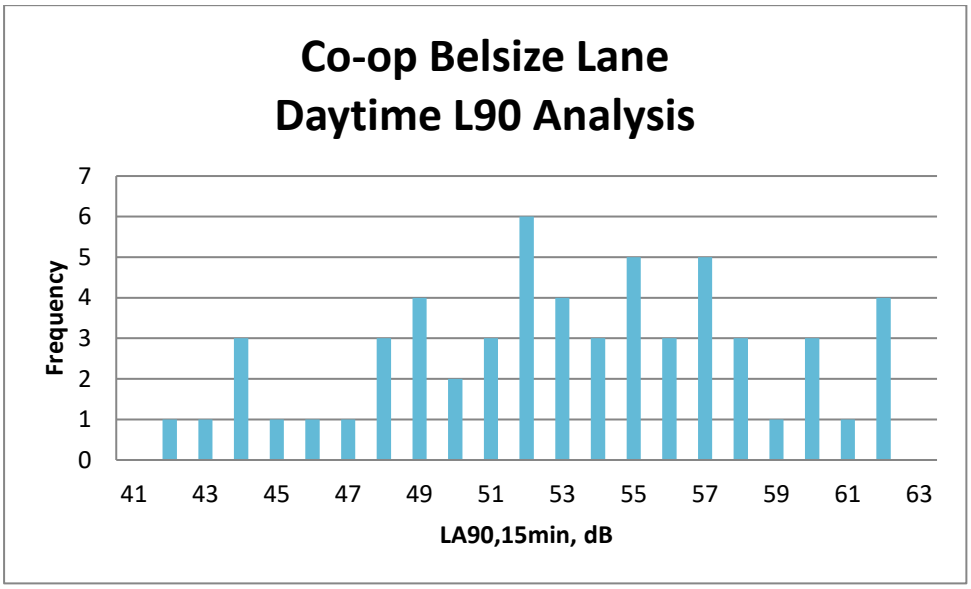
4.1. An environmental noise survey was undertaken to establish the typical background sound levels at a location representative of the noise climate outside the façades of the nearest noise sensitive receptors to the proposed plant area during the quietest times at which the plant will operate.

4.2. The results of the environmental sound survey are summarised in Table 1 below. The full set of measurement results and details of the survey methodology are presented in **Appendix C.**

Table 1 Summary of survey results

Measurement period	Range of recorded sound pressure levels (dB)			
	$L_{Aeq(15mins)}$	$L_{Amax(15mins)}$	$L_{A10(15mins)}$	$L_{A90(15mins)}$
Daytime (07.00 – 23.00 hours)	54-76	73-105	60-76	42-62
Night-time (23.00 – 07.00 hours)	39-62	49-87	41-64	38-46

Figure 1 Histogram of daytime L_{A90} background sound pressure levels



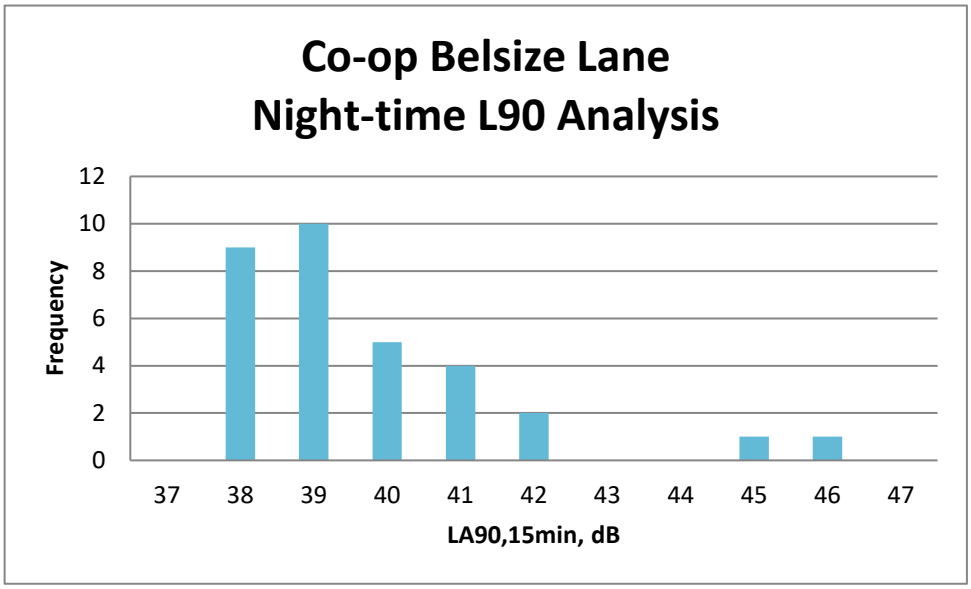
4.3. Additional statistical analysis has been undertaken. As shown in Table 2, the mean, median, and modal values have been calculated:

Table 2 Statistical analysis of $L_{A90,15min}$ levels during the daytime period

dB, L_{A90} daytime period	
Mean	53
Median	53
Mode	52

4.4. The mean, median and modal values range between 52 and 53dB L_{A90}. As shown in Figure 1, the background sound level only rarely falls below 48dB L_{A90}, so this has been considered as representative of the typical background sound level during the daytime period at Belsize Lane.

