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**NOISE IMPACT ASSESSMENT FOR PROPOSED DEVELOPMENT:
RESIDENTIAL DEVELOPMENT, ADJACENT TO 7 STATION ROAD,
DODWORTH, SOUTH YORKSHIRE S75 3DJ
PLANNING REFERENCE: 2020/0490**

Prepared for:

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Test Report Number: 1965-62-20

This report has been prepared by Acoustic Solutions with all reasonable skill, care and diligence within the terms of the Contract with the client, incorporating our General Terms and Conditions of Business and taking account of the resources devoted to us by agreement with the client.

We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above.

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The author of this report represents Acoustic Solutions to the exclusion of all other organisations.

1.0 Introduction

1.1

Acoustic Solutions has been commissioned by Mr A Asgari to undertake a noise impact assessment for a proposed development: 2x residential dwellings adjacent to 7 Station Road, Dodworth, planning application: 2020/0490.

1.2

The objectives for the noise impact assessment were as follows:

- Establish the sound level of all potential noise sources in the vicinity of the application site;
- Establish the external ambient sound levels at the application site and its surrounding environs;
- Establish the internal ambient sound levels at the application site, so to determine the potential noise impact upon future occupiers of the proposed residential dwelling in accordance with the National Planning Policy Framework Planning Practice Guidelines on Noise and other pertinent guidance;
- If appropriate, provide recommendations with respect to management and/or structural controls to mitigate and control the potential noise impact upon future occupiers of the proposed development.

Barnsley Metropolitan Borough Council requires: that a noise impact assessment be undertaken, given that the proposed dwelling is located in close proximity to the Dodworth Tap Public House and the Dodworth Central Social Club. No specific noise criteria have been cited, therefore Acoustic Solutions will compare predicted daytime, evening and night time noise levels at adjacent 7 Station Road to the following :

- *35 dB(A) Leq (1 hour) in the bedrooms with windows shut and other means of ventilation provided between 7 am and 11pm.*

- *30dB(A) Leq 5mins in the bedrooms with windows shut and other means of ventilation provided between 11pm and 7am.*
- *35 dB(A) Leq (1 hour) in the living room/s with windows shut and other means of ventilation provided between 7 am and 11pm.*
- *40 dB(A) Leq (1 hour) in other habitable rooms with win doors shut and other means of ventilation provided at all times.*
- *55 dB(A) Leq (1 hour) in all spaces, gardens and balconies at any time.*
- *Prior to the first occupation of each apartment hereby approved, a verification report shall have been first submitted to and approved in writing by the Local Planning Authority, confirming that the internal and external noise levels have been achieved.”*

1.3

This report details the methodology and results of the assessment.

1.4

This report has been prepared for the sole purpose described above and no extended duty of care to any third party is implied or offered.

Third parties referring to the report should consult Mr Asgari and Acoustic Solutions as to the extent to which the findings may be appropriate for their use.

1.5

A glossary of acoustic terms used in the main body of the text is contained in Appendix 1.

2.0 Noise Impact Assessment Criteria

2.1

In terms of noise impact assessment criteria, Paragraph 123 of the National Planning Policy Framework states that planning policies and decisions should aim to *'avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development'*.

2.2

Planning Practice Guidance specifically dealing with noise was uploaded to the Government's Planning Portal in March 2014 as an accompaniment to the National Planning Policy Framework. This guidance is summarised herein.

2.3

The guidance states that noise needs to be considered when new developments may create additional noise. Whilst noise can override other planning concerns, neither the Noise Policy Statement for England nor the National Planning Policy Framework (which reflects the Noise Policy Statement for England) expects noise to be considered in isolation, separately from the economic, social and other environmental dimensions of proposed development.

2.4

In order to determine noise impact, local planning authorities' plan-making and decision taking 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.

2.5

In line with the Explanatory Note of the Noise Policy Statement for England, this would include identifying whether the overall effect of the noise exposure is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation.

2.6

In terms of Observed Effect Levels:

- No Observed Adverse Effect Level (NOAEL) – This is the level of noise exposure below which no effect at all on health or quality of life can be detected;
- Lowest Observed Adverse Effect Level (LOAEL) – This is the level of noise exposure above which adverse effects on health and quality of life can be detected, and;
- Significant Observed Adverse Effect Level (SOAEL) – This is the level of noise exposure above which significant adverse effects on health and quality of life occur.

2.7

At the lowest extreme, when noise is not noticeable, there is by definition no effect. As the noise exposure increases, it will cross the 'no observed' effect level as it becomes noticeable. However, the noise has no adverse effect so long as the exposure is such that it does not cause any change in behaviour or attitude. The noise can slightly affect the acoustic character of an area but not to the extent there is a perceived change in quality of life. If the noise exposure is at this level no specific measures are required to manage the acoustic environment.

2.8

As the exposure increases further, it crosses the lowest observed adverse effect level boundary above which the noise starts to cause small changes in behaviour and attitude, for example, having to turn up the volume on the television or needing to speak more loudly to be heard. The noise therefore starts to have an adverse effect and consideration needs to be given to mitigating and minimising those effects (taking account of the economic and social benefits being derived from the activity causing the noise).

2.9

Increasing noise exposure will at some point cause the significant observed adverse effect level boundary to be crossed. Above this level the noise causes a material change in behaviour such as keeping windows closed for most of the time or avoiding certain activities during periods when the noise is present. If the exposure is above this level the planning process should be used to avoid this effect occurring, by use of appropriate mitigation such as by altering the design and layout. Such decisions must be made taking account of the economic and social benefit of the activity causing the noise, but it is undesirable for such exposure to be caused.

