



Noise Survey of a proposed residential development

Client: LCP Estates Ltd

Address: May Day Green,
Barnsley,
S70 1RD

Date: 25/10/2019



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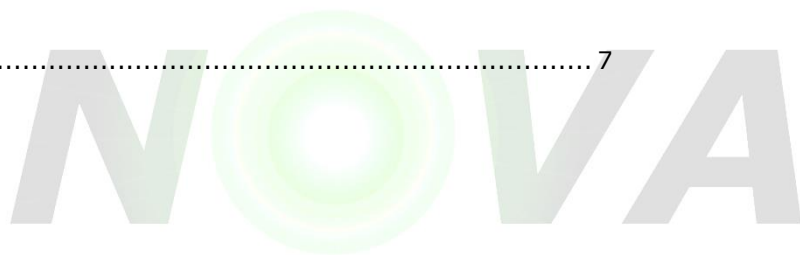
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Executive summary

An environmental noise survey and noise impact assessment have been undertaken at the proposed residential development at May Day Green, Barnsley, S70 1RD to assess the suitability of the site. The measured ambient sound levels have allowed a BS8233:2014 and ProPG noise assessment to be carried out.

Outline mitigation measures have been recommended in the body of the report including glazing and ventilation. These recommendations will be sufficient to achieve the internal noise levels for the proposed development according to BS8233:2014 noise criteria. An overview of all recommendations can be seen below:

Recommendations and Mitigation Overview

- A ProPG assessment has categorised the development as "Medium Risk". It is deemed that if good acoustic design can be implemented, internal noise levels will be reduced sufficiently, and the amenity of the future occupants can be protected.
- All glazing for living rooms and bedrooms require a minimum sound reduction of $30 R_w$ and $31 R_w + C_{tr}$
- Appropriate ventilation systems have been specified within the body of the report.
- The separating floor between ground-floor commercial and the development above requires a minimum sound reduction of $50 \text{ dB } D_{nt,w} + C_{tr}$

The findings of this report will require written approval from the Local Authority prior to work commencing.



1. Introduction

1.1 Overview

NOVA Acoustics Ltd has been commissioned to prepare a noise assessment for the conversion of a Class B1A (office) to a Class C3 (residential) ('the Proposed Development') at May Day Green, Barnsley, S70 1RD ('the Site').

The Applicant is preparing a Prior Notification application to be submitted ('the Application') to the Barnsley Metropolitan Borough Council.

Accordingly, the following technical noise assessment has been produced to accompany the Application to the Barnsley Metropolitan Borough Council.

This noise assessment is necessarily technical in nature; therefore, a glossary of terms is included in Appendix A to assist the reader.

1.2 Scope & Objectives

The scope of the noise assessment can be summarized as follows:

- Ambient sound monitoring survey to evaluate the prevailing sound levels incident on the Site;
- Detailed sound modelling, acoustic calculation and analysis in accordance with ISO9613 – 1 prediction methodology to predict sound levels incident on the Site;
- A detailed assessment of the suitability of the Site, in accordance with relevant standards in respect of sound from the surrounding noise sources; and
- Recommendation of mitigation measures, where necessary, to comply with the requirements of the National Planning Practice Guidance in England and Wales, BS8233:2014, ProPG and World Health Organisation Guidelines and other relevant standards.

1.3 Legislation, Policy and Guidance

This report is to be primarily based on the following legislation, policy and guidance.

- National Planning Policy Framework (2019)
- Noise Policy Statement for England
- ProPG: Planning & Noise
- BS8233:2014 'Guidance on sound insulation and noise reduction for buildings'
- ISO 9613-2 Attenuation of sound during propagation outdoors
- BS EN 12354-4 Building Acoustics

2. Site Description & Background Information

2.1 Site & Surroundings

The proposed site is located at May Day Green, Barnsley, S70 1RD. To the north of the proposed dwellings is Eldon Street, to the East and South is May Day Green Street, and to the West Queen Street. The surrounding area is predominantly commercial such as Barnsley Markets to the south, and West Queen street housing a range of Highstreet commercial brands; both considered to have moderate to high amounts of footfall and thus moderately high commercial noise sources from city centre activity.



Figure 1.0 – Site and Surroundings

2.2 Background

It is proposed that the site undergo a change of use from Class B1 offices to Class C3 residential. The proposal is currently in the preplanning stage for prior notification to assess the suitability of the site from the impacts of noise from commercial premises. The local authority has expressed concern with regards to the surrounding commercial area for residential development as follows:

***As you are aware, as part of the Prior Notification application process under Class O of the GPDO, one of the assessment criteria is 'impacts of noise from commercial premises on the intended occupiers of the development'. We have consulted our Regulatory Services department and they have raised objections given the town centre location and proximity to the Glassworks and proposed public square given the future night time economy and leisure offering that will be within that area, as such, they have recommended refusal.*

3. Environmental Noise Survey

In order to characterise the sound profile of the area of the proposed development, a long-term environmental sound survey was carried out from the 4th to 7th October 2019.

3.1 Measurement Methodology

For the long-term sound monitoring, the sound level meters were placed at 1st-floor level, protruding from windows of the proposed site. The microphones were positioned approximately 1m away from the building's façade. The monitoring positions were chosen in order to collect representative sound levels of the area during the week and weekend day time and night time periods. The measurement positions can be found in Figure 1.0.

3.2 Measurement Equipment

Piece of Equipment	Serial No	Calibration Deviation
SVAN 977 Class 1 Sound Level Meter	34826	≤0.5
SVAN Class 1 Calibrator SV31	32569	
CESVA SC420 Class 1 Sound level meter	T246471	≤0.5
CESVA CB006 Class 1 Calibrator	901955	

Table 1.0 – Measurement Equipment

All equipment used during the survey was field calibrated at the start and end of the measurement period with a negligible deviation of ≤0.5 dB. All sound level meters are calibrated every 24 months and all calibrators are calibrated every 12 months, by a third-party calibration laboratory. All microphones were fitted with a protective windshield for the entire measurements period. Calibration certificates can be provided upon request.

