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19th April 2023

Jean Image

Assessment of noise at the first floor use at
Oldham Street, Ancoats, M4 5FE for
proposed residential development.

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1.0 **SUMMARY**

At all times, the traffic on Oldham Road was the dominant noise source at both positions. There was negligible impact from the rear or side streets.

The measured levels suggested that that windows would need to remain shut on the facades overlooking the Oldham Road and significantly upgraded glazing is likely to be required. Although the rear and side facades will be far lower, it is likely that windows will still need to be assumed closed to certain of achieving all criteria, but the existing glazing should be fine as it is.

In order to assume that windows are shut, ventilation will need to be provided which gives occupants the realistic option of doing so and we are advised that the developers propose mechanical ventilation.

The ground floor retail unit is unlikely to create significant noise, but the onus should be put on prospective tenants at fitout stage to ensure compliance with criteria.



A R Raymond



P J Durell

2.0 INTRODUCTION

ADC was asked to carry out an independent assessment of the above site with regards to its suitability for residential development from a noise perspective.

This report begins by summarising assessment standards and, where appropriate, discusses alternative interpretations.

After a brief statement of survey details we discuss basic results and the resulting assessment, along with any mitigation which might be implied. We sum-up and conclude at the end, along with brief recommendations.

3.0 ASSESSMENT STANDARDS

3.1 NPPF, NPSE and NPPG

The National Planning Policy Framework (NPPF), the Noise Policy Statement for England (NPSE) and the National Planning Practice Guidance (NPPG) provide nothing in the way of quantitative criteria but instead provide general policy aims and statements and some guidance on how certain situations can be interpreted.

The NPPF's main statement on noise is to be found in paragraph 185:-

185. 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 life⁶⁵;
 - 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.

Paragraph 187 is also relevant:-

187. Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.

The NPPF refers to the NPSE which sets out the following aims:-

1. *avoid significant adverse impacts on health and quality of life;*
2. *mitigate and minimise adverse impacts on health and quality of life;*
and
3. *where possible, contribute to the improvement of health and quality of life.*

It also introduces the concepts of:

- *NOEL – No Observed Effect Level. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.*
- *LOAEL – Lowest Observed Adverse Effect Level. This is the level above which adverse effects on health and quality of life can be detected.*
- *SOAEL – Significant Observed Adverse Effect Level. This is the level above which significant adverse effects on health and quality of life occur.*

SOAEL is clearly something the policy seeks to avoid in aim 1. Aim 2 represents situations between SOAEL and LOAEL, and seeks to minimise and mitigate the effects.

The NPPG section on noise adds some further detail, much of it reproducing the NPPF and NPSE, but some useful qualitative guidance is provided Noise Exposure Hierarchy, as follows:-

Response	Examples of outcomes	Increasing effect level	Action
No Observed Effect Level			
Not present	No Effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

It also makes the point that the subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any particular situation, including the level of the noise in absolute terms and how it might compare with the underlying background noise, the impulsiveness or intermittence pattern of the noise, its spectral content, and the time of day. It discusses in very general terms the issues to consider when introducing noise sources to existing noise sensitive area, new residential development in areas affected by existing noise sources (most of which have their own specific guidance, such as BS 4142, BS 8233, etc.) and the potential impact on wildlife.

3.2 BS8233 and WHO

BS 8233 was updated in March 2014. Quantitatively, however, the design criteria are little changed – just expressed differently to reduce ambiguity in certain situations.

The criteria in Table 4 of BS 8233 are based on WHO guidance and give the desirable criteria for indoor ambient noise levels for dwellings as follows:-

Activity	Location	07:00 to 23:00	23:00 to 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 $L_{Aeq,8hour}$	30 dB $L_{Aeq,8hour}$

Note that the standard accepts the widely used rule of thumb that, for a partly open window, the levels just outside will be 15dB higher than those just inside. This brings us to an external equivalent of the above table, as follows:-

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	50 dB $L_{Aeq,16hour}$	-
Dining	Dining room/area	55 dB $L_{Aeq,16hour}$	-
Sleeping (daytime resting)	Bedroom	50 dB $L_{Aeq,8hour}$	45 dB $L_{Aeq,8hour}$

It goes on to state that, where necessary, the criteria can be relaxed by up to 5 dB and still achieve reasonable conditions.

Note that the new version does not explicitly state criteria for bedroom noise in terms of dB L_{Amax} but the WHO Guidelines for Community Noise (or similar) are widely used with a recommendation that the noise inside bedrooms should not typically exceed 45 dB L_{Amax} , for instance no more than 10 to 15 times a night.

Garden area criteria are unchanged with 50 dB L_{Aeq} and 55 dB L_{Aeq} being considered desirable and reasonable respectively.

Note that the new version of BS8233 more explicitly specifies the assessment periods as 16 hour and 8 hour for daytime and night time respectively.

3.3 Local Authority

As far as we are aware no planning conditions have been proposed. However, Manchester City Council has produced a useful document “*Planning and Noise – Technical Guidance*”. Section 3.6.1.1 deals with criteria for internal and garden levels for residential developments.

- *Bedrooms (night time - 23.00 - 07.00) 30 dB 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}*

The document gives a number of reasons for these criteria, but essentially they are at the more stringent end of the criteria suggested in BS 8233 and the WHO Guide. The document justifies the stringent end of the criteria by stating that the acoustic performance of is often less in practice than specified by manufacturers/suppliers, which is reasonable enough. They also state that glazing acoustic performance does not usually take vents into account, which again is true.

However, we must emphasise that our calculations are based on in-situ measurements with the glazing it is and as it will be, so we automatically take on-site performance into account. Also, our calculations always allow for trickle vents, although here mechanical ventilation is proposed so there are no trickle vents to allow for.

4.0 GUIDE TO MODELLING

Full details of calculations are given in Appendix 2. The basic approach is as follows.