Figure 2 Histogram of night-time L_{A90} background sound pressure levels



4.5. 38dB L_{A90} is considered as representative of the typical background sound level during the night-time period at Belsize Lane.

4.6. Therefore, the following values are considered as representative of the existing background sound pressure levels at nearby noise sensitive premises:

- 48dB L_{90} during the daytime period; and
- 38dB L_{90} during the night-time period

5.0 Plant noise design criteria

National Planning Policy Framework

5.1. The National Planning Policy Framework (NPPF) was published in March 2012. One of the documents that the NPPF replaced is Planning Policy Guidance Note 24 (PPG 24) "Planning and Noise." A new edition of NPPF was published in July 2018 and comes into effect in January 2019. The new edition contains no new directions with respect to noise, and all previous references remain extant. The paragraph references quoted below relate to the July 2018 edition.

5.2. Paragraph 170 of the NPPF states that the planning system should contribute to and enhance the natural and local environment by, (amongst others) "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, water or noise pollution or land stability."

5.3. The NPPF goes on to state in Paragraph 180 "planning policies and decisions 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;*
>
> *(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 ...*

5.4. The NPPF document does not refer to any other documents or British Standards regarding noise other than the NPSE.

5.5. Paragraph 2 of the NPPF states that "planning law requires that applications for planning permission must be determined in accordance with the development plan unless material considerations indicate otherwise."

5.6. Paragraph 12 of the NPPF states that "The presumption in favour of sustainable development does not change the statutory status of the development plan as the starting point for decision making. Where a planning application conflicts with an up-to-date development plan (including any neighbourhood plans that form part of the development plan), permission should not usually be granted. Local planning authorities may take decisions that depart from an up-to-date development plan, but only if material considerations in a particular case indicate that the plan should not be followed"

5.7. Paragraph 117 states that "Planning policies and decisions should promote an effective use of land in meeting the need for homes and other uses, while safeguarding and improving the environment and ensuring safe and healthy living conditions. Strategic policies should set out a clear strategy for accommodating objectively assessed needs, in a way that makes as much use as possible of previously-developed or 'brownfield' land.

BS 4142:2014

5.8. This standard is intended to be used to assess the likely effects of sound on people residing in nearby dwellings. The scope of BS 4142:2014 includes "sound from fixed plant installations which comprise mechanical and electrical plant and equipment".

5.9. The procedure contained in BS 4142:2014 provides an assessment of the likely effects of sound on people when comparing the specific noise levels from the source with representative background noise levels. Where the noise contains "a tone, impulse or other characteristic" then various corrections can be added to the specific (source) noise level to obtain the "rating level".

5.10. The likely effects of sound on people is assessed by subtracting the background noise level from the rating level. BS 4142:2014 states the following:

- Typically, the greater this difference, 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 the context;
- The lower the rating 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 the context.

London Borough of Camden

5.11. The Camden Local Policy document dated 2016 states in Policy A1 *'Managing the impact of development'* that for noise and vibration:

> *"Noise and vibration can have a major effect on amenity. The World Health Organisation (WHO) for example states that excessive noise can seriously harm human health, disturb sleep and have cardiovascular and behavioural effects. Camden's high density and mixed-use nature means that disturbance from noise and vibration is a particularly important issue in the borough.*

Where uses sensitive to noise are proposed close to an existing source of noise or when development that is likely to generate noise is proposed, the Council will require an acoustic report to accompany the application. Further detail can be found in Policy A4 - Noise and Vibration and our supplementary planning document Camden Planning Guidance 6: Amenity."

5.12. Policy A4 *'Noise and Vibration'* states under the section titled *'Plant and other noise generating equipment'* that:

"Planning conditions will be imposed to require that plant and equipment which may be a source of noise is kept working efficiently and within the required noise limits and time restrictions. Air conditioning will only be permitted where it is demonstrated that there is a clear need for it after other measures have been considered (Policy CC2 Adapting to climate change). Conditions may also be imposed to ensure that attenuation measures are kept in place and are effective throughout the life of the development."

5.13. The policy document goes on to describe noise thresholds in Appendix 2 and states in the *'Industrial and Commercial Noise Sources'* section:

"A relevant standard or guidance document should be referenced when determining values for LOAEL and SOAEL for non-anonymous noise. Where appropriate and within the scope of the document it is expected that British Standard 4142:2014 'Methods for rating and assessing industrial and commercial sound' (BS 4142) will be used. For such cases a 'Rating Level' of 10 dB below background (15dB if tonal components are present) should be considered as the design criterion)."

5.14. Table C of the appendix states the criteria at which development related noise levels will be acceptable:

Table C: Noise levels applicable to proposed industrial and commercial development (including plant and machinery)

Existing Noise sensitive receptor	Assessment Location	Design Period	LOAEL (green)	LOAEL to SOAEL (Amber)	SOAL (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

Existing Noise sensitive receptor	Assessment Location	Design Period	LOAEL (green)	LOAEL to SOAEL (Amber)	SOAL (Red)
Dwellings**	Outside bedroom window (façade)	Night	'Rating level' 10dB* below background and no events exceeding 57dBL_{Amax}	'Rating level' between 9dB below and 5dB above background or noise events between 57dB and 88dBL_{Amax}	'Rating level' greater than 5dB above background and/or events exceeding 88dBL_{Amax}

**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.*

Proposed criteria

5.15. Based on Camden Council's guidance it would be considered initially appropriate for noise from the plant to be at level that is lower than 10dB below the L_{A90} background level.