3.3 Weather Summary

As the environmental noise survey was carried out over a long un-manned period no localized records of weather conditions were taken. However, during the setup and collection of the monitoring equipment, the weather conditions have been documented in the following table. All measurements have been compared with met office weather data of the area, specifically, the closest weather station is at Brettas Park. When reviewing the time history of the noise measurements, any scenarios that were considered potentially to be affected by the local weather conditions have been omitted. The analysis of the noise data includes statistical and percentile analysis and review of minimum and maximum values, which aids in the preclusion of any periods of undesirable weather conditions. The weather conditions were deemed suitable for the measurement of environmental noise in accordance with BS7445 Description and Measurement of Environmental Noise. The table below presents the average temperature, wind speed and rainfall range for each 24-hour period during the entire measurement.

Weather conditions 04/10/2019 – 07/10/2019 Brettas Park				
Time period	Air temp (°C)	Rainfall mm/h	Prevailing Wind Direction	Wind Speed (m/s)
04/10/2019 00:00 – 23:59	8.0 – 15.9	0.0 – 1.8	SSE	0.0 – 3.0
05/10/2019 00:00 – 23:59	6.0 – 15.5	0.0 – 3.6	SSE	0.0 – 2.2
06/10/2019 00:00 – 23:59	9.5 – 15.4	0.0 – 6.0	SSE	0.0 – 5.0
07/10/2019 00:00 – 23:59	9.4 – 13.2	0.0 – 1.8	SE	0.0 – 2.1

Table 2.0 – Meteorological Data

3.4 Results

3.4.1 Summary Results

The following table shows a summary of the sound survey results; L_{Aeq} , L_{Amax} , L_{A90} and the L_{A10} for the measurement period at MP1.

Measurement Position MP1				
Measurement Time Period ('t')	$L_{Aeq,t}$	$L_{Amax,t}$	$L_{A90,t}$	$L_{A10,t}$
Day 1 - 04/10/19 - 11:15 - 23:00	59.0	91.0	52.0	61.0
Night 1 - 04/10/19 - 23:00 - 07:00	54.0	81.0	50.0	58.0
Day 2 - 05/10/19 - 07:00 - 23:00	58.0	86.0	52.0	61.0
Night 2 - 05/10/19 - 23:00 - 07:00	58.0	81.0	52.0	60.0
Day 3 - 06/10/19 - 07:00 - 23:00	56.0	91.0	51.0	57.0
Night 3 - 06/10/19 - 23:00 - 07:00	50.0	79.0	48.0	53.0
Day 4 - 07/10/19 - 07:00 - 10:00	61.0	88.0	59.0	63.0

Table 3.0 – Sound Survey Results Summary

The following table shows a summary of the sound survey results; L_{Aeq} , L_{Amax} , L_{A90} and the L_{A10} for the measurement period at MP2.

Measurement Position MP2				
Measurement Time Period ('t')	$L_{Aeq,t}$	$L_{Amax,t}$	$L_{A90,t}$	$L_{A10,t}$
Day 1 - 04/10/19 - 11:15 - 23:00	60.0	95.0	56.0	62.0
Night 1 - 04/10/19 - 23:00 - 07:00	55.0	79.0	54.0	56.0
Day 2 - 05/10/19 - 07:00 - 23:00	60.0	92.0	55.0	62.0

Night 2 – 05/10/19 – 23:00 – 07:00	58.0	87.0	55.0	59.0
Day 3 – 06/10/19 – 07:00 – 23:00	57.0	91.0	54.0	58.0
Night 3 – 06/10/19 – 23:00 – 07:00	55.0	91.0	51.0	54.0
Day 4 – 07/10/19 – 07:00 – 10:00	62.0	93.0	60.0	63.0

Table 3.0 – Sound Survey Results Summary

The following table shows a summary of the highest octave band sound levels measure during the day and night periods.

Measurement Position MP1							
Frequency Analysis	Z-weighted Octave Band Sound Pressure Level, Hz (dB)						
	63	125	250	500	1K	2K	4K
Highest $L_{eq,16\text{hour}}$ during the day	68.0	64.0	59.0	58.0	56.0	54.0	50.0
Highest $L_{eq,8\text{hour}}$ during the night	61.0	58.0	55.0	56.0	53.0	51.0	46.0

Table 4.0 – Highest Octave Band L_{eq} during day & night – MP1

Measurement Position MP2							
Frequency Analysis	Z-weighted Octave Band Sound Pressure Level, Hz (dB)						
	63	125	250	500	1K	2K	4K
Highest $L_{eq,16\text{hour}}$ during the day	67.0	64.0	61.0	58.0	57.0	56.0	50.0
Highest $L_{eq,8\text{hour}}$ during the night	60.0	58.0	56.0	54.0	52.0	51.0	42.0

Table 5.0 – Highest Octave Band L_{eq} during day & night – MP2

The following table shows a summary of the maximum sound level results during the measurement period.

Measurement Position MP1			
Measurement Period ('t')	$L_{AFMax,15\text{min}}$	Statistically most Repeated $L_{AFMax,15\text{min}}$	No. of exceedances of 75 dB $L_{AFMax,15\text{min}}$
Night 1 – 04/10/19 – 23:00 – 07:00	81.0	63.0	6
Night 2 – 05/10/19 – 23:00 – 07:00	81.0	66.0	4
Night 3 – 06/10/19 – 23:00 – 07:00	79.0	61.0	4

Table 6.0 – Maximum Sound Level Summary Results

Measurement Position MP2			
Measurement Period ('t')	$L_{AFMax,15\text{min}}$	Statistically most Repeated $L_{AFMax,15\text{min}}$	No. of exceedances of 75 dB $L_{AFMax,15\text{min}}$

Night 1 - 04/10/19 - 23:00 - 07:00	79.0	67.0	5
Night 2 - 05/10/19 - 23:00 - 07:00	87.0	69.0	5
Night 3 - 06/10/19 - 23:00 - 07:00	91.0	67.0	2

Table 7.0 – Maximum Sound Level Summary Results

Discussion

According to the statistical analysis, the highest most repeated $L_{Amax,15min}$ value during the nighttime period at MP1 and MP2 was 66.0 and 69.0 respectively. This $L_{Amax,t}$ values have been exceeded more than 10 times and, according to the ProPG, maximum noise events that occur more than 10 times per night do present an adverse effect on the quality of life. For this reason, a higher level of 75.0 dB L_{Amax} , with less than 10 exceedances per night has been considered typical for the area and will be used in the following assessment.

