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Environmental Noise Survey
Gutter Hill
Johnstown
Wrexham

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Introduction

AB Acoustics were commissioned by Design & Planning Associates Ltd to undertake an environmental noise assessment for J C Dyke Supplies of the proposal to build a number of industrial units on vacant land to the East of the Fire Station at Gutter Hill Johnstown Wrexham.

A Pre Application Response has been received from the LPA. Enquiry Number : ENQ/2019/0094 – part of which is copied below :

I understand that your client is proposing a speculative B1, B2 and B8 scheme. The nearest residential properties are located some in very close proximity and there is the significant potential for noise disturbance to occur. In some instances, such disturbance can be mitigated through building design and layout. However, I would strongly urge you to provide a noise report with any potential planning application address this matter. It may demonstrate that the B2 and B8 uses may not be appropriate on this site. An application for planning permission would not be validated without such a survey being carried out and submitted.

The following report is prepared to answer the concerns mentioned above.

Below is a photograph of the proposed site with the measurement locations shown. These locations was considered to be representative of the noise level experienced by the existing residential property adjacent to the proposed site.



Proposed Site

Location 1

Location 2

As can be seen from the above the proposed site is adjacent to residential property, the Fire Station at Gutter Hill and an existing commercial development of Wrights Garage.

The land is a brown field site which it is hoped to re develop for small starter units for smaller business.

The plan (at the moment) is for two rows of units consisting of 10 units to the East and 11 to the West.

It is understood that these units will be constructed from trapizodial panels mounted off a steel framework with access doors to the central yard area.

The proposal is that the Units will be made available for B1 – B8 use.

B1 – Office – Research & Development or any industrial development which can be carried out without causing detriment to the amenity of the area.

B8 – Storage and Distribution.

The following assessment is based on the above.

It is understood that the proposed operating hours are :

Monday to Friday	07.00 - 19.00 hrs
Saturday	07.00 – 19.00 hrs
Sunday and Bank Holidays	09.00 – 17.00 hrs.

Noise Assessment Criteria

The likelihood of complaints about noise from industrial plant can be assessed where the standard is appropriate using BS 4142 – 2014 – this has recently replaced the earlier standard BS 4142 : 1997

This standard describes methods for rating and assessing sound of an industrial / commercial nature. The methods described use outdoor sound levels to assess the likely effects of sound on people who might be inside / outside residential premises.

The significance of sound of an industrial / commercial nature depends upon the margin by which the rating level of the source exceeds the background sound level and the context in which the sound occurs.

The Standard is intended to be used for :

Investigating complaints regarding noise.

Assessing sound from proposed / new / modified or additional noise sources of an industrial / commercial nature.

Assessing sound at proposed new dwellings or premises used for residential purposes.

The sound level from a source when determined as a discrete entity distinct and free of other influences contributing to the ambient sound is referred to as the 'specific sound level'.

The specific sound level is evaluated at an identified location over the appropriate reference time intervals which are : 1 hours during the daytime – 07.00 to 23.00 hrs and 15 minutes during the night time – 23.00 to 07.00 hrs.

The specific noise may be subject to acoustic feature correction if the noise level at the measurement location is subjectively considered to contain certain acoustic features that may increase the significance of the impact of the noise over the background level.

If these features are present at the measurement location then the character correction is added to the specific sound level to arrive at the rating level.

The Standard requires the assessor to consider the subjective prominence of the character of the specific noise source at the measurement location / noise sensitive receptors and the extent to which the character of the noise will attract attention to it – such features are taken into account by applying the following corrections :

	Tonality	Impulsivity	Other Characteristics
Just Perceptible	+ 2 dB	+ 3dB	-
Clearly Perceptible	+ 4dB	+ 6 dB	-
Highly Perceptible	+ 6dB	+9 dB	-
Readily Distinctive against Residual Environment			+ 3 dB

If both tonal and impulsive characteristics are both present then two corrections can be made – however if only one is dominant then only one correction need be applied.

If no corrections are deemed appropriate then the Rating Level equals the Specific Noise Level.

An initial estimate of the impact of the specific sound is obtained by subtracting the measured background level from the rating level and considering the following :

- A) Typically the greater the difference the greater the impact.
- B) A difference of around + 10 dB or more is likely to be an indication of a significant adverse impact – depending on context.
- C) A difference of around + 5 dB or more is likely to be an indication of an adverse impact – depending on context.
- D) The lower the rating level is to the measured background level the less likely it is that the sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the measured background level this is an indication that the sound source will have a low impact depending upon context.

