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Welcome Break, Hinckley, LE10 3JB

Assessment of the noise impact of the proposed
Service Area, including Petrol Filling Station (PFS)
plus Shop, Restaurants and Toilets, Coffee Shop
with Drive Thru, and Car and Lorry Parks.

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Appendix 1: Definition of Acoustic Terms

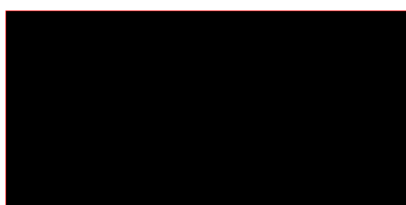
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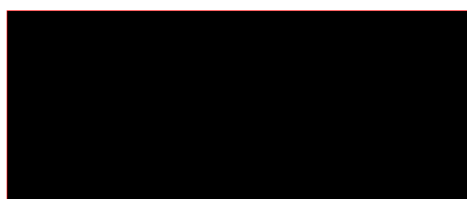
1.0 SUMMARY

The general noise climate was completely dominated by traffic on the nearby main roads, with the M69 by far the most dominant.

Overall modelled levels are based on fairly extreme worst cases. The busiest 1-hour period of a weekday or weekend is assumed to persist throughout the entire day, evening and night. Predicted levels are well within comparable BS 8233 criteria at all times, and below levels which would rate under BS 4142 as *“low Impact depending on the context”*. The context is a busy area dominated by the M69 motorway. The Impact is expected to be negligible.



A R Raymond



P J Durell

2.0 INTRODUCTION

ADC was instructed to carry out an independent assessment of the above site with regards to its suitability from a noise perspective for the development of a proposed Service Area, including Petrol Filling Station (PFS) plus Shop, Restaurants and Toilets, Coffee Shop with Drive Thru, and Car and Lorry Parks.

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. The impact is discussed along with any recommendations for mitigation.

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. Its guidance is primarily intended for new buildings, but the criteria are routinely referred to for putting general noise climates into context.

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 BS 4142

BS 4142 was updated in November 2014. The standard is very complicated but, basically, it describes methods for rating and assessing sound of an industrial and/or commercial nature, which includes:

- a) sound from industrial and manufacturing processes
- b) sound from fixed installations which comprise mechanical and electrical plant and equipment

- c) sound from the loading and unloading of goods and materials at industrial and/or commercial premises
- d) sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site.

The methods described in this British Standard use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.

Characteristics and Context

Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such features are present at the assessment location, we need to add a character correction to the specific sound level to obtain the rating level.

These features can include tonality, impulsivity and intermittency with corrections typically ranging potentially from 0dB to 9 dB. Corrections at the higher end would represent characteristics which are highly perceptible in the context of the ambient noise as a whole. Corrections at the lower end would represent characteristics which are just perceptible in the presence of the ambient noise as a whole,

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. An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context.

Assessment

We obtain an *initial estimate* of the impact of the specific sound by subtracting the measured background sound level from the rating level and considering the following.

- a) Typically, the greater this difference, the greater the magnitude of the impact.
- b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.
- d) 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.

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

1) The absolute level of sound.

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

Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.

Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse.

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

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

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

3.4 Local Authority

We are not aware of any criteria proposed by the local Authority.

4.0 **GUIDE TO CALCULATIONS AND MODELLING**

We have used the well-established CadnaA modelling software which calculates noise propagation based on the processes of *ISO 9613 : Acoustics – Attenuation of sound during propagation outdoors*.

Obviously, modelling software is reliant on the inputs and assumptions. The key ones are:-

1. The ground is mainly soft (absorption coefficient of 0.7 assumed).
2. Calculations are based on two orders of reflections.
3. The proposed site buildings and the surrounding buildings are assumed to be mainly reflective (0.5 dB loss on reflection assumed).
4. The surrounding trees and vegetation will provide a small degree of absorption but this has been neglected.
5. Where acoustic fences are used, they are also assumed to be reflective the same as the buildings, unless specified otherwise.
6. There are seven main components to the modelling – Vehicle Movements, Fuel Pumps, Vehicles Idling, Drive Thru Intercoms and speech, HGV refrigeration Units, and Mechanical Equipment.
7. For each of these source groups, the continuous source levels are corrected for their durations in a busy 1 hour period. More detail is given below.

Appendix 2 shows the full calculations for the assessment and the figures which are input to the model.

4.1 Visitor Numbers

We have been provided with estimated vehicle numbers using the site. These were provided by the traffic consultants, based on the TRICS database. The results cover 06:00 to 22:00, but our experience of numerous similar sites has fairly consistently found that vehicle visits drop by about 27% per hour from 22:00 until about 02:00, and after around 03:00 they build up again by about 39% per hour to morning rush hour. We have used the weekend (highest) figures from the Traffic Assessment and the consultant advised that he felt that these were probably excessively pessimistic, so we are confident that we have assumed a worst case.

We have used the busiest 1-hour period for daytime and have effectively assumed that the busiest 1 hour weekday period persists all day and that the early/mid evening activity levels persist to 23:00. There can be no doubt that we have assumed a worst case in this respect. Night time figures have been interpolated from presented figures as described above and based on an assumption that the 23:00 to 01:00 figures persist through the night.

The figures are given in Appendix 3.

4.2 Vehicle Movements

Vehicle movements are based on a series of 20 to 25m segments which include a vehicle pulling forwards from a standstill, accelerating to 15

km/hr, and slowing to a stop. The source of the noise data was from our own database and includes an “average” of various cars, all measured at 10m from the drive-past centre over hard ground. Each segment takes about 12 seconds. The figures are almost identical to a steady 40 to 50 km/hr drive past and so cover the steady and stop/start scenarios. Within the model, the source data is entered as a Sound Power Level per meter and calibrated to give the exact measured level at 10m from a 25m long line source. The actual line source entered can then be any length with the same Sound Power per meter. We then enter adjustments for the duration of the source data and for the number of vehicles per hour. There are of course different values for vehicle numbers using the access roads, car parks and petrol pumps. In the case of the latter, the total number of vehicles for fuel is split evenly across all pumps.

Where applicable, LGVs (eg. Vans) are approximately 5 dB louder, OGV1s (eg. Rigid Lorries) 10 dB louder and OGV2s (eg. Articulated HGVs) are approximately 12 dB louder at these speeds.

The derivation of these corrections is shown in Appendix 2.

4.3 Vehicles Idling

Idling vehicles at the Coffee Shop Drive Thru are based on a simple point source measurement of the same vehicles idling. It has been estimated that Drive Thru vehicles will idle around 30 seconds to order and around 60 seconds to queue/pay/collect.

For each, the model includes a correction for the duration of each event per hour and a correction for the number of events per hour (the number of vehicles). The derivation of these corrections is shown in Appendix 2.

4.4 Drive Thru Intercom

Verbal communication is based on typical raised speech levels of 70 dB L_{Aeq} at 1m, which also match a McDonald's study in the USA which showed similar levels. Actual measurement is extremely difficult as they are always located in busy areas, always screened by a car, and are of course set up to be heard at only 1m or so away, and are therefore more or less inaudible, and certainly unmeasurable at greater distances. However, there is simply no reason for them be any louder than raised speech levels, so we are confident that a reasonable source is being used. The model has assumed about 20 seconds of continuous speech for ordering and a similar duration for collection. Of course it takes place at the same time as the vehicle idling.

For each, the model includes a correction for the duration of each event per hour and a correction for the number of events per hour (the number of vehicles). The derivation of these corrections is shown in Appendix 2.