3.5 Subjective impression & Context

During the site visit, the subjective noise profile of the area was found to be medium to high, mainly due to the patron noise from people in the area shopping on the Highstreet. Moreover, traffic was considered to be medium to high which is expected given the demographics of the surrounding area

4. Noise Assessment

4.1 BS4142:2014 – Commercial Noise Sources

The following noise assessment relates specifically to the noise emissions produced by the commercial properties surrounding the proposed site such as 'Barnsley Markets', 'Yorkshire Building Society', the street market along Queen Street, among others. As such, the following assessment is completed considering a single 'mixed' commercial source. As the noise sources are assumed to run exclusively during the day, the assessment period according to BS4142:2014 is one hour.

4.1.1 Specific Sound Level

To calculate the specific noise level of the commercial noise emissions, the noise level measured at MP1 between 19:00 and 20:00 on Day 3 (residual) has been logarithmically subtracted from the highest 1-hour ambient measurement taken during the operational hours.

A summary of the ambient, residual and calculated specific sound levels can be seen in the following table.

Industrial/Commercial Noise Sources		
Description	Time	Sound Level (dBA)
Ambient	MP2 - 04/10/19 - 17:00 – 18:00	66.0
Residual	MP1 - 06/10/19 - 19:00 – 20:00	53.0
Specific Sound Level	MP2 - 10/10/19 - 10:30 – 11:30	66.0

Table 8.0 – BS4142 Calculation

4.1.2 Rating Level

Rating Penalty

Section 9 of BS4142:2014 describes how the rating sound level should be derived from the specific sound level, by deriving a rating penalty.

BS4142:2014 states:

"Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such features are present at the assessment location, add a character correction to the specific sound level to obtain the rating level. This can be approached in three ways:

- a) subjective method;*
- b) objective method for tonality;*
- c) reference method."*

Due to the nature of the development the subjective method has been adopted to derive the rating sound level from the specific sound level. This is discussed in Section 9.2 of BS4142:2014, which states:

"Where appropriate, establish a rating penalty for sound based on a subjective assessment of its characteristics. This would also be appropriate where a new source cannot be measured because it is only proposed at that time, but the characteristics of similar sources can subjectively be assessed. Correct the specific sound level if a tone, impulse or other characteristics occurs, or is expected to be present, for new or modified sound sources."

BS4142:2014 defines four characteristics that should be considered when deriving a rating penalty, namely; tonality; impulsivity; intermittency; and other sound characteristics, which are defined as:

a) Tonality

A rating penalty of +2 dB is applicable for a tone which is "just perceptible", +4 dB where a tone is "clearly perceptible", and +6 dB where a tone is "highly perceptible".

b) Impulsivity

A rating penalty of +3 dB is applicable for impulsivity which is "just perceptible", +6 dB where it is "clearly perceptible", and +9 dB where it is "highly perceptible".

c) Other Sound Characteristics

BS4142:2014 states that where "the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of +3 dB can be applied."

d) Intermittency

BS4142:2014 states that when the "specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time ... if the intermittency is readily distinctive against the residual acoustic environment, a penalty of +3 dB can be applied."

Rating Penalty Assessment

Considering the requirements of the rating penalty, an assessment of the various sound sources in terms of whether any rating penalties are applicable and has been detailed in the following table.

Tonality	Impulsivity	Intermittency	Other Sound Characteristics	Discussion
--	--	--	--	Not characterizable components due to the mixture of commercial sources.

Table 9.0 – Rating Penalty Assessment

Rating Level

Incorporating the rating penalties with the specific sound levels, the rating sound levels have been derived and have been detailed in the following table.

Description	Rating Sound Level (dB)
Industrial Activities	66.0

Table 10.0 – Summary of Rating Sound Levels

4.1.3 Background Sound Level

The background sound level is the underlying level of sound over a period, T, and is indicative of the relative quietness at a given location. It does not reflect the occurrence of transient and/or higher sound level events and is generally governed by continuous or semi-continuous sounds.

To ensure the background sound level values used within the assessment are reliable and suitably represent both the particular circumstance and periods of interest, efforts have been made to quantify a 'typical' background sound level for a given period. The purpose has not been to simply select the lowest measured value. Diurnal patterns have also been considered as they can have a major influence on background sound levels, for example, the middle of the night can be distinctly different (and potentially of lesser importance) compared to the start or end of the night time period for sleep purposes.

The table below shows the prevailing background sound level of the area between 19:00 and 20:00 on the 6th of October 2019.

MP1				
Operational Hours ('t')	L _{A90,t}	Statistical L _{A90,10second}	Minimum L _{A90,10second}	Maximum L _{A90,10second}
MP1 - 06/10/19 - 19:00 - 20:00	49.0	49.0	48.0	55.0

Table 11.0 – Summary of Background Sound Levels

Discussion:

The statistically most repeated $L_{A90,10\text{second}}$ value during the hour after the local commercial properties closed was 49 dB. This value sits towards the lower end of the range. For this reason, this value is deemed to be 'typical' and 'robust' and will, therefore, be used in the following assessment.

4.1.4 BS4142 Assessment

The rating sound level has been assessed in accordance with BS4142:2014 at the proposed development. The BS4142:2014 assessment for the industrial/commercial properties can be seen in the table below.