5.16. The cumulative noise rating level for the proposed plant at the nearest residential windows should not therefore exceed the limits shown in the table below:

Table 3 Proposed plant noise emissions level limits at noise sensitive residential receptors

Period	Cumulative plant noise rating level, dB(A)
Daytime (07.00 – 23.00 hours)	38
Night-time (23.00 – 07.00 hours)	28

6.0 Plant noise impact assessment

6.1. The cumulative plant noise level at the most affected noise sensitive receptors has been predicted. The assessment has considered the directivity of sound propagation, as well as the screening (although minor) provided by the proposed louvred enclosure and distance losses between the source and the receiver.

6.2. The predictions have been based on the proposed plant operating at full capacity during the day and with the refrigeration plant operating at night-time duty when the store is closed.

6.3. It should be noted that the proposed plant is not anticipated to exhibit any tonal or impulsive characteristics provided it is well maintained. All proposed external plant will be inverter driven and, therefore, will gently ramp up and down depending on the demands on the various systems. In addition, the new unit is to replace an existing condenser, so some plant noise is already part of the acoustic environment affecting the nearest houses. It is therefore not considered appropriate to impose any of the acoustic penalties described in BS 4142:2014.

6.4. Table 4, below, summarises the results of the assessment at the most affected residential property. All other nearby receptors benefit from increased distance/screening to the plant. The full set of calculations can be found in **Appendix E**.

Table 5 Assessment of predicted noise levels at Receptor

Receptor	Period	Predicted rating level at receptor, L_{Aeq} (dB)	Proposed design criterion (dB)	Difference (dB)
R1	Daytime (07.00 – 23.00 hours)	38	38	0
	Night-time (23:00 – 07:00 hours)	23	28	-5

6.1. The plant noise impact assessment has demonstrated that cumulative noise emissions from the proposed plant will comply with London Borough of Camden's typical design criteria (as established in Table 3) at the nearest residential premises.

6.1. As BS 4142:2014 advises, the impact must be considered within the context of the site and the surrounding acoustic environment. The following must, therefore, also be taken into consideration when determining the potential impact that may be experienced:

- The assessment is undertaken at the nearest residential windows. The impact on all other nearby residential windows will be lower due to screening and distance attenuation.
- The area around the site has includes various commercial premises. Many of these premises will have existing building services plant and, therefore, noise emitted from the Co-operative store will be in keeping with the existing noise climate.

6.2. Where possible, uncertainty in this assessment has been minimised by taking the following steps:

- The measurement of the background sound levels was undertaken at a location within close proximity to the nearest noise sensitive receptors, with comparable distance and screening to local noise sources.
- The meter and calibrator used have a traceable laboratory calibration and was field calibrated before and after the measurements.
- Uncertainty in the calculated impact has been reduced by the use of a well-established calculation method.

6.3. All reasonable steps have been taken to robustly assess noise from the proposed plant.

Vibration

6.4. It is recommended that all plant, and connected ducts and pipes, is resiliently isolated to reduce the risk of vibration entering the building structure.

7.0 Conclusions

7.1. Noise Solutions Ltd (NSL) has been commissioned by Tyburn Management LLP to undertake a noise impact assessment of new plant serving the proposed Co-operative store located at 29 Belsize Lane, Camden.

7.2. An environmental noise survey has been undertaken to establish the existing prevailing noise levels at a location representative of the noise climate outside the nearest noise sensitive receptors to the proposed plant area.

7.3. The plant noise impact assessment shows that noise from the new plant meets the typical requirements of the London Borough of Camden.

Appendix A Acoustic terminology

Parameter	Description
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near (LAeq,T).
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log10 (s1/s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa. The threshold of normal hearing is in the region of 0 dB and 140 dB is the threshold of pain. A change of 1 dB is only perceptible under controlled conditions.
dB(A), L_{Ax}	Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).
Fast Time Weighting	Setting on sound level meter, denoted by a subscript F, that determines the speed at which the instrument responds to changes in the amplitude of any measured signal. The fast time weighting can lead to higher values than the slow time weighting when rapidly changing signals are measured. The average time constant for the fast response setting is 0.125 (1/8) seconds.
Free-field	Sound pressure level measured outside, far away from reflecting surfaces (except the ground), usually taken to mean at least 3.5 metres
Façade	Sound pressure level measured at a distance of 1 metre in front of a large sound reflecting object such as a building façade.
$L_{Aeq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level recorded during a noise event with a period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall Leq noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise. $L_{A10,18h}$ is the A –weighted arithmetic average of the 18 hourly $L_{A10,1h}$ values from 06:00-24:00.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. Generally used to describe background noise level.