4.5 Fuel Pumps

Source data for fuel pumps are based on measurements at 1m from pumps at other numerous other sites. Pump use is estimated to be 60

seconds per Car/LGV, 150 seconds (2.5 minutes) for OGV1s (eg. rigid lorries) and 300 seconds (5 minutes) for OGV2s (eg. articulated HGVs).

Again, the model includes a correction for the duration of each event per hour and a correction for the number of events per hour (the number of vehicles). The derivation of these corrections is shown in Appendix 2.

4.6 HGV Refrigeration Units

Source data is based on numerous site assessments and assume the units run on diesel power through the day, evening and night. It is assumed that the Lorry park is full to capacity and that one in three has a constantly running refrigeration unit.

4.7 Mechanical Equipment

The details of the proposed mechanical equipment are not yet available and would not normally be developed until the detailed design stages. However, we have worked on numerous similar developments and have based the indicative assessment on the following, which is taken from the mechanical consultant's specifications. The equipment so far selected is as follows:-

PFS Shop, Restaurants and Toilets:

- 6 x Mitsubishi PUHZ-ZRP250YKA outdoor heating/aircon unit
- 3 x Foster DCU2-1H Freezer/Cold Room fan
- 1 x Elta SPP450/4-3 Main Inlet Fan
- 1 x Elta SPP630/4-3 Main Extract Fan
- 2 x Elta SJ250A toilet extract fan

All units are assumed to run constantly on full load throughout the entire day and night. This is of course an exceptionally unlikely scenario.

Coffee Shop:

- 2 x Mitsubishi PUHZ-ZRP250YKA outdoor heating/aircon unit
- 2 x Elta SJ250A toilet and server extract fan

Again all units are assumed to run constantly on full load throughout the entire day and night, which is also exceptionally unlikely.

HGV PFS Shop:

- 1 x Mitsubishi PUHZ-ZRP250YKA outdoor heating/aircon unit

This unit is assumed to run constantly on full load throughout the entire day and night.

4.8 Other Issues

The following covers issues which are rarely a problem but which some local authorities like to see considered.

Vehicle Doors

Door closing is an impulsive event (ie. of very short duration) and so is only a relevant measure for night time.

We assume that a door is opened and closed (not slammed for now) twice for every vehicle visiting the car parks and PFS forecourts. We begin with source levels for a car door opening and closing in terms of dB L_{AE} which is explained in the footnote¹ and dB L_{Amax} which represents the “peak”. The L_{AE} figure is adjusted for the number of events and the total duration of the events over 1 hour (3600 seconds). This gives the 1 hour “average” dB L_{Aeq} level. Along with the “peak” dB L_{Amax} level. It is then adjusted to for distance to give levels at the houses. We show later that the impact is negligible and discuss how much more force would be required for slammed doors to make any significant impact.

Deliveries

Deliveries have not been individually modelled but are clearly going to be insignificant compared with the large number of vehicle movements assumed in the overall figures.

Speech

Speech is rarely a problem but can be roughly analysed as follows:-

Normal speech is generally 60 dB L_{Aeq} and 70 dB L_{Amax} at 1m from a person talking relentlessly without any pause. We have done a lot of work on Pub and Club smoking areas and a rule of thumb is that noise levels increase by 5 dB L_{Aeq} and 2 dB L_{Amax} per doubling of speakers². Note also that these levels are for these number of people taking continuously, unrelentingly, and without a pause. On the basis that there will be at least one person listening at any given time, and allowing for pauses, the actual number of people is generally four times the figure used in calculations.

From these source levels we correct for distance from 1m to the nearest residential locations.

Car Audio Systems

It is not realistic to treat this issue analytically but it is discussed pragmatically.

¹ L_{AE} or SEL is a useful, but not particularly intuitive, method of processing impulsive or transient noise. Basically the noise from an event, here the opening and closing of a car door, is compressed into a 1 second period. We then adjust this level for the number of events and the time period being considered.

² It is well known that doubling the power of a sound increases the level by 3 dB. So doubling the number of people could be expected to increase the speech noise by 3 dB. However, in speech, the noisier environment causes speakers to increase the levels of their voices, typically by 2 dB per doubling of speakers. The net effect is a 5 dB per doubling for the L_{Aeq} level. The L_{Amax} level increases by 2 dB per doubling or is 1 dB above the L_{Aeq} level, whichever is the greater.

Antisocial Behaviour

It is also not realistic to treat this issue analytically but it is discussed pragmatically.

5.0 SURVEY DETAILS

5.1 Site times and Personnel

The survey on the proposed site was carried out on 19th June 2023 from approximately 08:00 through to approximately 07:30 the following day. Note that the survey period was stopped slightly early due to sudden heavy rain. The survey work was carried out by Mark Pimlett of ADC Acoustics. The measurements were periodically attended.

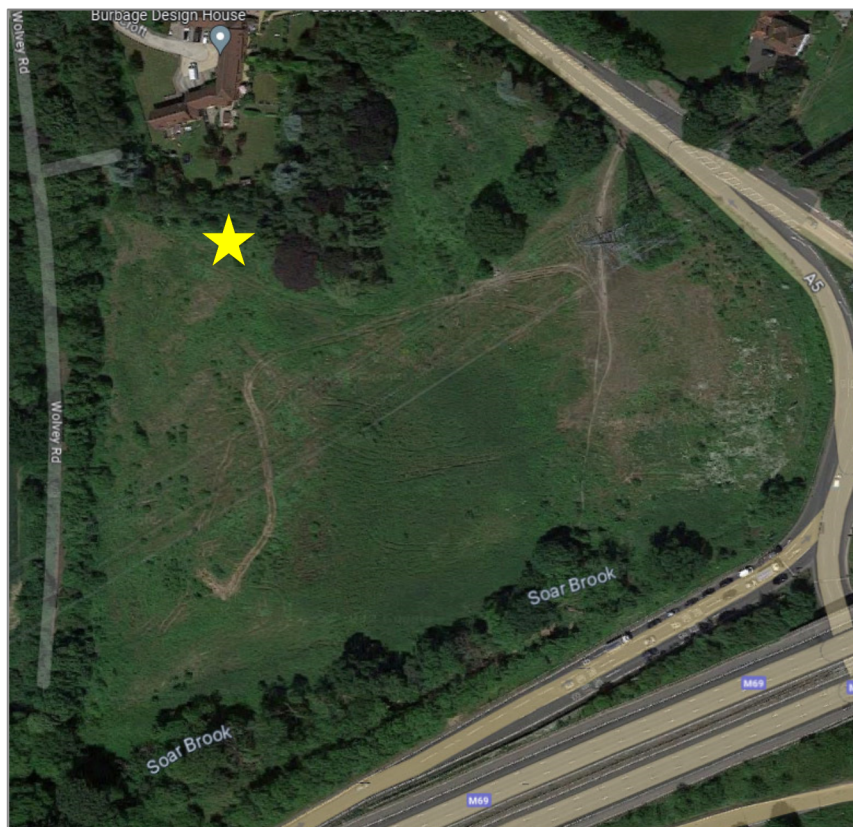
5.2 Instrumentation

Instrumentation used was a Rion NL-52. This is a Class I sound level meter which holds a current calibration certificate and which was field-calibrated as necessary. The meter was set up to measure continuous 5 minute samples of the noise climate.

All measurements have been gathered 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. See Definition of Acoustic Terms in Appendix 1.

5.3 Measurement Positions

The main measurement position was as shown by the yellow star on the plan below.



The position was chosen to represent the nearest residential property to the proposed site and its main sources of noise. The microphone was approximately 1.3 m above the ground.