2.10

At the highest extreme, noise exposure would cause extensive and sustained changes in behaviour without an ability to mitigate the effect of noise. The impacts on health and quality of life are such that regardless of the benefits of the activity causing the noise, this situation should be prevented from occurring.

2.11

The following table summarises noise exposure hierarchy, based on likely average response.

		Table 2.1 Guideline “Absolute” Sound Level ¹							
Absolute Sound Level		Absolute Level:	≤40dB	41 - 45dB	46 - 50dB	51 - 55dB	56 - 60dB		≥60dB
		Daytime Effect: ²	NOAEL	NOAEL	NOAEL	LOAEL	SOAEL	SOAEL	SOAEL+
		Evening Effect: ³	NOAEL	NOAEL	LOAEL	SOAEL	SOAEL	SOAEL	SOAEL+
		Night-time Effect: ⁴	NOAEL	LOAEL	SOAEL	SOAEL	SOAEL	SOAEL	SOAEL+
		Effect / Impact Description:	No observed effect on health or quality of life.	Sleep disturbance in bedrooms with window open.	Speech intelligibility within living areas with windows open resulting in moderate annoyance. Greater potential for sleep disturbance and adverse health impact.	Increased potential for sleep disturbance, including significant adverse health effects. Gardens and amenity spaces affected.	Significant adverse health effects likely to all habitable rooms. Occupants unable to open windows due to noise ingress and unable to enjoy garden / amenity areas.	High risk of significant adverse health impact. Unable to use garden and amenity space or have windows open for ventilation.	
Mitigation Considerations:			A1 Use design, layout and landscaping (DLL) to create and preserve areas of amenity and tranquillity to enhance the noise environment.	A2 Protect bedroom facades from noise through DLL. Provide minimum double-glazing with trickle vents to bedrooms.	A3 Protect habitable room facades from noise through DLL with greater protection for bedrooms. Provide higher spec double-glazing with trickle-vents to all habitable rooms.	A4 Bedroom facades to be protected through DLL to bring below LOAEL. Provide higher spec double-glazing with trickle vents to all habitable rooms. Protection of gardens and amenity space through DLL and acoustic fencing.	A5 Bespoke assessment of noise mitigation needs, including consideration of alternative to open window ventilation provision to protect internal noise environment and protection of garden / amenity areas through DLL to bring below LOAEL.		A6 Bespoke assessment of noise impact and mitigation, including DLL, protection of building envelope and provision of alternative amenity space.
Planning Consideration:			No objection	No objection subject to Approved Plans and/or conditions to include satisfactory window specification to bedrooms with facades exposed to LOAEL noise.	No objection subject to Approved Plans and/or conditions to include satisfactory window specification to all habitable rooms with facades exposed to LOAEL noise.	Details of noise mitigation to be supplied as part of planning approval process. Conditions required to implement control measures within the noise report. Refusal if noise report is inadequate.	Details of noise mitigation to be supplied as part of planning approval process. Conditions required to implement control measures within the noise report. Refusal if noise report is inadequate.		Presumption against planning permission being granted, unless detailed noise impact assessment and approved mitigation measures implemented through conditions. Post completion verification of mitigation measures required.

¹ Free-field, outdoor noise level expressed as dB LAeq(T), where T is the reference time period for the relevant Day, Evening or Night-time period.

² Day is from 07:00 to 19:00 and the reference time period (T) is 8 hours.

³ Evening is from 19:00 to 23:00 and the reference time period (T) is 4 hours.

⁴ Night is from 23:00 to 07:00 and the reference time period (T) is 8 hours.

2.12

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. These factors include:

- The source and absolute level of the noise together with the time of day it occurs;
- For non-continuous sources of noise, the number of noise events, and the frequency and pattern of occurrence of the noise;
- The spectral content of the noise (i.e. whether or not the noise contains particular high or low frequency content) and the general character of the noise (i.e. whether or not the noise contains particular tonal characteristics or other particular features);
- The local acoustic character of the area.

2.13

In addition, further useful contextual guidance is provided in:

- British Standard 4142:2014 'Methods for Rating and Assessing Industrial and Commercial Sound' (BS 4142);
- British Standard 8233:2014 'Guidance on Sound Insulation and Noise Reduction for Buildings' (BS 8233);
- World Health Organisation (WHO) Guidelines for Community Noise (1999)

2.14

BS 4142 states:

The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs'. Typically, the greater this difference, the greater the magnitude of the impact. For example:

- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context;*
- A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context;*
- The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context*
- Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact. Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including 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.

2.15

British Standard 8233:2014 'Guidance on Sound Insulation and Noise Reduction for Buildings' (BS 8233: 2014) sets indoor ambient noise levels from residential dwellings (see table below). It should be noted that the daytime criteria is 5 dB lower than that required by Barnsley Metropolitan Borough Council.

Table 2.2 – Indoor Ambient Noise Levels in Dwellings (BS 8233)

Activity	Location	Good Indoor Ambient Noise Levels	
Resting	Living Room	35 dB LAeq (0700–2300)	-
Sleeping (daytime resting)	Bedroom	35 dB LAeq (0700–2300)	30 dB LAeq (2300–0700)

2.16

With regard to sound attenuation through the building envelope, the 'weak points' in the building façade are generally considered to be the windows. The worked example (G.1) at Annex G of BS 8233 suggests that a partially opened window would provide sound attenuation of approximately 15 dB R_w . The Standard also suggests that “..*standard insulating glass units have an insulation value of approximately 30 dB R_w* ” when closed.

2.17

With respect to noise affecting external areas, i.e. gardens, BS 8233 states that “..*it is desirable that the steady noise level does not exceed 50 dB LAeq, and 55 dB LAeq should be regarded as the upper limit*”.

