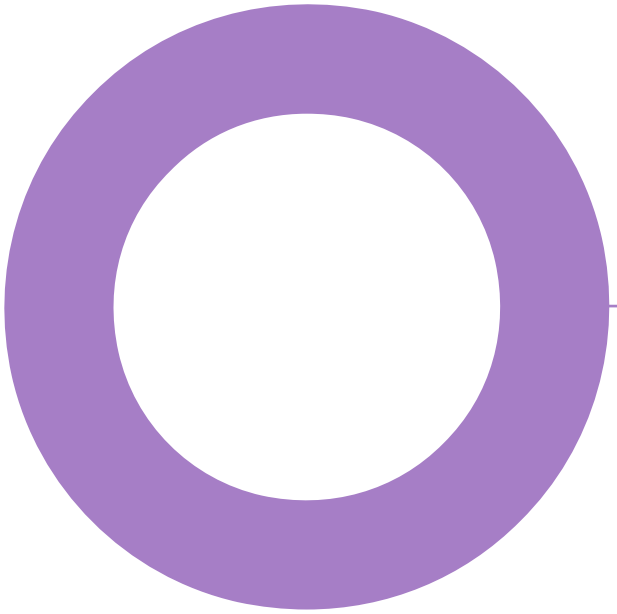
HOARE LEA

FP McCann, Brascote Lane, Cadeby, Leicestershire. Proposed New Rooftile Factory.

FP McCann Ltd.

ACOUSTICS
PROPOSED NEW PRODUCTION SHED
NOISE IMPACT ASSESSMENT
REVISION 2 – 28 APRIL 2022



Audit sheet.

Rev.	Date	Description of change / purpose of issue	Prepared	Reviewed
0	04/01/2022	Draft Report	AM	
1	07/02/2022	Updated Site Plan	AM	
2	28/04/2022	Updated following client comments	AM	AM

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Contents.

1. Introduction.

FP McCann Ltd located off Brascote Lane, Cadeby have purchased adjacent land to the north east formally owned and occupied by Tarmac Ltd. It is proposed that a new roof tile production building will be constructed with associated open aggregate and product storage on site.

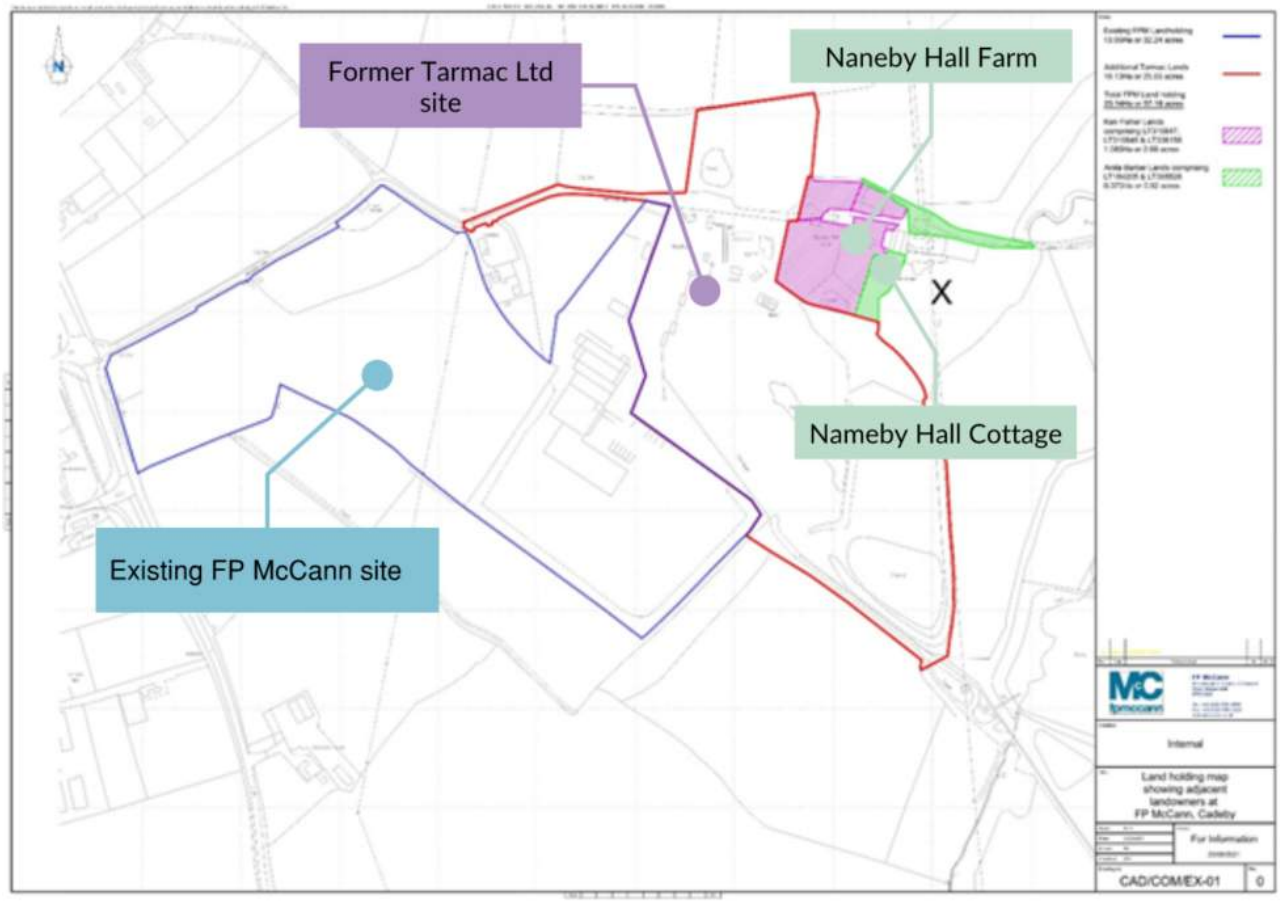
The purpose of this report is to determine the likely impact of the proposed new development upon the nearby residential property located to the north east on Brascote Lane known as Naneby Hall Cottage.