Results	Level (dB)	Notes
Rating Sound Level	66.0	As shown in Table 10.0
Operational Period Background Sound Level	49.0	As shown in Table 11.0
Excess of Rating over Background Sound Level	+17.0	Assessment Indicates 'Adverse Impact - Depending on Context'

Table 12.0 – BS4142:2014 Assessment

Discussion

The BS4142 assessment indicates a possibility of 'Adverse Impact', however, appropriate internal noise levels can easily be achieved in accordance with BS8233. BS4142 does not have the flexibility to consider attenuation measures of sound insulation, i.e. glazing, for new noise-sensitive developments as it uses external measurements to determine the likelihood of complaints from inside the building. It assumes, in effect, standard forms of existing housing and not specifically designed forms of housing that have taken current and likely future noise sources into account as is the case in the proposed development. Within the BS4142 assessment methodology, there must be assumptions made as to the sound insulation of the building envelope.

Another issue with BS4142 is that it is solely a comparative assessment tool. Rather than also considering absolute criteria, the likelihood of adverse impact is judged exclusively on the difference between the rating level and the background sound level, rather than achievable internal noise levels. Whilst this might be relevant for existing housing that has a new industrial noise source created nearby, for new residential development, the background sound climate can include existing industrial/commercial noise sources.

This is further corroborated in the following section of BS4142;

Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including the following.

The absolute level of sound. For a given difference between the rating level and the background sound level, the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is

low. Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night. Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse.

The character and level of the residual sound compared to the character and level of the specific sound. Consider whether it would be beneficial to compare the frequency spectrum and temporal variation of the specific sound with that of the ambient or residual sound, to assess the degree to which the specific sound source is likely to be distinguishable and will represent an incongruous sound by comparison to the acoustic environment that would occur in the absence of the specific sound. Any sound parameters, sampling periods and averaging time periods used to undertake character comparisons should reflect the way in which sound of an industrial and/or commercial nature is likely to be perceived and how people react to it.

The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:

- i) facade insulation treatment;
- ii) ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and
- iii) acoustic screening.

In order to provide adequate mitigation, the necessary SRI of the facades will be calculated using the highest of either the BS4142:2014 rating level, or the highest 1-hour measurement taken during the day time period. An octave band assessment will also be undertaken to ensure that any tonal component of the noise is reduced within the development. This is thought to be in line with the Leeds City Council supplementary noise document and BS8233:2014 guidance.

4.2 ProPG Stage 1 Initial Noise Risk Assessment

Considering the noise levels measured across the entire measurement period, the development site falls into Noise Risk Category (NRC) 2. As shown in the following table.

Noise Risk Category	Potential Effect if unmitigated	Pre-Planning Application Guidance
2 – Medium L _{Aeq, 16hour} < 60 - 70dB L _{Aeq, 8hour} < 50 - 60dB	Significant adverse effect on health and quality of life	High noise levels indicate that there is an increased risk that development may be refused on noise grounds. The 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.

Table 13.0 – Noise Risk Category for Site

4.3 BS8233:2014 Noise Assessment

4.3.1 Internal Noise Level Assessment

The following section analyses the ambient sound levels incident on the development compared with the internal noise level criteria presented within BS8233:2014.

To ensure a robust analysis the following considerations have been taken:

- The BS4142:2014 rating level during the day.
- The highest $L_{Aeq,16hour}$ and $L_{Aeq,8hour}$ during day and night
- The $L_{AFmax,15min}$ during the night exceeded less than 10 times
- The highest 16-hour and 8-hour Octave Band during the day and night

The following table analyses the required composite SRI required of the dwelling to achieve appropriate internal noise levels.

Measurement position	Location	Time Period	Façade Noise Level	BS8233 Criteria	Min. SRI Required (dB)
MP1	Bedroom / Living Room	Day time	66.0	35 dB $L_{Aeq,16hour}$	31.0 $R_w + C_{tr}$
	Bedroom	Night time	58.0	30 dB $L_{Aeq,8hour}$	28.0 $R_w + C_{tr}$
	Bedroom	Night time	75.0	45 dB $L_{Amax,8hour}$	30.0 R_w^{**}

Table 14.0 – BS8233 Internal Noise Level Analysis

Measurement position	Location	Time Period	Façade Noise Level	BS8233 Criteria	Min. SRI Required (dB)
MP2	Bedroom / Living Room	Day time	66.0	35 dB $L_{Aeq,16hour}$	31.0 $R_w + C_{tr}$
	Bedroom	Night time	58.0	30 dB $L_{Aeq,8hour}$	28.0 $R_w + C_{tr}$
	Bedroom	Night time	75.0	45 dB $L_{Amax,8hour}$	30.0 R_w^{**}

Table 15.0 – BS8233 Internal Noise Level Analysis

The following tables analyses the required composite octave band SRI required of the dwelling to achieve appropriate internal noise levels during the night time period.

(MP1) Frequency Analysis	Z-weighted Octave Band Sound Pressure Level, Hz (dB)						
	63	125	250	500	1K	2K	4K
Highest $L_{eq,8h}$ during the night	61.0	58.0	55.0	56.0	53.0	51.0	46.0
NR25 Curve (dB)	55.2	43.7	35.2	29.2	25.0	21.9	19.5
Required Octave Band SRI (R_w)	6.0	15.0	20.0	27.0	28.0	30.0	27.0

Table 16.0 – Octave Band Internal Noise Level Analysis

(MP2) Frequency Analysis	Z-weighted Octave Band Sound Pressure Level, Hz (dB)						
	63	125	250	500	1K	2K	4K
Highest $L_{eq,8h}$ during the night	60.0	58.0	56.0	54.0	52.0	51.0	42.0
NR25 Curve (dB)	55.2	43.7	35.2	29.2	25.0	21.9	19.5
Required Octave Band SRI (R_w)	5.0	15.0	21.0	25.0	27.0	30.0	23.0

Table 17.0 – Octave Band Internal Noise Level Analysis

4.3.2 Noise Breakthrough Assessment

The site is situated above ground floor commercial units and as such there is potential for noise breaking through the partition floor to adversely impact any future residents. Consequently, a noise breakthrough assessment has been undertaken. It is assumed that the internal noise level within the ground floor units will not exceed 80 dBA which is in line with the Noise at Work regulations 2005. The required sound reduction of the floor has been calculated using the nighttime internal noise criteria as the ground floor unit 'Greggs' may begin operating before 7 am.