1. The external noise break-in is based on the level of external noise just outside the façade(s), the area of the façade(s), the sound insulation properties of the façade(s) and the internal absorption of the room.
2. Measurements were made within two of the worst affected. At face value, the measured levels should be reasonably representative of the proposed internal levels. However, we also need to incorporate changes, such as room sizes and layouts, glazing, vents, carpeting, etc.
3. We begin by analysing the existing room, and then comparing it to the proposed room(s) where different. The first input to the calculation process is the area of the exposed façade. Where more than one façade is exposed, then they can all be entered. The room depth is also entered so as to derive the room volume. Where the room is not a straight forward rectangular shape, an “effective depth” is sometimes entered so as to derive the approximate room volume. Judgement may occasionally be used if the room is not simple, such as a very unusual shape or a multi-use room such as a through-kitchen/dining room/living room, or studio-style area.
4. The reverberation time (RT) is entered. Usually this is a standardised 0.5 seconds for a completed and fitted out room and represents the absorption properties of the room. For an undeveloped site it is usually longer due to the absence of carpets and furnishings.
5. Two corrections result from the above inputs. Firstly, we have the Area Correction. Put simply, the greater the exposed area, the more noise will break in. The correction is $10 \times \log(\text{Effective Area})$ and is usually a positive number. Note that the “Effective Area” takes account of the method of modelling vents – see later. The Room Correction takes account of the room absorption (more absorption

reduces the noise) and the room volume (a larger volume disperses, and so reduces, the noise). The correction is $10 \times \log(RT/0.163/\text{Volume})$ and is usually a negative number.

6. These corrections, together with the sound insulation properties of the façade(s) give us the basic outside-to-inside level difference. The sound insulation properties of the façade(s), known as the Sound Reduction Index (SRI or just R) are effectively the sound insulation of 1m^2 of material (apart from vents – see later). Of course, a façade is usually made up of more than one element – windows and walls for instance. The overall SRI or R is referred to as the Composite SRI or composite R and is related to the SRI or R of the individual elements and their respective areas. SRI or R figures are usually based on laboratory tests and therefore somewhat idealised.

An additional complication is that performance data for vents is generally standardised to 10m^2 . The area of a vent is therefore usually entered as 10m^2 , even though its actual area will usually be nowhere near that much. Note, however, that mechanical ventilation is proposed in this case so there are no trickle vents to allow for.

7. So, the composite SRI or R, combined with the areas and room corrections gives us the basic level difference to be expected under perfect (laboratory) conditions. However, actual site conditions are affected by workmanship, which can never be guaranteed to be perfect, and flanking paths (noise paths other than straight through the façade(s)). Here, however, the measured internal noise includes these and so a correction is not usually required.
8. The calculated inside-to-outside level difference for the existing rooms is set against the actual measured levels when looking at the proposed rooms so that any changes (room sizes and layouts, glazing, vents, absorption (fit-out), etc.) can be taken into account and used to calculate the proposed internal levels.
9. The process is repeated in octave bands across the frequency range to derive the predicted internal levels.

5.0 SURVEY DETAILS

5.1 Site Times and Personnel

The measurements were carried out by Mark Pimlett of ADC Acoustics.

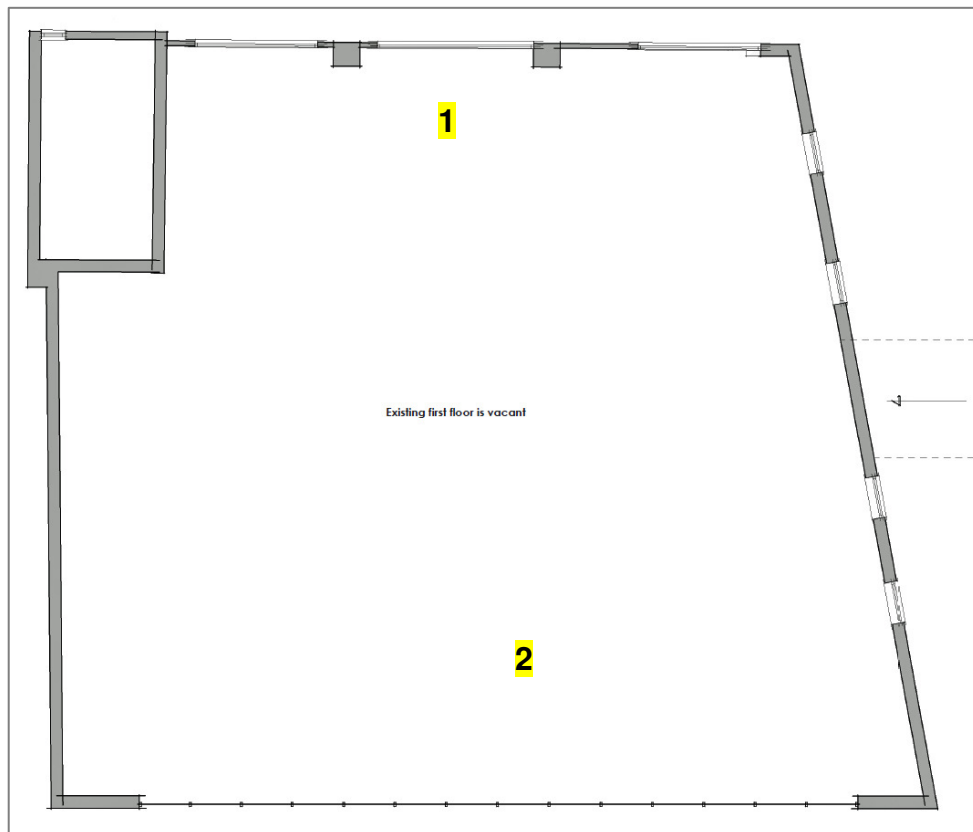
Measurements were carried out on 31st March 2023 from approximately 18.40 hours to 10:10 hours on the 3rd April 2023. These times covered a Friday afternoon through to mid-morning the following Monday, so as to capture what is likely to be the busiest times. Measurements were continuous, apart from a power failure on one of the two meters during the Saturday daytime. The measurements were periodically attended.

