



KENYON LANE,
MOSTON,
MANCHESTER

Acoustic Assessment
Report
(Planning Stage)

Reference: 9948.RP01.AAR.2

Prepared: 28 July 2020

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Acoustic Assessment Report



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Revision	Comment	Date	Prepared By	Approved By
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First	Minor amendments to Section 1.0	6 July 2020	Callum Brewer	Helen Sheldon
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The recommendations within this report relate to acoustics performance only and will need to be integrated within the overall design by the lead designer to incorporate all other design disciplines such as fire, structural integrity, setting-out, etc. Similarly, any sketches appended to this report illustrate acoustic principles only and again will need to be developed in to full working drawings by the lead designer to incorporate all other design disciplines.

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1.0 INTRODUCTION

A new residential development is proposed at Kenyon Lane, Moston. The proposed development comprises the demolition of the existing industrial building and the construction of 33 apartments, with associated car parking.

An assessment has been carried out in relation to the noise levels likely to be incident on the proposed building façades and to provide acoustic performance specifications such that acceptable internal noise criteria can be achieved.

This report details the results of the noise survey and sets out the acoustic performance requirements of the external building fabric elements. In addition, suitable plant noise emission criteria have also been developed based upon the survey results and the requirements of Manchester City Council.

2.0 COVID-19

The COVID-19 outbreak has meant it is generally not possible to undertake surveys of existing environmental noise levels. As well as the obvious health issues related to travel and obtaining access to sites, background noise levels are likely to be affected by changes in work traffic, school closures, etc.

RBA Acoustics are, therefore, following COVID-19 guidance from the Institute of Acoustics and the Association of Noise Consultants, which states:

“The acoustics professional will need to consider whether alternative sources of information in respect of sound levels can reasonably be used. Where appropriate, a case should be made regarding why the proposed alternative methods are suitable for a robust assessment and should clearly set out the estimated uncertainties in the assessment.

Liaison between acoustics professionals and relevant regulators is especially important during this period where characterising environmental sound climates cannot be undertaken in the conventional way. It is recognised that projects should be assessed on a case by case basis.

A pragmatic approach may be needed with regard to the information required for planning applications and/or the discharge of planning conditions. Having said that, it will continue to be important that such assessments remain robust, and follow current good practice.

One outcome may be that supplementary information will be required at a later date or controlled by condition to allow planning authorities to maintain momentum in the planning system during this period.”

RBA Acoustics has been in contact with Sharon McAndrew (Environmental Health Officer) at Manchester City Council on 5 June 2020 and it was agreed that a noise survey would be carried out during this period and that a tolerance would be used for the measured levels to compensate for the reduced traffic flow during this period.

3.0 ENVIRONMENTAL NOISE SURVEY

3.1 Survey Methodology

In accordance with the requirements of Manchester City Council, monitoring of the prevailing background noise was undertaken over the following 24 hour period:

Thursday 11 June to Tuesday 16 June 2020.

As the survey was unattended it is not possible to comment with certainty regarding meteorological conditions throughout the entire survey period, however the based on observations during the site visits, and weather reports for the area, it was generally considered suitable for obtaining representative noise measurements, it being predominantly dry with little wind.

Measurements were made of the L_{A90} , L_{Amax} and L_{Aeq} noise levels over sample periods of 15 minutes duration.

3.2 Measurement Locations

To determine the existing noise climate around the site measurements were undertaken at the following locations.

Measurement Position 1

Measurements were taken at the northern site boundary with the microphone positioned at second floor level, approximately 1m from the façade. Measurements at this position were subject to façade reflections. The measurement position is also illustrated on the site plan attached in Figure 1.

The prevailing noise climate at this position was noted to be dominated by road traffic movements occurring along Kenyon Lane and the surrounding road network.

Measurement Position 2

Measurements were taken at the southern site boundary with the microphone positioned on a tripod approximately 1.5m above ground level. The microphone was considered to be in free-field conditions at this measurement position. The measurement position is also illustrated on the site plan attached in Figure 1.

The prevailing noise climate at this position was noted to mainly consist of screened road traffic movements occurring along Kenyon Lane and the surrounding road network.

3.3 Instrumentation

For information regarding the equipment used for the measurements please refer to Appendix C.

The sound level meters were calibrated both prior to and on completion of the survey with no significant calibration drifts observed.

3.4 Results

The noise levels measured are shown as time-histories on the attached Graphs 1-4.

Combining the measured noise levels during the daytime (07:00 – 23:00 hours) and night-time (23:00 – 07:00 hours) periods, the period-averaged L_{Aeq} levels are derived, as summarised in the following Table 1 below.

Also shown is the range of maximum (L_{Amax}) night-time noise levels and the typical maximum level (90th percentile of 15-minute samples).

Table 1 – Measured Noise Levels

Measurement Position	Measured $L_{Aeq, period}$ Noise Level (dB)		Range and (typical) $L_{Amax, f}$ Noise Level (dB)
	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)	Night-time (23:00 – 07:00)
Position 1 – Front of Site*	60	53	59-84 (74)
Position 2 – Rear of Site	49	44	41 – 79 (63)

*Measurements at this position were subject to facade reflections therefore the levels shown include a 3dB correction.

Effect on Measured L_{Aeq} and night-time $L_{Amax, f}$ Noise Levels During COVID-19 Pandemic

It is considered that the lower volumes of road traffic caused by the restrictions put in place during the COVID-19 pandemic are likely to cause the measured noise levels during this period to be lower than usual. As such, a worst-case assumption has been made that the volume of traffic travelling along Kenyon Lane is roughly half of that which would occur under normal conditions, resulting in noise levels which would be around 3 dB lower than typical. As such, a correction of 3dB has been added to the measured $L_{Aeq, period}$ noise levels shown in Table 1.

In addition, consideration has also been made for the night-time $L_{Amax, f}$ levels. During our time on site, buses and vans were noted to pass by, and these will generate the highest noise levels on the Kenyon Lane façade. As it is expected that these occurrences will simply increase more frequently during normal conditions, the typical night-time $L_{Amax, f}$ has been determined by that which does not exceed 5 occurrences per night, as supposed to 10-15 which is recommended in BS 8233:2014.

The corrected levels shown below in Table 2 have been used in our assessment.

Table 2 – Corrected Noise Levels

Measurement Position	Measured $L_{Aeq, period}$ Noise Level (dB)		Range and (typical) $L_{Amax, f}$ Noise Level (dB)
	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)	Night-time (23:00 – 07:00)
Position 1 – Front of Site*	63	56	59-84 (76)
Position 2 – Rear of Site	52	47	41 – 79 (65)

*Measurements at this position were subject to facade reflections therefore the levels shown include a 3dB correction. These corrected values have been used in our analysis.

Typical Background Levels

When considering the existing background levels of a site, BS 4142:2014, Methods for Rating and Assessing Industrial and Commercial Sound” recommends assessing to the “typical” measured $L_{A90, 15\text{mins}}$ background levels, BS 4142:2014 goes on to state:

“In using the background sound level in the method for rating and assessing industrial and commercial sound it is important to ensure that values are reliable and suitably represent both the particular circumstances and periods of interest. For this purpose, the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods.”

Appendix A of the *Manchester City Council’s Planning & Noise Technical Guidance (December 2015)* provides an example calculation method of how the typical background noise level could be determined. BS 4142:2014 also suggests that statistical analysis is a suitable method to determine the typical background level by calculating the level of the most-commonly occurring $L_{A90, 15\text{mins}}$ period during the proposed operating hours of the equipment. This statistical method suggested in BS 4142:2014 has been used to determine the typical background level for this site.

The typical background noise levels ($L_{A90, 15\text{mins}}$) at both measurement positions are summarised in the following Table 3 below. This data can be used to set plant noise emission criteria for use in the assessment of noise emissions from any proposed plant at the development.

Table 3 – Measured Typical $L_{A90, 15\text{mins}}$ Noise Levels

Measurement Position	Typical $L_{A90, 15\text{mins}}$ Noise Level During Period (dB)	
	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)
Position 1 – Front of Site	45	36
Position 2 – Rear of Site	40	35

Effect on Measured L_{A90} Background Noise Levels During COVID-19 Pandemic

The measured L_{A90} background levels during the COVID-19 pandemic are expected to be lower than usual due to the lower volumes of traffic. As such, these will provide a worst-case assessment when used to determine the plant noise criteria.

4.0 PLANT NOISE EMISSION CRITERIA

4.1 Manchester City Council's Planning & Noise Technical Guidance (December 2015)

The Manchester City Council's Planning & Noise Technical Guidance (December 2015) states plant noise assessment should be carried out in accordance with BS 4142:2014 and the following design objective for new plant installations:

"The development should be designed so as to achieve a rating level of 5dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location."

4.2 BS 4142:2014 'Method for Rating and Assessing Industrial & Commercial Sound'

Guidance for noise emissions from proposed new items of building services plant is given in BS 4142: 2014 'Methods for rating and assessing industrial and commercial sound'.

BS 4142 provides a method for assessing noise from items such as building services plant against the existing background noise levels at the nearest noise sensitive adjacencies.

BS 4142 suggests that if the noise level is 10 dB or more higher than the existing background sound level, it is likely to be an indication of a significant adverse impact. If the level is 5 dB above the existing background sound level, it is likely to be an indication of an adverse impact. If the level does not exceed the background level, it is an indication of having a low impact.

If the noise contains 'attention catching features' such as tones, bangs, etc., a penalty, based on the type and impact of those features, is applied.