5.4 Survey Conditions

Weather conditions on were as follows :-

Rain	: none, dry roads (note measurements stopped slightly early due to sudden heavy rain)
Cloud	: 0 to 100%
Temperature	: 16 to 24 Celsius
Wind	: 0 to 2 m/s from the SW

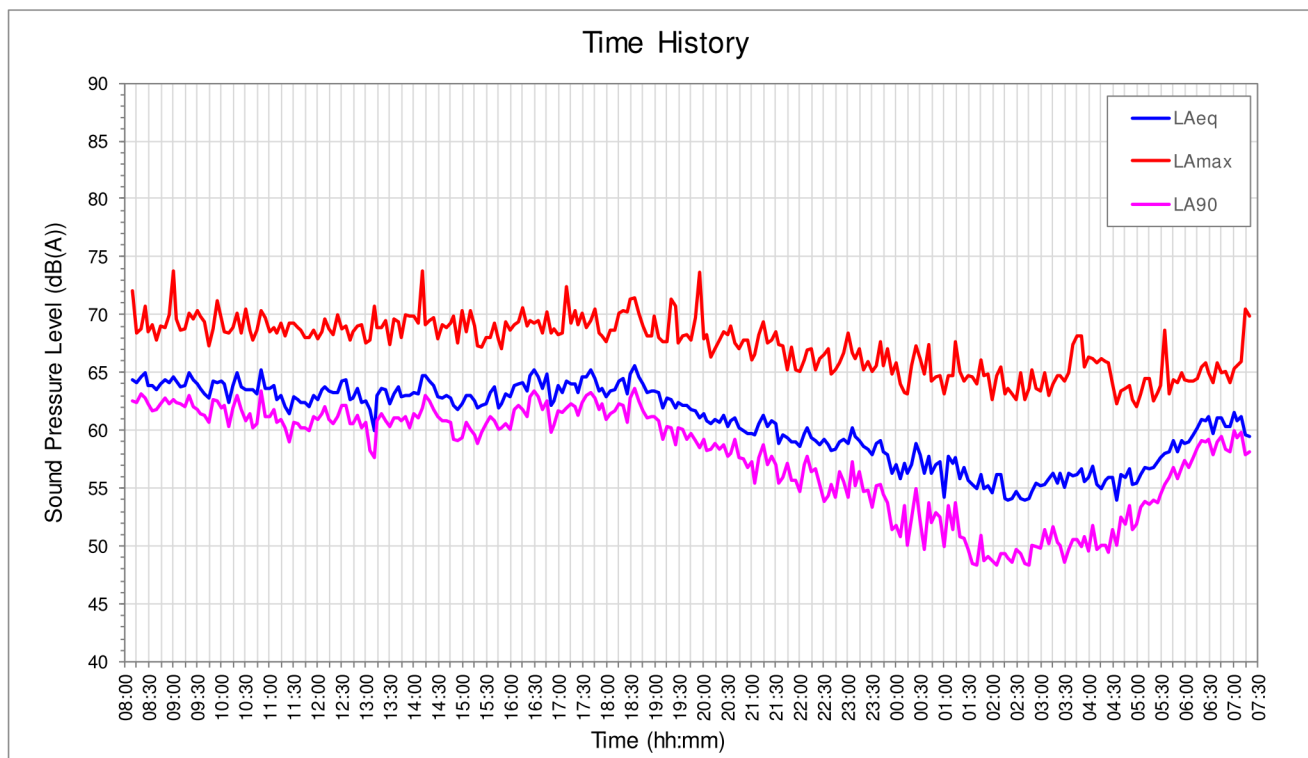
The general noise climate appeared to be normal and representative.

6.0 RESULTS AND DISCUSSIONS

6.1 Noise Survey Results

The general noise climate was completely dominated by traffic on the nearby main roads, with the M69 by far the most dominant.

Results of existing noise measurements are presented graphically as follows:-



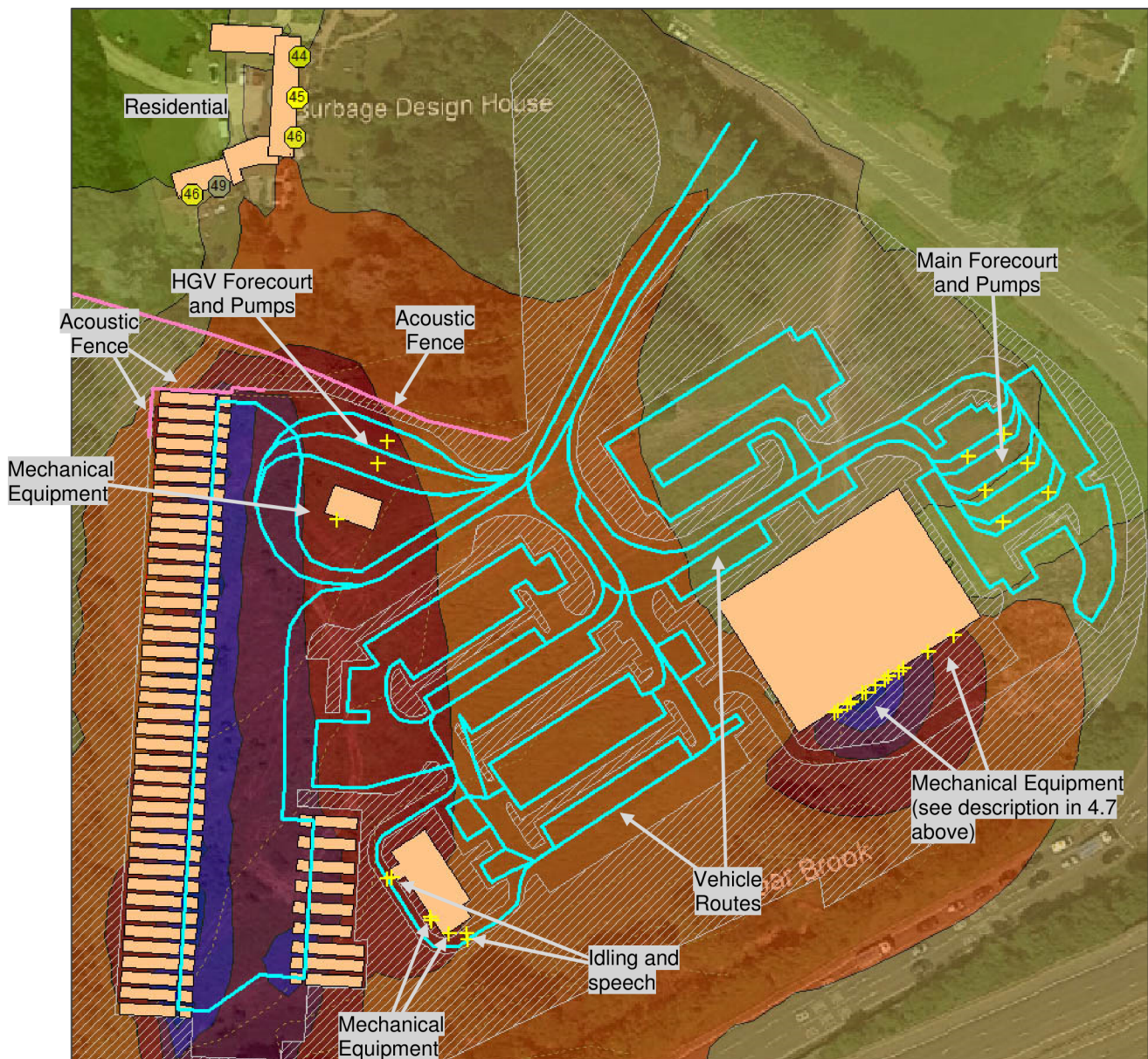
A summary of the lowest 15 minute periods (lowest in terms of the dB LA90 index) is as follows:-

<i>Time Period</i>	<i>Index</i>	<i>dB(A)</i>
Lowest Daytime	Leq	60
	Lmax	69
	L90	59
Lowest Evening	Leq	59
	Lmax	65
	L90	55
Lowest Night Time	Leq	55
	Lmax	64
	L90	49

Very importantly, BS 4142 does not require the lowest measurements to be used as the representative Background Sound Level. However, we have used the lowest 15 minute periods here as a means of assuming a worst case, for instance to mitigate for variations on different days.