Where the initial estimate of the impact needs to be modified due to the context then all pertinent factors need to be taken into consideration – these include the following :

The absolute level of the sound.

The character and level of the residual sound compared to the character and level of the specific sound.

The sensitivity of the receptor and whether residential dwellings already incorporate design measures that secure good internal and outdoor conditions eg facade insulation – ventilation / cooling that reduces the need to open windows – acoustic screening.

The standard recognises that the response to sound can be subjective as well as to the local attitudes to the source of the sound and the character of the neighbourhood.

Also relevant are the World Health Organisation (WHO) Guidelines for Community Noise – these identify that sleep may be disturbed by short term noise events and the level associated with this is 45 dB L_{Amax} inside the bedroom – this relates to 60 dB L_{Amax} external to the bedroom.

In brief an 'Outdoor Living Area' should be subject to a noise level less than 55 dBA in order to prevent serious annoyance during the daytime and evening - a level less than 50 dBA is desirable to prevent moderate annoyance : reference World Health Organisation.

BS 4142 : 2014

Regarding the residential properties the survey was undertaken – as stated above - with respect to BS 4142 : 2014 .

It is now a requirement of BS 4142 to consider the potential uncertainty of the assessment – the steps taken to reduce uncertainty as far as practical included :

All the measurements were made with a Type 1 sound level meter with certificates of calibration and field calibration checks were undertaken after each series of measurements with a minimal drift (0.1 dB) recorded.

The weather conditions were considered ideal for environmental noise measurements with no rain – dry / damp surfaces - low wind speeds (< 5.0 m /sec).

Variations in ground cover between the proposed site and the receivers could affect the ground absorption and therefore the calculated levels at the various receivers – in order to reduce this problem it has been assumed that there is acoustically reflective ground cover over the various distances.

Inaccuracies that could result from estimates of the intervening ground cover – meteorological conditions etc. will not be significant.

The measurements were undertaken over a number of days / times in order to obtain – what is considered to be – a representative measurement of the existing noise climate at this location.

Therefore taking the above into account it is considered that the uncertainty has been controlled as far as practically possible with the results being over predicted rather than under predicted and therefore the above represents a robust assessment.

National Planning Policy Framework

This provides brief guidance on planning and noise – it states that planning policies and the resultant decisions should aim to :

A – 'avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of the development.'

B – 'mitigate and reduce to a minimum other adverse impacts on health and quality of life arise from the new development – this includes the use of conditions'.

C – recognise the development will often create some noise and existing businesses wanting to expand to develop in continuance of their business should not have unreasonable restrictions placed on them because of changes in nearby land uses since they were established.

D – identify and protect areas of tranquility which have remained relatively undisturbed by noise and are prized for their recreational and amenity value.'

BS 8233 : 2014

The above standard is used to assess noise within residential property and in 'private amenity areas' that can be attached to these properties. They are used to assess the design of new buildings (or refurbishment) rather than assess the effects of changes to the external noise.

However it is recognised that this is not always achievable in existing areas such as City Centres or adjacent to existing commercial development.

In such cases it is suggested that a compromise between the possible raised noise level and the advantages of the commercial development should be reached – therefore any development should be designed to achieve the lowest practical noise level and should not necessarily be prohibited.

Equipment Used and Measurement Method

The noise levels were measured using a :

Bruel & Kjaer 2238 Sound Level Meter (Type 1 instrument)

Calibration was undertaken using a :

Bruel & Kjaer type 4231 calibrator

The measurements were carried out at the location shown at a height of 1500mm above the ground and away from reflecting surfaces.

The measurements were undertaken at the times stated in the results.

The location of the measurements are indicated on the plan above.

Results

These are tabulated below :

The measurements were undertaken over a number of days in order to obtain a more robust assessment.