5.2 Instrumentation

Instrumentation used were two Rion NL-52 Class I sound level meters which hold current calibration certificates and which were field-calibrated as necessary with no drift noted. The meters were set up to measure continuous 5 minute samples in terms of dB L_{eq} , dB L_{max} and dB L_{90} in overall A-weighted terms, and in octave bands across the frequency range. In addition a Rion N28 was used to measure reverberation times. See Definition of Acoustic Terms in Appendix 1.

5.3 Measurement Positions

The main measurement positions were as shown on the following plan.



The positions were chosen to represent the front and back of the development, position 1 at the rear façade and position 2 at the front façade. However, as it turned out, the open plan area meant that results for the two positions were almost identical. The microphones were 1.3 m above the floor.

5.4 Survey Conditions

We have no reason to believe that the conditions we found on the survey were anything other than representative of normal conditions. As the measurements were internal, the weather was not crucial but, for the record, there was no rain and roads were dry, and there was negligible wind.

The room was entirely open-plan, uncarpeted and unfurnished and was very reverberant.

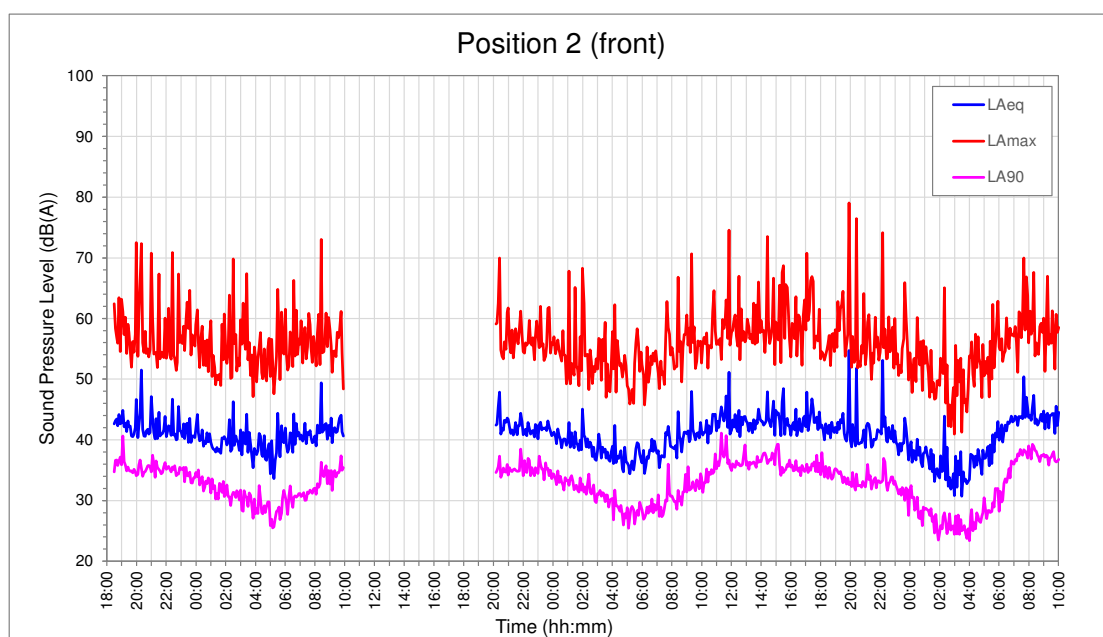
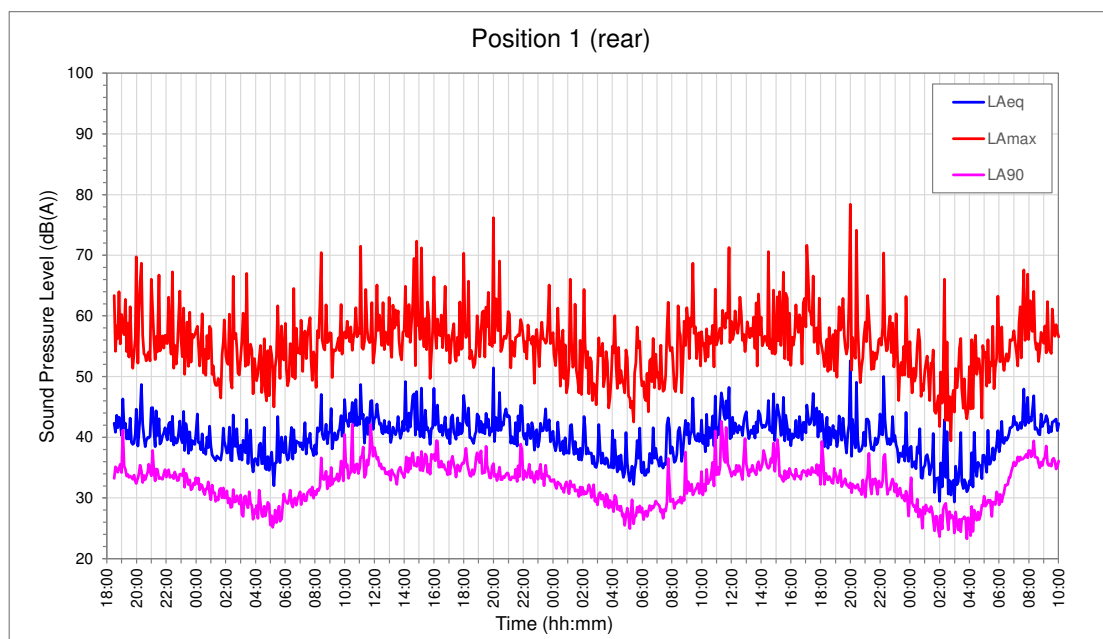
6.0 RESULTS AND DISCUSSIONS

At all times, the traffic on Oldham Road was the dominant noise source at both positions. There was negligible impact from the rear or side streets. At times, the flow of water was audible from a waste pipe from the apartments above, most likely, showers, baths, toilets, etc. It is not an important part of the planning process, but should be kept in mind for the design development stage – ie. the pipe will need boxing-off. It is not referred to any further in this report.