2.18

The World Health Organisation's Guidelines for Community Noise (1999) sets indoor ambient noise levels from residential dwellings (see table below). It should be noted that the daytime criteria is 5 dB lower than that required by Barnsley Metropolitan Borough Council.

Table 2.3 – Indoor Ambient Noise Levels in Dwellings (WHO 1999)

Activity	Location	Good Indoor Ambient Noise Levels	
		Daytime (0700–2300)	Nighttime (2300–0700)
Resting	Living Room	35 dB LAeq (0700–2300)	-
Sleeping (daytime resting)	Bedroom	35 dB LAeq (0700–2300)	30 dB LAeq (2300–0700)

3.00 Baseline Noise Survey

3.1 Site Setting and Proposed Development

The application site is adjacent to 7 Station Road, near Dodworth town centre. (Appendix 2). Station Road itself is fairly busy B-road consisting mostly of domestic dwellings, except where it intersects with B6449 Barnsley Road where 2x licenced premises are located, the Dodworth Tap Public House and the Dodworth Central Social Club. Road traffic travelling along Station Road and customers in the Dodworth Tap's beer garden were the principle noise sources observed.

The application site is situated to the south of Station Road at the junction of Station Road and Baslow Crescent which runs south. Along the site's eastern façade is mature evergreen hedging, approximately 3 metres high. It is understood that the developer proposes to retain this hedging. The hedging stands between the proposed development's east façade and Baslow Crescent; however, it has no real significant acoustic value as a barrier against noise from road traffic using Baslow Crescent..

3.2 Noise Survey

In order to establish the ambient noise level at the application site and its surrounding environs, a baseline noise survey was undertaken on 29 & 30 August 2020.

3.3

For the purpose of the assessment, two noise monitoring position, MP1 & MP2, were adopted (see Appendix 2):

- MP1. Outside the north-east façade of the electricity sub-station. MP1 is 4 metres from the kerb of Station Road and 10 metres from the boundary of the Dodworth Tap Public House. Noise impact at MP1 will likely arise from road traffic, the Dodworth Tap Public House and the Dodworth Central Social Club.

- MP2. Outside the south-west façade of 7A Station Road, the currently empty fast food takeaway located immediately west of 7 Station Road. MP2 is situated on the garden/yard footprint of the proposed dwellings. Noise impact at MP2 will likely arise from air-handling plant serving the fast food takeaway. This includes an air extraction unit located on the rear, south-west façade of 7A. Secondary impact will likely arise from road traffic, the Dodworth Tap Public House and the Dodworth Central Social Club.

3.4 Identified Noise Sources

3.4.1 Road Traffic on Station Road

The proposed development is located approximately 10 metres from Station Road. Daytime, evening and night time noise from road traffic was measured. At its daytime peak, 12x vehicles per-minute passed 7 Station Road. By 19:00 hours this had dropped to 4x vehicles per minute. After midnight, road traffic was insignificant.

3.4.2 Dodworth Tap Public House

The Dodworth Tap PH is located, north-east, directly across Station Road from the proposed development. Immediately to the west is a large beer garden associated with the premises. The weather was dry but cold, and the use of the beer garden by customers only became in any way significant after 19:00 hours. In accordance with current Covid-19 regulations, amplified music was not being played; however, it is general policy, adopted by most local authorities, that amplified music from licenced premises should not be audible in nearby domestic dwellings. This being the case, it is not anticipated that amplified music will become audible at adjacent 7 Station Road upon the lifting of Covid-19 restrictions.

3.4.3 Dodworth Central Social Club

The Dodworth Central Social Club is located 20 metres east, on the same side of Station Road as adjacent number 7. A fire exit door was observed on the

premises' western façade, but no amplified music was heard to be playing. The comments in Paragraph 4.3.2 pertaining to Covid-19 and audibility also apply to the Dodworth Central Social Club. A smoking shelter serving the club is located 40 metres from MP1. Customers using it were not audible at MP1 or MP2 throughout the assessment.

3.4.4 7A Station Road

Although currently vacant, 7A Station Road has historically been used as a fast food takeaway/fish & chip shop. The noise sources associated with this are the premises' air extraction unit. For the purpose of this report, the following assumptions will be made regarding noise levels associated with these sources:

Extraction Fan: MUB/T042 500EC in-line fan manufactured by Systemair. Quoted Sound Power Level (SWL): 73 dB @1 metre. Circular extraction duct emerging vertically from 7A's single storey roof to a height of 1.5m above roof height. Duct diameter: 58cm. Assumed sound attenuation provided by the duct: 0 dB. It is assumed that the extraction unit will operate throughout the premises' hours of operation. The following predictions are made on the assumption that 7A's times of operation will be: 12:00 to 23:00 hours.

3.5

At each microphone location, a series of hourly 15-minute noise measurements were undertaken using a Type 1 integrating sound level meter (Appendix 4). The measurement system calibration was verified immediately before the commencement of the measurement sessions and again at the end. Daytime weather conditions were mostly dry and cold. Night time conditions were cold and dry and cold. The wind was northerly. Speeds throughout were between 2 and 3 m/s. Measurements consisted of A-weighted parameters: L_{Aeq} and L_{Amax} .

3.6 Daytime/Evening Assessment

3.6.1 MP1

The overall external daytime time sound environment, summarised in Table 3.1, could be described as moderately loud. The principle existing daytime/evening noise sources in the vicinity of MP1 was road traffic on Station Road, and (from 19:00 onwards) customers talking in the Dodworth Tap PH beer garden. No Noise from other sources were insignificant.