4.3 Criteria

In line with the above and utilising the typical $L_{A90, 15mins}$ from Table 3, we propose the following noise limits be applied to the site for any future plant noise installations:

Table 4 – Plant Noise Emission Limits

Measurement Position	L_{Aeq} Noise Level of all operating plant (dB) at 1m from the nearest noise sensitive façade	
	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)
Position 1 – Front of Site	40	31
Position 2 – Rear of Site	35	30

5.0 PLANNING CRITERIA

This section outlines the assessment criteria we anticipate Manchester City Council will require in terms of the relevant standards.

5.1 National Planning Policy Framework

The *Manchester City Council's Planning & Noise Technical Guidance (December 2015)* refers to *National Planning Policy Framework (NPPF)*, which sets out the Government's planning policies for England.

In respect of noise, Paragraph 180 of the NPPF (February 2019) states the following:

"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 the 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"

5.2 Planning Practice Guidance

The *Manchester City Council's Planning & Noise Technical Guidance (December 2015)* refers to the national *Planning Practice Guidance (PPG)* "which advises how planning can manage potential noise impacts in new development" and provides guidelines that are in line with the NPPF.

The PPG states that local planning authorities should take account of 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.

This guidance introduced the additional concepts of NOAEL (No Observed Adverse Effect Level), LOAEL (Lowest Observed Adverse Effect Level) and SOAEL (Significant Observed Adverse Effect Level) where.

- NOAEL: 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.
- LOAEL: 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.
- SOAEL: 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.

Factors to be considered in determining whether noise is a concern are identified including the absolute noise level of the source, the existing ambient noise climate, time of day, frequency of occurrence, duration, character of the noise and cumulative effects.

With particular regard to mitigating noise effects on residential development the PPG highlights that effects may be partially offset if residents have access to a relatively quiet façade as part of their dwelling or a relatively quiet amenity space (private, shared or public).

5.3 Local Policy

The Development Plan in Manchester consists of the following documents:

- *The Manchester Core Strategy (2012)*; and
- Saved policies of the *Unitary Development Plan for the City of Manchester (1995)*

Relevant policies within the Manchester Core Strategy

Policy SP1 'Spatial Principles' states that one of the key spatial principles is the emphasis on the creation of neighbourhoods of choice, providing high quality and diverse housing around district centres which meet local needs, all in a distinct environment.

All development should have regard to the character, issues and strategy for each regeneration area.

The policy goes on to state that development in all parts of the City should make a positive contribution to neighbourhoods of choice including.

- Creating well designed places that enhance or create character.
- Making a positive contribution to the health, safety and wellbeing of residents.
- Consider the needs of all members of the community.
- Protect and enhance the built and natural environment.
- Minimise emissions, ensure efficient use of natural resources and reuse previously developed land wherever possible.
- Improve access to jobs, services, education and open space by being located to reduce the need to travel and provide good access to sustainable transport provision.

Policy DM1 'Development Management' states that all development should have regard to the specific issues such as:

- Appropriate siting, layout, scale, form, massing, materials and detail.
- Impact on the surrounding areas in terms of the design, scale and appearance of the proposed development. Development should have regard to the character of the surrounding area.
- Effects on amenity, including privacy, light, noise, vibration, air quality, odours, litter, vermin, birds, road safety and traffic generation. This could also include proposals which would be sensitive to existing environmental conditions, such as noise.
- Design for health.
- Adequacy of internal accommodation and external amenity space.

5.4 ProPG

Although no specific reference is made to *ProPG*, in the *Manchester City Council's Planning & Noise Technical Guidance (December 2015)*, *ProPG: Planning & Noise* provides guidance on a recommended approach to the management of noise within the planning system in England and was published by the Association of Noise Consultants, the Institute of Acoustics and the Chartered Institute of Environmental Health in May 2017.

It encourages better acoustic design for new residential development and aims to protect people from the harmful effects of noise. In light of the recent publication of ProPG, it was considered appropriate to make use of this document for this report, containing the results of our noise survey and provides advice for the pre-planning stage of development conditions.

ProPG provides the following Noise Risk Assessment scale:

Table 5 – ProPG Noise Risk Assessment

Noise Risk	Indicative $L_{Aeq, period}$ Noise Levels (dB)		Comments
	Daytime $L_{Aeq, 16\text{ hr}}$ (07:00 – 23:00)	Night-time $L_{Aeq, 8\text{ hr}}$ (23:00 – 07:00)	
Negligible	<50 dB	<40 dB	These noise levels indicate that the development site is likely to be acceptable, and the application need not normally be delayed on noise grounds.
Low	50 dB < L < 60 dB	40 dB < L < 50 dB	At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development.
Medium	60 dB < L < 70 dB	50 dB < L < 60 dB	As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised, and which clearly demonstrate that a significant adverse noise impact will be avoided in the finished development.
High	>70 dB	>60 dB	High noise levels indicate that there is an increased risk that development may be refused on noise grounds. This risk may be reduced by following a good acoustic design process that is demonstrated in a detailed ADS. Applicants are strongly advised to seek expert advice.

6.0 EXTERNAL BUILDING FABRIC CRITERIA

This section outlines typical assessment criteria in terms of the relevant standards.

6.1 Internal Noise Levels

Manchester City Council's Planning & Noise Technical Guidance (December 2015)

Section 3.6.1.1 of this document specifies the following noise levels to be achieved for residential developments.

- Bedrooms (night time - 23:00 – 07:00) 30dB L_{Aeq} (individual noise events should not normally exceed 45 dB $L_{Amax,F}$ by more than 15 times)
- Living Rooms (daytime 07:00 – 23:00): 35 dB L_{Aeq}
- Gardens and terraces (daytime) 55 dB L_{Aeq}

British Standard 8233:2014

BS 8233:2014 *Guidance on Sound insulation and noise reduction for buildings* draws on the results of research and experience to provide information on achieving internal acoustic environments appropriate to their functions.

The noise level values given are in terms of an average (L_{Aeq}) level.

The standard advises internal ambient noise levels for achieving suitable resting and sleeping conditions within residential properties as set out in Table 6.

Table 6 – BS 8233:2014 Criteria

Room	07:00 to 23:00	23:00 to 07:00
Living Rooms	35 dB $L_{Aeq,16hour}$	--
Dining Room/area	40 dB $L_{Aeq,16hour}$	--
Bedrooms	35dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

World Health Organisation: Environmental Noise Guidelines

This document sets out to define “recommended exposure levels for environmental noise in order to protect population health”. The guidance documents relates specifically to external noise levels, and recommends that “all CNG (WHO Community Noise Guidelines, 1999) indoor guideline values and any values not covered by the current guidelines (such as industrial noise and shopping areas) should remain valid”. We therefore make reference to the WHO Community Noise Guidelines for recommendations on internal noise levels.

The WHO document “Guidelines for Community Noise” describes guideline levels that are “essentially values for the onset of health effects from noise exposure”. A table of guideline values is included, relating to adverse health effects, referred to as any temporary or long term deterioration in physical, psychological, or social functioning that is associated with noise exposure. The following is an extract from the Table 4.1: Guideline values for community noise in specific environments, as stated in the WHO document.

Table 7 – Guideline Values for Community Noise

Specific Environment	Critical Health Effect(s)	L_{Aeq} (dB)	Time Base (hours)	$L_{Amax,T}$ (dB)
Dwelling, indoors	Speech intelligibility and moderate annoyance, daytime and evening	35	16	-
Inside bedrooms	Sleep disturbance, night-times	30	8	45
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45	8	60

With reference to maximum noise levels the following guidance is provided within the WHO guidance:

“For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45dB L_{Amax} more than 10-15 times per night (Vallet & Vernet 1991) and most studies show an increase in the percentage of awakenings at SEL values of 55-60 dBA (Passchier-Vermeer 1993; Finegold et al. 1994; Pearsons et al. 1995). For intermittent events that approximate aircraft noise, with an effective duration of 10-30s, SEL values of 55-60 corresponds to a L_{Amax} value of 45dB. Ten to 15 of these events during an 8 hour night-time implies a $L_{Aeq, 8h}$ of 20-25dB. This is 10-15dB below the $L_{Aeq, 8h}$ or 30dB for continuous night-time noise exposure, and shows that intermittent character of noise must be taken into account when setting night-time noise limits for noise exposure. For example, this can be achieved by considering the number of noise events and the difference between the maximum sound pressure level and the background of these events.”

Therefore, the frequency of occurrence of maximum noise events should not typically exceed 10-15 times in any night.

6.2 Noise in External Amenity Areas

Manchester City Council's Planning & Noise Technical Guidance (December 2015)

Section 3.6.1.1 of this document specifies the following noise levels to be achieved for residential developments.

- Gardens and terraces (daytime) 55 dB L_{Aeq}

British Standard 8233:2014

BS 8233:2014 *Guidance on Sound insulation and noise reduction for buildings* draws on the results of research and experience to provide information on achieving suitable external levels for external amenity spaces. Recommended external noise levels are given, however, it is also recognized that the recommended values are not achievable in all circumstances such as urban areas.

With reference to noise levels in external amenity areas, the following guidance is provided within BS 8233:2014:

“For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognised that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in

these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.

The following relates specifically to balconies and terraces:

Other locations, such as balconies, roof gardens and terraces, are also important in residential buildings where normal external amenity space might be limited or not available, i.e. in flats, apartment blocks, etc. In these locations, specification of noise limits is not necessarily appropriate. Small balconies may be included for uses such as drying washing or growing pot plants, and noise limits should not be necessary for these uses. However, the general guidance on noise in amenity space is still appropriate for larger balconies, roof gardens and terraces, which might be intended to be used for relaxation. In high-noise areas, consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels. Achieving levels of 55 dB $L_{Aeq,T}$ or less might not be possible at the outer edge of these areas, but should be achievable in some areas of the space."