Appendix B Aerial photograph site showing areas of interest

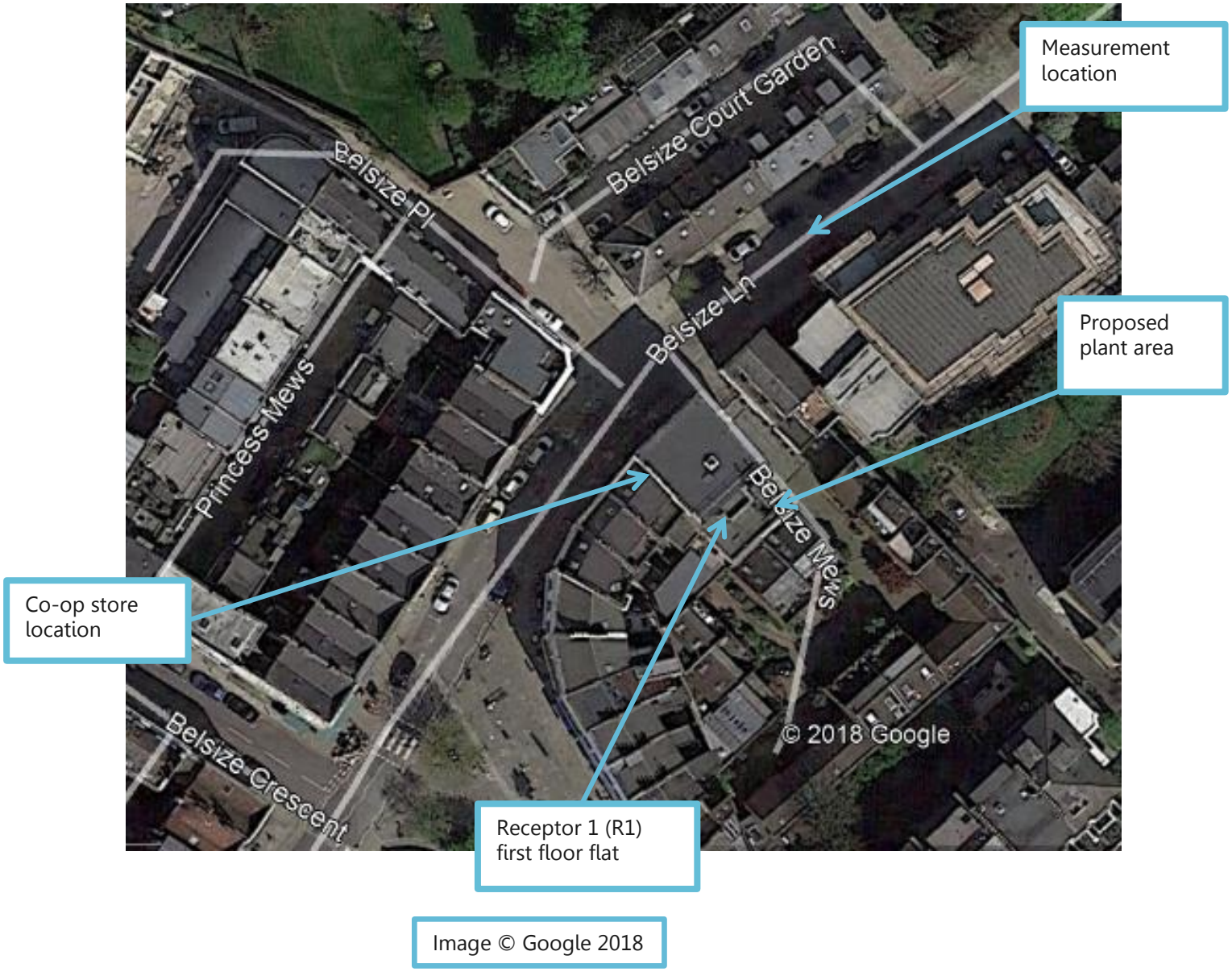


Image © Google 2018

Appendix C Environmental and plant surveys

Details of sound surveys

C.1 Measurements of the existing background sound levels were undertaken from 13.00 hours on Monday 26th February to 11.30 hours on Tuesday 27th February 2018.

C.2 The sound level meter was programmed to record the A-weighted L_{eq}, L_{90}, L_{10} and L_{max} noise indices for consecutive fifteen-minute sample periods for the duration of the survey.

Measurement position

C.3 The sound level meter was positioned on a lamppost along Belsize Lane. The approximate location of the microphone is indicated on the aerial photograph in Appendix B. In accordance with BS 7445-2:1991 *'Description and measurement of environmental noise – Part 2: Guide to the acquisition of data pertinent to land use'*, the measurements were undertaken under free-field conditions.

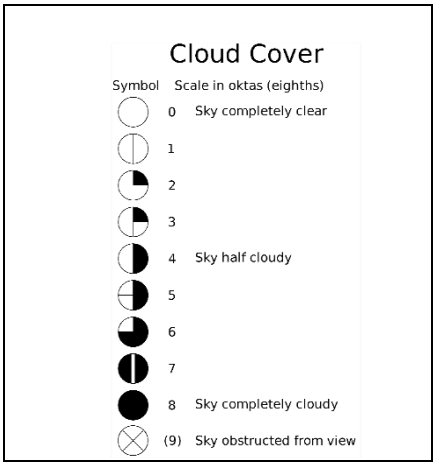
Equipment

C.4 Details of the equipment used during the survey are provided in the table below. The sound level meter was calibrated before and after the survey; no significant change (+/-0.2 dB) in the calibration level was noted.