Date	Wind Speed M/sec	Wind Direction	Temperature C	Rain	Cloud Cover %	Road Conditions
Friday 24.05.2019	1.3	SE	14	No	100	Dry
Monday 10.06.2019 Start	2.1	E	16	No	60	Dry
Monday 10.06.2019 End 15.50	-	-	14	Heavy	100	Wet
Tuesday 18 June 2019	-	-	14	No	100	Dry

Date	LA eq	LA 90	LA 10	LA max
Friday 24.05.2019 16.00 – 17.00 Location 2	58.3	44.3	54.9.	-
17.10 – 18.00 Location 1	60.7	45.4	63.8	-
Monday 10.06.2019 09.30 – 10.30 Location 1	65	49.5	68.5	
10.30 – 11.30 Location 1	62.7	48	66	
13.15 – 14.15 Location 1	61.1	49.1	65	
14.30 – 15.30 Location 2	61.8	47	55.5	
15.30 – 15.50 Location 2 End – Rain	59.6	47.1	56.2	
Tuesday 18 June 2019 Location 1	63	47.5	65.9	

Over the measurement period the average LA eq is calculated to be **63 (62.7) dBA at Location 1** and **60 (60.1) dBA at Location 2.**

At Location 1 the major source of noise was the traffic movement along Gutter Hill.

At Location 2 this again was the main source of noise but noise was also audible from operations at Wrights Garage.

The lowest measured background was **44.3 dBA** at Location 2 and **45.4 dBA** at Location 1

Units – Possible B1 and B8 usage

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The use to which these units can be put is varied and therefore the internal noise level within the Units could also vary..

In the discussion the following noise levels, from library figures, are used :

Internal Measurements

B1 – Office / Research & Development.

The noise in offices by their very nature is low.

B8 - Storage / Distribution

The following are library figures for the internal noise levels within the units. These are used as the actual usage of the units is unknown at the present time.

Location	Measurement Period	LA eq
Decopart Nelson	1 hour	81 (81.3) dBA
Salt Union Winsford	1 hour	79 dBA

As can be seen the above measured noise levels vary , the highest recorded being **81 dBA** – in the following discussion an internal noise level of **81 dBA** has been assumed.

The Units that back onto the residential properties of interest are all approximately the same size – having dimensions of 5.1m wide – 2.5m high (at the rear) and 9.2m long.

Assessment Re 27 Gutter Hill

The noise level at the residential properties can be determined from -

$$L_2 = L_1 - 6 - R + 10 \log S - 11 - 20 \log r + DI$$

Where

L_2 = Calculated level at distance r metres

L_1 = Internal Level within building. This is assumed to be **81 dBA** and could be regarded as the *worst case situation* as it is unlikely that this level will be the noise level within the whole of the building – See above

R = the sound reduction index of the building element which in this case is assumed to be **25 dBA** – see enclosed data for the standard AWP/60 with No Lining – 1W on data sheet

S = surface Area of building facing the residential property (wall) = $5.1 \times 2.5 = 12.75$
sq m

r = distance to houses (Number 27 Gutter Hill) = **2m** – this is the scaled distance to the nearest residential property – Location 1

DI = Directivity Index = **3**

$$L_2 = 81 - 6 - 25 + 10 \log 12.75 - 11 - 20 \log 2 + 3$$

$$\mathbf{L_2 = 47 (47.0) dBA.}$$

With respect to the roof the average distance of the roof area has been used (scaled at 5m) and the directivity factor is changed to – 3 dB for a plane radiator at $60^\circ < X < 90^\circ$ incidence.

Therefore from the above the calculated level with respect to the roof **$L_2 = 36 (35.8) \text{ dBA}$** .

It is usual to fit in the roof – roof lights – the usual area being 10% of the total area therefore in this case 4.7 sq m with (for standard sheet roof lights) an attenuation of 12 dBA. Therefore the noise level due to the roof lights **$L_2 = 39 (39.3) \text{ dBA}$**

Therefore the overall level from a Unit is the sum of the above **$47 + 36 + 39 = 48 (47.9) \text{ dBA}$**

However, the residential property is unlikely to be affected by the noise from just 1 of the Units. If it is assumed that the residential property will be affected by noise from a number of Units then the following levels are calculated :

Number of Units	Calculated dBA
1	48
2	51
3	53

The lowest measured background level was recorded at **45.4 dBA** – the above calculated levels are in excess of the background therefore the attenuation of the three building elements considered needs to be improved.

If the wall construction is changed to 9W on the data sheet – KS 1000 RW/40 + I + L the R_w increases to 40 dB.

Repeating the above calculation for this wall construction results in a calculated noise level at the residential property of **L2 = 32 (32.0) dBA**.

If the roof construction is changed to 3R on the data sheet – KS 1000 RW/40 +I + L the Rw increases to 46 dB – therefore the calculated **L2 = 15 (15.0) dBA**.

Changing the roof lights from standard sheet to the Filon GRP Roof Light which have a quoted Rw of 24 dB – see data sheet - the calculated **L2 = 27 (27.3) dBA**

Summing these results in an overall calculated level of $32 + 15 + 27 = 33$ (33.2)**dBA**.