Therefore we have considered that noise levels within external amenity areas should not normally exceed 55dB $L_{Aeq,T}$, and that control measures such as acoustic screening of potential non-development noise sources will be utilised where practicable.

6.3 Summary

The project criteria adopted are therefore as follows.

Bedrooms	Night-time (23:00-07:00)	30dB L_{Aeq} typically <45dB $L_{Amax,f}$
Living Rooms	Daytime (07:00-23:00)	35dB L_{Aeq}
External Amenity Areas	Daytime (07:00-23:00)	normally <55dB L_{Aeq}

7.0 PROPG ASSESSMENT

With reference to Section 2.4, noise levels at each measurement position fall within the following Noise Risk Categories as defined in ProPG for both daytime and night-time periods.

Table 8 – ProPG Noise Risk Categories

Measurement Position	ProPG Noise Risk Category	
	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)
Position 1 – Front of Site	Medium	Medium
Position 2 – Rear of Site	Low	Low

Table 8 above indicates that the measured $L_{Aeq,T}$ noise levels at Position 1 during the daytime and night-time periods are categorised as medium risk. In these locations, where noise levels are anticipated to be at their highest, due consideration is required to the acoustic design of the external building fabric (including external wall, glazing and ventilation) – see Section 7.0.

To the rear of the development (Position 2) where facades are largely screened from road traffic noise, facades fall into the 'Low' risk categories meaning site is likely to be acceptable for noise in these areas, without the need for significant additional consideration.

8.0 EXTERNAL BUILDING FABRIC ASSESSMENT

8.1 Background

Analyses of the external building fabric have been undertaken in order to ascertain the required acoustic performance of the glazing and other external fabric elements to achieve the project criteria.

8.2 Assumptions

Our external building fabric analyses have assumed the following:

(a) Drawings

The assessment has been based on the information provided in the following drawing provided by Falconer Chester Hall architects:

Table 9 – Drawings Used in Assessment

Drawing Title	Date	Drawing Reference	Revision
P19-008-02-01-002C	15/07/2020	Proposed: Site Plan	C
P19-008-02-03-001C	15/07/2020	Proposed: Ground Floor Plan	C
P19-008-02-03-002D	20/07/2020	Proposed: First and Second and Third Floor Plan	D
P19-008-02-05-001A	17/06/2020	Proposed: Elevation 01	A
P19-008-02-05-002A	17/06/2020	Proposed: Elevation 01	A

(b) Noise Levels

The assessment has been based on the measured noise levels as detailed in Section 2.4.

(c) Room Absorption

The bedrooms are assumed to be acoustically "soft" with carpets, curtains and other soft furnishings. For the purposes of our analyses we have assumed the absorption coefficients detailed in Tables 10 and 11.

Table 10 – Bedroom Absorption Coefficients

Absorption Coefficient (α) at Octave Band Centre Frequency (Hz)							
63	125	250	500	1k	2k	4k	8k
0.15	0.18	0.25	0.27	0.31	0.32	0.32	0.32

The living rooms are assumed to be less acoustically absorptive (with a hard floor finish, although with furnishings). For the purposes of our analyses we have assumed the following absorption coefficients.

Table 11 – Living Room Absorption Coefficients

Absorption Coefficient (α) at Octave Band Centre Frequency (Hz)							
63	125	250	500	1k	2k	4k	8k
0.15	0.18	0.20	0.22	0.22	0.22	0.23	0.27

(d) External Wall

We understand external non-glazed areas are to comprise the following:

- Brickwork
- Thermal insulation and cavity
- Metsec type frame with mineral wool in void
- Internal plasterboard lining

As such, we have assumed the following sound reduction indices (equating to an overall R_w of 58dB) for all non-glazed façade areas comprising the above construction:

Table 12 – Non-Glazed SRIs

Assumed Sound Reduction Index (dB) at Octave Band Centre Frequency (Hz)							
63	125	250	500	1k	2k	4k	8k
35	42	48	53	63	70	74	74

Should the proposals for non-glazed areas change, it is critical we are informed at the earliest opportunity as this could have a significant impact on the sound insulation performance requirements of the glazing systems.

(e) Ventilation

It is understood the chosen strategy is natural ventilation via trickle ventilators. These have also been assessed and the acoustic performance specification for such trickle ventilators is detailed below.

It should be noted the trickle ventilators provide background trickle ventilation only and that windows are to generally be openable to provide rapid ventilation. During those periods where windows are opened for purge/rapid ventilation, noise levels will naturally be increased internally.

8.3 Guidance Constructions

For guidance purposes we would typically expect the glazing configurations detailed in Table 13 to be required at this development. These configurations should prove commensurate with achieving the required sound insulation performance such that acceptable internal noise levels are achievable within the future accommodation. However, it is recommended that a full review of the external building fabric proposals be undertaken during the detailed design stage of the development.

Table 13 – Glazing Guidance Constructions

Glazing Type	Glazing Configuration
G1	Medium specification double glazing comprising 10mm glass / 12mm cavity / 6mm glass
G2	Standard thermal double glazing with differing pane thicknesses, e.g. 4mm glass / 12mm cavity / 6mm glass

For guidance purposes we would typically expect the following trickle ventilator types to prove commensurate such that acceptable internal noise levels are achievable within the future accommodation.

Table 14 – Guidance Trickle Ventilator Types

Ventilator Type	Example Ventilator Type
V1	Medium specification acoustically rated trickle ventilator, e.g. Passivent AL-dB 450/40
V2	Any standard acoustically rated “through-the-frame” type trickle ventilator with direct air path

8.4 Applicable Zoning

Due to the differences in the prevailing noise climate around the site and the types of rooms at each floor level, two primary glazing zones have been defined, as indicated on the façade zoning plan provided in Figure 2-3 in Appendix D.

- | | | | | |
|------|--------|---|------------------|----|
| (i) | Zone 1 | – | Glazing Type: | G1 |
| | | | Ventilator Type: | V1 |
| (ii) | Zone 2 | – | Glazing Type: | G2 |
| | | | Ventilator Type: | V2 |

9.0 EXTERNAL AMENITY SPACE ASSESSMENT

An assessment of noise experienced in the proposed residential amenity space, to be located towards the rear of the site, has also been carried out and the measured noise levels at Measurement Position 2 are considered representative of this area.

The measured levels, as shown in Table 2 of this report show that the daytime $L_{Aeq, 16\text{hour}}$ is 52 dB, as such, within the criteria recommended by the Local Authority and BS 8233:2014.

10.0 OVERHEATING

The Association of Noise Consultants Acoustics, Ventilation and Overheating Residential Design Guide (hereafter referred to as 'AVO Design Guide') was published in January 2020. The AVO Design Guide refers to the implementation of a multi-stage process, to identify the risk of overheating and impact of noise on the completed and operational residential development.

In accordance with the Design Guide, a Level 1 assessment has been undertaken, as presented below, which determines the existing baseline noise conditions and identifies whether further assessment (i.e. a Level 2 AVO assessment) is required.

10.1 Background

Many buildings require closed windows to provide good internal acoustic conditions, however, opening a window is the normal way to keep a building cool during the warmer summer months. These opposing requirements have become a major issue in the design of buildings, in particular for single-aspect residential dwellings, especially given the general desire to avoid the widespread use of mechanical cooling.

The recently released Acoustics Ventilation & Overheating (AVO) Residential Design Guide published by the Association of Noise Consultants (ANC) attempts to address this increasingly urgent need for an integrated approach to consider noise, ventilation and overheating. The guide advocates an inter-disciplinary approach from acousticians, energy and sustainability assessors, M&E engineers and the wider design team.

The guide outlines a two-level approach to addressing issues of overheating with respect to noise as summarised below:

A Level 1 assessment is a site risk assessment based on external free-field noise levels and the assumption that openable windows are the chosen strategy for mitigating overheating. The normal way to ascertain external noise levels will be through an environmental noise survey, as has been described in Section 2.0, and subsequent modelling of the predicted site-wide façade-incident noise levels. The predicted noise levels will then be categorised by their indication of risk of adverse effect. The categories are Negligible, Low to Medium and High.

Based on the categorisation of the predicted external noise levels a Level 2 assessment may be required.

Level 2 Assessment

A Level 2 assessment is a more detailed assessment of the potential adverse effect of noise during the overheating condition (the period for which the overheating condition is predicted by the energy / sustainability assessor). The assessment is based on the proposed strategy for mitigating overheating from which predicted internal ambient noise levels can be calculated. The risk of adverse effect can then be assessed as a product of the predicted internal noise levels and the duration for which they are predicted to occur. A Level 2 assessment requires a greater amount of input from the wider design team than a Level 1

assessment, including details of sizes and types of windows, details of the chosen ventilation and overheating mitigation strategies and the results of a full overheating assessment conducted in accordance with TM59.

This report addresses the Level 1 assessment only; a Level 2 assessment may be required at design stage based on the results of the Level 1 assessment.

The following section presents the Level 1 assessment which has been undertaken.