Description	Model / serial no.	Calibration date	Calibration certificate no.
Class 1 Sound level meter	Rion NL-52 / 00654035	09/10/2017	TCRT17/1660
Condenser microphone	Rion UC-59 /08290		
Preamplifier	Rion NH-25 / 54080		
Calibrator	Rion NC-74 /34535932	09/10/2017	1657

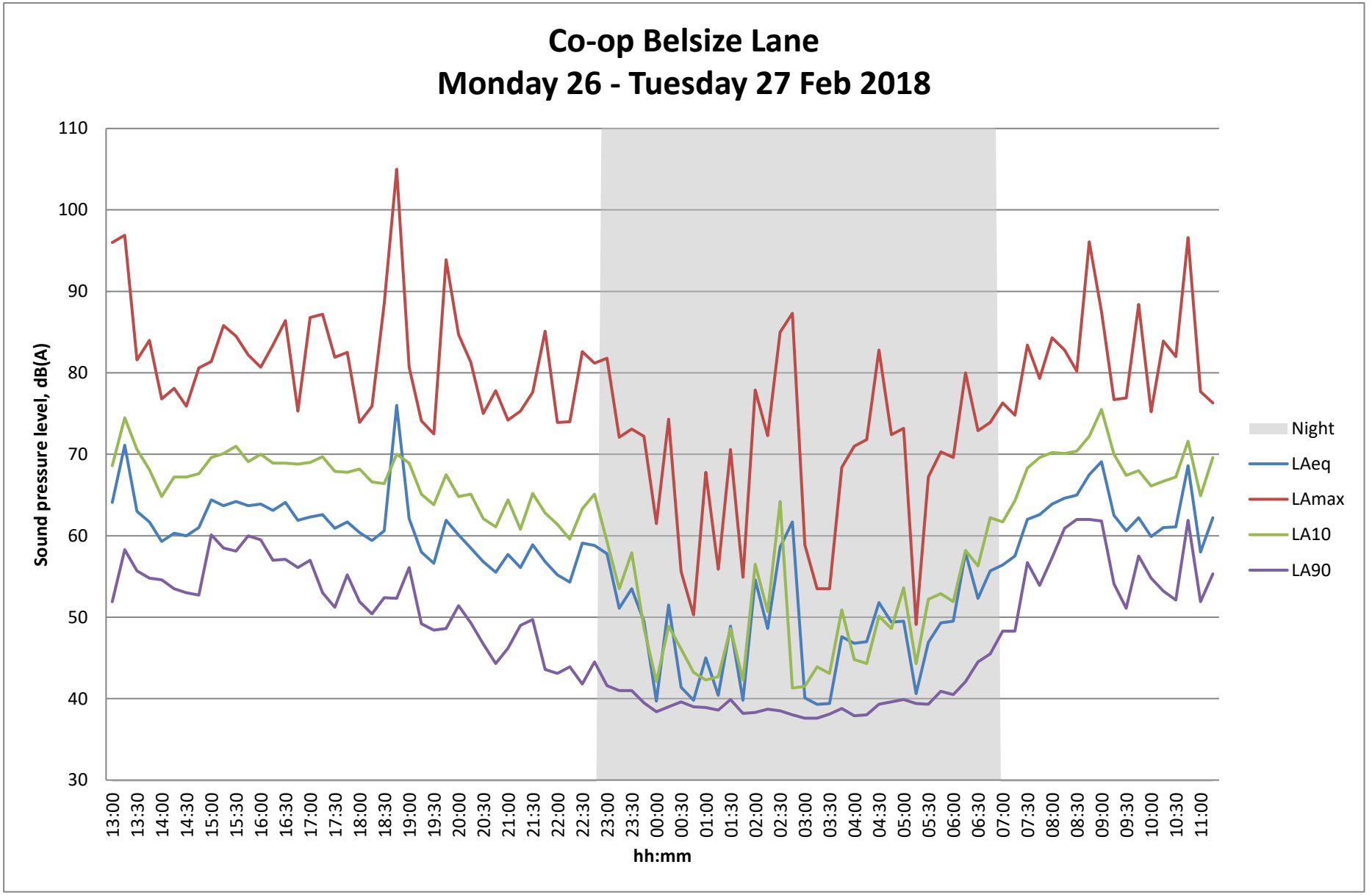
Weather conditions

C.5 Weather conditions were determined both at the start and on completion of the survey. It is considered that the meteorological conditions were appropriate for environmental noise measurements. The table below presents the weather conditions recorded on site at the beginning and end of the survey.