Description	Level (dB)
Internal noise level GF	80.0
Nighttime Noise Criteria	30.0
Required $D_{nt,w} + C_{tr}$	50.0

Table 18.0 – Noise Breakthrough Analysis

As can be seen in the table above to ensure the amenity of the future residents can be fully protected the adjoining floor between the ground and 1st floor requires a minimum sound reduction of 50 dB $D_{nt,w} + C_{tr}$.

4.3.3 Recommendations & Mitigation

Building Envelope

The noise levels within the proposed dwellings will be dictated by the configuration, materials and elements of the façade. The non-glazed elements of the facade will contribute significantly to the reduction of ambient noise levels in combination with a superior quality appropriate acoustic glazing specification.

a) Facades

The prediction of the performance of the facade is based upon a construction of 200mm brick and is calculated within INSUL software, the expected performance is shown in the following table.

Frequency (Hz)	63	125	250	500	1K	2K	4K	R _w
Façade SRI	41	44	42	47	55	63	68	53

Table 19.0 – Façade SRI

Any other configuration of external walls that would achieve at least these insulation figures will be suitable for the development.

b) Roofs

If the dwelling has rooms within the roof space the roof system will require additional sound insulation to achieve appropriate internal noise levels. If the roof, is being utilized as a voided loft space with thermal insulation the following detailing is not required. The ceilings in the roof space should consist of 100mm 45kg/m³ fitted tightly between the 200mm roof joists and 2no. 15mm SoundBloc plasterboard fixed to resilient bars to achieve a uniform sound reduction. The expected performance as predicted within INSUL software is shown in the following table.

Frequency (Hz)	63	125	250	500	1K	2K	4K	R _w
Roof SRI	33	45	52	57	60	57	61	58

Table 20.0 – Roof SRI

Any other configuration of roof that would achieve at least these insulation figures will be suitable for the development.

c) Glazing

Windows can be considered the weakest point of a façade in terms of noise reduction from external noise. To provide a robust assessment the composite SRI required for the entire building envelope will be used to provide the glazing specification.

Glazed elements installed in all the living rooms and bedrooms require a minimum sound reduction index value as shown in Table 14.0. The glazing units shown in the following table would provide a suitable sound reduction, any other window capable of providing this attenuation will be suitable. The performance is specified for the whole window unit, including frame and other design features.

Location	Glazing Configuration	Attenuation (dB)
MP1 & MP2	<i>Double Glazing</i>	35 R _w
	10mm Glass – 6 - 16mm Air Cavity – 6mm Glass	32 R _w + C _{tr}

Table 21.0 – Glazing SRI

The glazing system above will protect the amenity of the occupants of the dwellings against the extraneous noise. The glazing specifications have been taken from the BS6262 – 2 and Pilkington's Optiphon range however any glazing providing the same attenuation can be used.

d) Ventilation

BS8233 States;

"If relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level."

and

"The Building Regulations' supporting documents on ventilation [48, 49, 50] recommend that habitable rooms in dwellings have background ventilation. Where openable windows cannot be relied upon for this ventilation, trickle ventilators can be used and sound attenuating types are available. However, windows may remain openable for rapid or purge ventilation, or at the occupant's choice. Alternatively, acoustic ventilation units are available for insertion in external walls. These can provide sound reduction comparable with double glazed windows. However, ducted systems with intakes on the quiet side of the building might be required in very noisy situations, or where appearance rules out through-the-wall fans."

It is recommended that an alternative ventilation system is installed to fully protect the amenity of future inhabitants. As stated in BS8233:2014 section 5.4.4, having complete enclosure of the noise source or receiver is the most effective barrier of sound. An alternative ventilation strategy allows for maximum sound insulation from the noise source whilst still maintaining a sufficient level of ventilation. It is recommended that the alternative ventilation should provide the same resistance to sound as the glazed elements. The following table provides one ventilation system that meets the above recommendations. However any other passive ventilation system that provides a minimum 31 dB $D_{n,ew} + C_{tr}$ could also be installed.

Model	Attenuation (dB)
Simon Acoustic Trickle Ventilation	38dB Open / 41dB Closed $D_{n,e,w}$

Table 22.0 – Ventilation Specification

If the above ventilation systems are not deemed suitable for the development then a mechanical heat-recovery ventilation (MHRV) system should be employed. It should be noted that if a MHRV system is used, the self-generating noise from the system will need to conform to the internal noise levels outlined in BS8233:2014.

e) *Partition Floor*

It is assumed that the separating floor between the ground and 1st floors is a minimum 200mm concrete with a suspended MF ceiling, minimum drop 150mm and standard ceiling tile. The above detail has been modelled in INSUL 8.0 and the expected performance is found to be 51 dB $D_{nt,w} + C_{tr}$. This level is above both the required sound reduction and that of the criteria stated in the Building Regulations Part E for this type of development and is, therefore, deemed sufficient.

Appendix A – Acoustic Terminology

Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of 20µPa (20x10 ⁻⁶ Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s ₁ and s ₂ is given by 20 log ₁₀ (s ₁ / s ₂). 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.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
L _{eq,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 during the period T. L _{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L _{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
L _{90,T}	A noise level index. The noise level exceeded for 90% of the time over the period T. L ₉₀ can be considered to be the "average minimum" noise level and is often used to describe the background noise.
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.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m
Facade	At a distance of 1m in front of a large sound reflecting object such as a building façade.
Fast Time Weighting	An averaging time used in sound level meters. Defined in BS 5969.

A

In order to assist the understanding of acoustic terminology and the relative change in noise, the following background information is provided. The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0 dB (the threshold of hearing) to over 120 dB. An indication of the range of sound levels commonly found in the environment is given in the following table.