Assessment has been made of typical activity and production noise levels for the existing facility and this report reviews these levels with respect to the existing noise climate at the nearest residential properties.

Recommendations for noise control measures are provided where appropriate.

2. Site Description and Proposals.

The FP McCann works are located approximately 400 metres east of the village of Cadeby located in the Hinckley and Bosworth district of Leicestershire. FP McCann have purchased land to the north east formally owned and occupied by Tarmac Ltd as shown in Figure 1 below.



The existing works to the west produce precast concrete structures for the construction industry and comprises a large covered production building and a large yard area used for the storage and handling of materials and concrete products.

To the north east of the site are a series of buildings, the nearest of which is a residential dwelling referred to within this report as Naneby Hall Cottage.

To the east of site is a large area of open farmland.

To the south west of site at a distance of 500 metres is the A447 Ashby Road Cadeby with the village of Cadeby beyond.

Both the existing FP McCann site and the extended site is accessed via Brascote Lane which joins the A447 from the west. Traffic flow on Brascote Lane is generally very low, with the majority of vehicles using the lane to access the FP McCann and the former Tarmac Ltd site.

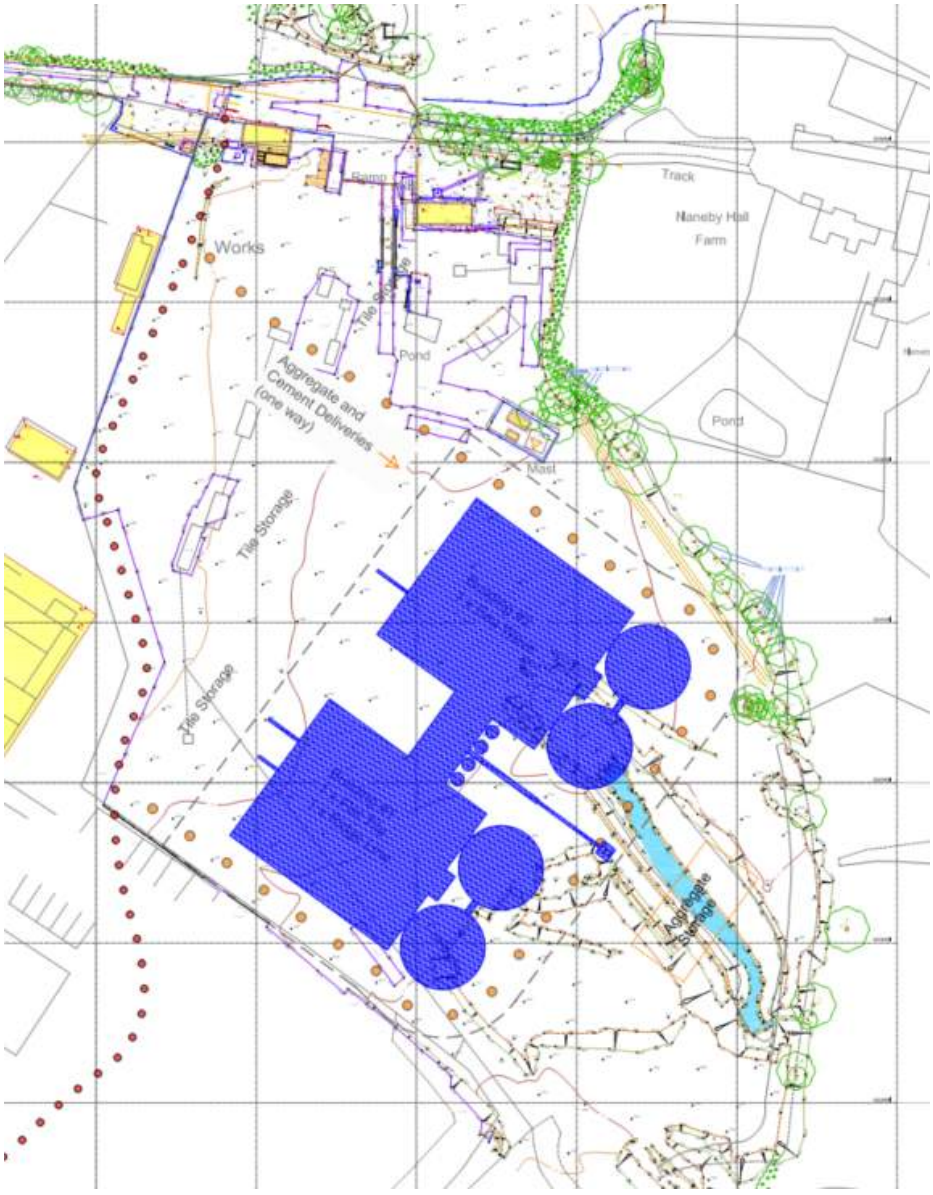
3. Development Proposals.

It is proposed that the new site will include the construction of two new roof tile production buildings which would ideally operate on a 24 hour basis.

In addition to the production buildings, the western half of the site will be used to provided additional storage space for the tiles. The area will be covered in fine, compacted aggregate material to provide a smooth, level surface. It is expected that, in line with the remainder of the site, concrete surfacing may also be provided on the main access routes and this will significantly reduce the level of bounce (and associated noise) as forklifts move around this area.

Vehicle access to the site will be via the existing entrance to the north west with a new access road constructed that would enable HGV movements from Brascote Lane in the north west corner of site along the western site boundary to the existing FP McCann site, whilst aggregate and cement deliveries travel follow a one-way access road around the perimeter of the new production building.