Table 3.1 MP1 Measured External Sound Levels, Daytime/Evening

Start Time	Measured Noise Level, dB, L _{Aeq} , 15 min	Measured Noise Level, dB L _{Amax} , 15 min
07:00	49	75
08:00	52	76
09:00	51	77
10:00	53	77
11:00	53	75
12:00	58	78
13:00	57	74
14:00	59	75
15:00	55	77
16:00	56	78
17:00	55	77
18:00	54	78
19:00	52	78
20:00	47	75
21:00	46	77
22:00	47	77
Average/Max	53	78

3.6.2 MP2

The overall external daytime time sound environment, summarised in Table 3.2, could be described as quiet to moderately loud. The principle existing daytime/evening noise sources in the vicinity of MP2 was road traffic on Station Road and (from 19:00 onwards) customers talking in the Dodworth Tap PH beer garden (the structure of 7A Station road acting as a partial acoustic barrier to reduced noise levels). No Noise from other sources were insignificant.

Table 3.2 MP2 Measured External Sound Levels, Daytime/Evening

Start Time	Measured Noise Level, dB, L_{Aeq}, 15 min	Measured Noise Level, dB L_{Amax}, 15 min
07:00	44	69
08:00	48	70
09:00	48	69
10:00	49	68
11:00	47	68
12:00	49	69
13:00	46	71
14:00	46	71
15:00	47	72
16:00	45	68
17:00	47	69
18:00	45	68
19:00	45	68
20:00	42	70
21:00	40	67
22:00	41	66
Average/Max	46	72

3.7 Night Time Assessment

3.7.1 MP1

The overall external night time sound environment, summarised in Table 3.3, could be described as moderately quiet to quiet. Between 23:00 and 23:45, the dominant noise source was from customers using the Dodworth Tap Public House. From midnight onwards, intermittent road traffic on Station Road was the principle noise source.

Table 3.3 MP2 Measured External Sound Levels, Night

Start Time	Measured Noise Level, dB, $L_{Aeq, 15 \text{ min}}$	Measured Noise Level, dB $L_{Amax, 15 \text{ min}}$
23:00	48	61
00:00	41	62
01:00	41	64
02:00	39	62
03:00	40	61
04:00	38	62
05:00	40	63
06:00	39	65
Average/Max	41	65

3.7.2 MP2

The overall external night time sound environment, summarised in Table 3.4, could be described as moderately quiet. The dominant noise source from this point onwards was steady to intermittent road traffic on Station Road.

Table 3.4 MP2 Measured External Sound Levels, Night

Start Time	Measured Noise Level, dB, $L_{Aeq, 15 \text{ min}}$	Measured Noise Level, dB $L_{Amax, 15 \text{ min}}$
23:00	39	70
00:00	36	67
01:00	36	68
02:00	37	67
03:00	35	67
04:00	33	66
05:00	34	68
06:00	34	70
Average/Max	36	70

3.8

For the purposes of the Noise Policy Statement for England assessment, Table 3.5 summarises the average measured Daytime, Evening and Average external sound levels, L_{Aeq} .

Table 3.5 Average measured Daytime, Evening and Average external sound levels

Time	MP1	MP2
Ave Day	54	47
Ave Eve	48	42
Ave Night	41	36
Max Day	78	75
Max Eve	78	70
Max Night	65	70

3.9 Predicted Noise Contribution of Noise Sources Associated with 7A Station Road

Table 3.6 summarises the predicted distance-corrected sound levels of the air extraction unit at MP1 & MP2 (Western Façade).

Table 3.6 Predicted distance-corrected sound levels of the air extraction unit at MP1 (Western Façade) & MP2.

Receptor	Noise Source SWL, dB	Distance, m	Absorption Factor, dB	Receptor SPL, dB
MP1	73	20	8	39
MP2	73	5	8	51

Tables 3.7, 3.8 & 3.9 summarise the predicted combined sound level associated with the air extraction unit, road traffic and noise from the Dodworth Tap PH at MP1(west & east facades) & MP2. The prediction is based upon the assumed 12:00-23:00 hours operation hours of any future hot food takeaway at 7A Station Road.

Table 3.7 MP1, West Façade. All Noise Sources

Noise Source	Daytime SPL, dB	Evening SPL, dB	Night Time SPL, dB
Extraction Fan	39	39	0
Road Traffic, Dodworth Tap Customers	54	48	41
Total	54	49	41

Table 3.8 MP1, East Façade. All Noise Sources

Noise Source	Daytime SPL, dB	Evening SPL, dB	Night Time SPL, dB
Extraction Fan	0	0	0
Road Traffic, Dodworth Tap Customers	54	48	41
Total	54	48	41

Table 3.9 MP2, All Noise Sources

Noise Source	Daytime SPL, dB	Evening SPL, dB	Night Time SPL, dB
Extraction Fan	51	51	0
Road Traffic, Dodworth Tap Customers	47	42	36
Total	52	52	36

At MP1, West Façade, although noise from the air extraction unit at 7A will have an influence, it is predicted that a combination of its distance from the western facades of the proposed development and the impact of noise from road traffic and Dodworth Tap customers will render the air extraction unit inaudible during the daytime hours.

4.0 Discussion

4.1 External Sound Levels

4.1.1 National Planning Policy Framework

With reference to the National Planning Policy Framework Planning Practice Guidance on Noise, Table 4.1 summarises external daytime, evening and night time noise levels at MP1, MP2 and the proposed dwelling's east-facing façade, and presents their relative Observed Effect Levels.