6.2 Results of Modelling

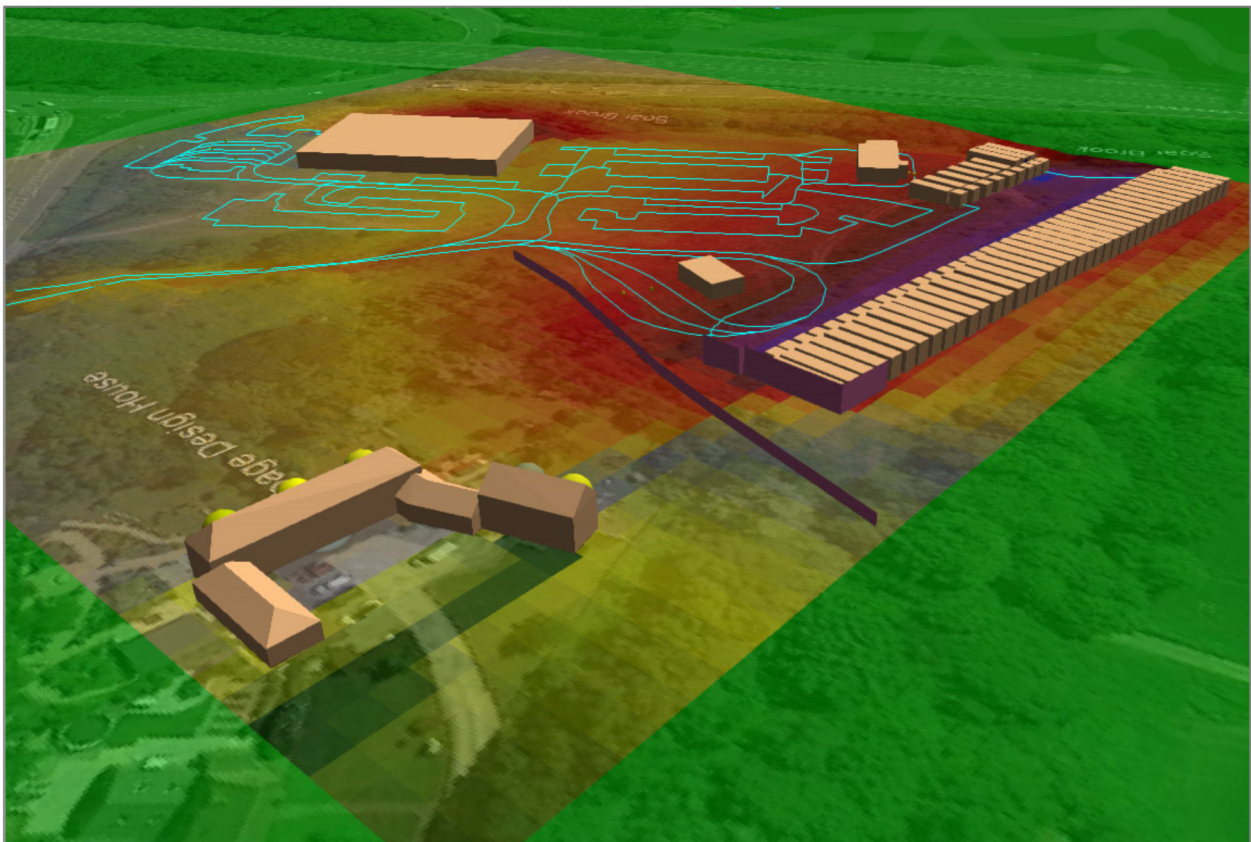
Full details of sources are given in Appendix 2 and methods and assumptions described in Section 4.0 above. The results of the modelling of the busiest 1-hour daytime period is as shown below.



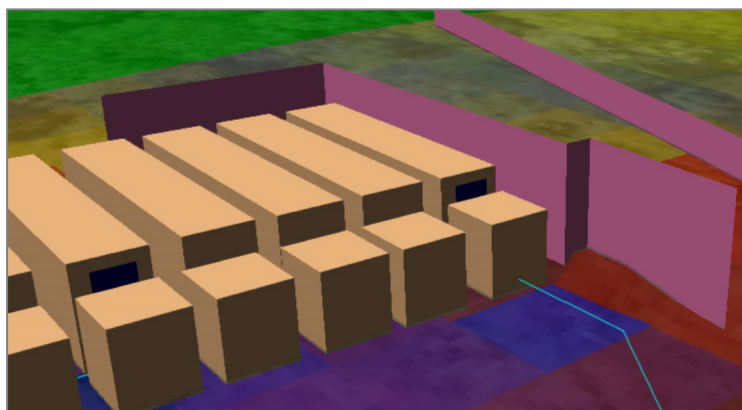
Note that:-

- The beige shapes are surrounding buildings and the application site building in its proposed form.
- Vehicle routes are the pale blue lines
- The yellow crosses are point sources (pumps, mechanical equipment, intercoms, idling, etc)
- The refrigeration units are entered as vertical area sources. They are thin blue lines on the fronts ends to the lorry trailers and are difficult to see in plan view, but a 3 D view is shown below.
- The magenta lines are acoustic fences.
- The coloured numbers are the noise levels at the residential facades. Note that the software is set up to present the noisiest floor level.
- Note that the noise contours are shown for guidance as to how the noise propagates. The contours are at a height of 4 m.

The following main 3D view should help to visualise the model.



The following additional 3D view should help to visualise the HGV refrigerated units – the area sources are the dark blue rectangles.



As described in section 4 above, the daytime figures represent the busiest 1-hour period of a weekday and are assumed to persist throughout the entire day. In fact, as we have assumed that the Refrigeration units and mechanical equipment all run continuously day and night, the variations in traffic volumes make no difference and the daytime model is used to assess all times of the day and night as a very significant worst case assumption.

6.3 Mitigation

Acoustic fences are proposed approximately as shown by the magenta lines in the above image. The boundary fence is 2 m high as shown on the planning drawings. It has very little overall impact on the levels at the residential properties but will reduce the perception of HGVs passing close to it when accessing the refuelling. Even so, it does not need to have a particularly high specification.

We have also specified a 4.5 m acoustic barrier around the NW corner of the HGV parking bays as shown in the above images. This is relied upon to reduce the noise by up to 7 dB, so still does not have to be a specialist fence.

Theoretically, a barrier which is required to provide a 10 dB reduction only needs a density of 3 kg/m² which would be equivalent to around 6 mm thick timber. Of course the fences would be far thicker than this for structural purposes, especially the 4.5 m high one. The important point is that there are no gaps, including allowance for shrinkage and warping. An overlapping 12 to 15 mm fence would be a typical example of a simple acoustic fence.