A detailed proposed site layout is shown below and in Appendix 1 attached to this report.



4. Basis of Assessment.

4.1 National Planning Policy Framework.

The National Planning Policy Framework (NPPF): July 2021 sets out the Government's planning policies for England and how these are expected to be applied. The document seeks to encourage sustainable development subject to all relevant factors.

Section 15: 'Conserving and enhancing the natural environment', paragraph 174, states the following:

'*Planning policies and decisions should contribute to and enhance the natural and local environment by:*

- *preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability'.*

Furthermore, paragraph 183 states *'Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:*

- *mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*
- *identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason'*

Paragraph 188, additionally, states *'The focus of planning policies and decisions should be on whether a proposed development is an acceptable use of land, rather than control of processes or emissions (where these are subject to separate pollution control regimes)'.*

NPPF also makes reference to the DEFRA Noise Policy Statement for England (NPSfE) 2010. This latter document is intended to apply to all forms of noise other than that which occurs in the workplace. It includes environmental noise and neighbourhood noise in all forms.

NPSfE advises that the impact of noise should be assessed on the basis of adverse and significant adverse effect but does not provide any specific guidance on assessment methods or limit sound levels. Moreover, the document advises that it is not possible to have *'a single objective noise-based measure…that is applicable to all sources of noise in all situations'*. It further advises that the sound level at which an adverse effect occurs is *'likely to be different for different noise sources, for different receptors and at different times'.*

In the absence of specific guidance for assessment of environmental noise within NPPF and NPSfE, it is considered appropriate to base this assessment on current British Standards and appropriate local or national guidance.