Sound Level	Location
0dB(A)	Threshold of hearing
20 to 30dB(A)	Quiet bedroom at night
30 to 40dB(A)	Living room during the day
40 to 50dB(A)	Typical office
50 to 60dB(A)	Inside a car
60 to 70dB(A)	Typical high street
70 to 90dB(A)	Inside factory
100 to 110dB(A)	Burglar alarm at 1m away
110 to 130dB(A)	Jet aircraft on take off
140dB(A)	Threshold of Pain

The ear is less sensitive to some frequencies than to others. The A-weighting scale is used to approximate the frequency response of the ear. Levels weighted using this scale are commonly identified by the notation dB(A).

In accordance with logarithmic addition, combining two sources with equal noise levels would result in an increase of 3 dB(A) in the noise level from a single source. A change of 3 dB(A) is generally regarded as the smallest change in broadband continuous noise which the human ear can detect (although in certain controlled circumstances a change of 1 dB(A) is just perceptible). Therefore, a 2 dB(A) increase would not be normally be perceptible. A 10 dB(A) increase in noise represents a subjective doubling of loudness.

A noise impact on a community is deemed to occur when a new noise is introduced that is out of character with the area, or when a significant increase above the pre-existing ambient noise level occurs.

For levels of noise that vary with time, it is necessary to employ a statistical index that allows for this variation. These statistical indices are expressed as the sound level that is exceeded for a percentage of the time period of interest. In the UK, traffic noise is measured as the L_{A10} , the noise level exceeded for 10% of the measurement period. The L_{A90} is the level exceeded for 90% of the

time and has been adopted to represent the background noise level in the absence of discrete events. An alternative way of assessing the time varying noise levels is to use the equivalent continuous sound level, L_{Aeq} .

This is a notional steady level that would, over a given period of time, deliver the same sound energy as the actual fluctuating sound. To put these quantities into context, where a receiver is predominantly affected by continuous flows of road traffic, a doubling or halving of the flows would result in a just perceptible change of 3 dB, while an increase of more than 25%, or a decrease of more than 20%, in traffic flows represent changes of 1 dB in traffic noise levels (assuming no alteration in the mix of traffic or flow speeds).

Note that the time constant and the period of the noise measurement should be specified. For example, BS4142:2014 specifies background noise measurement periods of 1 hour during the day and 15 minutes during the night. The noise levels are commonly symbolised as $L_{A90,1hour}$ dB and $L_{A90,15mins}$ dB. The noise measurement should be recorded using a 'FAST' time response equivalent to 0.125ms.



Appendix B – Legislation, Policy and Guidance

This report is to be primarily based on the following legislation, policy and guidance.

National Planning Policy Framework (2019)

Government policy on noise is set out in the National Planning Policy Framework (NPPF), published in 2019. This replaced all earlier guidance on noise and places an emphasis on sustainability. In section 15, Conserving and enhancing the natural and local environment, paragraph 170e, it states:

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;

Paragraph 180 states:

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; and*
- c) Limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.*

Noise Policy Statement for England

Paragraph 180 of the NPPF also refers to advice on adverse effects of noise given in the Noise Policy Statement for England (NPSE). This document sets out a policy vision to:

Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.

To achieve this vision the Statement identifies the following three aims:

Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

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

In achieving these aims the document introduces significance criteria as follows:

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur. It is stated that “significant adverse effects on health and quality of life should be avoided while also considering the guiding principles of sustainable development”.

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected. It is stated that the second aim above lies somewhere between LOAEL and SOAEL and requires that: “all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also considering the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur.”

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 the noise. This can be related to the third aim above, which seeks: “where possible, positively to improve health and quality of life through the pro-active management of noise while also considering the guiding principles of sustainable development, recognising that there will be opportunities for such measures to be taken and that they will deliver potential benefits to society. The protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim.”

The NPSE recognises that it is not possible to have a single objective noise-based measure that is mandatory and applicable to all sources of noise in all situations and provides no guidance as to how these criteria should be interpreted. It is clear, however, that there is no requirement to achieve noise levels where there are no observable adverse impacts but that reasonable and practicable steps to reduce adverse noise impacts should be taken in the context of sustainable development and ensure a balance between noise sensitive and the need for noise generating developments.

Any scheme of noise mitigation outlined in this report will, therefore, aim to abide by the above principles of the NPPF and NPSE whilst recognizing the constraints of the site.

ProPG: Planning & Noise

The Professional Practice Guidance on Planning and Noise (ProPG) has been produced to provide practitioners with guidance on the management of noise within the planning system in England.

Noise can have a significant effect on the environment and on the quality of life enjoyed by individuals and communities. For these reasons, noise is a material consideration in the planning process and a key aspect of sustainable development. Noise must therefore be considered and given serious attention when new developments might create additional noise and when new developments would be sensitive to the prevailing acoustic conditions.

It aims to:

- Advocate full consideration of the acoustic environment from the earliest possible stage of the development control process;
- Encourage the process of good acoustic design in and around new residential developments;

- Outline what should be taken into account in deciding planning applications for new noise-sensitive developments.
- Promote appropriate noise exposure standards; and
- Assist the delivery of sustainable development.

This document describes an acoustic design process which is multi-faceted and that seeks to deliver the best acoustic outcome for a particular site. The advice and procedures contained in the ProPG are restricted to the consideration of new residential development that will be exposed predominantly to airborne noise from existing transport sources. New housing is the most common type of new residential development, however the ProPG can also be applied to other types of residential developments such as residential institutions, care homes etc.

The document a Stage 1 Initial Site Risk Assessment, as follows:

Noise Risk Category	Potential Effect if unmitigated	Pre-Planning Application Guidance
0 – Negligible $L_{Aeq, 16hour} < 50dB$ $L_{Aeq, 8hour} < 40dB$	No adverse effect	These noise levels indicate that the development site is likely to be acceptable from a noise perspective, and the application need not normally be delayed on noise grounds.
1 - Low $L_{Aeq, 16hour} < 50 - 60dB$ $L_{Aeq, 8hour} < 40 - 50dB$	Adverse effect on health and quality of life	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 the minimized in the finished development.
2 - Medium $L_{Aeq, 16hour} < 60 - 70dB$ $L_{Aeq, 8hour} < 50 - 60dB$	Significant adverse effect on health and quality of life	As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimize, and which clearly demonstrated that a significant adverse noise impact will be avoided in the finished development.
3 - High $L_{Aeq, 16hour} > 70dB$ $L_{Aeq, 8hour} > 60dB$	Unacceptable adverse effect on health and quality of life	High noise levels indicate that there is an increased risk that development may be refused on noise grounds. The 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.