Weather Conditions				
Measurement Location	**Date/Time**	**Description**	**Beginning of Survey**	**End of Survey**
As indicated on Appendix B	13.00 26/02/2018 – 11.30 27/02/2018	Temperature	1	1
		Precipitation:	No	No
		Cloud cover (oktas - see guide)	7	7
		Presence of fog/snow/ice	No	No
		Presence of damp roads/wet ground	No	No
		Wind Speed (m/s)	2	2
		Wind Direction	NNE	n/a
		Conditions that may cause temperature inversion (i.e. calm nights with no cloud)	No	No

Results

C.6 The results of the environmental survey are considered to be representative of the background sound pressure levels at the façades of the nearest noise sensitive receptors during the quietest times at which the deliveries and plant will operate. The noise climate at the measurement position was dominated by local road traffic along with nearby construction noise. The results of the survey are presented in a time history graph overleaf.


Co-op Belsize Lane
Monday 26 - Tuesday 27 Feb 2018
Sound pressure level, dB(A)
110
100
90
80
70
60
50
40
30
13:00
13:30
14:00
14:30
15:00
15:30
16:00
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06:00
06:30
07:00
07:30
08:00
08:30
09:00
09:30
10:00
10:30
11:00
hh:mm
Night
LAeq
LAmax
LA10
LA90

Appendix D Plant noise levels

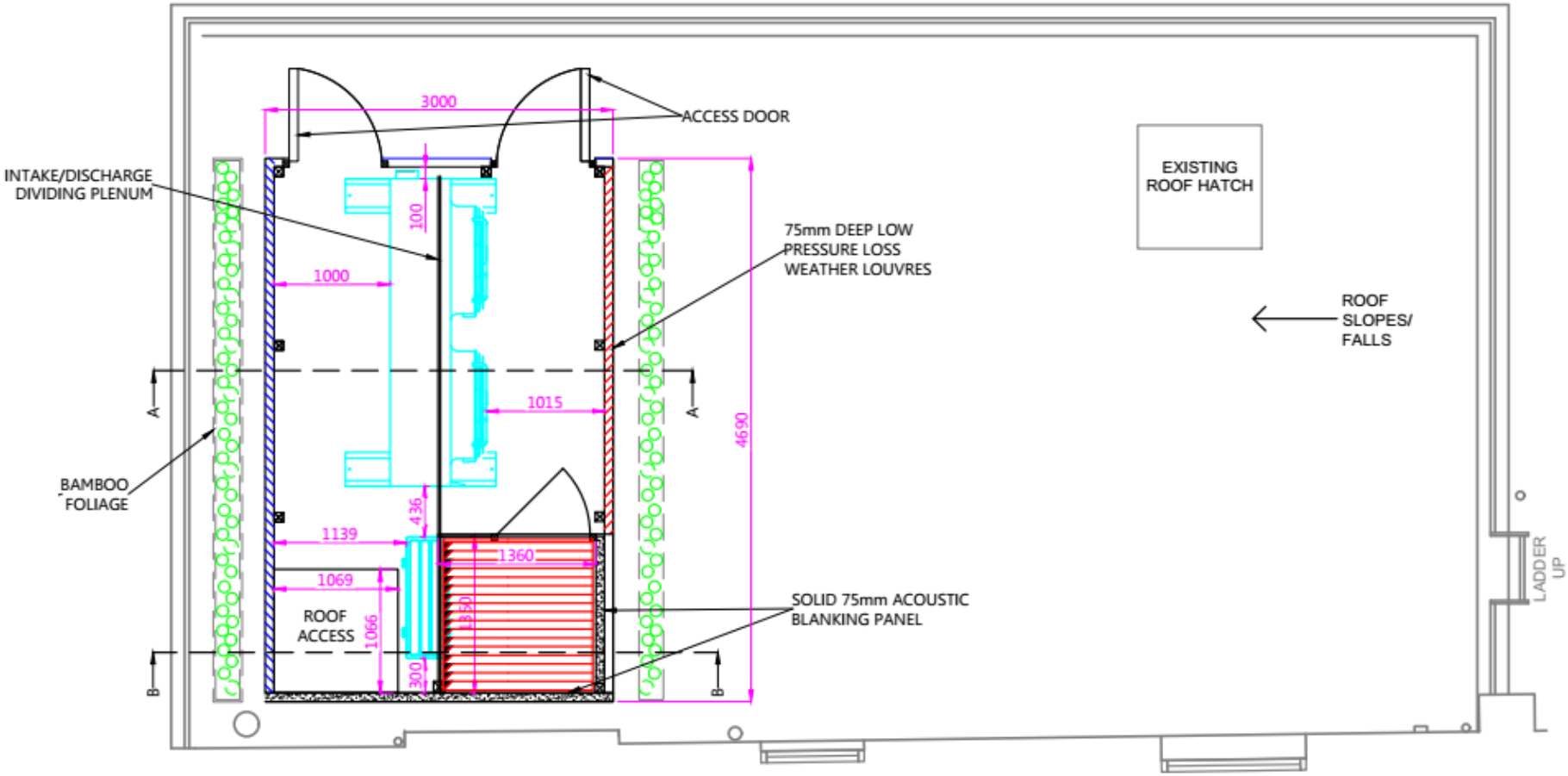
Plant Ref	Manufacturer / Model	Operating Hours	Sound pressure level
ACU-1	Mitsubishi PUZ-ZM125YKA	Daytime only	52dBA at 1m
ACU-2	Mitsubishi PUZ-ZM125YKA	Daytime only	52dBA at 1m
Refrigeration Condenser	Kelvion RF-PA102L3V-091M380	Daytime	27dBA at 10m
		Night	16dBA at 10m