However, the residential property is unlikely to be affected by the noise from just one of the Units. If it is assumed that the residential property will be affected by noise from a number of Units then the following levels are calculated :

Number of Units	Calculated dBA
1	33
2	36
3	37

Assessment Re Residential to rear of Grapes Inn

If the above is repeated for the residential property to the rear of the Grapes Inn which is scaled at a distance of 15m from the proposed site then the following results.

Wall – L2 = **16 (14.5) dBA** : Roof L2 = **5 (5.3) dBA** : Roof Lights L2 = **18 (17.8) dBA** resulting in an overall calculated level $L2 = 16 + 5 + 18 = 20$ **dBA**

However, the residential property is unlikely to be affected by the noise from just one of the Units. If it is assumed that the residential property will be affected by noise from a number of Units then the following levels are calculated :

Number of Units	Calculated dBA
1	20
2	23
3	25

Assessment Re 43 Gutter Hill

This property has been scaled at 25m from the site boundary – the property is at a raised level to the site and in fact part of the rear facade of the proposed units will be screened from the No. 43 by the existing retaining wall – the effect of this screening is ignored in the following in order to achieve a more robust assessment.

Repeating the above calculations for No. 43 at a distance of 25m the following results -as the property is at a raised level to the proposed development the Directivity Factor remains at + 3

Wall – L2 = **10 (10.0) dBA** : Roof L2 = **8 (7.7) dBA** : Roof Lights L2 = **20 (20.2) dBA** resulting in an overall calculated level $L2 = 10 + 8 + 20 = 21$ **dBA**

However, the residential property is unlikely to be affected by the noise from just one of the Units. If it is assumed that the residential property will be affected by noise from a number of Units then the following levels are calculated :

Number of Units	Calculated dBA
1	21
2	24
3	26

Operation of Units

From previous experience some of the units will operate with the doors open. Therefore effectively there is no attenuation provided by the structure of the unit to the noise. Below is the calculated levels at the three properties of interest assuming SOME of the units operate with the doors open.

In the following it is assumed that the noise level from the unit is 81 dBA – the resultant level at the residential property can be determined from $SPL = SPL \text{ (source)} - 20 \log R$ where R= distance between source and receiver.

Address	SPL dBA	Distance m	Attenuation due to distance dBA	Attenuation due to Screening dBA	Resultant dBA	No. of Units
No.27	81	51	34	10	37	1
					40	2
					42	3
No.43	81	73	37	5	39	1
					42	2
					43	3
To Rear of Grapes Inn						
	81	53	34	10	37	1
					40	2
					42	3

Therefore the overall Specific Noise Level at the various residential properties are a sum of the above calculated levels :

Address	1 Unit	2 Units	3 Units
27 Gutter Hill			
Due to Building	33	36	37
Open Doors	37	40	42
Total	38	41	43
43 Gutter Hill			
Due to Building	21	24	26
Open Doors	39	42	43
Total	39	42	43
Rear of Grapes P/H			
Due to Building	20	23	25
Open Doors	37	40	42
Total	37	40	42

The above calculated noise levels are the Specific Noise Level – as it is very likely that the noise from the proposed site (particularly the open doors) will contain both Tonal and Impulsive sounds then a correction needs to be added to the above calculated levels in order to determine the Rating Level at the three properties of interest – in the following the 'worst case ' situation is taken ie. three of the Units will be operating with open doors.

The following is an assessment of the above operation with respect to BS 4142 : 2014 for Number 27 / 43 Gutter Hill –

Results		Clause	Comment
Calculated ambient sound level	LA eq (1 hr) = 43 dBA	7.1 7.3.1	Specific sound source active and generally unaffected by other sound sources
Residual Sound Level	LA eq (1 hr) = 63 dBA	07/03/03	Specific sound source not active
Background Sound Level	LA 90 (1 hr) = 45.4 dBA	8.1.3 8.3	Deemed to be representative of existing level
Assessment made during day time – reference time interval 1 hr.			
Specific Sound Level	LA eq(60 minutes) = 43 dBA	7.3.4 7.3.5	
Acoustic feature correction	3 + 2	9.2	Impulsive / Tonal noise 'Just Perceptible'.
Rating Level	43 + 3 + 2 = 48 dBA	9.2	Sound
Background Sound Level	LA 90 (1 hr) = 45.4 dBA	8	Lowest level measured
Excess of Rating Level over Background	48 – 45.4 = 2.6 dBA	11	
Assessment indicates no adverse impact		11	
Uncertainty of the assessment	Not Significant	11	