10.2 Level 1 Assessment Criteria

The numerical values associated with indication of risk categories are expressed as external noise levels. Setting these levels is based on achieving suitable internal noise levels during the overheating condition, assuming opening windows is the chosen mitigation strategy. At this stage, a partially open window is assumed to provide an outside to inside level difference of 13dB. The following numerical values are considered appropriate internal noise limits for each risk category:

Negligible Risk

Section 5.1 of this report provides the criteria for achieving internal acoustic environments appropriate to their functions, as advised in BS 8233:2014. Internal noise levels due to airborne noise from transport sources during the overheating condition are based on a 5dB relaxation of these levels. The relaxation is considered reasonable as the overheating condition should only occur some of the time and it is assumed that occupants will be tolerant of higher noise levels during periods where better thermal comfort is desired.

The relevant standards are therefore:

- Daytime: 40dBA $L_{Aeq,T}$
- Night-time: 35dBA $L_{Aeq,8hour}$

N.B. an appropriate averaging period should be adopted based on likely occupant activities and the control they have over the environment during waking hours.

Typical internal maximum noise levels of 45 dB L_{max} are considered to result in negligible adverse noise effects.

High Risk

During daytime hours there is considered to be a high risk of adverse effect resulting from noise when internal noise levels would result in task interference. Task interference could be causing a barrier to the clear understanding of speech, or distraction from written tasks etc. An internal noise level of 50 dB $L_{eq,T}$ is considered to result in a high risk of adverse noise effects in this instance.

During night-time hours there is considered to be a high risk of adverse effect resulting from noise when internal noise levels would result in sleep disturbance. The WHO *Night Noise Guidelines for Europe* considers that external noise levels of 55 dB L_{night} are "increasingly dangerous for health."

Internal noise levels above 65 dB $L_{Amax,fast}$ are also considered to give rise to sleep disturbance over and above what is considered reasonable.

Low to Medium Risk

Low and medium risk categories fall between the numerical values set for negligible and high risk scenarios.

Based on achieving the internal noise levels outlined above, and allowing for a level difference of 13dB due to a partially open window, the external noise levels in Table 15 provide the Level 1 Risk Assessment categories and associated recommendations:

Table 15 – Guidance for Level 1 Risk Assessment

Daytime Noise Levels ($L_{Aeq,T}^*$ during 07:00-23:00)	Night-time Noise Levels ($L_{Aeq,8h}$ during 23:00-07:00)	Night-time Noise Levels (L_{Amax} during 23:00 – 07:00)	Risk Category	Recommendation
> 63 dB	> 55 dB	> 78 dB (not normally exceeded)	High Risk	A Level 2 assessment is recommended. Opening windows to mitigate the overheating situation is likely to result in adverse effects due to noise levels
54 – 62 dB	49 – 54 dB	59 – 78 dB	Medium / Low Risk	A Level 2 assessment is optional to give more confidence in the suitability of internal noise conditions.
≤ 53 dB	≤ 48 dB	≤ 58 dB (not normally exceeded more than 10 times a night)	Negligible Risk	Opening windows is suitable as a primary strategy for mitigating overheating is unlikely to result in adverse effects

*an appropriate averaging period should be adopted based on likely occupant activities and the control they have over the environment during waking hours.

10.3 Level 1 Assessment

Section 2.4 provides details of the environmental noise survey conducted at the site. As part of the Level 1 assessment, the measured noise levels have been averaged into a 16-hour daytime period between the hours of 07:00 – 23:00 and an 8-hour night-time period between 23:00 – 07:00.

The calculated façade-incident averaged L_{Aeq} noise levels used in the Level 1 assessment are summarised in Table 16, along with typical $L_{Amax,fast}$ levels measured during the night-time. Distance attenuation, reflections, and barrier attenuation have been taken into account when determining the façade-incident noise levels

Table 16 – Façade Incident Noise Levels Used in Level 1 Assessment

Measurement Position	Measurement Period	L_{Aeq} , [dB]	Typical $L_{Amax,fast}$ [dB]*
Position 1 – Front of Site*	Daytime (07:00 – 23:00)	62 $L_{Aeq,8hour}$	N/A
	Night-time (23:00 – 07:00)	55 $L_{Aeq,8hour}$	75
Position 2 – Rear of Site	Daytime (07:00 – 23:00)	51 $L_{Aeq,8hour}$	N/A
	Night-time (23:00 – 07:00)	46 $L_{Aeq,8hour}$	64

Based on the derived external noise levels and the Level 1 risk assessment categories provided in Table 15, the façades of the development can be categorised in terms of their indication of risk. The site plans in Figures 4-5 in Appendix D provide a site-wide visual indication of the risk categories.

As can be seen from Figures 4-5, the development falls into the upper end of the Medium risk category on the most exposed façades. Other façades fall into the negligible risk categories.

Medium Risk Areas

The Level 1 assessment shows that the properties overlooking Kenyon Lane fall towards the upper-end of the Level 1 medium-risk category if opening windows is used as a strategy for mitigating overheating. However, considering that this façade is north-facing, it is considered unlikely that overheating will be a potential issue at this location.

As such, consideration should be made during the later design stages for the potential risk of overheating in these properties. The necessity for a Level 2 assessment will depend on the other factors including the duration and frequency for which the overheating condition is likely to occur.

Negligible Risk Areas

Occupants of flats on the south facing façade are at negligible risk of adverse effects resulting from noise if opening windows is the used as a strategy for mitigating overheating. Opening windows can therefore be considered an appropriate strategy for mitigating overheating.

11.0 CONCLUSION

RBA Acoustics have undertaken noise monitoring at the proposed development site at Kenyon Lane, Moston. The measured noise levels are presented within this report. The resultant noise levels have been used in the assessment of the glazing requirements to ensure suitable internal noise levels are achieved at the proposed development with reference to BS 8233 and WHO.

General guidance configurations have been suggested for the glazing constructions that should be capable of achieving the required internal noise criteria. A worst-case configuration of 6/12/8 double glazing is required in the worst affected bedrooms at first floor level to protect the residences from any potential noise impact. However, other areas only require more standard double glazing. Trickle ventilators have also been assessed and specified herein.

Reference to the Association of Noise Consultants Acoustics, Ventilation and Overheating Residential Design Guide is provided for further background information, and our assessment suggests that noise is unlikely to be a significant factor, with a low to medium risk of noise issues arising with opening windows for overheating. A Level 2 Assessment may be required at the design stage to minimise the risk of adverse noise effects on residents resulting from the chosen over-heating mitigation strategy.

We do not consider planning approval should be rejected on the basis of noise and can confirm internal noise levels can be effectively controlled by fairly simple glazing configurations on the whole.

Appendix A - Acoustic Terminology

dB	Decibel - Used as a measurement of sound pressure level. It is the logarithmic ratio of the noise being assessed to a standard reference level.
dB(A)	The human ear is more susceptible to mid-frequency noise than the high and low frequencies. To take account of this when measuring noise, the 'A' weighting scale is used so that the measured noise corresponds roughly to the overall level of noise that is discerned by the average human. It is also possible to calculate the 'A' weighted noise level by applying certain corrections to an un-weighted spectrum. The measured or calculated 'A' weighted noise level is known as the dB(A) level. Because of being a logarithmic scale noise levels in dB(A) do not have a linear relationship to each other. For similar noises, a change in noise level of 10dB(A) represents a doubling or halving of subjective loudness. A change of 3dB(A) is just perceptible.
L_{eq}	L_{eq} is defined as a notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the actual, fluctuating sound measured over that period (1 hour).
L_{Aeq}	The level of notional steady sound which, over a stated period of time, would have the same A-weighted acoustic energy as the A-weighted fluctuating noise measured over that period.
L_{An} (e.g. L_{A10} , L_{A90})	If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time, hence L_{10} is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L_{90} is the average minimum level and is often used to describe the background noise.
$L_{max,T}$	The instantaneous maximum sound pressure level which occurred during the measurement period, T. It is commonly used to measure the effect of very short duration bursts of noise, such as for example sudden bangs, shouts, car horns, emergency sirens etc. which audibly stand out from the general level of, say, traffic noise, but because of their very short duration, maybe only a very small fraction of a second, may not have any effect on the L_{eq} value.

Appendix B - Instrumentation

The following equipment was used for the measurements

Manufacturer	Model Type	Serial No.	Calibration	
			Certificate No.	Expiry Date
Norsonic Type 1 Sound Level Meter	Nor140	1406007	U28864	26 June 2020
Norsonic Pre Amplifier	1209	20043		
Norsonic ½" Microphone	1225	208146	28863	26 June 2020
Norsonic Sound Calibrator	1251	34127	U28862	26 June 2020
Norsonic Type 1 Sound Level Meter	Nor140	1406407	U26539	20 September 2021
Norsonic Pre Amplifier	1209	20688		
Norsonic ½" Microphone	1225	226839	26538	20 September 2021
Norsonic Sound Calibrator	1251	34482	U26537	20 September 2021

Appendix C – CDM Considerations

The likelihood the harm will occur can be assessed by applying an indicative score (from 1 to 5) as follows:

- 1 – Remote (almost never)
- 2 – Unlikely (occurs rarely)
- 3 – Possible (could occur, but uncommon)
- 4 – Likely (recurrent but not frequent)
- 5 – Very likely (occurs frequently)

The severity of harm can be assessed by applying an indicative score (from 1 to 5) as follows:

- 1 – Trivial (e.g. discomfort, slight bruising, self-help recovery)
- 2 – Minor (e.g. small cut, abrasion, basic first aid need)
- 3 – Moderate (e.g. strain, sprain, incapacitation > 3 days)
- 4 – Serious (e.g. fracture, hospitalisation > 24 hrs, incapacitation > 4 weeks)
- 5 – Fatal (single or multiple)

The rating value is obtained by multiply the two scores and is then used to determine the course of action.