Note that there was power failure at Position 2 for a few hours on the Saturday as shown in the results below. This was rectified as soon as it was noticed and the calibration checked.

6.1 Basic Results

Results are best presented graphically as follows:-



A summary of overall levels is as follows:-

<i>Position 1 (rear)</i>	<i>Index</i>	<i>dB(A)</i>
Overall Daytime	Leq	42
	Lmax	61
	L90	35
Overall Night Time	Leq	38
	Lmax	55
	L90	30

<i>Position 2 (front)</i>	<i>Index</i>	<i>dB(A)</i>
Overall Daytime	Leq	43
	Lmax	62
	L90	35
Overall Night Time	Leq	40
	Lmax	57
	L90	31

6.2 Assessments

The above results give the following assessments.

The measured levels appear to suggest that sound insulation will need to be designed to reduce external noise break-in as follows:

<i>Position</i>	<i>Environment</i>	<i>MCC and BS8233 desirable* criteria</i>	<i>MCC and WHO-Type Criteria</i>
1	Living Rooms	7 dB L _{Aeq}	-
	Bedrooms	8 dB L _{Aeq}	10 dB L _{Amax}
2	Living Rooms	8 dB L _{Aeq}	-
	Bedrooms	10 dB L _{Aeq}	12 dB L _{Amax}

* BS 8233 considers a 5 dB relaxation would still provide *reasonable* conditions

So, ignoring for now changes to windows, room layouts and fit out, rooms to the front facades are up to 10 dB above BS 8233 criteria for reasonable conditions, which are the same as the MCC typical criteria, and up to 12 dB in terms of the L_{Amax} levels. To the rear the level appear to very similar, but the measurements were totally dominated by the noise from Oldham Road across the existing open plan area. There was negligible impact from the rear and side streets themselves. See later.

6.3 Modelled Levels and Mitigation

The levels suggested that that windows would need to remain shut on the facades overlooking the Oldham Road. Although the rear and side facades will be far lower, it is likely that windows will still need to be assumed closed to certain of achieving all criteria.

In order to assume that windows are shut, ventilation will need to be provided which gives occupants the realistic option of doing so. We are advised that the developers propose mechanical ventilation.

A summary of mitigation (or building elements assumed in our calculations) is as follows:-

<i>Façade</i>	<i>Room Type</i>	<i>Make-Up on Which Calculations are Based</i>
Rear and Side Facades	Plot B Kitchen/Dining/Living Room	Walls: Traditional Masonry
		Glazing: As Existing
		Vents: None
Rear Façade	Plot B Bedroom	Walls: Traditional Masonry
		Glazing: As Existing
		Vents: None
Rear Façade	Plot A Bedroom	Walls: Traditional Masonry
		Glazing: As Existing
		Vents: None
Oldham Road	Plot D Kitchen/Dining/Living Room	Walls: Traditional Masonry
		Glazing: 38 dB R_w + Ctr, eg. Existing+50+4
		Vents: None
Oldham Road	Plot D Bedroom	Walls: Traditional Masonry
		Glazing: 38 dB R_w + Ctr, eg. Existing+100+4
		Vents: None
Oldham Road	Plot C Bedroom	Walls: Traditional Masonry
		Glazing: 38 dB R_w + Ctr, eg. Existing+100+4
		Vents: None

NB. R_w should come with a negative C_{tr} term, usually around -5 dB, eg. 35 dB R_w and -5 dB C_{tr} is 30 dB R_w+C_{tr}

The rooms are used as worst case examples as they are exposed on two facades and/or have large window areas and/or short room depths. Other rooms on the same façade with the same glazing and vent specification can be expected to perform better.

Note that the table provides the acoustic specifications (such as R_w for windows) to meet appropriate criteria. The glazing build-ups which are also shown are examples and many other options achieving the same acoustic performance are available. For instance the existing glazing can be fitted with secondary panes internally, or replaced with a double glazed unit with the same performance.

Full calculation details are shown in Appendix 2 and a summary of predicted internal noise levels is as follows:-

6.4 Commercial Unit

We are advised that the ground floor retail unit is currently under development as a convenience store for a major brand. It is not possible to assess the potential impact in detail but basic Building Regulations requirements for the party floor should be more than adequate. As a rough guide, a Building Regulations sound insulation of around 50 dB D_w should allow levels up to around 80 dB in the store before the criteria are exceeded within the apartments. However, we recommend that the onus should be put on prospective commercial tenants at fitout stage to ensure compliance with criteria. It would also be for prospective tenants to submit proposals for any mechanical equipment.

7.0 CONCLUSIONS/RECOMMENDATIONS

The measured levels suggested that that windows would need to remain shut on the facades overlooking the Oldham Road and significantly

upgraded glazing is likely to be required. Although the rear and side facades will be far lower, it is likely that windows will still need to be assumed closed to certain of achieving all criteria, but the existing glazing should be fine as it is.

In order to assume that windows are shut, ventilation will need to be provided which gives occupants the realistic option of doing so and we are advised that the developers propose mechanical ventilation.

The ground floor retail unit is unlikely to create significant noise, but the onus should be put on prospective tenants at fitout stage to ensure compliance with criteria.

We recommend that you issue this report to planners and we would encourage officers to contact us directly with any queries.

Appendix 1

Definition of Acoustic Terms

The Decibel

The decibel is the basic unit of noise measurement and is denoted dB. Technically, it is a means of expressing the difference in noise level between the measured noise and a standard level of noise. Most often the threshold of human hearing is used as the standard reference but it really should be stated. The threshold of human hearing is a sound pressure of $20\mu\text{Pa}$ or a sound power of 1pW .

A sound pressure level or SPL should be expressed in dB(re. $20\mu\text{Pa}$). A sound power level or SWL should be expressed in dB(re. 1pW). If the reference levels are omitted, it will often (but not always) be safe to assume that they are referenced to the threshold of human hearing.