Table 23.0 – ProPG Stage 1 Initial Risk Assessment Criteria

BS8233:2014` Guidance on sound insulation and noise reduction for buildings'

The British Standard BS 8233: 2014, Guidance on Sound insulation and noise reduction for buildings provides additional guidance on noise levels from sources without specific character in the built environment, based on the recommendations of the World Health Organization; specifically, WHO Guidelines on Community Noise, 1999. The criteria desirable levels of steady state, "anonymous" noise in unoccupied spaces within dwellings, from sources such as road traffic, mechanical services and other continuously running plant, are tabulated below:

Activity	Location	07:00 – 23:00	23:00 – 07:00
Resting	Living Room	35 dB $L_{Aeq,16hour}$	--
Dining	Dining Room/Area	40 dB $L_{Aeq,16hour}$	--
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

Table 24.0 - BS8233 criteria for internal noise levels in dwellings

It is noted, however that where development is considered necessary or desirable, despite external noise level above WHO guidelines, the above target levels may be relaxed by up to 5 dB.

The standard also recommends that for traditional external amenity areas, such as gardens, it is desirable that external noise levels do not exceed 50 dB $L_{Aeq,T}$, and that 55 dB $L_{Aeq,T}$ would be acceptable in noisier environments. However, it is recognised that these values may not be achievable in all areas where development is desirable and in such locations, development should be designed to achieve the lowest practicable levels.

General recommendations for mitigation to enable these targets to be achieved are provided, including the use of bunds and barriers to reduce external noise and space planning and sound insulation for the control of internal noise levels.

For this assessment, the above criteria are considered to be the LOAEL as defined in the NPSE above.

ISO 9613-2 Attenuation of sound during propagation outdoors

The ISO 1996 series of standards specifies methods for the description of noise outdoors in community environments. Part 2 of ISO 9613 is intended to enable noise levels in the community to be predicted from sources of known sound emission. The method is general in the sense that it may be applied to a wide variety of noise sources, and cover most of the major mechanisms of attenuation.

This standard provides guidance on the outdoor propagation of sound. It is widely used to establish the different attenuations that occur during the transmission of the sound from the sources to the receivers. The total attenuation is the sum of the following: geometrical divergence, atmospheric absorption, ground effect, barriers, and miscellaneous other effects.

BS EN 12354-4 Building Acoustics

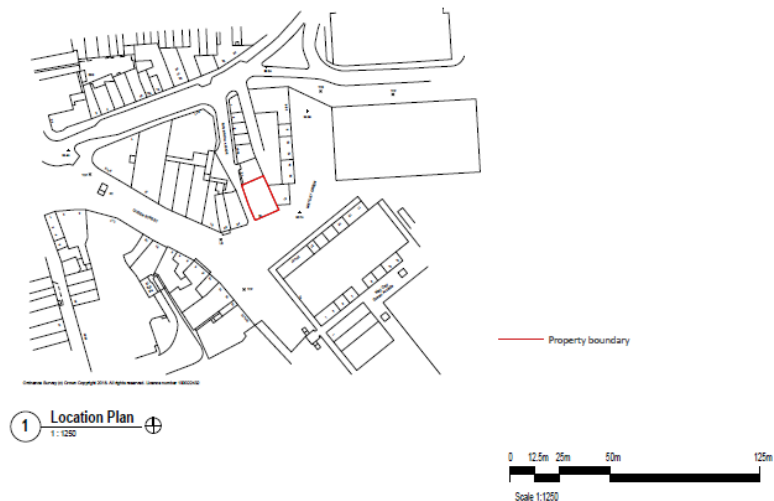
Estimation of acoustic performance of buildings from the performance of elements – Transmission of indoor sound to the outside

This European Standard describes a calculation model for the sound power level radiated by the envelope of a building due to airborne sound inside that building, primarily by means of measured sound pressure levels inside the building and measured data which characterize the sound transmission by the relevant elements and openings in the building envelope. These sound power levels, together with those of other sound sources in or in front of the building envelope, form the basis for the calculation of the sound pressure level at a chosen distance from a building as a measure for the acoustic performance of buildings.