Rating Bands (Severity x Likelihood)		
Low Risk (1 – 8)	Medium Risk (9 -12)	High Risk (15 – 25)
May be ignored but ensure controls remain effective	Continue, but implement additional reasonable practicable controls where possible	Avoidance action is required; therefore alternative design solutions must be examined. Activity must not proceed until risks are reduced to a low or medium level

The following hazards pertinent to our design input have been identified and control measures suggested:

Hazard	Risk Of	At Risk	Rating			Control Measures	Controlled		
			L	S	R		L	S	R
Mineral wool within drywalls and linings	Skin and respiratory irritation	Contractors	4	3	12	Wear gloves and mask	1	3	3
Acoustic glazing - weight	Strain of neck, limbs or back. Fall from height.	Contractors	3	5	15	Provide sufficient manpower, lifting gear and structural support	1	5	5

L: Likelihood S: Severity R: Rating

Appendix D – Graphs and Site Plans

Kenyon Lane, Moston

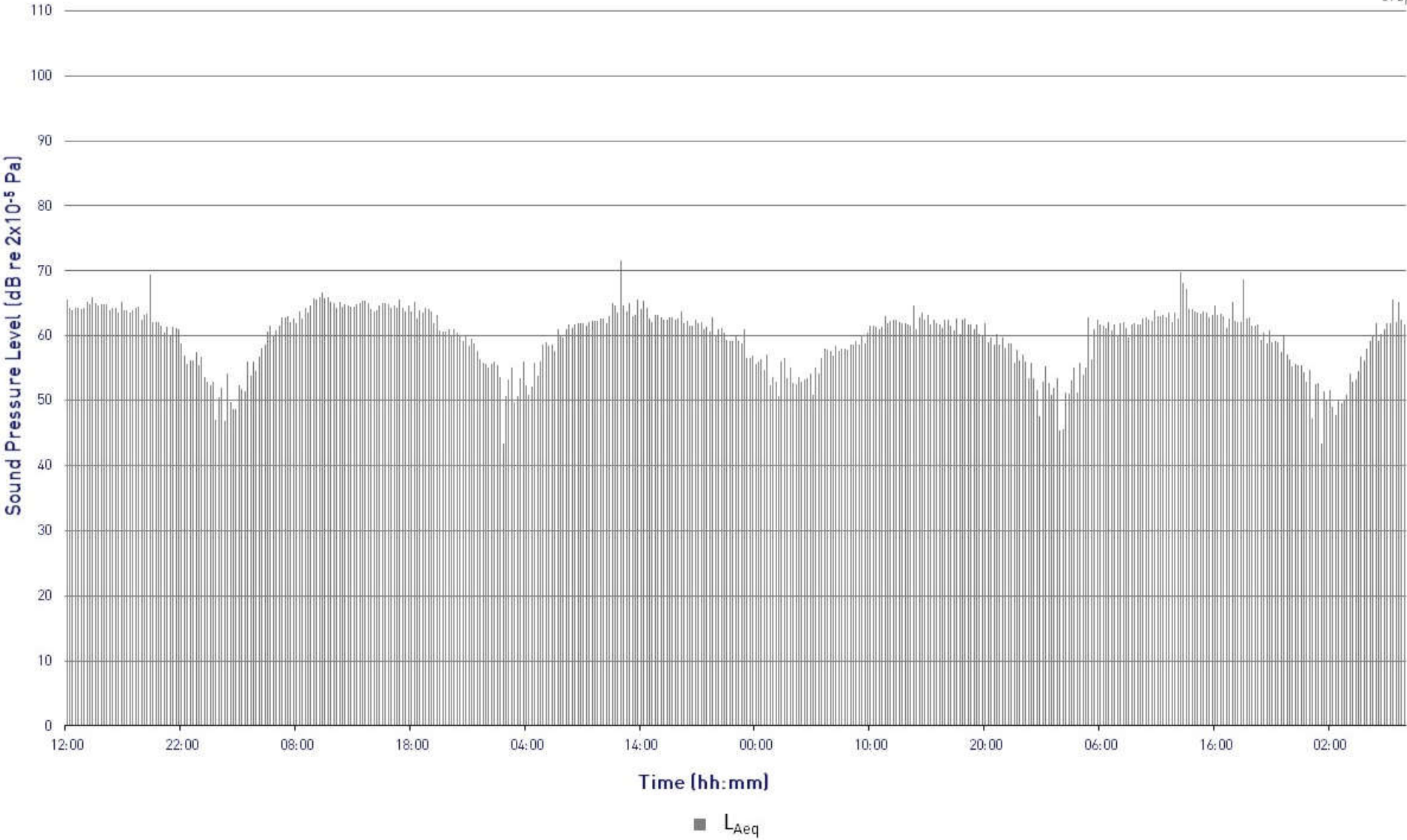
L_{Aeq} 15-minute Time History

Measurement Position 1, Thursday 11th June to Tuesday 16th June 2020



Project: 9948

Graph 1



Kenyon Lane, Moston

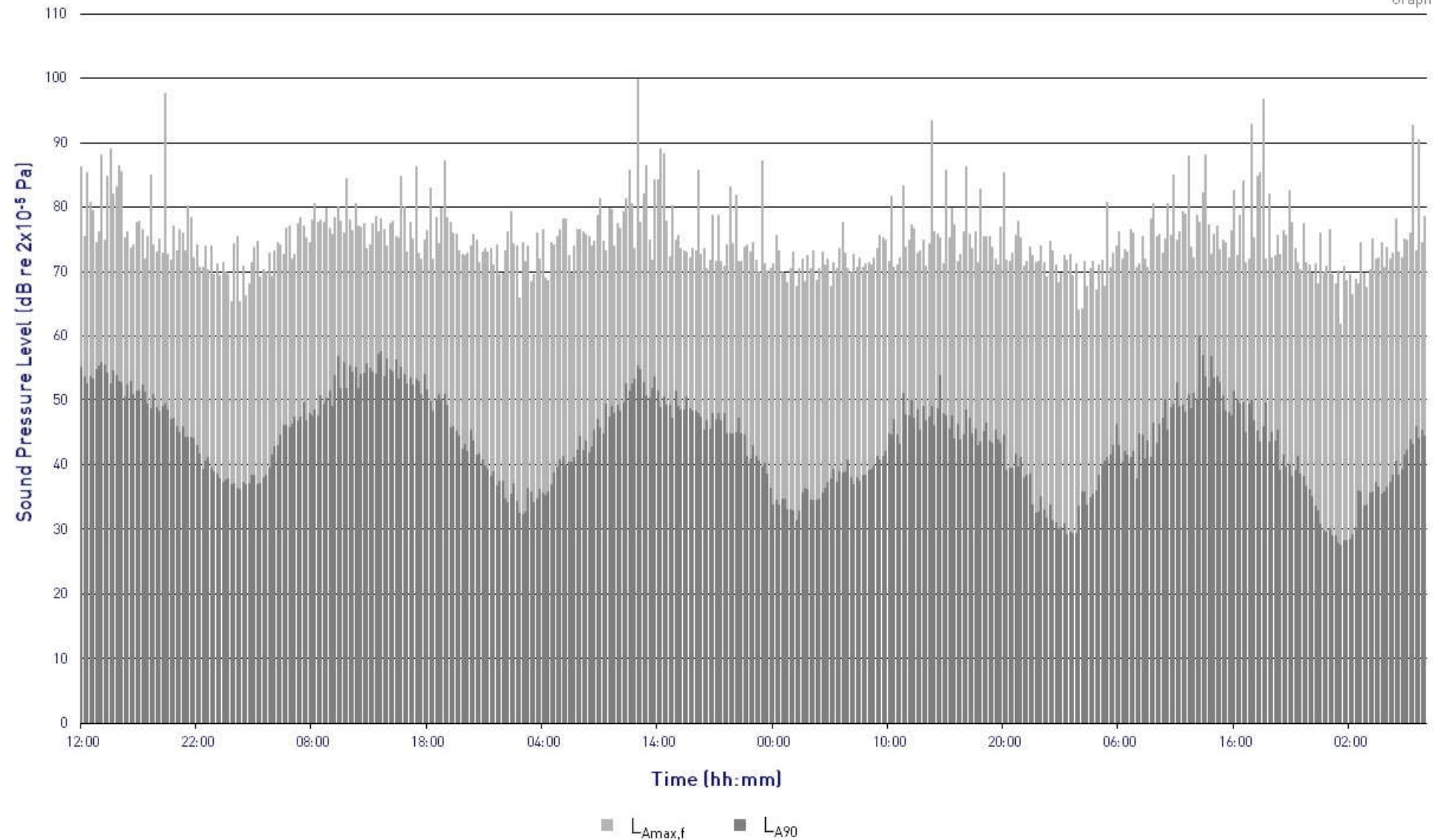
$L_{Amax,f}$ and L_{A90} 15-minute Time History