A-Weighting and dB(A)

The human hearing system responds differently to different frequencies. The A-weighting system takes account of this by emphasising mid and high frequencies more than low frequencies to give an overall level. An A-Weighted noise level, therefore, reflects the way normal, healthy hearing would perceive the overall level of the noise. The basic unit is dB(A), although other systems of expressing an A-weighted level are discussed below.

Other weighting systems, such as C-Weighting, denoted dB(C), reflect the human hearing system's response at higher noise levels.

Equivalent Continuous Sound Level, L_{eq}

This is a kind of mean noise level.

The unit is dB L_{eq} . For A-weighted levels the unit is dB(A) L_{eq} or, in more modern units, dB L_{Aeq} . The Noise at Work Regulations use $L_{eq(s)}$ which refers to a sample level.

Maximum Level, L_{max}

This is the maximum level reached (usually for a fraction of a second) in the measurement period.

The unit is dB L_{max} . For A-weighted levels the unit is dB(A) L_{max} or, in more modern units, dB L_{Amax} .

Statistical (Percentile) Levels, L_n

During a measurement of fluctuating noise, it is often useful to establish the levels exceeded for a percentage of the time. L_n is the index representing the level exceeded for $n\%$ of the measurement period.

The unit is dB L_n . For A-weighted levels, the unit is dB(A) L_n or, in more modern units, dB L_{A_n} .

Common examples are as follows :-

dB L_{A90} is the A-weighted level exceeded for 90% of the time and is often used to describe the underlying background noise.

dB L_{A50} is the A-weighted level exceeded for 50% of the time. Mathematically, it is the median, another kind of average.

dB L_{A10} is the A-weighted level exceeded for 10% of the time and has traditionally been used to describe the intermittent highs in the noise climate such as passing cars or aircraft.

Frequency Analysis

Here the audible frequency range is divided up into bands and the noise level is expressed in each frequency band from low pitches to high pitches.

Octave Band analysis is where the frequency range is divided into 8 bands from 63 Hz to 8kHz, or sometimes into 10 bands from 31.5 Hz to 16kHz.

1/3 Octave Band analysis provides more detailed subdivision into 24 bands from 50 Hz to 10kHz, or sometimes into 30 bands from 20Hz to 20kHz.

Narrow Band analysis takes this further with the possibility of many thousands of bands, possibly only 1Hz wide, or even less.

In all types of frequency analysis, the level in each band can be expressed in terms of L_{eq} , L_{max} , L_n , etc. as defined above.

Appendix 2

Measurement and Calculation Details

Measurement Summary

Position	Time	Index	dB(A)	63	125	250	500	1k	2k	4k	8k
1	Daytime	Leq	42	54	51	43	36	36	34	32	25
		Lmax	61	69	71	63	55	54	52	48	41
		L90	35	47	42	36	30	30	25	23	17
	Night Time	Leq	38	51	47	39	31	33	29	27	22
		Lmax	55	66	66	58	48	48	45	43	37
		L90	30	43	38	32	25	25	18	13	14
2	Daytime	Leq	43	57	52	45	37	37	34	30	22
		Lmax	62	72	72	65	56	55	53	49	39
		L90	35	50	43	37	30	30	25	21	15
	Night Time	Leq	40	54	48	41	33	34	30	25	18
		Lmax	57	70	68	60	50	49	46	42	34
		L90	31	45	39	33	26	26	21	13	13

Required Reductions for BS 8233 Guidelines

Position	Environment	MCC and BS8233 desirable* criteria	MCC and WHO-Type Criteria
1	Living Rooms	7 dB L _{Aeq}	-
	Bedrooms	8 dB L _{Aeq}	10 dB L _{Amax}
2	Living Rooms	8 dB L _{Aeq}	-
	Bedrooms	10 dB L _{Aeq}	12 dB L _{Amax}

* BS 8233 considers a 5 dB relaxation would still provide *reasonable* conditions

Mitigation Summary

Façade	Room Type	Make-Up on Which Calculations are Based
Rear and Side Facades	Plot B Kitchen/Dining/Living Room	Walls: Traditional Masonry
		Glazing: As Existing
		Vents: None
Rear Façade	Plot B Bedroom	Walls: Traditional Masonry
		Glazing: As Existing
		Vents: None
Rear Façade	Plot A Bedroom	Walls: Traditional Masonry
		Glazing: As Existing
		Vents: None
Oldham Road	Plot D Kitchen/Dining/Living Room	Walls: Traditional Masonry
		Glazing: 38 dB R _w + C _{tr} , eg. Exisitng+50+4
		Vents: None
Oldham Road	Plot D Bedroom	Walls: Traditional Masonry
		Glazing: 38 dB R _w + C _{tr} , eg. Exisitng+100+4
		Vents: None
Oldham Road	Plot C Bedroom	Walls: Traditional Masonry
		Glazing: 38 dB R _w + C _{tr} , eg. Exisitng+100+4
		Vents: None

NB. R_w should come with a negative C_{tr} term, usually around -5 dB, eg. 35 dB R_w and -5 dB C_{tr} is 30 dB R_w+C_{tr}

Predicted Summary

Façade	Room Type	Time	Index	dB(A)	63	125	250	500	1k	2k	4k	8k
Rear and Side Facades	Plot B Kitchen/Dining/Living Room	Daytime	Leq	31	42	40	31	24	24	22	21	16
		Night Time	Leq	27	39	36	27	19	20	17	16	13
			Lmax	44	55	55	46	36	36	34	32	28
Rear Façade	Plot B Bedroom	Daytime	Leq	28	41	37	29	21	22	20	18	14
		Night Time	Leq	24	37	33	25	16	18	15	13	10
			Lmax	41	53	52	43	33	33	31	29	25
Rear Façade	Plot A Bedroom	Daytime	Leq	29	40	38	30	22	22	20	20	15
		Night Time	Leq	25	37	34	26	18	19	16	15	12
			Lmax	42	53	53	44	34	34	32	31	26
Oldham Road	Plot D Kitchen/Dining/Living Room	Daytime	Leq	31	47	42	27	22	25	21	7	5
		Night Time	Leq	27	44	38	23	18	22	16	2	2
			Lmax	44	59	57	41	34	37	33	18	17
Oldham Road	Plot D Bedroom	Daytime	Leq	30	46	44	25	15	14	17	11	9
		Night Time	Leq	26	43	40	21	11	10	12	6	6
			Lmax	44	58	59	39	28	26	28	22	21
Oldham Road	Plot C Bedroom	Daytime	Leq	30	47	45	25	16	14	17	11	10
		Night Time	Leq	26	43	41	21	11	11	12	6	6
			Lmax	44	59	60	40	28	26	29	22	21