It is noted that NPSfE also advises that the general principle that increases in ambient noise should be 'minimised', needs to be considered in context for each site and, in this regard, states:

'Of course, taken in isolation and to a literal extreme, noise minimisation would mean no noise at all. In reality, although it has not always been stated, the aim has tended to be to minimise noise as far as is reasonably practical… the application of the NPSfE should enable noise to be considered alongside other relevant issues and not to be considered in isolation. In the past, the wider benefits of a particular…development or other activity may not have been given adequate weight when assessing the noise implications'.

4.2 BS8233: 2014.

BS 8233:2014 'Guidance on sound insulation and noise reduction for buildings' is the current British Standard providing guidance for acoustic requirements within buildings. The Standard advises appropriate criteria and limits for different building types including dwellings.

BS 8233 provides guidance regarding acceptable internal and external noise level criteria for dwellings but does not form any statutory requirement to achieve the guidance values provided therein.

The BS 8233 internal design criteria for dwellings are as follows:

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

BS 8233 Section 7.2.2 Note 7 advises that where development is desirable or necessary, then 'reasonable' living conditions can be achieved with sound levels up to 5dB higher than those given in the table above.

BS 8233 Section G1 advises that, where windows are open for ventilation, then sound reduction is limited to 15dB. The Standard does, however acknowledge that additional sound reduction will result from room effect. Available site test data for a furnished room indicates that the typical sound reduction from outside to inside is approximately 20dB for mid frequencies when windows are open 100mm.

For gardens and terraces, the Standard states that it is desirable that the steady noise level does not exceed $L_{Aeq,T}$ 50dB whilst a level of $L_{Aeq,T}$ 55dB would be acceptable in noisier environments.

4.3 BS 4142:2014.

BS4142:2014 'Methods for rating and assessing industrial and commercial sound' is the current British Standard providing guidance for assessment of noise impact from industrial and commercial sites. In general, the likelihood of adverse impact for a particular noise is dependent upon factors including the margin by which it exceeds the background noise level, the character of the noise and its occurrence. The Standard recommends the determination of the Rating Level of the specific source and advises a correction factor of between +3dB and +9dB if the sound has a tonal quality, is intermittent or impulsive or has any other distinct characteristics which would make it more noticeable.

The degree of impact is assessed by comparing the measured background level with the Rating Level. Where the Rating Level exceeds the background, the level of impact increases as shown below:

Comparison with background	Assessment
+0 dB or below measured background	Low impact
+ 5 dB	Adverse impact
+ 10 dB or more above measured background	Significant adverse impact

It should be noted that the assessment method applies to free-field external sound levels.

5. Measurements.

Monitoring at the site was, previously, undertaken over the period Thursday 9th to Friday 17th December 2021 to determine the diurnal noise climate.

The measurement equipment was located close to the northern boundary on land formally associated with Tarmac Ltd with gardens to Naneby Hall Cottage beyond.

Levels were recorded continuously in 15-minute samples to determine the equivalent continuous sound level, L_{Aeq}, the short duration level L_{Amax} and also the percentiles L_{A10} and L_{A90}. It is considered that the measurement data obtained is representative of the overall noise climate that currently occurs at the nearest residential gardens to the factory extension.

The measurement position is indicated on the aerial view below:

All measurements were made with calibrated, precision grade sound level meters in accordance with BS EN 60651 and BS 7445:1993. Details of the equipment used are provided in Appendix 3 – List of Measurement