The National Planning Guidance 2014 states that noise exposure defined by the response of people to the noise – briefly it states that :

Perception	Examples of Outcome	Increasing Effect Level	Action
Not Noticeable	No effect	No observed Effect	No Specific Measures required
Noticeable and not Intrusive	Noise can be heard – does not cause any change in behaviour or attitude	No Observed Adverse Impact	No Specific Measures required
Noticeable and Intrusive	Noise can be heard and causes small changes in behaviour and / or attitude – affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Impact	Mitigate and reduce to a minimum.

Note the above is based on the lowest background level measured.

The following is an assessment of the above operation with respect to BS 4142 : 2014 for the residential property to the rear of The Grapes Inn

Results		Clause	Comment
Calculated ambient sound level	LA eq (1 hr) = 42 dBA	7.1 7.3.1	Specific sound source active and generally unaffected by other sound sources
Residual Sound Level	LA eq (1 hr) = 60 dBA	07/03/03	Specific sound source not active
Background Sound Level	LA 90 (1 hr) = 44.3 dBA	8.1.3 8.3	Deemed to be representative of existing level
Assessment made during day time – reference time interval 1 hr.			
Specific Sound Level	LA eq(60 minutes) = 42 dBA	7.3.4 7.3.5	
Acoustic feature correction	3 + 2	9.2	Impulsive / Tonal noise 'Just Perceptible'.
Rating Level	42 + 3 + 2 = 47 dBA	9.2	Sound
Background Sound Level	LA 90 (1 hr) = 44.3 dBA	8	Lowest level measured
Excess of Rating Level over Background	47 – 44.3 = 2.7dBA	11	
Assessment indicates no adverse impact		11	
Uncertainty of the assessment	Not Significant	11	

The impact of the above combination of activities is likely to be reduced at the residential properties of interest as the existing traffic flow along Gutter Hill generates high levels of noise throughout the time that the proposed site will be operative.

With respect to BS 8233 : 2014 it is recognised that the levels specified are not always achievable in existing areas such as City Centres or adjacent to existing commercial development.

In such cases it is suggested that a compromise between the possible raised noise level and the advantages of the commercial development should be reached – therefore any development should be designed to achieve the lowest practical noise level and should not necessarily be prohibited.

Vehicle Noise

An additional noise on the proposed site will be that of vehicles accessing the site either of people working on the proposed site or collections / deliveries to site.

The noise from this source can only be estimated as the actual number of vehicles using the proposed site is unknown. However, it is worth noting that the character of the noise from this source will be very similar to the character of the existing noise from the vehicle movements along Gutter Hill.

Cars

There are 21 units proposed for the site. It is assumed that ALL these will be occupied as the cars arrive in the morning and then depart in the early evening. It is also assumed that there could be 2 cars per unit resulting in a possible total of 42 cars.

The noise levels from different car types have been measured and are detailed below ;

From previous measurements undertaken on car movement of a car park the following levels were recorded :

Vehicle Type	LAeq	LA max
Rover 75	63.8	68.5
Transit Van	64.9	79.3
Volvo	63.8	71.4
Mercedes	66.1	78.7
BMW	67.8	78.7

All the above measurements were carried out at a height of 1.5m and at a distance of 2.0m from the source – these levels are for a car arriving – the driver getting out and closing the door and then returning – opening the door starting the engine and driving off. Therefore in effect they are for twice the operation that would occur in the morning or evening so therefore they can be regarded as the 'worst case situation'.

If it is assumed that half of the above cars – 21 – could arrive / depart in any one hour at the start / end of the working day and it is assumed that the noisiest car is used the **LA eq = 67.8 dBA** and that there are 21 of them then the calculated level of the total car arrivals / departures = $67.8 + 10 \log 21 = 81\text{dBA}$.