Position 1 Break-In

Position 1 Open Plan Area (Existing)			dB(A)	63	125	250	500	1k	2k	4k	8k
Width of Exposed Façade 1	22.00 m		-	-	-	-	-	-	-	-	-
Width of Exposed Façade 2	19.00 m		-	-	-	-	-	-	-	-	-
Width of Exposed Façade 3	16.00 m		-	-	-	-	-	-	-	-	-
Width of Exposed Façade 4	0.00 m		-	-	-	-	-	-	-	-	-
Total Exposed Façade Width	57.00 m		-	-	-	-	-	-	-	-	-
Element Height	3.20 m		-	-	-	-	-	-	-	-	-
Effective Room Depth (re. Exposed façade 1)	16.50 m										
Element Area	182.40 m ²		-	-	-	-	-	-	-	-	-
Effective Area (ie. with vents)	182.40 m ²		-	-	-	-	-	-	-	-	-
Room Volume	1161.60 m ³		-	-	-	-	-	-	-	-	-
Measured RT			-	2.16	1.60	1.62	1.78	1.88	1.55	1.27	0.80
Element Area Correction			-	23	23	23	23	23	23	23	23
Room Correction 10 x Log (RT/0.163/V)			-	-19	-21	-21	-20	-20	-21	-22	-24
Walls: Traditional Masonry	88.48 m ²		-	23	32	41	47	49	53	58	55
Glazing: As Existing (est 4+20+4)	93.92 m ²		-	15	21	17	25	35	37	31	31
Vents: None	0.00 m ²		-	0	0	0	0	0	0	0	0
Composite SRI	182.40 m ²		-	17	24	20	28	38	40	34	34
Level Difference (Reverberant only)			-	-14	-22	-18	-26	-35	-38	-33	-35
Façade relative to Measurement Position			-	14	22	18	26	35	38	33	35
Allowance for flanking/workmanship (as measured so n/a)			-	0	0	0	0	0	0	0	0
Existing Levels Modelled	Daytime	Leq	42	54	51	43	36	36	34	32	25
	Night	Leq	38	51	47	39	31	33	29	27	22
	Time	Lmax	55	66	66	58	48	48	45	43	37

Predicted Break-in

Rear and Side Facades Plot B Kitchen/Dining/Living Room			dB(A)	63	125	250	500	1k	2k	4k	8k
Width of Exposed Façade 1	3.80 m		-	-	-	-	-	-	-	-	-
Width of Exposed Façade 2	6.60 m		-	-	-	-	-	-	-	-	-
Width of Exposed Façade 3	0.00 m		-	-	-	-	-	-	-	-	-
Width of Exposed Façade 4	0.00 m		-	-	-	-	-	-	-	-	-
Total Exposed Façade Width	10.40 m		-	-	-	-	-	-	-	-	-
Element Height	2.50 m		-	-	-	-	-	-	-	-	-
Effective Room Depth (re. Exposed façade 1)	8.16 m										
Element Area	26.00 m ²		-	-	-	-	-	-	-	-	-
Effective Area (ie. with vents)	26.00 m ²		-	-	-	-	-	-	-	-	-
Room Volume	77.50 m ³		-	-	-	-	-	-	-	-	-
Assumed RT	0.50 s		-	-	-	-	-	-	-	-	-
Element Area Correction			-	14	14	14	14	14	14	14	14
Room Correction 10 x Log (RT/0.163/V)			-	-14	-14	-14	-14	-14	-14	-14	-14
Walls: Traditional Masonry	20.90 m ²		-	23	32	41	47	49	53	58	55
Glazing: As Existing	5.10 m ²		-	15	21	17	25	35	37	31	31
Vents: None	0.00 m ²		-	0	0	0	0	0	0	0	0
Composite SRI	26.00 m ²		-	20	27	24	32	41	44	38	38
Level Difference (Reverberant only)			-	-20	-27	-24	-32	-41	-44	-38	-38
Façade relative to Measurement Position -6 dB*			-	8	16	12	20	29	32	27	29
Allowance for flanking/workmanship (based on as measured, so n/a)			-	0	0	0	0	0	0	0	0
Predicted Internal Levels	Daytime	Leq	31	42	40	31	24	24	22	21	16
	Night	Leq	27	39	36	27	19	20	17	16	13
	Time	Lmax	44	55	55	46	36	36	34	32	28