6.4 Overall Assessment

The BS 4142 assessment is presented as follows:-

Daytime

Specific Sound Level:	49 dB L _{Aeq}
Feature Corrections ³	
tonality:	0 dB L _{Aeq}
impulsivity:	0 dB L _{Aeq}
intermittency:	0 dB L _{Aeq}
other:	0 dB L _{Aeq}
Rating Level:	49 dB L _{Ar}
Background Sound Level:	59 dB L _{A90}
Rating Level Excess re. Background	-10 dB

This is substantially below what a BS 4142 “*initial estimate*” rates as “*low impact depending on the context*”.

³ The noise is clearly not impulsive or tonal. Vehicle movements will be intermittent at source but unlikely to be even audible at the houses, and certainly not distinguishable from the existing traffic noise. Therefore, no character/feature corrections apply.

Evening

Specific Sound Level:	49 dB L _{Aeq}
Feature Corrections ³	
tonality:	0 dB L _{Aeq}
impulsivity:	0 dB L _{Aeq}
intermittency:	0 dB L _{Aeq}
other:	0 dB L _{Aeq}
Rating Level:	49 dB L _{Ar}
Background Sound Level:	55 dB L _{A90}
Rating Level Excess re. Background	-6 dB

This is substantially below what a BS 4142 *“initial estimate”* rates as *“low impact depending on the context”*.

Night Time

Specific Sound Level:	49 dB L _{Aeq}
Feature Corrections ³	
tonality:	0 dB L _{Aeq}
impulsivity:	0 dB L _{Aeq}
intermittency:	0 dB L _{Aeq}
other:	0 dB L _{Aeq}
Rating Level:	49 dB L _{Ar}
Background Sound Level:	49 dB L _{A90}
Rating Level Excess re. Background	0 dB

This is right on the boundary what a BS 4142 *“initial estimate”* rates as *“low impact depending on the context”*.

In all cases, the context of course is one of a busy area already dominated by traffic noise. We have used numerous worst case assumptions, the main one being that the refrigerated HGV units and building mechanical equipment run constantly on full load throughout the day and night, which is exceptionally unlikely to happen, if ever. We have also used the quietest 15 minute periods of background levels which is not a requirement of BS 412.

6.5 Discussion of Uncertainty

BS 4142 requires us to:

“Consider the level of uncertainty in the data and associated calculations. Where the level of uncertainty could affect the conclusion, take reasonably practicable steps to reduce the level of uncertainty”.

The measurements of Background/Residual Sound were taken over a 24 hour period. We have no reason to believe that the conditions were anything other than representative of normal conditions. Note that we have compared our measurements with those of the 2020 application for this site and find them entirely consistent. Note, however, that the 2020 assessment took what appears to have been “average” levels of background sound level, whereas this assessment takes the lowest 15

minute periods. BS 4142 does not state what would be a representative background noise but there is certainly no suggestion that it should be lowest, and indeed it states, “...*the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods*”. However, in order to allow for the possibility of variation in levels, we have used the lowest 15 minute respective periods.

Source data taken for the vehicles, etc. can of course vary but is based on a lot of measurements and we would expect this uncertainty to be compensated for by the numerous worst case assumptions listed throughout the report.

6.6 Other Issues

Sometimes queries are raised regarding Vehicle Doors, Speech, Car Audio Systems and Antisocial Behaviour.

These issues are rare on a site like this but we can offer the following discussion for completeness.

Vehicle Doors

It is our firm view that door slamming is infrequent in nearly all situations. It cannot be said never to happen, but it should not be taken as normal. The method of calculation is described in Section 4.

Normal door opening and closing is calculated to give worst case 1 hour night time levels at the houses of just 7 dB L_{Aeq} and 38 dB L_{Amax} , not including the screening effects of buildings, fences, etc. The existing dB L_{Amax} levels are much higher than this at 62 to 69 dB L_{Amax} , even at the quietest time of night. To exceed the WHO Guide level of 60 dB L_{Amax} the doors would have to be slammed with more than 250 times the energy used in the calculations and this would need to occur 10 to 15 times a night before this would be a problem.

Speech

Notwithstanding antisocial behaviour (see later), we can see no reason why there would be significant amounts of speech other than small numbers of customers sitting outside. However, at the distances involved, and ignoring the screening effects of buildings, barriers, garden fences, etc. very large numbers would be able to have conversations outside before there is any realistic risk of disturbance.

Normal speech is generally 60 dB L_{Aeq} and 70 dB L_{Amax} at 1m from a person talking relentlessly without any pause. We have done a lot of work on Pub and Club smoking areas and a rule of thumb is that noise levels increase by 5 dB L_{Aeq} and 2 dB L_{Amax} per doubling of speakers⁴.

⁴ It is well known that doubling the power of a sound increases the level by 3 dB. So doubling the number of people could be expected to increase the speech noise by 3 dB. However, in speech, the

For a night time period it would require 110 people talking continuously, unrelentingly, and without a pause before levels would be comparable with existing levels, even without considering acoustic screening effects. Bearing in mind that in order for someone to be talking constantly there would need to be at least one person listening. In practice, for a given number of people to be constantly talking, there is likely to be around four times as many people in total. So we can see clearly that the numbers of people required are substantially in excess of anything that is likely.

Car Audio Systems

This is not something which we can deal with analytically. There is clearly no denying that an open top car with a loud sound system can cause disturbance, and that nearly all sound systems would not be a problem with hard top cars and the windows closed. However, notwithstanding antisocial behaviour (see later), our own experience is that we very rarely see it and we would suggest that the chances of disturbance are minimal.

Antisocial Behaviour

Clearly antisocial behaviour can cause disturbance, including speech, and including unreasonable use of car audio systems. However, responsible operators should be able to implement reasonable controls.

7.0 CONCLUSIONS/RECOMMENDATIONS

Overall modelled levels are based on fairly extreme worst cases. The busiest 1-hour period of a weekday or weekend is assumed to persist throughout the entire day, evening and night. Predicted levels are well within comparable BS 8233 criteria at all times, and below levels which would rate under BS 4142 as *“low Impact depending on the context”*. The context is a busy area dominated by the M69 motorway. The Impact is expected to be negligible.

Simple acoustic fencing is proposed around part of the boundary. We have also specified acoustic fencing around the NW corner of the HGV parking area. We would suggest that this can be controlled by a condition requiring details to be submitted and approved.

As the exact details of mechanical equipment is not set, it may be necessary to submit details, although the impact is likely to be negligible whatever is proposed.

noisier environment causes speakers to increase the levels of their voices, typically by 2 dB per doubling of speakers. The net effect is a 5 dB per doubling for the L_{Aeq} level. The L_{Amax} level increases by 2 dB per doubling or is 1 dB above the L_{Aeq} level, whichever is the greater.

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 levels are discussed below.

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

NR and NC Levels

NR curves and NC curves are a series of curves representing noise levels across the frequency range. A given noise climate has an NR level or NC level if it equals a point on the curve at any frequency. They are particularly, although by no means exclusively, used as a means of specifying noise limits in an indoor environment, for instance from mechanical services or traffic noise break-in from the outside. They are typically expressed as NR or NC followed by a number, e.g. NR40, NC55, etc.

Equivalent Continuous Sound Level, L_{eq}

This can be simplistically described as a way of expressing the average 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} .

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 $L_{A\max}$.

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_{An} .

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.

Sound Insulation

Sound insulation is best expressed across the frequency range in octave bands or third octave bands. Often, however, in known environments such as domestic sound insulation and speech privacy, it is simpler to express the sound insulation as a single figure. A higher value means better sound insulation.

The most common ways are $\text{dB } D_{nTw}$, $\text{dB } R_w$ and $\text{dB}_{(\text{mean } 100-3150\text{Hz})}$. The first two are ways of expressing average sound insulation, weighted to account for speech frequencies. The third is simply an un-weighted mean value.