The centre of the proposed site is scaled at the following distances from the three residential properties of interest (as shown on the above plan)

27 Gutter Hill = 26m
Rear of Grapes P/H = 44 m
43 Gutter Hill = 57 m

Therefore from $SPL = Level - 20 \log R / r$ where $r = 2m$ and $R =$ distance to houses the following is calculated.

$$\begin{aligned} 27 \text{ Gutter Hill} &= 81 - 20 \log 26 / 2 = \mathbf{59 (58.7) dBA} \\ \text{Rear of Grapes P/H} &= 81 - 20 \log 44 / 2 = \mathbf{54 (54.1) dBA} \\ 43 \text{ Gutter Hill} &= 81 - 20 \log 57 / 2 = \mathbf{52 (51.9) dBA.} \end{aligned}$$

However, the residential properties will be screened to varying degrees from the proposed 'yard' by the development itself – according to **BS 5228 : Part1 : 2009 Section F.2.2.2.1 Section C** an attenuation to the noise from this source of the order of 5 to 10 dBA expected – as the cars are not actually visible to 7 Gutter Hill and to the rear of the Grapes P/H then an attenuation of 10 dBA is assumed. If this is the case then the noise level at the residential properties could be of the order of **49 / 44 dBA** respectively.

As 43 Gutter Hill is at a raised level then the same degree of screening is unlikely therefore an attenuation of 5 dBA has been assumed resulting in a calculated Sound Pressure Level of **47 dBA**.

These calculated noise levels due to car movements in the 'yard' at the proposed development are well below the measured LA eq noise level at Location 2 of 60 dBA and therefore their effect will be insignificant.

It is also worth noting that noise from the above events will be of the same acoustic character as the existing noise environment and therefore should not appear as intrusive.

Delivery / Collection Lorries

No information is available as to the number or type of lorry that will deliver or collect goods to / from the proposed site.

However, from previous measurements on vehicles of this type an estimate can be made using the following information – these measurements include the contribution from vehicle reversing alarms :

Location	Measurement Period	Measurement Distance	LA eq
J Freight Rochdale	3 minutes 12 seconds	2m	70.2
Howarth Bros Harrogate	5 minutes	2m	71.5
Urban Skip Hire Salford	1.4 minutes	2m	75.7

Taking an average level from the above of 73 dBA the following is calculated with an average movement time of 3.2 minutes or 0.05 hrs.

The noise level at the residential properties can be calculated from $SPL = Source Level + 10 \log T$ with the corrections used above for both distance and screening.

Location	Calc SPL dBA	Attenuation due to distance	Attenuation due to screening	Overall Level dBA
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1	60	22	10	28
2	60	27	10	23
3	60	29	5	26

The above calculated sound pressure levels at the properties are for 1 delivery /collection per hour – below is the calculated level for differing numbers of delivery / collections.

Location / Number	1	2	3
1	28	23	26
2	31	26	29
3	33	28	31
4	34	29	32

Again as can be seen the calculated noise level at the residential properties for the collection / delivery of goods is well below the measured LA eq of 60 dBA and therefore can be considered insignificant with respect to the existing environmental noise level.

The above are for Artic type vehicles with curtain sides. It is possible that due to the size of the units on the proposed site it will be more likely that 'Transit' type vans are used. Which as can be seen from the above this recorded a level approximately 10 dBA below the noise levels for the Artic lorries and therefore the resultant noise level could be 10 dBA lower.

It is worth noting that reversing alarms are a safety requirement on any site.

Fork Lift Trucks (FLT's)

From experience on developments of this type it is likely that a number of the units may operate FLT's there contribution is detailed below.

The noise level of a 'typical' FLT has been measured at 70 dBA at a distance of 5.0m. Again assuming that the FLT will operate at the mid point of the proposed yard the following noise levels are calculated :

Taking the noise level of 70 dBA the following is calculated with an average movement time of 5 minutes or 0.08 hrs.

The noise level at the residential properties can be calculated from $SPL = \text{Source Level} + 10 \log T$ with the corrections used above for both distance and screening.

Location	Calc SPL dBA	Attenuation due to distance	Attenuation due to screening	Overall Level dBA
1	59	14	10	35
2	59	19	10	30
3	59	21	5	33

The above calculated sound pressure levels at the properties are for 1 movement per hour – below is the calculated level for differing numbers of FLT movements

Location / Number	1	2	3
1	35	30	33
2	38	33	36
3	40	35	38
4	41	36	39

Again as can be seen the calculated noise level at the residential properties for the movement of FLT's is well below the measured LA eq of 60 dBA and therefore can be considered insignificant with respect to the existing environmental noise level.

Conclusions

With respect to the proposed speculative development of starter units at Gutter Hill Wrexham the following results :

- B1 usage will not cause any noise issues.
- B8 usage should not result in any noise complaints provided the buildings are constructed as detailed in the report and summarised below :

Wall – these should be constructed from steel trapizodial type panels that have a quoted Rw of at least 40 dB.