<i>Rear Façade</i> <i>Plot B Bedroom</i>		<i>dB(A)</i>	63	125	250	500	1k	2k	4k	8k
Width of Exposed Façade 1	3.90 m	-	-	-	-	-	-	-	-	-
Width of Exposed Façade 2	0.00 m	-	-	-	-	-	-	-	-	-
Width of Exposed Façade 3	0.00 m	-	-	-	-	-	-	-	-	-
Width of Exposed Façade 4	0.00 m	-	-	-	-	-	-	-	-	-
Total Exposed Façade Width	3.90 m	-	-	-	-	-	-	-	-	-
Element Height	2.50 m	-	-	-	-	-	-	-	-	-
Effective Room Depth (re. Exposed façade 1)	3.80 m	-	-	-	-	-	-	-	-	-
Element Area	9.75 m2	-	-	-	-	-	-	-	-	-
Effective Area (ie. with vents)	9.75 m2	-	-	-	-	-	-	-	-	-
Room Volume	37.05 m3	-	-	-	-	-	-	-	-	-
Assumed RT	0.50 s	-	-	-	-	-	-	-	-	-
Element Area Correction		-	10	10	10	10	10	10	10	10
Room Correction 10 x Log (RT/0.163/V)		-	-11	-11	-11	-11	-11	-11	-11	-11
Walls: Traditional Masonry	8.45 m2	-	23	32	41	47	49	53	58	55
Glazing: As Existing	1.30 m2	-	15	21	17	25	35	37	31	31
Vents: None	0.00 m2	-	0	0	0	0	0	0	0	0
Composite SRI	9.75 m2	-	21	28	26	34	43	45	40	40
Level Difference (Reverberant only)		-	-22	-29	-27	-35	-44	-46	-41	-41
Façade relative to Measurement Position -6 dB*		-	8	16	12	20	29	32	27	29
Allowance for flanking/workmanship (based on as measured, so n/a)		-	0	0	0	0	0	0	0	0
Predicted Internal Levels	Daytime	Leq	28	41	37	29	21	22	20	18
	Night	Leq	24	37	33	25	16	18	15	13
	Time	Lmax	41	53	52	43	33	33	31	29

<i>Rear Façade</i> <i>Plot A Bedroom</i>		<i>dB(A)</i>	63	125	250	500	1k	2k	4k	8k
Width of Exposed Façade 1	3.30 m	-	-	-	-	-	-	-	-	-
Width of Exposed Façade 2	0.00 m	-	-	-	-	-	-	-	-	-
Width of Exposed Façade 3	0.00 m	-	-	-	-	-	-	-	-	-
Width of Exposed Façade 4	0.00 m	-	-	-	-	-	-	-	-	-
Total Exposed Façade Width	3.30 m	-	-	-	-	-	-	-	-	-
Element Height	2.50 m	-	-	-	-	-	-	-	-	-
Effective Room Depth (re. Exposed façade 1)	5.80 m	-	-	-	-	-	-	-	-	-
Element Area	8.25 m2	-	-	-	-	-	-	-	-	-
Effective Area (ie. with vents)	8.25 m2	-	-	-	-	-	-	-	-	-
Room Volume	47.85 m3	-	-	-	-	-	-	-	-	-
Assumed RT	0.50 s	-	-	-	-	-	-	-	-	-
Element Area Correction		-	9	9	9	9	9	9	9	9
Room Correction 10 x Log (RT/0.163/V)		-	-12	-12	-12	-12	-12	-12	-12	-12
Walls: Traditional Masonry	6.05 m2	-	23	32	41	47	49	53	58	55
Glazing: As Existing	2.20 m2	-	15	21	17	25	35	37	31	31
Vents: None	0.00 m2	-	0	0	0	0	0	0	0	0
Composite SRI	8.25 m2	-	19	26	23	31	40	42	37	37
Level Difference (Reverberant only)		-	-22	-29	-25	-33	-43	-45	-39	-39
Façade relative to Measurement Position -6 dB*		-	8	16	12	20	29	32	27	29
Allowance for flanking/workmanship (based on as measured, so n/a)		-	0	0	0	0	0	0	0	0
Predicted Internal Levels	Daytime	Leq	29	40	38	30	22	22	20	15
	Night	Leq	25	37	34	26	18	19	16	15
	Time	Lmax	42	53	53	44	34	34	32	31

Position 2 Break-In

Position 2 Open Plan Area (Existing)			dB(A)	63	125	250	500	1k	2k	4k	8k
Width of Exposed Façade 1	22.00 m		-	-	-	-	-	-	-	-	-
Width of Exposed Façade 2	19.00 m		-	-	-	-	-	-	-	-	-
Width of Exposed Façade 3	16.00 m		-	-	-	-	-	-	-	-	-
Width of Exposed Façade 4	0.00 m		-	-	-	-	-	-	-	-	-
Total Exposed Façade Width	57.00 m		-	-	-	-	-	-	-	-	-
Element Height	3.00 m		-	-	-	-	-	-	-	-	-
Effective Room Depth (re. Exposed façade 1)	16.50 m		-	-	-	-	-	-	-	-	-
Element Area	171.00 m ²		-	-	-	-	-	-	-	-	-
Effective Area (ie. with vents)	171.00 m ²		-	-	-	-	-	-	-	-	-
Room Volume	1089.00 m ³		-	-	-	-	-	-	-	-	-
Measured RT			-	2.16	1.60	1.62	1.78	1.88	1.55	1.27	0.80
Element Area Correction			-	22	22	22	22	22	22	22	22
Room Correction 10 x Log (RT/0.163/V)			-	-19	-20	-20	-20	-20	-21	-21	-23
Walls: Traditional Masonry	77.08 m ²		-	23	32	41	47	49	53	58	55
Glazing: As Existing (est 4+20+4)	93.92 m ²		-	15	21	17	25	35	37	31	31
Vents: None	0.00 m ²		-	0	0	0	0	0	0	0	0
Composite SRI	171.00 m ²		-	17	23	20	28	37	40	34	34
Level Difference (Reverberant only)			-	-14	-21	-18	-25	-35	-38	-33	-35
Façade relative to Measurement Position			-	14	21	18	25	35	38	33	35
Allowance for flanking/workmanship (as measured so n/a)			-	0	0	0	0	0	0	0	0
Existing Levels Modelled	Daytime	Leq	42	54	51	43	36	36	34	32	25
	Night	Leq	38	51	47	39	31	33	29	27	22
	Time	Lmax	55	66	66	58	48	48	45	43	37