The Building Regulations Approved Document E (ADE) routinely refer to $D_{nTw} + C_{tr}$. The C_{tr} term is a negative number which is used to modify the D_{nTw} value for the insulation properties at lower frequencies.

ADE also uses the L_{nTw} index for impact sound transmission. It is a measure of the level of noise in the room below a room in which a standard tapping machine is being used. It represents the impact sound transfer such as footfall noise, scraping chairs, washing machines, etc. A lower value means better insulation.

Reverberation Time

The most common measure of Reverberation Time is, effectively the time taken for sound from a steady source to decay by 60 dB after it has been abruptly cut off. In practice it is often difficult to measure a 60 dB decay and so decays of 30 dB, 20 dB, or even 10 dB are often used and adjusted pro rata, although the exact measure is not quite the same.

Reverberation Time is generally expressed as RT in seconds. We may, if we are being precise, add subscripts 60, 30, etc. to show whether the basis of the measure is 60 dB decay, 30 dB decay, etc. E.g. the $RT_{60} = 0.52\text{s}$, the $RT_{30} = 0.49\text{s}$, etc.

RT can be expressed in octave bands or 1/3 octave bands across the frequency range, or at central frequencies such as 500 Hz or 1kHz.

Appendix 2

Modelling Inputs

Visitor Based Source Data

Continuous Source Inputs

Description	Index	dB(A)	63	125	250	500	1k	2k	4k	8k
Car Drive Past	Leq	53	70	53	53	50	46	43	39	34
25m/12s long - pull away, pass at 10m, and stop	Lmax	57	73	60	59	53	50	47	44	38
LGV (eg. Van) Drive Past	Leq	58	75	58	58	55	51	48	44	39
25m/12s long - pull away, pass at 10m, and stop	Lmax	62	78	65	64	58	55	52	49	43
OGV1 (eg. Rigid Lorry) Drive Past	Leq	63	80	63	63	60	56	53	49	44
25m/12s long - pull away, pass at 10m, and stop	Lmax	67	83	70	69	63	60	57	54	48
OGV2 (eg. Articulated HGV) Drive Past	Leq	65	82	65	65	62	58	55	51	46
25m/12s long - pull away, pass at 10m, and stop	Lmax	69	85	72	71	65	62	59	56	50
Car Idling at 10m	Leq	46	59	44	42	44	40	38	35	29
Van Idling at 10m	Leq	51	64	49	47	49	45	43	40	34
Refrigeration Unit running on diesel power (sound power level)	Leq	95	95	97	99	91	90	86	79	71
Car Door	SEL	58	69	65	60	57	48	46	42	33
5m - Average of 16 open and close of driver's door	Lmax	63	75	71	66	61	52	51	45	34
Fuel Pumps at 1m	Leq	59	58	59	62	52	52	50	49	45
Continuous Intercom/Raised Speech at 10m	Leq	50	20	44	46	51	41	42	35	32
	Lmax	60	30	52	56	60	52	53	45	45
Continuous Conversational Speech at 10m	Leq	40	21	40	41	39	34	30	29	22
	Lmax	50	31	46	47	49	44	41	40	34

PFS

Length of Vehicle Source Segment	25 m
Duration of Vehicle Segment	12 s
Correction for the Duration of a Segment	-25 dB

Description	Activity	Day	Eve	Night
Number of Cars per hour	Fuel	1.07	0.90	0.90
Correction for number of Cars (dB)	Fuel	0	0	0
Overall Correction for Cars (dB)	Fuel	-24	-25	-25
Number of LGVs per hour	Fuel	0.12	0.10	0.10
Correction for number of LGVs (dB)	Fuel	-9	-10	-10
Overall Correction for LGVs (dB)	Fuel	-34	-35	-35
Combined Correction for Cars and LGVs (dB)	Fuel	-23	-24	-24
Number of OGV1s per hour	Fuel	0.17	0.17	0.17
Correction for number of OGV1s (dB)	Fuel	-8	-8	-8
Overall Correction for OGV1s (dB)	Fuel	-32	-32	-32
Number of OGV2s per hour	Fuel	0.83	0.83	0.83
Correction for number of OGV2s (dB)	Fuel	-1	-1	-1
Overall Correction for OGV2s (dB)	Fuel	-26	-26	-26
Combined Correction for OGV1s and OGV2s (dB)	Fuel	-23	-23	-23

Pump Duration per Car	60 s
Correction for Duration of Car Pump Use	-18 dB
Pump Duration per LGV	60 s
Correction for Duration of LGV Pump Use	-18 dB
Pump Duration per OGV1	150 s
Correction for Duration of OGV1 Pump Use	-14 dB
Pump Duration per OGV2	300 s
Correction for Duration of OGV2 Pump Use	-11 dB

Description	Activity	Day	Eve	Night
Correction for Car Pump no. of uses per hour (dB)	Fuel	0	0	0
Overall Correction for Car Pumps (dB)	Fuel	-17	-18	-18
Correction for LGV Pump no. of uses per hour (dB)	Fuel	-9	-10	-10
Overall Correction for LGV Pumps (dB)	Fuel	-27	-28	-28
Combined Correction for Cars and LGVs	Fuel	-17	-18	-18
Correction for OGV1 Pump no. of uses per hour (dB)	Fuel	-8	-8	-8
Overall Correction for OGV1 Pumps (dB)	Fuel	-21	-21	-21
Correction for OGV2 Pump no. of uses per hour (dB)	Fuel	-1	-1	-1
Overall Correction for OGV2 Pumps (dB)	Fuel	-12	-12	-12
Combined Correction for OGV1s and OGV2s	Fuel	-11	-11	-11

Coffee Shop

Length of Vehicle Source Segment	25 m
Duration of Vehicle Segment	12 s
Correction for the Duration of a Segment	-25 dB
Assumed DT percentage of total	50 %

Description	Activity	Day	Eve	Night
Number of Cars per hour	DT	2.15	0.90	
Correction for number of Cars (dB)	DT	3	0	n/a
Overall Correction for Cars (dB)	DT	-21	-25	n/a
Number of LGVs per hour	DT	0.24	0.10	
Correction for number of LGVs (dB)	DT	-6	-10	n/a
Overall Correction for LGVs (dB)	DT	-31	-35	n/a
Combined Correction for Cars and LGVs (dB)	DT	-20	-24	n/a

Ordering Idling duration per vehicle	30 s
Queuing/Collection Idling duration per vehicle	60 s
Ordering Intercom/Speech duration per vehicle	20 s
Queuing/Collection Speech duration per vehicle	20 s

Correction for Ordering Idling	-21 dB
Correction for Queuing/Collection Idling	-18 dB
Correction for Ordering Intercom/Speech	-23 dB
Correction for Queuing/Collection Speech	-23 dB

Description	Activity	Day	Eve	Night
Correction for number of Cars (dB)	DT	3	0	n/a
Overall Correction for Ordering Idling (dB)	DT	-17	-21	n/a
Overall Correction for Collection Idling (dB)	DT	-14	-18	n/a
Overall Correction for Ordering speech (dB)	DT	-19	-23	n/a
Overall Correction for Collection Speech (dB)	DT	-19	-23	n/a
Correction for number of LGVs (dB)	DT	-6	-10	n/a
Overall Correction for Ordering Idling (dB)	DT	-27	-31	n/a
Overall Correction for Collection Idling (dB)	DT	-24	-28	n/a
Overall Correction for Ordering speech (dB)	DT	-29	-33	n/a
Overall Correction for Collection Speech (dB)	DT	-29	-33	n/a
Combined Corrections for Cars and LGVs (dB)	DT	-	-	-
Overall Correction for Ordering Idling (dB)	DT	-16	-20	n/a
Overall Correction for Collection Idling (dB)	DT	-13	-17	n/a
Overall Correction for Ordering speech (dB)	DT	-18	-22	n/a
Overall Correction for Collection Speech (dB)	DT	-18	-22	n/a