Roof – these should be constructed from steel trapizodial type panels that have a quoted Rw of at least 46 dB

Roof Lights – the coverage of these should not exceed 10% of the roof area in the individual units and the quoted attenuation of them should be at least Rw = 24 dB.

- Cars assessing the site / leaving at the start and end of the working day will not add to the overall existing noise level.
- Deliveries to site should not add to the existing overall noise level.
- If it is proposed to operate Fork Lift Trucks on site then the operation of these should not add to the existing noise level

Recommendations

That there are no 'holes' cut into the facade of the Units that any of the residential properties for ventilation purposes etc.

Any ventilation units / air conditioning units that are mounted in line of sight of the residential property must have a noise output at least 10 dBA BELOW the measured background ie. The noise output must not exceed 34 dBA

Roger Leach AMIOA

Acoustic Test Results Appendix A - Wall/Facade Panel Construction

Octave Band Sound Reduction Index (R) and Weighted Sound Reduction Index (R_w)

Wall	Panel and Lining	Octave Band Sound Reduction Index R								R _w	C _{tr}	Surface Weight Kg/m ²
		63	125	250	500	1k	2k	4k	8k			
1W	AWP/60 + no lining	15	16	19	23	26	22	39	–	25	-3	18
2W	AWP/60 + F	12	19	32	42	50	52	60	–	43	-10	30
3W	AWP/60 + W15	14	17	31	40	48	46	56	–	41	-10	28
4W	AWP/60 + W15 + F	17	24	37	45	52	54	64	–	47	-9	40
5W	AWP/60 + P + W12	16	22	37	45	51	50	63	–	46	-10	41
6W	AWP/60 + P + W12	18	23	35	44	49	50	61	–	45	-8	41
7W	AWP/60 + I + P + W	18	24	37	48	53	55	63	–	48	-10	4
8W	KS1000 RW/40 + I + L	13	14	29	38	40	45	55	–	38	-9	20
9W	KS1000 RW/40 + I + L	12	16	30	40	44	51	64	–	40	-9	20
10W	AWP/70 + no lining	20	15	17	23	18	25	40	46	24	-4	12.5

Key

AWP = Architectural Wall Panel with various profiles (Optimo, MR, EB, FL, MM, CX, WV, Longspan)

F = 10mm dense particle board (11.7kg/m²)

W15 = 15mm plasterboard (10kg/m²)

W12 = 12.5mm wallboard (7.9kg/m²)

P = 19mm dense plasterboard plank (15.2kg/m²)

I = Insulation (see construction description for details)

L = 0.7mm profiled steel liner sheet

The figures after the forward slash refers to the panel thickness in mm (ie AWP/60 = panel thickness of 60mm)

Acoustic Test Results Appendix B - Roof Panel Construction

Octave Band Sound Reduction Index (R) and Weighted Sound Reduction Index (R_w)

Roof	Panel and Lining	Octave Band Sound Reduction Index R								R _w	C _s	Surface Weight Kg/m ²
		63	125	250	500	1k	2k	4k	8k			
1R	KS1000 LP/45 + I + 2 x SB	27	32	47	61	69	69	75	–	58	-11	–
2R	KS1000 RW/40 + I + L	8	17	32	43	48	54	60	–	43	–	2
3R	KS1000 RW/40 + I + L	11	19	36	48	54	61	73	–	46	–	19
4R	KS1000 RW/40 + I + Py	17	27	39	44	49	57	67	–	48	–	31
5R	KS1000 RW/30 + no lining	–	17	20	23	23	23	41	–	25	-3	–
6R	KS1000 RW/30 + I + L	–	18	35	50	55	59	60	–	44	-11	–
7R	KS1000 RW/50 + I + L	–	19	34	48	52	56	63	–	44	-10	–
8R	KS1000 RW/80 + I + L	–	20	36	48	50	66	70	–	46	-11	–
9R	KS1000 RW/80 + no lining	–	18	21	23	20	38	42	–	26	-4	–
10R	KS1000 RW/80 + no lining	20	18	20	24	20	29	39	47	25	-3	–
11R	KS1000 RW/80 + I + PL	18	19	22	29	31	40	58	49	32	-4	–
12R	KS1000 ZIP/90 + no lining	19	18	19	20	17	35	38	44	23	-4	–
13R	KS1000 LP/80 + no lining	19	19	19	22	19	35	39	46	24	-4	–
14R	KS1000 RT + no lining	20	19	21	22	22	32	38	44	25	-2	–
15R	KS1000 TS + no lining	20	16	15	23	29	39	45	53	27	-4	27