Measurement Position 1, Thursday 11th June to Tuesday 16th June 2020



Project: 9948

Graph 2



Kenyon Lane, Moston

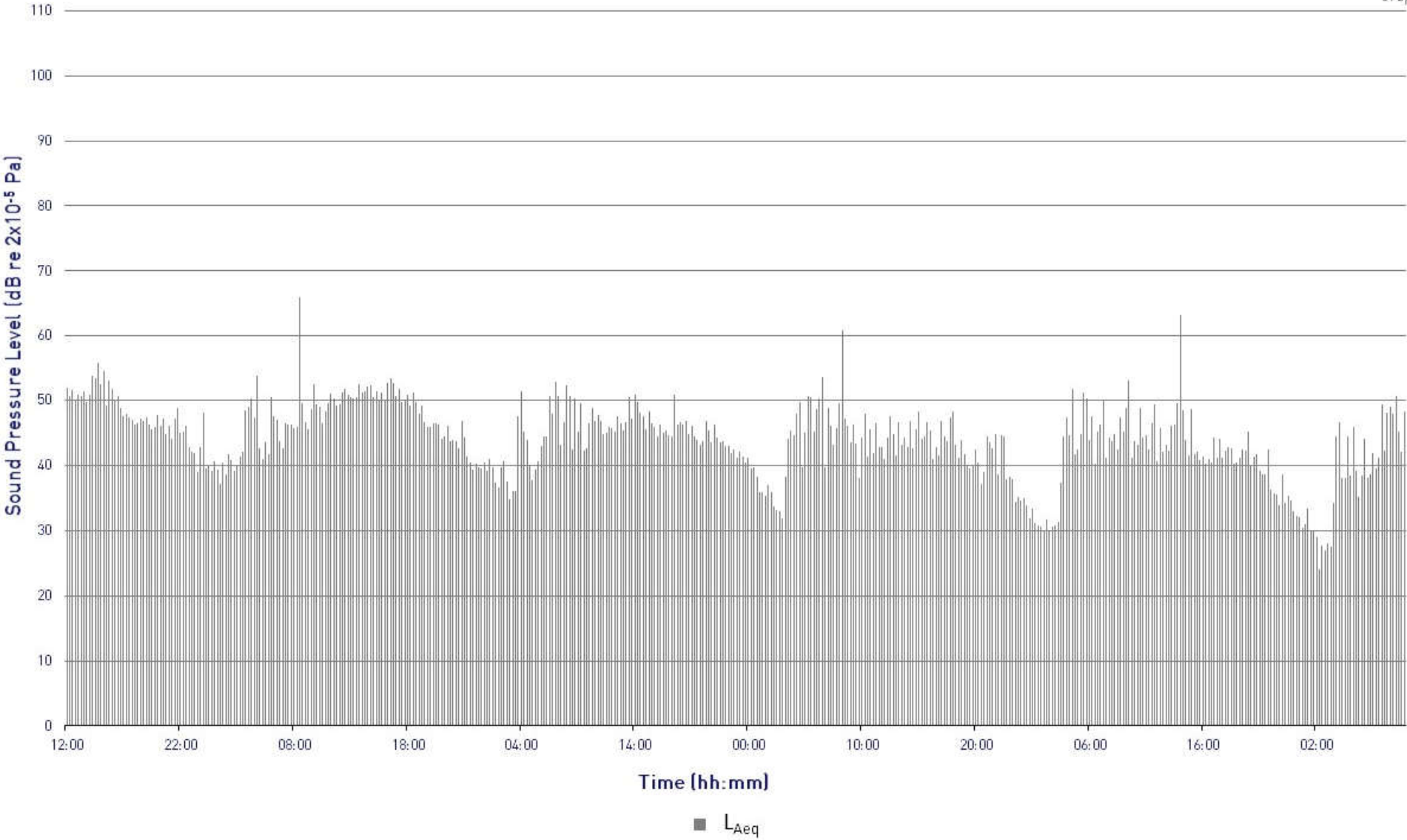
L_{Aeq} 15-minute Time History

Measurement Position 2, Thursday 11th June to Tuesday 16th June 2020



Project: 9948

Graph 3



Kenyon Lane, Moston

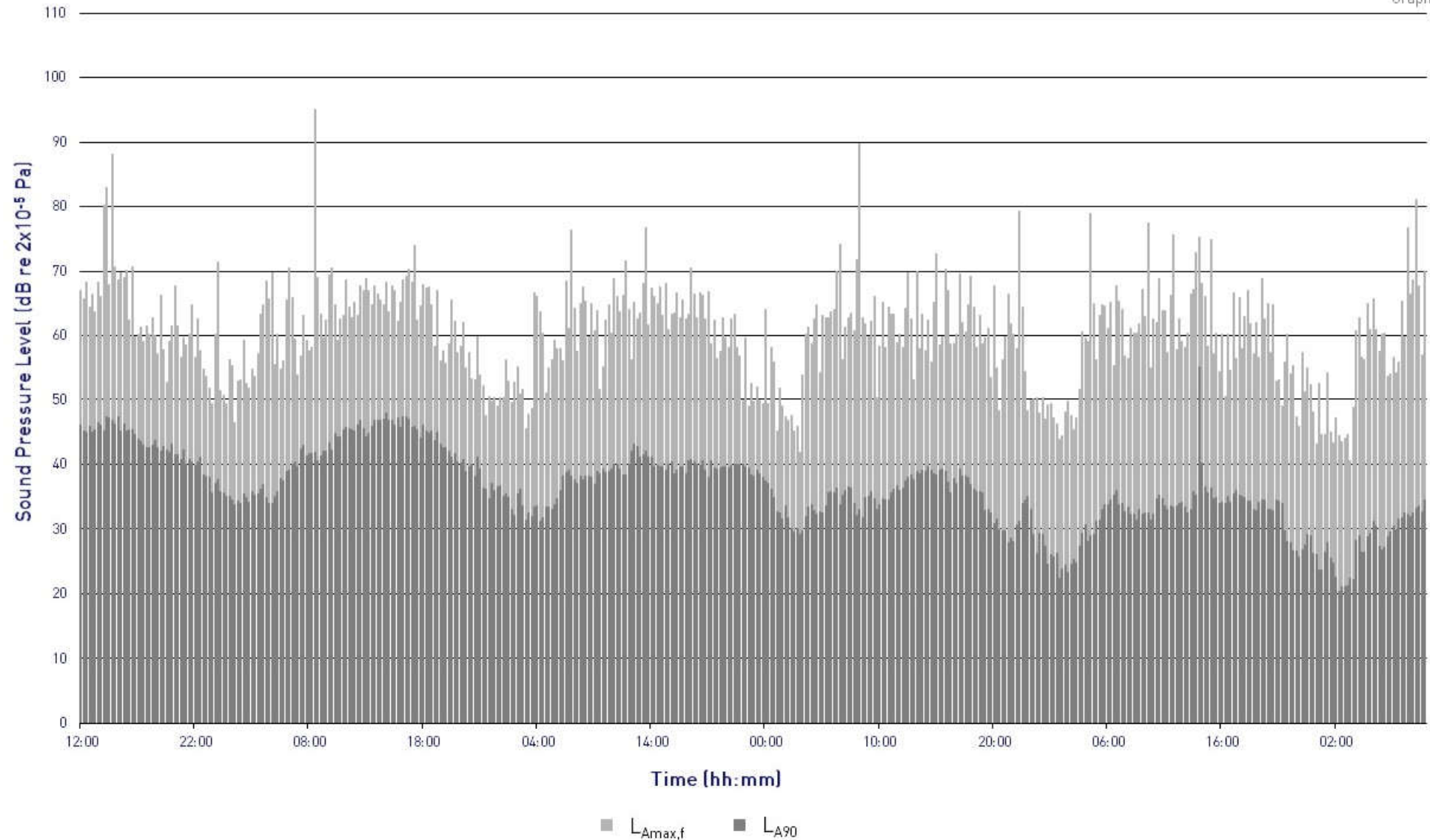
$L_{Amax,f}$ and L_{A90} 15-minute Time History