Parking

Length of Vehicle Source Segment	25 m
Duration of Vehicle Segment	12 s
Correction for the Duration of a Segment	-25 dB
Assumed DT percentage of total	50 %

Description	Activity	Day	Eve	Night
Number of Cars per hour	Park	7.51	2.28	1.19
Correction for number of Cars (dB)	Park	9	4	1
Overall Correction for Cars (dB)	Park	-16	-21	-24
Number of LGVs per hour	Park	0.83	0.25	0.13
Correction for number of LGVs (dB)	Park	-1	-6	-9
Overall Correction for LGVs (dB)	Park	-26	-31	-34
Combined Correction for Cars and LGVs (dB)	Park	-15	-20	-23
Number of OGV1s per hour	Park	0.23	0.17	0.17
Correction for number of OGV1s (dB)	Park	-6	-8	-8
Overall Correction for OGV1s (dB)	Park	-31	-32	-32
Number of OGV2s per hour	Park	1.11	0.83	0.83
Correction for number of OGV2s (dB)	Park	0	-1	-1
Overall Correction for OGV2s (dB)	Park	-24	-26	-26
Combined Correction for OGV1s and OGV2s (dB)	Park	-22	-23	-23

Vehicle Doors

Number of closes 23:00 to 00:00	9 (2 per vehicle)
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Description	Dist (m)	Index	dB(A)	63	125	250	500	1k	2k	4k	8k
Overall Levels at Source	5	Leq	31	43	39	33	30	21	20	16	7
		Lmax	63	75	71	66	61	52	51	45	34
Overall Levels at Houses	85	Leq	7	18	14	9	6	-3	-5	-9	-18
		Lmax	38	51	46	42	37	28	27	21	9

Voices

Number of People talking Outside - Small Hours	110
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Description	Dist (m)	Index	dB(A)	63	125	250	500	1k	2k	4k	8k
Conversational Speech Levels at Source	10	Leq	74	54	73	75	73	67	64	63	55
		Lmax	75	55	74	76	74	68	65	64	56
Conversational Levels at Houses	85	Leq	55	36	55	56	54	49	45	44	37
		Lmax	57	38	57	58	56	51	47	46	39

Appendix 3

Vehicle Counts

Assumed Percentages

- 13% DTP
- 83% Drawings
- OGV2s : OGV1s/Coaches
- 10% Previous Projects
- 10% DTP
- 25% DTP
- 20% DTP
- SBX 01 % of LGVs and Cars

TRICS Source Data

Times		All										PFS				Coffee Shop				Parking			
		TRICS Figures per 100m2					Figures are IN +OUT					Figures are IN+OUT				Figures are IN+OUT							
		All	Cars	LGVs	OGV1s	OGV2s	Cars	LGVs	OGV1s	OGV2s	Cars	LGVs	OGV1s	OGV2s	Cars	LGVs	OGV1s	OGV2s	Cars	LGVs	OGV1s	OGV2s	
07:00	- 08:00	11,211	8,778	9,975	0,250	1,208	0,878	0,988	0,062	0,392	1,756	0,195	0,683	0,906	6,145	0,683	0,187	0,829	6,145	0,683	0,187	0,829	
08:00	- 09:00	13,778	10,788	11,999	0,307	1,484	1,079	0,120	0,077	0,371	2,158	0,240	0,839	0,230	7,552	0,839	0,230	1,113	7,552	0,839	0,230	1,113	
09:00	- 10:00	15,566	12,204	1,356	0,347	1,679	1,220	0,136	0,087	0,420	2,441	0,271	0,949	0,261	8,543	0,949	0,261	1,259	8,543	0,949	0,261	1,259	
10:00	- 11:00	17,908	14,022	1,558	0,399	1,929	1,402	0,156	0,100	0,482	2,804	0,312	0,981	0,299	9,815	1,091	0,299	1,447	9,815	1,091	0,299	1,447	
11:00	- 12:00	24,508	19,190	2,132	0,546	2,640	1,919	0,213	0,137	0,660	3,838	0,426	1,343	0,410	13,433	1,493	0,410	1,980	13,433	1,493	0,410	1,980	
12:00	- 13:00	27,396	21,451	2,363	0,611	2,951	2,145	0,238	0,153	0,739	4,290	0,477	1,5016	0,458	15,016	1,668	0,458	2,213	15,016	1,668	0,458	2,213	
13:00	- 14:00	27,461	21,502	2,369	0,612	2,958	2,150	0,239	0,153	0,739	4,300	0,478	1,5051	0,459	15,051	1,672	0,459	2,218	15,051	1,672	0,459	2,218	
14:00	- 15:00	25,727	20,144	2,238	0,573	2,771	2,014	0,224	0,143	0,683	4,029	0,448	1,4101	0,430	14,101	1,567	0,430	2,078	14,101	1,567	0,430	2,078	
15:00	- 16:00	21,513	16,845	1,872	0,479	2,317	1,684	0,187	0,120	0,579	3,869	0,374	1,1791	0,360	11,791	1,310	0,360	1,738	11,791	1,310	0,360	1,738	
16:00	- 17:00	20,143	15,772	1,752	0,449	2,170	1,577	0,175	0,112	0,542	3,154	0,350	1,1227	0,337	11,040	1,227	0,337	1,627	11,040	1,227	0,337	1,627	
17:00	- 18:00	20,689	16,199	1,800	0,461	2,229	1,620	0,180	0,115	0,557	3,240	0,360	1,1340	0,346	11,340	1,260	0,346	1,671	11,340	1,260	0,346	1,671	
18:00	- 19:00	19,437	15,219	1,691	0,433	2,094	1,522	0,169	0,108	0,523	3,044	0,338	1,0653	0,325	10,653	1,184	0,325	1,570	10,653	1,184	0,325	1,570	
19:00	- 20:00	15,950	12,489	1,388	0,355	1,718	1,249	0,139	0,089	0,430	2,498	0,278	0,971	0,267	8,742	0,971	0,267	1,289	8,742	0,971	0,267	1,289	
20:00	- 21:00	8,312	6,508	0,723	0,185	0,895	0,651	0,072	0,046	0,224	1,302	0,145	0,506	0,139	4,556	0,506	0,139	0,671	4,556	0,506	0,139	0,671	
21:00	- 22:00	6,343	4,967	0,552	0,141	0,683	0,497	0,055	0,035	0,171	0,993	0,110	0,366	0,106	3,477	0,366	0,106	0,512	3,477	0,366	0,106	0,512	
22:00	- 23:00	4,630	3,626	0,403	0,103	0,499	0,364	0,040	0,026	0,125	0,691	0,081	0,265	0,056	2,382	0,265	0,056	0,273	2,382	0,265	0,056	0,273	
23:00	- 00:00	3,380	2,647	0,294	0,075	0,384	0,265	0,029	0,019	0,091	0,491	0,066	0,149	0,041	1,739	0,149	0,041	0,199	1,739	0,149	0,041	0,199	
00:00	- 01:00	2,468	1,932	0,215	0,055	0,286	0,193	0,021	0,014	0,066	0,328	0,041	0,0927	0,103	0,927	0,103	0,022	0,106	0,927	0,103	0,022	0,106	
01:00	- 02:00	1,801	1,410	0,157	0,040	0,194	0,141	0,016	0,010	0,049	0,269	0,041	0,030	0,146	0,269	0,041	0,030	0,146	0,269	0,041	0,030	0,146	
02:00	- 03:00	1,315	1,030	0,114	0,029	0,142	0,103	0,011	0,007	0,035	0,187	0,022	0,031	0,148	0,187	0,022	0,031	0,148	0,187	0,022	0,031	0,148	
03:00	- 04:00	1,828	1,431	0,159	0,041	0,197	0,143	0,016	0,010	0,049	0,269	0,041	0,030	0,146	0,269	0,041	0,030	0,148	0,269	0,041	0,031	0,148	
04:00	- 05:00	2,541	1,989	0,221	0,057	0,274	0,199	0,022	0,014	0,068	0,328	0,041	0,0927	0,103	0,927	0,103	0,022	0,106	0,927	0,103	0,022	0,106	
05:00	- 06:00	3,531	2,765	0,307	0,079	0,380	0,277	0,031	0,020	0,095	0,489	0,059	0,130	0,285	2,489	0,277	0,059	0,285	2,489	0,277	0,059	0,285	
06:00	- 07:00	7,788	6,098	0,678	0,174	0,839	0,610	0,068	0,043	0,210	1,220	0,136	0,474	0,130	4,269	0,474	0,130	0,629	4,269	0,474	0,130	0,629	