Key

I = Insulation (see construction description for details)

2 x SB = 2 x 12.5mm dense plasterboard (15.2kg/m²)

L = Profiled Steel Liner Sheet

Py = 10mm thick dense particle board (11.7kg/m²)

PL = Profiled Perforated Steel Liner Sheet

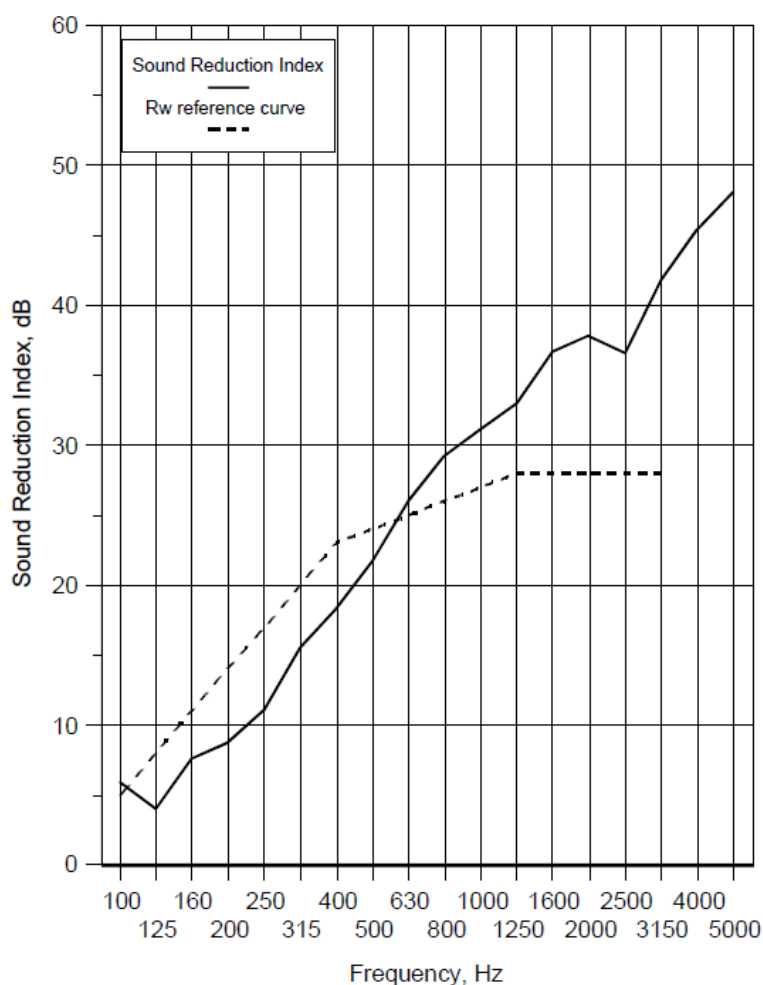
The figures after the forward slash refers to the panel thickness in mm (ie LP/45 = panel thickness of 45mm)

Data Sheet 3

Test Number : 4
Client: Filon Products Limited
Test Date: 20/02/2012
Sample height: 2.19 m
Sample width: 1 m
Product Filon GRP Rooflight
Identification: 2.44kg/m² - film core

Air temperature: 11 °C
Air humidity: 43 %
Receiving room volume: 300 m³
Source room volume: 115 m³
Sample weight: 6.07 kg/m²

Freq f Hz	Sound Reduction Index, dB	
	1/3 Oct	1/1 Oct
50+	12.6	7.6
63+	7.9	
80+	5.1	
100	5.9	5.6
125	4.0	
160	7.6	
200	8.7	11.0
250	11.1	
315	15.5	
400	18.3	21.0
500	21.8	
630	26.0	
800	29.2	30.8
1000	31.1	
1250	33.0	
1600	36.7	37.0
2000	37.8	
2500	36.6	
3150	41.8	44.3
4000	45.4	
5000	48.1	
6300+	53.6	50.3
8000+	53.1 *	
10000+	47.3 *	
Average 100-3150	22.8	Version v1.7



Rating according to BS EN ISO 717-1:1997
 Rw(C;Ctr)= **24 (-2;-7) dB**

* shows measurement corrected for background
 # shows limit of measurement due to background
 + shows frequency beyond standard and not UKAS accredited