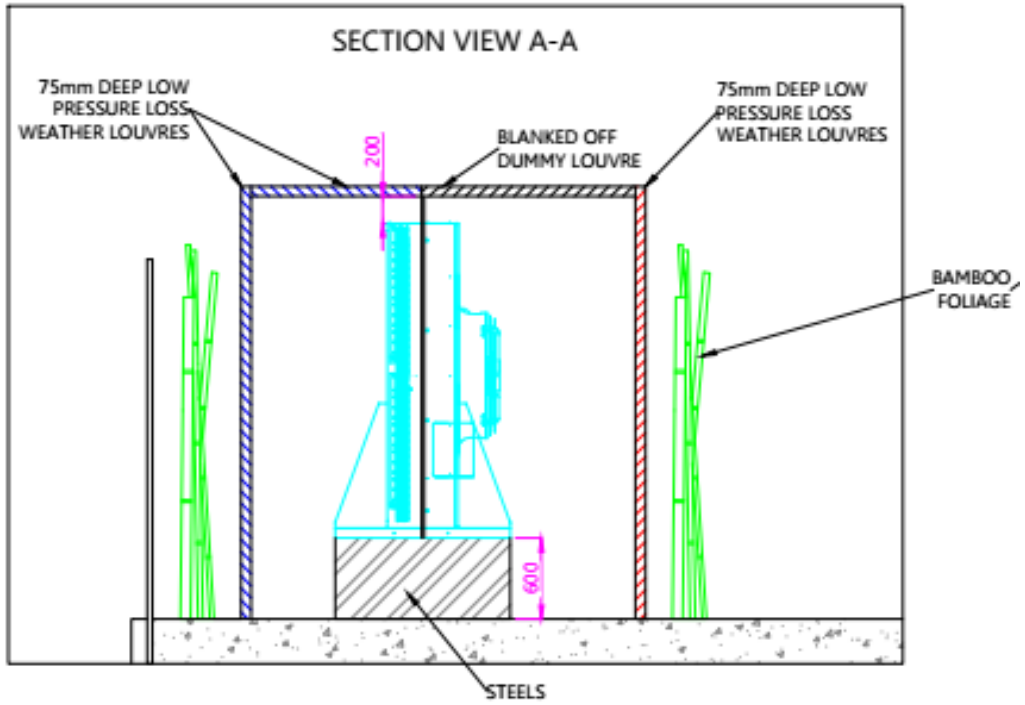
Appendix E Plant noise calculations

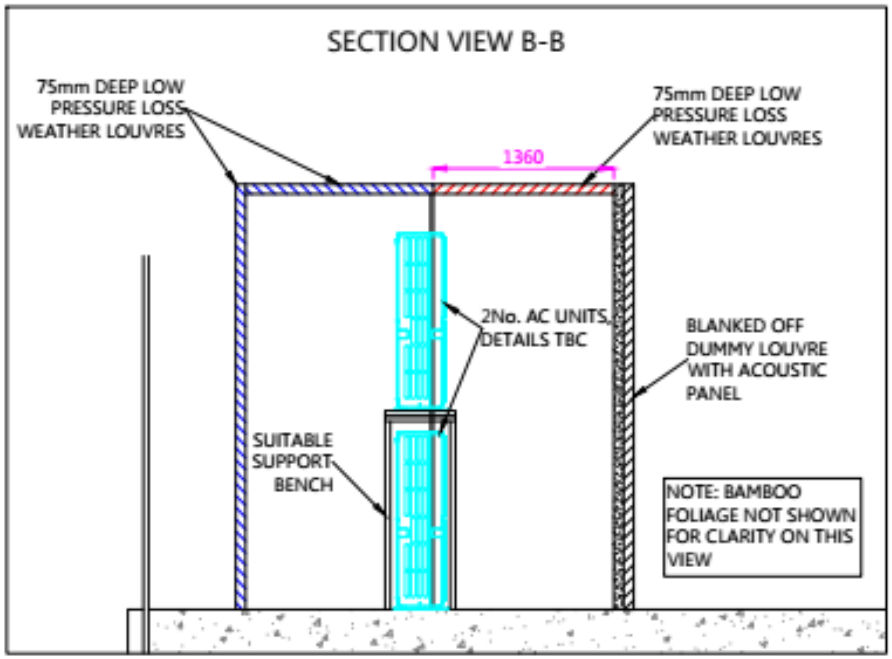
Plant noise to Receptor R1

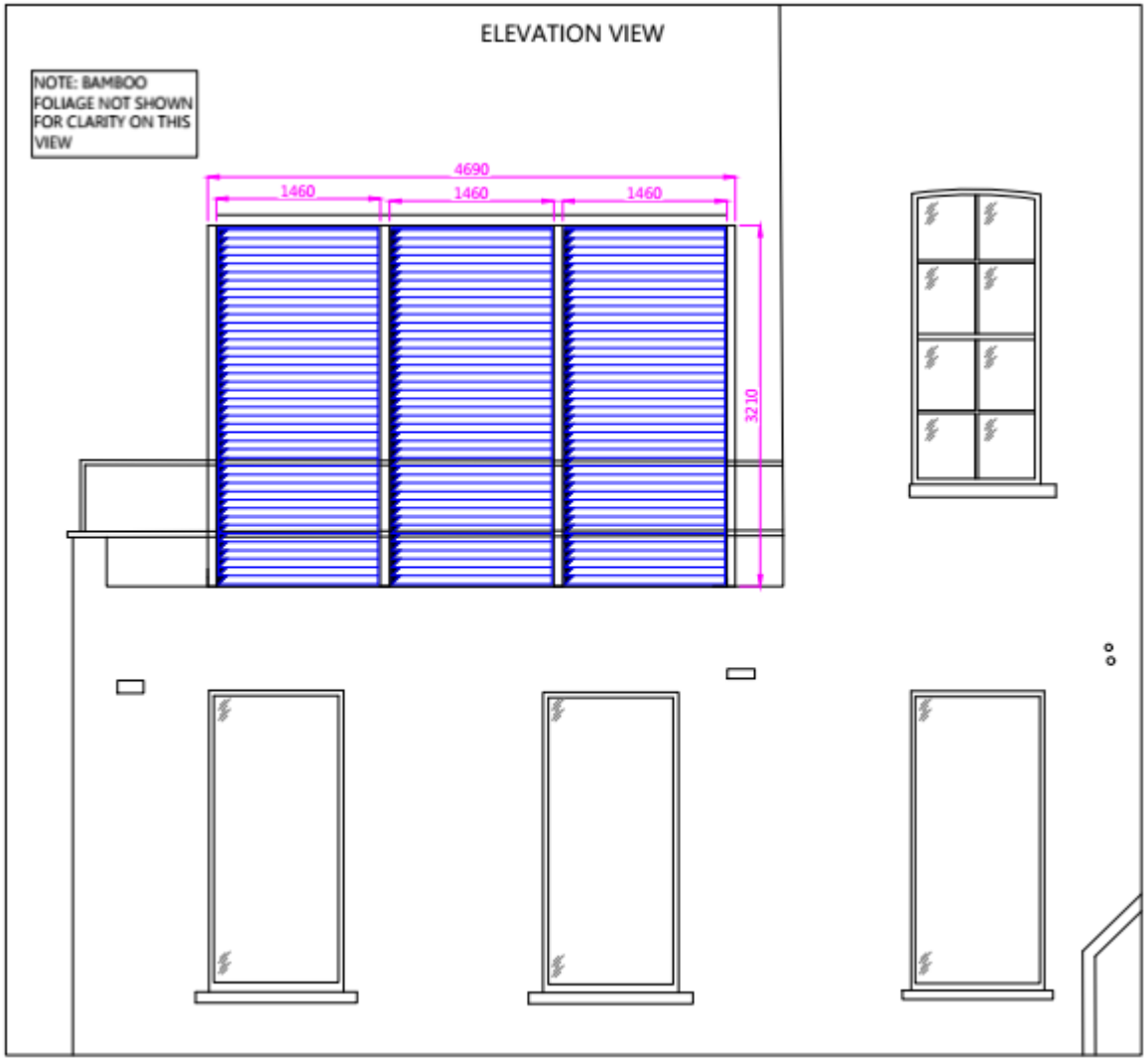
Plant item	Operating Period	Source Sound level (dBA)	Distance		Acoustic Screening (dB)	Cumulative plant noise level at façade L_{Aeq} (dB)
			Distance to Receptor (m)	Correction (dB)		
ACU-1	Daytime only	52 @ 1m	3.2	-10	-9	33
ACU-2	Daytime only	52 @ 1m	3.2	-10	-9	33
Refrigeration condenser	Day	27 @ 10m	4.4	+7	0	34
	Night	16 @ 10m	4.4	+7	0	23
					Daytime Cumulative	38
					Night-time Cumulative	23

Appendix F Plant layout plan, sections and elevation




SECTION VIEW A-A
75mm DEEP LOW PRESSURE LOSS WEATHER LOUVRES
200
BLANKED OFF DUMMY LOUVRE
75mm DEEP LOW PRESSURE LOSS WEATHER LOUVRES
BAMBOO FOLIAGE
600
STEELS


SECTION VIEW B-B
75mm DEEP LOW PRESSURE LOSS WEATHER LOUVRES
1360
75mm DEEP LOW PRESSURE LOSS WEATHER LOUVRES
2No. AC UNITS DETAILS TBC
BLANKED OFF DUMMY LOUVRE WITH ACOUSTIC PANEL
SUITABLE SUPPORT BENCH
NOTE: BAMBOO FOLIAGE NOT SHOWN FOR CLARITY ON THIS VIEW


ELEVATION VIEW
NOTE: BAMBOO FOLIAGE NOT SHOWN FOR CLARITY ON THIS VIEW
4690
1460
1460
1460
3210