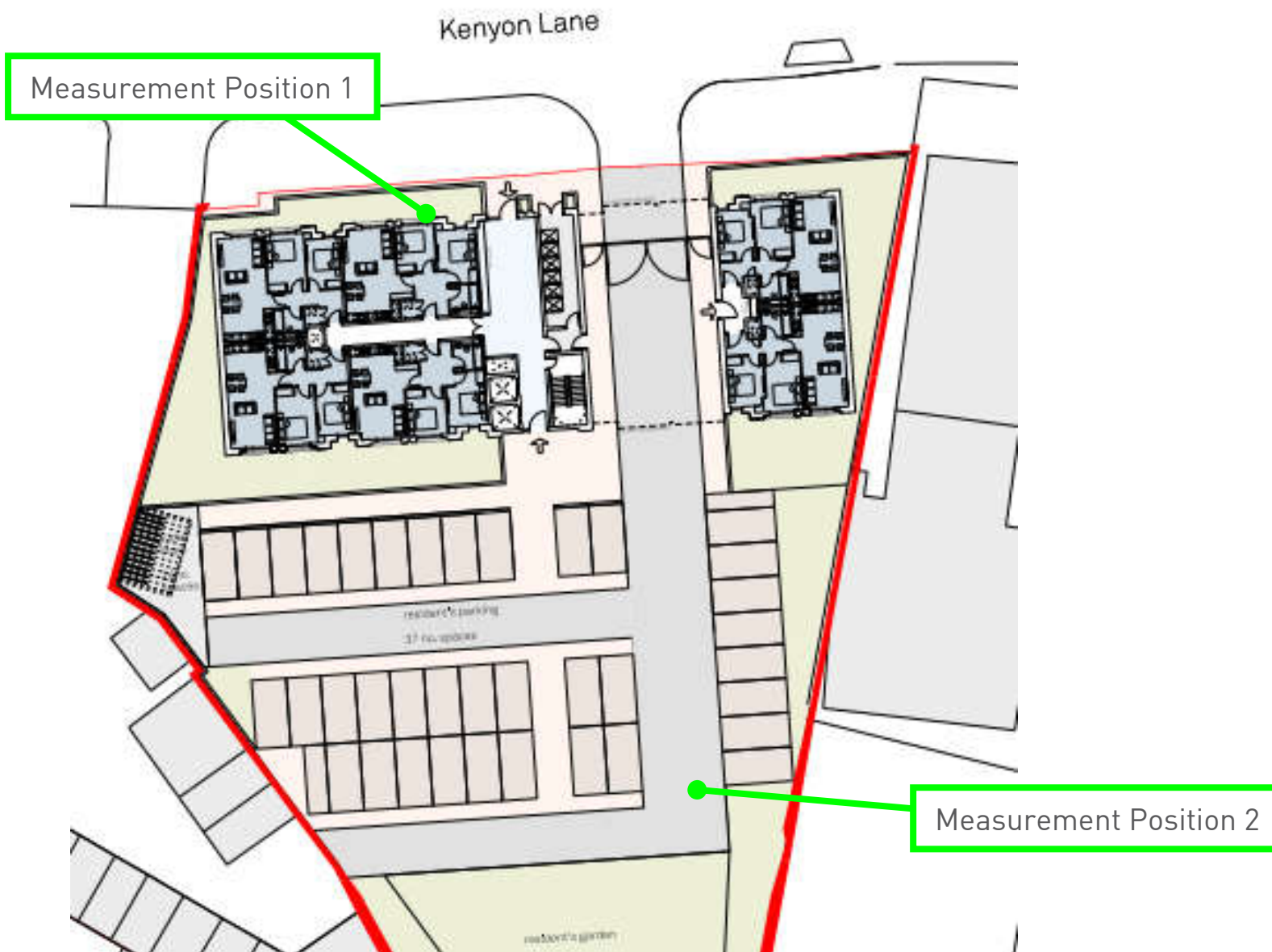
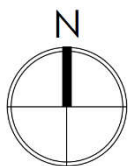
Measurement Position 2, Thursday 11th June to Tuesday 16th June 2020



Project: 9948

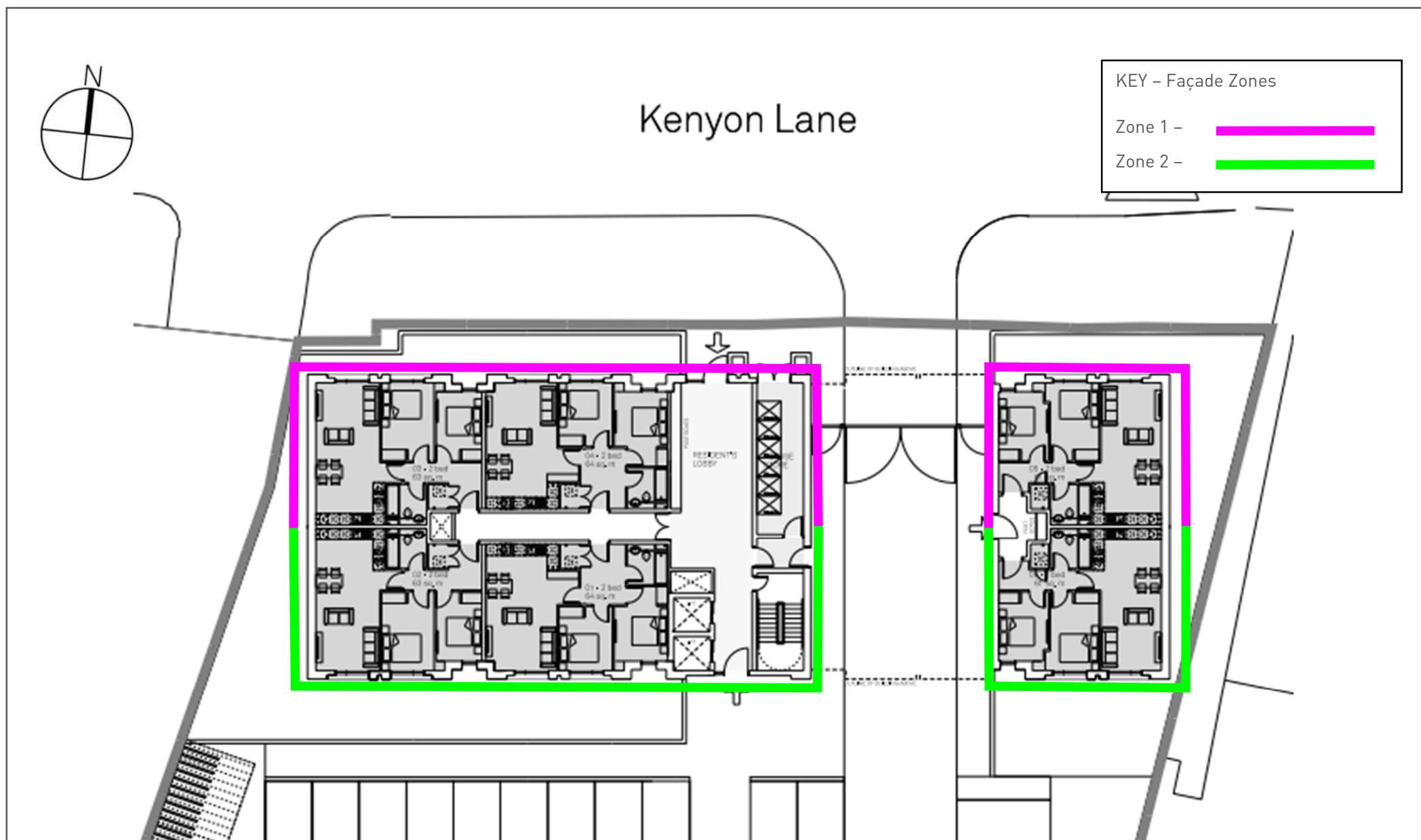
Graph 4





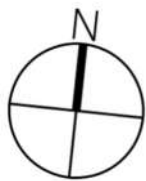
Kenyon Lane, Moston, Manchester
Site Plan Showing Measurement Positions
Project 9948

Figure 1
28 July 2020
Not to Scale



Kenyon Lane, Moston, Manchester
 Façade Zoning Plan (Ground Floor Level)
 Project 9948