Table 4.1 Observed Effect Levels at MP1 & MP2

Location	Predicted Daytime Observed Effect Level	Predicted Evening Observed Effect Level	Predicted Night Time Observed Effect Level
MP1, West Façade	54 dB, LOAEL	49 dB, LOAEL	41 dB, LOAEL
MP1, East Façade	54 dB, LOAEL	48 dB, LOAEL	41 dB, LOAEL
MP2	52 dB, LOAEL	52 dB, SOAEL	L36 dB, NOAEL

At MP1, West Façade, where all identified noise sources will exert an influence, all average external daytime, evening and night time sound levels meet the Lowest Observed Adverse Effect Level (LOAEL).

At MP1, East Façade, where all road traffic and Dodworth Tap customer noise will exert an influence, all average external daytime, evening and night time sound levels meet the Lowest Observed Adverse Effect Level (LOAEL).

At MP2, where 7A's structure will act as a partial acoustic barrier against noise from road traffic and Dodworth Tap customers, the daytime and evening noise environment will be dominated by the air extraction unit at 7A Station Road. As such, the daytime sound level meets Lowest Observed Adverse Effect Level (LOAEL); however, the evening noise level will meet the Significant Observed Adverse Effect Level (SOAEL). Night time noise level at MP2 will meet No Observed Adverse Effect Level (NOAEL).

4.1.2 WHO & BS8233

Tables 4.2, 4.3 & 4.4 summarise predicted Daytime, Evening and Night Time external levels at MP1 & MP2, and compares them against World Health Organisation's (1999) and BS 8233: 2014 maximum recommended levels, 55 dB. At MP2, the influence of the air extraction noise from 7A Station Road results in no difference between daytime and evening noise levels.

Table 4.2 External Daytime noise levels compared against WHO & BS 8233

Location	External SPL, dB	WHO & BS8233 35 dB Criteria met?
MP1, West Facade	54	Yes
MP1, East Façade	54	Yes
MP2	52	Yes

Table 4.3 External Evening noise levels compared against WHO & BS 8233

Location	Evening SPL, dB	WHO & BS8233 35 dB Criteria met?
MP1, West Facade	49	Yes
MP1, East Façade	48	Yes
MP2	52	Yes

Table 4.4 External Night Time noise levels compared against WHO & BS 8233

Location	Night Time SPL, dB	WHO & BS8233 35 dB Criteria met?
MP1, West Facade	41	Yes
MP1, East Façade	41	Yes
MP2	36	Yes

4.2 Internal Sound Levels

With reference to internal noise levels, given a slightly open window, Tables 4.7, 4.8 & 4.9 summarise predicted Daytime, Evening and Night Time levels in west and east-facing rooms of the proposed dwellings.

Table 4.7 Predicted Daytime Internal Noise Levels

Location	External Day Time SPL, dB	Open Window Attenuation, dB	Internal Day Time SPL, dB	WHO & BS8233 35 dB Criteria met?
MP1, West Facade	54	15	39	No
MP1, East Façade	54	15	39	No

Table 4.8 Predicted Evening Internal Noise Levels

Location	External Evening SPL, dB	Open Window Attenuation, dB	Internal Evening SPL, dB	WHO & BS8233 35 dB Criteria met?
MP1, West Facade	49	15	34	Yes
MP1, East Façade	48	15	33	Yes

Table 4.9 Predicted Night Time Internal Noise Levels

Location	External Night Time SPL, dB	Open Window Attenuation, dB	Internal Night Time SPL, dB	WHO & BS8233 35 dB Criteria met?
MP1, West Facade	41	15	26	Yes
MP1, East Façade	41	15	26	Yes

At MP1 (west and east-facing facades), it is predicted that the influence of noise from road traffic and Dodworth Tap customers will result in internal noise levels (assuming open window) that will exceed BS 8233: 2014 and WHO 1999 maximum evening criteria.

5.0 Recommendations

5.1 External Noise Levels

The proposed dwellings' gardens/yards are located at MP2. At this location it is predicted that noise from 7A's air extraction unit will exert the most significant noise impact. It is acknowledged that the following recommendations could only be acted upon with the permission and co-operation of 7A Station Road's owner/future occupier.

5.1.1 Air Extraction Unit

A 'downstream' in-duct silencer capable of attenuating the extraction system should be incorporated. Such a silencer should be fitted as close to the fan as possible. The internal ductwork should be internally lagged with appropriate noise insulating material. To address any likelihood of structure-borne noise or vibration impacting upon the garden serving the proposed development, the fan should be acoustically isolated from the duct work. Isolation can be achieved by incorporating anti-vibration mounts and fixings. Care should be taken to prevent any fixing bolts from "short-circuiting" the mounts, resulting in a loss of isolation. To prevent this, additional pads must be fitted under the fixing bolt heads. Additionally, a flexible section consisting of rubber or similar should be introduced to duct's body 'down-wind' of the fan. The fan's structure-borne sound energy will be absorbed by this section, thus preventing its transmission along the ductworks' lengths.

It is recommended that a Model: Lindlab Circular straight SLU100 silencer, or similar or similar be introduced. Such a model has a quoted sound attenuation of 28 dB(A), resulting in sound level of 24 dB the gardens of the proposed dwellings. As such, daytime, evening and night time external noise levels at MP2 will satisfy all noise criteria used in this report.

5.2 Internal Noise Levels

It is predicted that the structure of 7A Station Road will act as a noise barrier to protect the rear gardens of the proposed development from noise from road traffic and Dodworth Tap customers; however these noise sources will have a

negative impact upon the internal sound levels of the east and west-facades of the dwellings and the dwellings' ground floor rooms.

As such, two alternate recommendations are proposed.

5.2.1 Recommendation One - Acoustic Barrier

An acoustic barrier should then be erected along the northern and eastern perimeters (shown in black in Appendix 3) of the proposed development so to protect the ground storey rooms of the dwellings' western and eastern facades.