Predicted Break-in

Oldham Road Plot D Kitchen/Dining/Living Room			dB(A)	63	125	250	500	1k	2k	4k	8k
Width of Exposed Façade 1	5.10 m		-	-	-	-	-	-	-	-	-
Width of Exposed Façade 2	0.00 m		-	-	-	-	-	-	-	-	-
Width of Exposed Façade 3	0.00 m		-	-	-	-	-	-	-	-	-
Width of Exposed Façade 4	0.00 m		-	-	-	-	-	-	-	-	-
Total Exposed Façade Width	5.10 m		-	-	-	-	-	-	-	-	-
Element Height	2.50 m		-	-	-	-	-	-	-	-	-
Effective Room Depth (re. Exposed façade 1)	7.00 m		-	-	-	-	-	-	-	-	-
Element Area	12.75 m ²		-	-	-	-	-	-	-	-	-
Effective Area (ie. with vents)	12.75 m ²		-	-	-	-	-	-	-	-	-
Room Volume	89.25 m ³		-	-	-	-	-	-	-	-	-
Assumed RT	0.50 s		-	-	-	-	-	-	-	-	-
Element Area Correction			-	11	11	11	11	11	11	11	11
Room Correction 10 x Log (RT/0.163/V)			-	-15	-15	-15	-15	-15	-15	-15	-15
Walls: Traditional Masonry	1.47 m ²		-	23	32	41	47	49	53	58	55
Glazing: 38 dB Rw + Ctr, eg. Existing+50+4	11.28 m ²		-	17	26	30	35	42	46	54	51
Vents: None	0.00 m ²		-	0	0	0	0	0	0	0	0
Composite SRI	12.75 m ²		-	17	26	30	35	42	46	54	51
Level Difference (Reverberant only)			-	-21	-30	-34	-39	-46	-50	-58	-55
Façade relative to Measurement Position			-	14	21	18	25	35	38	33	35
Allowance for flanking/workmanship (based on as measured, so n/a)			-	0	0	0	0	0	0	0	0
Predicted Internal Levels	Daytime	Leq	31	47	42	27	22	25	21	7	5
	Night	Leq	27	44	38	23	18	22	16	2	2
	Time	Lmax	44	59	57	41	34	37	33	18	17

Oldham Road Plot D Bedroom			dB(A)	63	125	250	500	1k	2k	4k	8k
Width of Exposed Façade 1	3.70 m		-	-	-	-	-	-	-	-	-
Width of Exposed Façade 2	0.00 m		-	-	-	-	-	-	-	-	-
Width of Exposed Façade 3	0.00 m		-	-	-	-	-	-	-	-	-
Width of Exposed Façade 4	0.00 m		-	-	-	-	-	-	-	-	-
Total Exposed Façade Width	3.70 m		-	-	-	-	-	-	-	-	-
Element Height	2.50 m		-	-	-	-	-	-	-	-	-
Effective Room Depth (re. Exposed façade 1)	4.60 m										
Element Area	9.25 m2		-	-	-	-	-	-	-	-	-
Effective Area (ie. with vents)	9.25 m2		-	-	-	-	-	-	-	-	-
Room Volume	42.55 m3		-	-	-	-	-	-	-	-	-
Assumed RT	0.50 s		-	-	-	-	-	-	-	-	-
Element Area Correction			-	10	10	10	10	10	10	10	10
Room Correction 10 x Log (RT/0.163/V)			-	-11	-11	-11	-11	-11	-11	-11	-11
Walls: Traditional Masonry	0.37 m2		-	23	32	41	47	49	53	58	55
Glazing: 38 dB Rw + Ctr, eg. Exisitng+100+4	8.88 m2		-	20	26	34	44	56	53	52	49
Vents: None	0.00 m2		-	0	0	0	0	0	0	0	0
Composite SRI	9.25 m2		-	20	26	34	44	55	53	52	49
Level Difference (Reverberant only)			-	-22	-28	-36	-46	-57	-55	-54	-51
Façade relative to Measurement Position			-	14	21	18	25	35	38	33	35
Allowance for flanking/workmanship (based on as measured, so n/a)			-	0	0	0	0	0	0	0	0
Predicted Internal Levels	Daytime	Leq	30	46	44	25	15	14	17	11	9
	Night	Leq	26	43	40	21	11	10	12	6	6
	Time	Lmax	44	58	59	39	28	26	28	22	21

Oldham Road Plot C Bedroom			dB(A)	63	125	250	500	1k	2k	4k	8k
Width of Exposed Façade 1	3.80 m		-	-	-	-	-	-	-	-	-
Width of Exposed Façade 2	0.00 m		-	-	-	-	-	-	-	-	-
Width of Exposed Façade 3	0.00 m		-	-	-	-	-	-	-	-	-
Width of Exposed Façade 4	0.00 m		-	-	-	-	-	-	-	-	-
Total Exposed Façade Width	3.80 m		-	-	-	-	-	-	-	-	-
Element Height	2.50 m		-	-	-	-	-	-	-	-	-
Effective Room Depth (re. Exposed façade 1)	4.10 m										
Element Area	9.50 m2		-	-	-	-	-	-	-	-	-
Effective Area (ie. with vents)	9.50 m2		-	-	-	-	-	-	-	-	-
Room Volume	38.95 m3		-	-	-	-	-	-	-	-	-
Assumed RT	0.50 s		-	-	-	-	-	-	-	-	-
Element Area Correction			-	10	10	10	10	10	10	10	10
Room Correction 10 x Log (RT/0.163/V)			-	-11	-11	-11	-11	-11	-11	-11	-11
Walls: Traditional Masonry	0.38 m2		-	23	32	41	47	49	53	58	55
Glazing: 38 dB Rw + Ctr, eg. Exisitng+100+4	9.12 m2		-	20	26	34	44	56	53	52	49
Vents: None	0.00 m2		-	0	0	0	0	0	0	0	0
Composite SRI	9.50 m2		-	20	26	34	44	55	53	52	49
Level Difference (Reverberant only)			-	-21	-27	-35	-45	-57	-54	-53	-50
Façade relative to Measurement Position			-	14	21	18	25	35	38	33	35
Allowance for flanking/workmanship (based on as measured, so n/a)			-	0	0	0	0	0	0	0	0
Predicted Internal Levels	Daytime	Leq	30	47	45	25	16	14	17	11	10
	Night	Leq	26	43	41	21	11	11	12	6	6
	Time	Lmax	44	59	60	40	28	26	29	22	21