Appendix C - Location Plan

LOCATION PLAN



LCP PROPERTIES LTD
220 Floor, Millbank Tower, Millbank, London, SW1P 4QP

LCP

PROJECT NAME
MAY DAY GREEN

TITLE
Location Plan

PROJECT NUMBER
Project Number
P-003

PHOTOGRAPHIC SURVEY



LOCATION MAP



VIEW 01



VIEW 03



VIEW 02

LCP PROPERTIES LTD
220 Floor, Millbank Tower, Millbank, London, SW1P 4QP

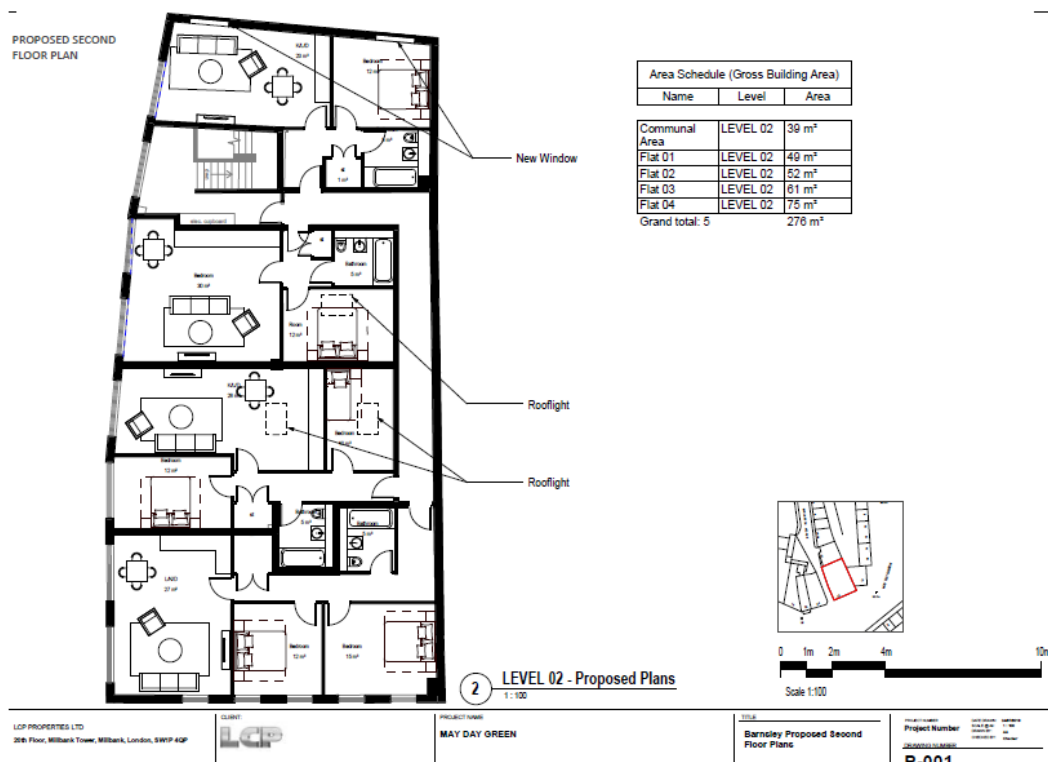
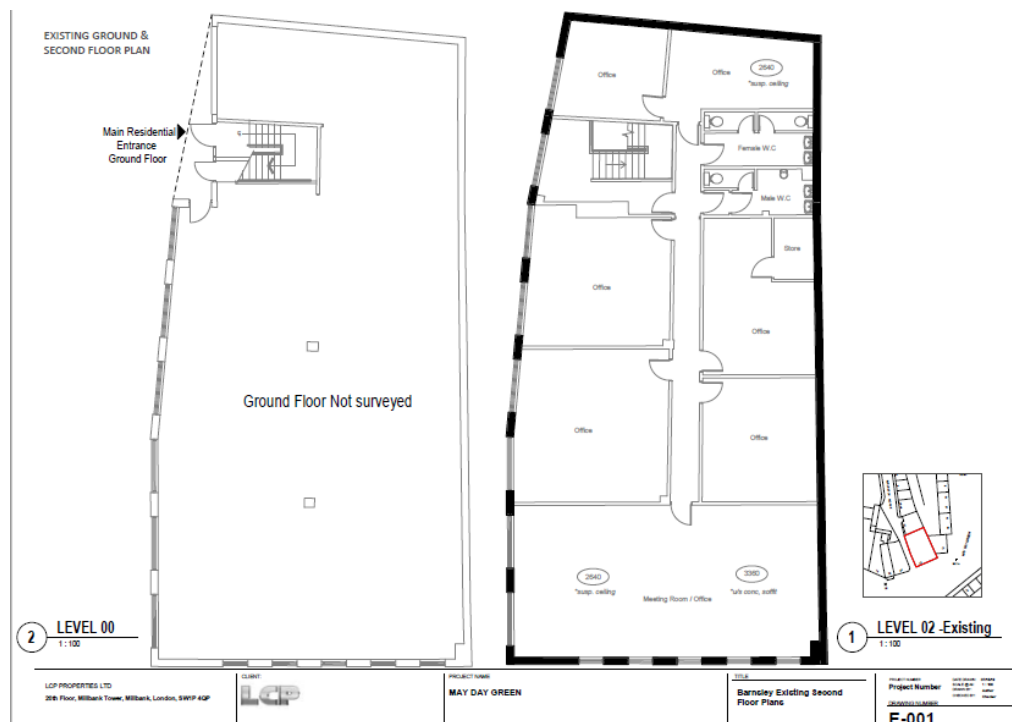
LCP

PROJECT NAME
MAY DAY GREEN

TITLE
Photographic survey

PROJECT NUMBER
Project Number
0012

Appendix D – Site Plans



EXISTING ELEVATIONS

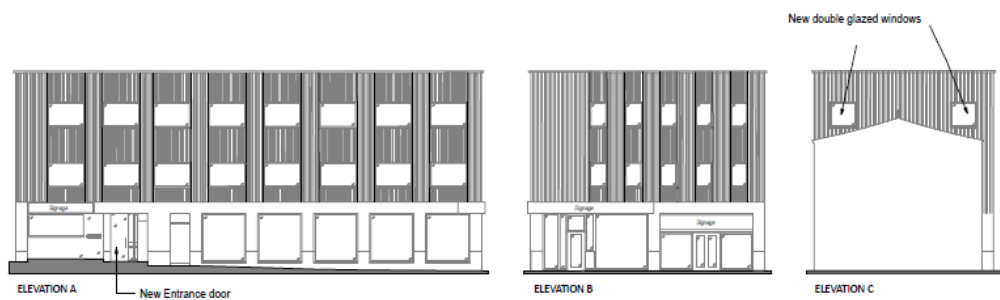


1 Level 02 -Existing Elevations
1:150



LCP PROPERTIES LTD 20th Floor, Millbank Tower, Millbank, London, SW1P 4QP	CLIENT 	PROJECT NAME MAY DAY GREEN	TITLE Existing Elevations	PROJECT NUMBER E-002
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PROPOSED ELEVATIONS



1 Level 02 -Proposed Elevations
1:150



LCP PROPERTIES LTD 20th Floor, Millbank Tower, Millbank, London, SW1P 4QP	CLIENT 	PROJECT NAME MAY DAY GREEN	TITLE Proposed Elevations	PROJECT NUMBER P-002
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Appendix E – Environmental Sound Survey