Using the equation:

$$N=10\log(3\pm40((\delta)/\gamma))$$

Where:

N=Noise Reduction

δ=Path Difference

γ=Wavelength

it is possible to predict a barrier's sound reduction performance over any given frequency.

(a) Western Façade

Assuming a barrier-to-noise source distance of 6 metres and barrier-to-receiver distance of 2 metres, a noise source height of 1 metre and a receiver height of 2 metres, it is predicted that a 2.5 metre-tall barrier would achieve a noise reduction of 12 dB. Such a reduction would result in internal noise levels in ground floor rooms satisfying all noise criteria used in this report.

In the presence of an acoustic barrier as described in Paragraph 5.2.1, it is recommended that all ground floor glazing in the properties' west-facing façade be of 6.4mm laminated glass, 12mm air-filled cavity, 8.8mm toughened glass. Optional acoustic vents. The Pilkington datasheet (Pilkington, 2019, see

Appendix 6) cites an insulation value of 32 dB, R_w (window closed) for this approximate specification. Trickle ventilation should be available, however in general, open-window ventilation will not be problematic. Glazing for habitable first storey rooms should be as described in Paragraph 5.2.2(a).

(b) Eastern Facade

Assuming a barrier-to-noise source distance of 2 metres and barrier-to-receiver distance of 2 metres, a noise source height of 1 metre and a receiver height of 2 metres, it is predicted that a 2.5 metre-tall barrier would achieve a noise reduction of 20 dB. Such a reduction would result in internal noise levels in ground floor rooms satisfying all noise criteria used in this report. The visual impact of such a barrier upon the eastern façade will be mitigated by the existing evergreen hedge that runs along the development's eastern perimeter

In the presence of an acoustic barrier as described in Paragraph 5.2.1, it is recommended that all ground floor glazing in the properties' east-facing façade be of 6.4mm laminated glass, 12mm air-filled cavity, 8.8mm toughened glass. Optional acoustic vents. The Pilkington datasheet (Pilkington, 2019, see Appendix 6) cites an insulation value of 32 dB, R_w (window closed) for this approximate specification. Trickle ventilation should be available, however in general, open-window ventilation will not be problematic. Glazing for habitable first storey rooms should be as described in Paragraph 5.2.2(b).

5.2.2 Recommendation Two - Glazing

(a) West Facade

All habitable ground and first storey west facing rooms should have glazing of 6.4mm laminated glass, 12mm air-filled cavity, 8.8mm toughened glass. Optional acoustic vents. The Pilkington datasheet (Pilkington, 2019, see Appendix 6) cites an insulation value of 32 dB, R_w (window closed) for this approximate specification. Open-window ventilation will result in excessive internal sound levels during daytime hours; therefore closed-window mechanical ventilation should be available.

The glazing must incorporate sufficient ventilation so to prevent overheating. ProPG calls for glazing with 'good ventilation'. In terms of temperature, this report interprets this as ventilation sufficient to provide a range of between 15-21°C. It is thought that this can only be provided by means of mechanical ventilation. Given the windows' west-facing aspect, the risk of overheating should be prevented by means of controllable mechanical ventilation, with a control range extending from background/trickle through to purge, see Appendix 6 for ventilation details. Open-window ventilation will not be problematic in the evening or at night.

(b) East Façade

All habitable ground and first storey east facing rooms should have glazing of 6.4mm laminated glass, 12mm air-filled cavity, 8.8mm toughened glass. Optional acoustic vents. The Pilkington datasheet (Pilkington, 2019, see Appendix 6) cites an insulation value of 32 dB, R_w (window closed) for this approximate specification. Open-window ventilation will result in excessive internal sound levels during daytime hours; therefore closed-window mechanical ventilation should be available.

The glazing must incorporate sufficient ventilation so to prevent overheating. ProPG calls for glazing with 'good ventilation'. In terms of temperature, this report interprets this as ventilation sufficient to provide a range of between 15-21°C. It is thought that this can only be provided by means of mechanical ventilation. Given the windows' east-facing aspect, the risk of overheating is less likely, nonetheless it should be prevented by means of controllable mechanical ventilation, with a control range extending from background/trickle through to purge, see Appendix 6 for ventilation details. Open-window ventilation will not be problematic in the evening or at night.

5.3 Roof

Although glazing is acoustically the weak-spot for noise-break-in, consideration should be given the premises' roof construction. Given the necessity for roof

void ventilation it is predicted that the roof tiles will afford 15 dB sound attenuation, while the ceiling void will provide a further 3 dB attenuation.

It is recommended that, within the ceiling void, 22mm or thicker MDF boarding be attached to the top of the ceiling joists. 150mm Isowool APR 1200 should be rolled between the joists. 2x layers of 12.5mm sound board should be attached to the underside of the ceiling. It is anticipated that this ceiling treatment will provide a sound attenuation value of between 50 and 55 dB. The additional attenuation provided by the roof tiling and the void will provide an overall value of 68-73 dB. This will be sufficient to prevent noise break-in via the roof.

APPENDICES

Appendix 1

Glossary of Acoustic Terms

Sound Pressure Level (L_p)

The basic unit of sound measurement is the sound pressure level. As the pressures to which the human ear responds can range from 20 μ Pa to 200 Pa, a linear measurement of sound levels would involve many orders of magnitude. Consequently, the pressures are converted to a logarithmic scale and expressed in decibels (dB) as follows:

$$L_p = 20 \log_{10}(p/p_0)$$

Where L_p = sound pressure level in dB; p = rms sound pressure in Pa; and p_0 = reference sound pressure (20 μ Pa).