Adjustments to Source Data

Source Data Feature		All Figures in bold are multiplication factors										PFS Figures are IN+OUT				Coffee Shop Figures are IN+OUT				Parking Figures are IN+OUT			
		All	Cars	LGVs	OGV1s	OGV2s	Cars	LGVs	OGV1s	OGV2s	Cars	LGVs	OGV1s	OGV2s	Cars	LGVs	OGV1s	OGV2s	Cars	LGVs	OGV1s	OGV2s	
	Source counts per visit	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
	Model counts per visit	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
	Adjustment per visit	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
	Area for source data	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	
	Actual Area	2062.6	2062.6	2062.6	2062.6	2062.6	2062.6	2062.6	2062.6	2062.6	2062.6	2062.6	2062.6	2062.6	2062.6	2062.6	2062.6	2062.6	2062.6	2062.6	2062.6	2062.6	
	Adjustment for Area	20.626	20.626	20.626	20.626	20.626	20.626	20.626	20.626	20.626	20.626	20.626	20.626	20.626	20.626	20.626	20.626	20.626	20.626	20.626	20.626	20.626	
	Total Adjustments	10.313	10.313	10.313	10.313	10.313	10.313	10.313	10.313	10.313	10.313	10.313	10.313	10.313	10.313	10.313	10.313	10.313	10.313	10.313	10.313	10.313	

Adjusted TRICS and Mod Levels

Times		All Figures are total visits per hour										PFS Figures are IN + OUT				Coffee Shop Figures are IN-OUT				Parking Figures are IN + OUT			
		All	Cars	LGVs	OGV1s	OGV2s	Cars	LGVs	OGV1s	OGV2s	Cars	LGVs	OGV1s	OGV2s	Cars	LGVs	OGV1s	OGV2s					
07:00 - 08:00		115,619	90,530	10,059	2,577	12,454	9,900	0.100	0.171	0.829	0.900	0.100	0.171	0.829	3,072	0.341	0.171	0.829					
08:00 - 09:00		142,093	111,258	12,362	3,167	15,305	12,362	0.100	0.171	0.829	1,079	0.120	0.171	0.829	3,776	0.420	0.171	0.829					
09:00 - 10:00		160,738	125,858	13,994	3,582	17,314	13,994	0.100	0.171	0.829	1,220	0.136	0.171	0.829	4,271	0.475	0.171	0.829					
10:00 - 11:00		184,685	144,609	16,068	4,116	19,983	16,068	0.100	0.171	0.829	1,402	0.156	0.171	0.829	4,908	0.545	0.171	0.829					
11:00 - 12:00		252,751	197,904	21,989	5,633	27,225	21,989	0.100	0.171	0.829	1,919	0.213	0.171	0.829	6,716	0.746	0.205	0.990					
12:00 - 13:00		282,535	221,225	24,531	6,296	30,433	24,531	0.119	0.171	0.829	2,145	0.238	0.171	0.829	7,508	0.834	0.229	1.107					
13:00 - 14:00		283,205	221,750	24,639	6,311	30,505	24,639	0.119	0.171	0.829	2,150	0.238	0.171	0.829	7,509	0.836	0.229	1.109					
14:00 - 15:00		265,323	207,748	23,083	5,913	28,579	23,083	0.112	0.171	0.829	2,014	0.224	0.171	0.829	7,050	0.783	0.215	1.039					
15:00 - 16:00		221,864	173,719	19,302	4,944	23,898	19,302	0.100	0.171	0.829	1,684	0.187	0.171	0.829	5,986	0.655	0.180	0.869					
16:00 - 17:00		207,735	162,656	18,073	4,630	22,376	18,073	0.100	0.171	0.829	1,577	0.175	0.171	0.829	5,520	0.613	0.171	0.829					
17:00 - 18:00		213,366	167,065	18,563	4,755	22,983	18,563	0.100	0.171	0.829	1,620	0.180	0.171	0.829	5,670	0.630	0.173	0.836					
18:00 - 19:00		200,454	156,955	17,439	4,467	21,592	17,439	0.100	0.169	0.829	1,522	0.169	0.171	0.829	5,327	0.592	0.171	0.829					
19:00 - 20:00		164,492	128,798	14,311	3,666	17,718	14,311	0.100	0.171	0.829	1,249	0.139	0.171	0.829	4,371	0.486	0.171	0.829					
20:00 - 21:00		85,722	67,120	7,458	1,923	9,933	9,900	0.100	0.171	0.829	900	0.100	0.171	0.829	2,278	0.253	0.171	0.829					
21:00 - 22:00		45,415	31,220	3,581	1,458	5,120	5,829	0.100	0.171	0.829	0.900	0.100	0.171	0.829	1,738	0.193	0.171	0.829					
22:00 - 23:00		47,753	37,391	4,195	1,155	5,144	5,829	0.100	0.171	0.829	0.900	0.100	0.171	0.829	1,632	0.181	0.171	0.829					
23:00 - 00:00		25,448	19,956	2,214	0,567	2,741	2,829	0.100	0.171	0.829	0.900	0.100	0.171	0.829	990	0.103	0.171	0.829					
00:00 - 01:00		18,577	14,546	1,616	0,414	2,001	2,000	0.100	0.171	0.829	0.900	0.100	0.171	0.829	900	0.100	0.171	0.829					
01:00 - 02:00		13,561	10,618	1,190	0,302	1,461	0.900	0.100	0.171	0.829	0.900	0.100	0.171	0.829	900	0.100	0.171	0.829					
02:00 - 03:00		18,850	14,759	1,640	0,420	2,030	2,000	0.100	0.171	0.829	0.900	0.100	0.171	0.829	900	0.100	0.171	0.829					
03:00 - 04:00		26,201	20,510	2,280	0,584	2,822	2,829	0.100	0.171	0.829	0.900	0.100	0.171	0.829	900	0.100	0.171	0.829					
04:00 - 05:00		36,420	28,517	3,169	0,812	3,923	3,900	0.100	0.171	0.829	0.900	0.100	0.171	0.829	1,244	0.138	0.171	0.829					
05:00 - 06:00		80,318	62,889	6,988	1,790	8,651	8,829	0.100	0.171	0.829	0.900	0.100	0.171	0.829	2,134	0.237	0.171	0.829					