Figure 2
 28 July 2020
 Not to Scale



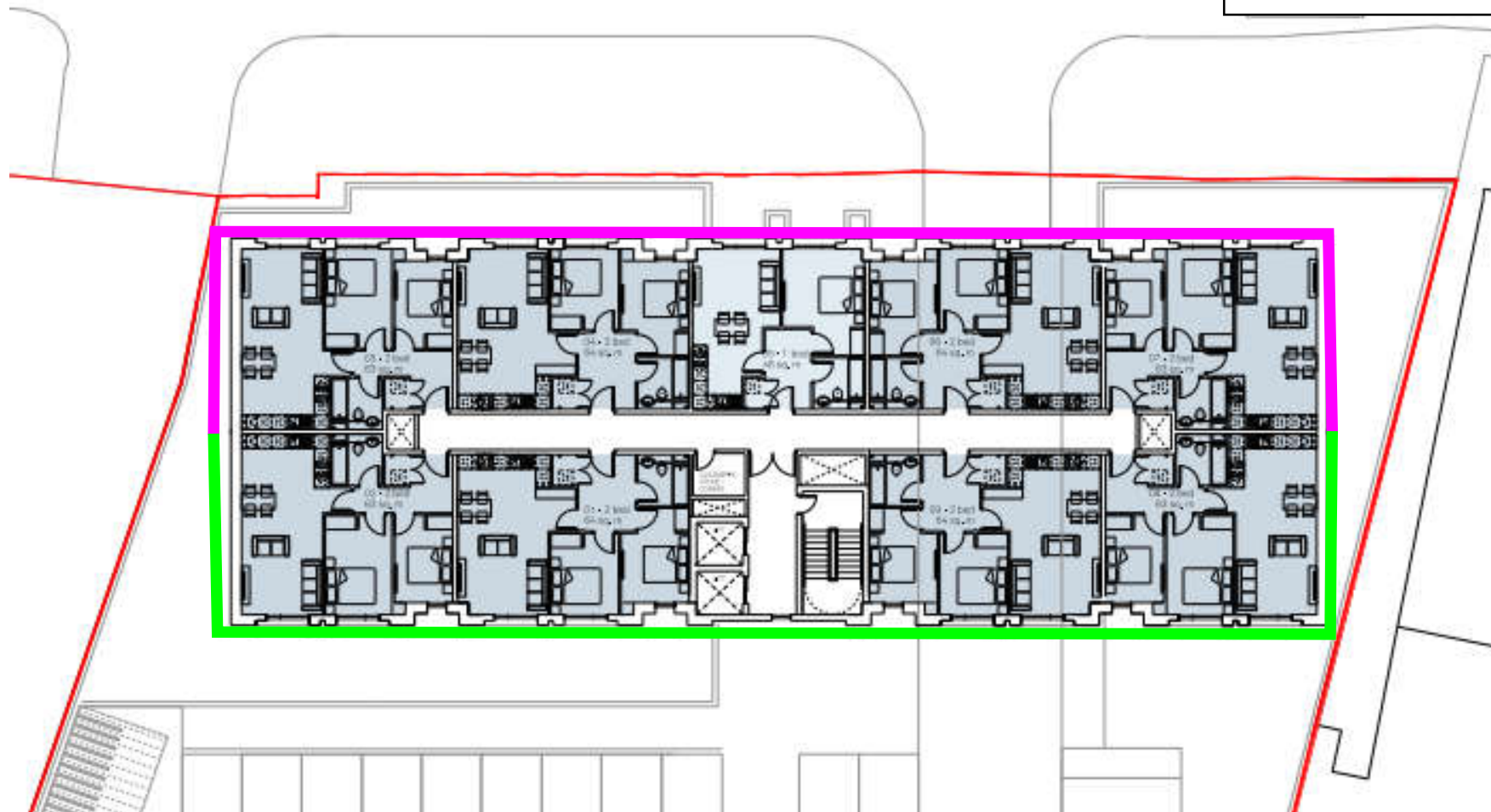
Kenyon Lane

KEY - Façade Zones

Zone 1 -



Zone 2 -



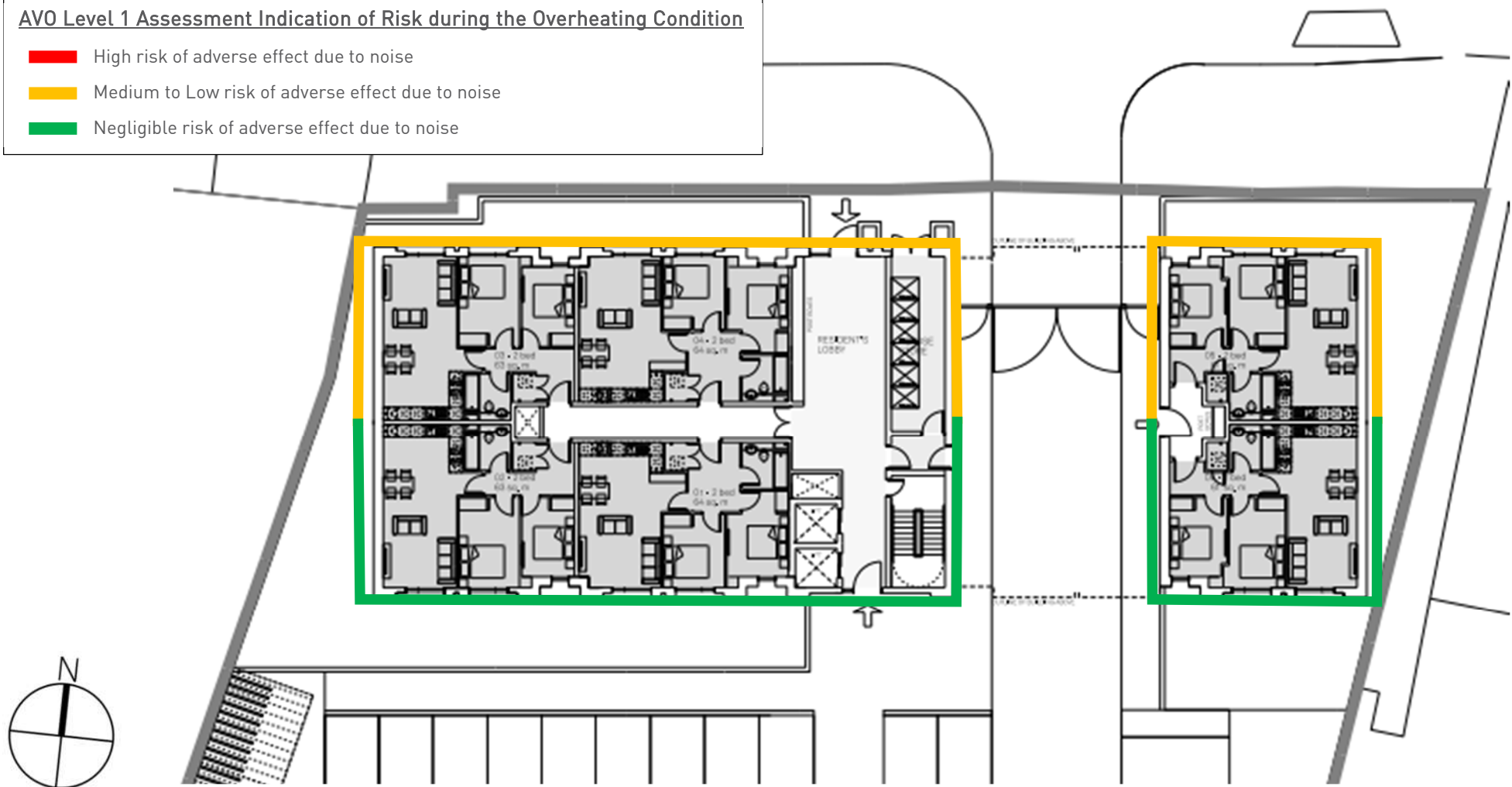
Kenyon Lane, Moston, Manchester
Façade Zoning Plan (First to Third Floor Levels)
Project 9948

Figure 3
28 July 2020
Not to Scale

Kenyon Lane

AVO Level 1 Assessment Indication of Risk during the Overheating Condition

- High risk of adverse effect due to noise
■ Medium to Low risk of adverse effect due to noise
■ Negligible risk of adverse effect due to noise



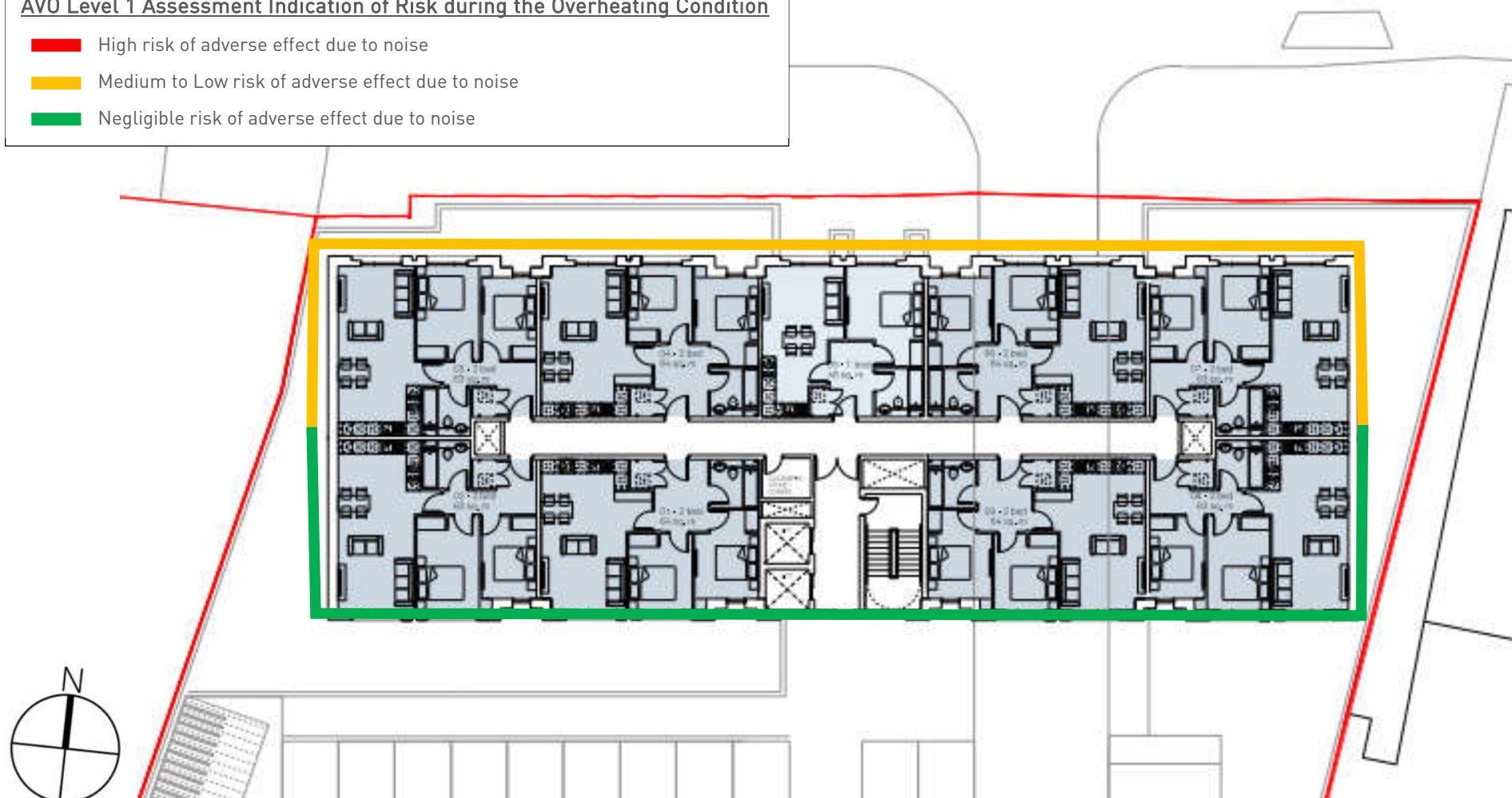
Kenyon Lane, Moston, Manchester
AVO Level 1 Assessment Façade Plan 1 of 2
Project 9948

Figure 4
28 July 2020
Not to Scale

Kenyon Lane

AVO Level 1 Assessment Indication of Risk during the Overheating Condition

- High risk of adverse effect due to noise
- Medium to Low risk of adverse effect due to noise
- Negligible risk of adverse effect due to noise



Kenyon Lane, Moston, Manchester
 AVO Level 1 Assessment Façade Plan 2 of 2
 Project 9948

Figure 5
 28 July 2020
 Not to Scale

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