A-weighting Network

A frequency filtering system in a sound level meter, which approximates under defined conditions the frequency response of the human ear. The A-weighted sound pressure level, expressed in dB(A), has been shown to correlate well with subjective response to noise.

Equivalent continuous A-weighted sound pressure level, $L_{Aeq, T}$

The A-weighted 'equivalent continuous noise level' which is an average of the total sound energy measured over a specified period of time. In other words, L_{Aeq} is the level if a continuous noise which has the same total (A-weighted) energy as the real fluctuating noise, measured over the same time period. L_{Aeq} is increasingly being used as the preferred parameter for all forms of environmental noise.

$L_{A90, T}$

The A-weighted sound pressure level of the residual noise in decibels exceeded 90% of a given time interval, T . L_{A90} is typically taken as representative of background noise.

LA max

The maximum A-weighted noise level recorded during the measurement period.

Hz

The unit of frequency. The number of cycles (in the context of acoustics, the number of complete sound waves generated) per second.

Appendix 2

Location Plan and Noise Monitoring Positions



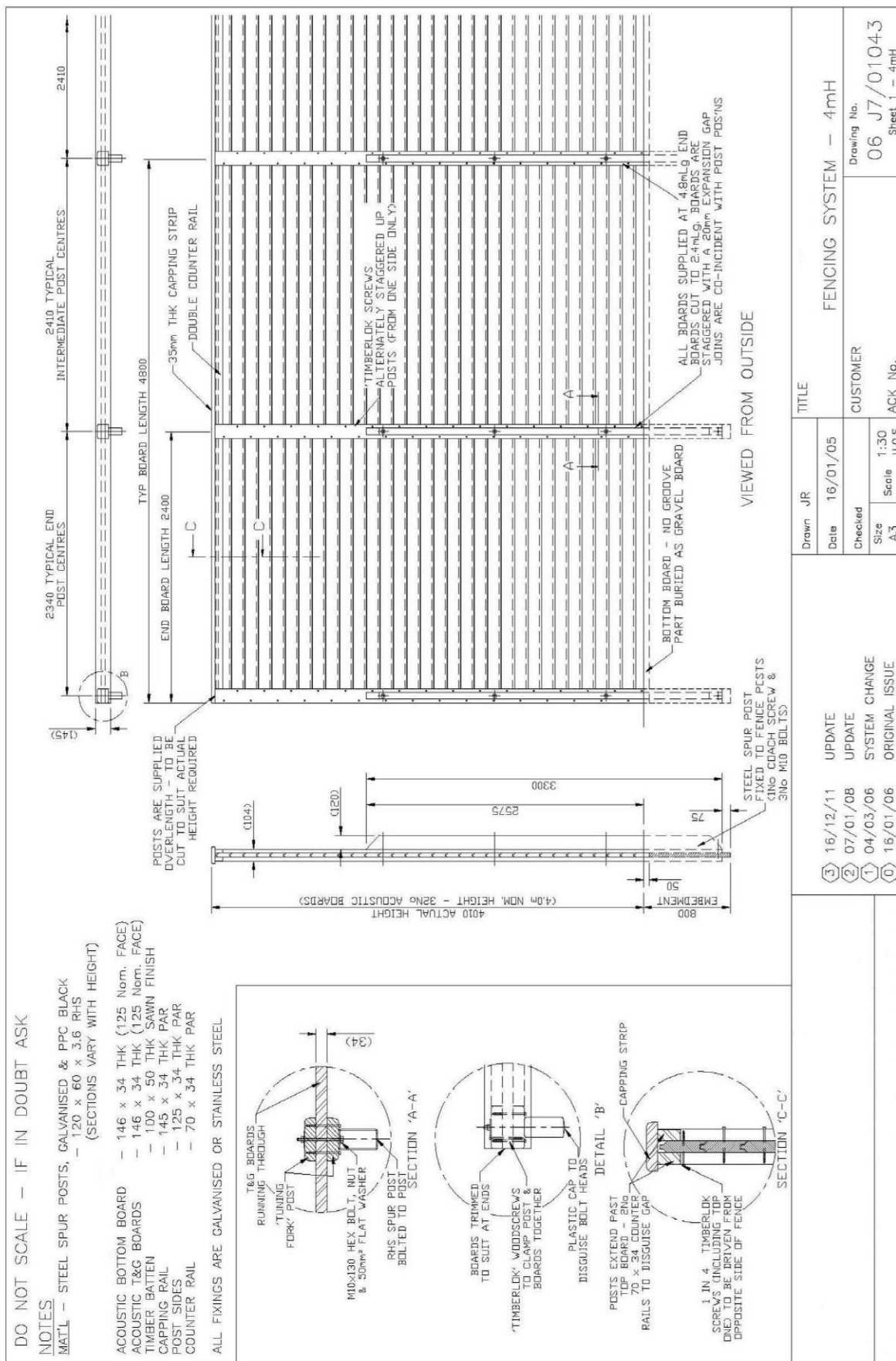
MP1

MP2

Barrier Location Plan & Specification



Counter rails: 70 x 34 thick



Appendix 4

Equipment Used

B & K 2260 Model integrating sound level meter, Serial Number 172181
Certificate Number 12308
Last Laboratory Calibrated 13/2/20

B & K Microphone 4189 Model, Serial Number 1783702

B & K 4230 Model calibrator, Serial Number 724157
Last Laboratory Calibrated 13/2/20

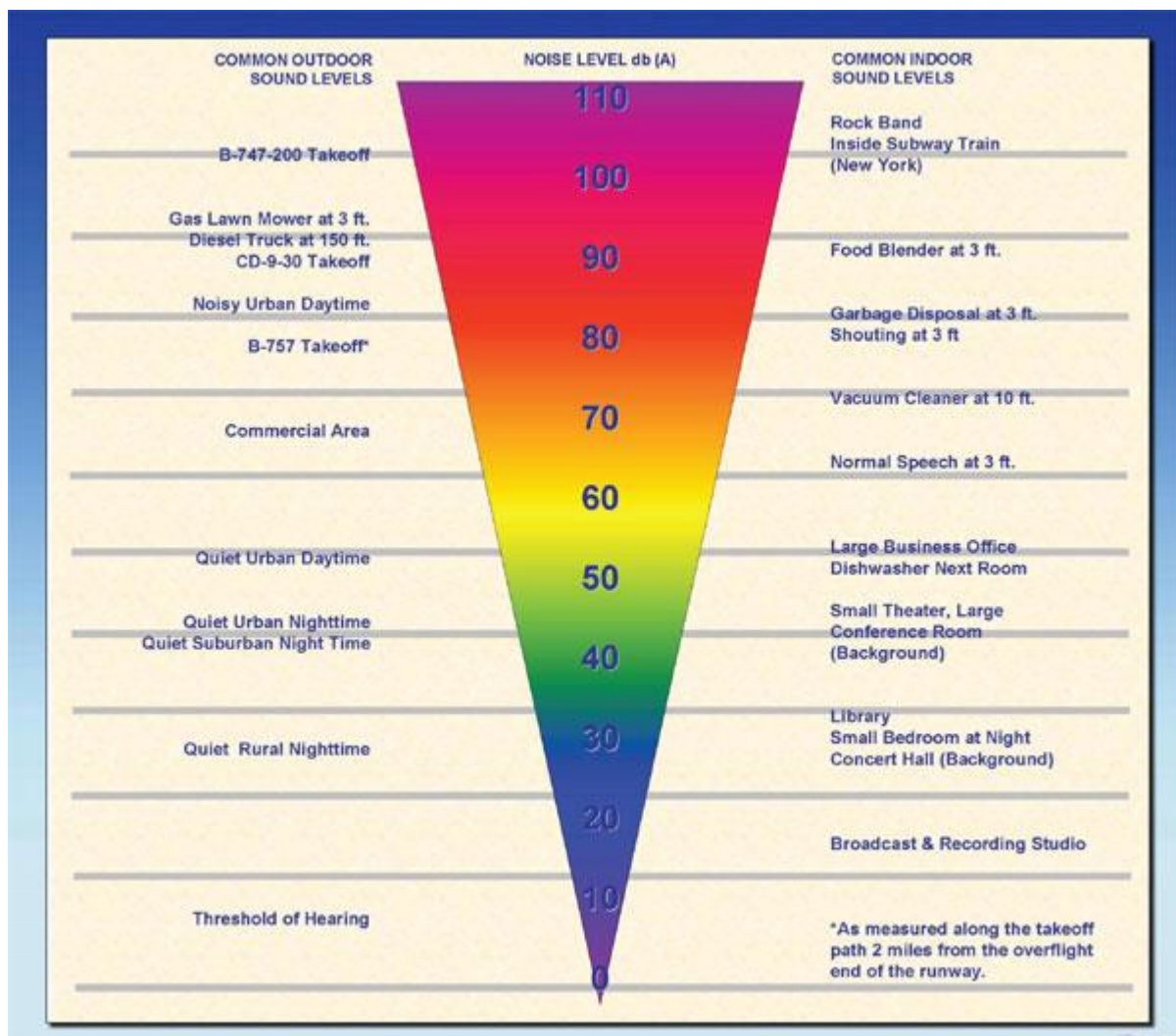
Microphone windshield
Tripod
Anemometer/Thermometer, Serial Number EA931486

The Sound Level Meter was calibrated before and after all measurement periods, with no significant change in calibration. All calibrations took place on site.

The SLM met the requirements of BS EN 60651: 1994 and BS EN 60804: 2001 IEC 60804: 2000. It was capable of simultaneously measuring Leq and Ln values. Batteries for the SLM and calibrator were checked prior to all measurements.

Appendix 5

Sound Level Comparison Chart



Appendix 6

Room Ventilation

Where mechanical ventilation is required, it is recommended that ventilation be provided by 1x Solace Decentralised Mechanical Ventilation Unit (dMEV) per room (Titon, 2019).

Table 5.1.b of Approved Document F, 'Approved means of ventilation' (2010) prescribes a whole dwelling ventilation rate of 13 l/s per bedroom. The dMEV meets this criteria. Additionally, its sound rating at 13 l/s is 23 dB @ 3 metres. Assuming an existing night time internal sound level of 30 dB, an additional 23 dB would increase the SPL to 31 dB: an imperceptible increase.

HM Government (2010) '*Approved Document F, 'Approved means of ventilation'*' [online]. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/468871/ADF_LOCKED.pdf [Accessed 31 August 2020];

Titon (2019) '*Solace dMEV*' [online]. Available at: <http://www.titon.co.uk/pages/ventilation-systems/continuous-mechanical-extract/solace-dmev.php> [Accessed 31 August 2020];

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HM Government (2010) "*Approved Document F, 'Approved means of ventilation'*" [Online]. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/468871/ADF_LOCKED.pdf [Accessed: 31 August 2020];

Vectaire (2019) [Online]. Available at: <http://www.vectaire.co.uk/products/microbox-125-2dc-b> [Accessed 31 August 2020];

Pilkington (2012) '*Optiphon Glazing webpage*' [Online]. Available at: assetmanager-ws.pilkington.com/fileserver.aspx?cmd=get_file&ref=8222&cd... [Accessed 31 August 2020]