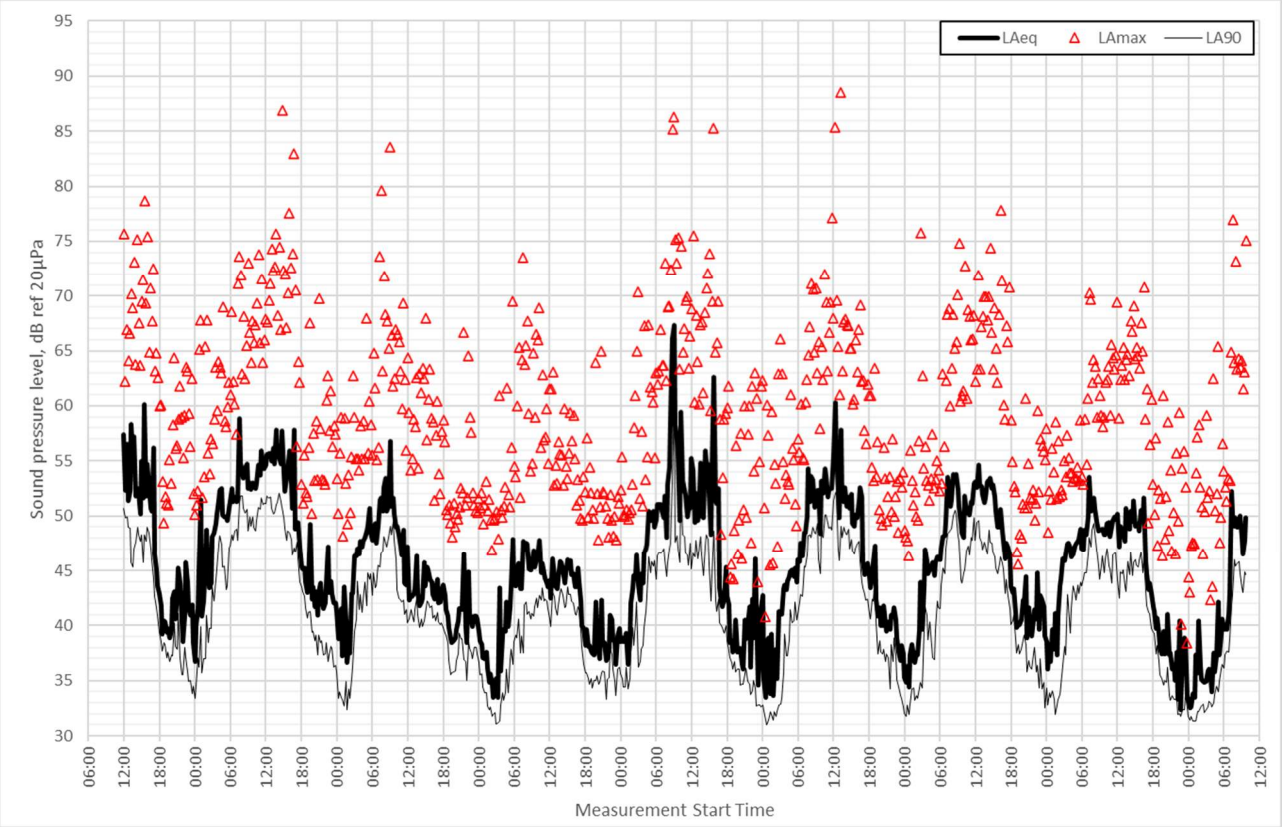
Equipment. All equipment was calibration-checked before and after the survey with no significant drift observed.

Weather conditions over the survey period were dry with no reported period of rain. Wind speeds over the course of the survey were sufficiently low for environmental noise monitoring.

6. Results.

6.1 Automated Noise Logging Meter (Position L1).

The results of all diurnal site measurements are tabulated in Appendix 2. Levels are shown as hourly values derived from the measured 15-minute sample results.



The following table shows the average measured ambient sound levels (L_{Aeq}), the measured background sound levels (L_{A90}) and the measured maximum sound levels (L_{Amax}) during the survey:

Period	L_{Aeq}, dB	L_{Amax} dB	L_{A90}, dB
Thursday (12:00 – 23:00)	51.9	55 – 79	36.6
Thursday night	48.7	62 – 69	34.6
Friday	53.0	56 – 87	37.5
Friday night	45.9	59 – 68	33.3
Saturday	47.1	51 – 84	36.0
Saturday night	41.0	50 – 70	31.6
Sunday	43.9	52 – 74	34.9
Sunday night	46.5	51 – 70	34.9
Monday	54.9	56 – 86	34.3
Monday night	42.6	56 – 66	31.7
Tuesday	51.1	54 – 89	36.8

Period	L_{Aeq}, dB	L_{Amax} dB	L_{A90}, dB
Tuesday night	43.5	49 – 76	32.1
Wednesday	50.1	48 – 78	36.1
Wednesday night	45.3	54 – 59	33.0
Thursday	47.9	54 – 71	32.3
Thursday night	37.5	48 – 65	31.6
Friday	49.2	73 - 77	42.4

The mean daytime ambient noise level was $L_{Aeq,16hr}$ 51.1dB.

The mean night time ambient noise level was $L_{Aeq,8hr}$ 45.0dB.

Night time maximum noise levels were mostly in the range L_{Amax} 47 to 70dB.

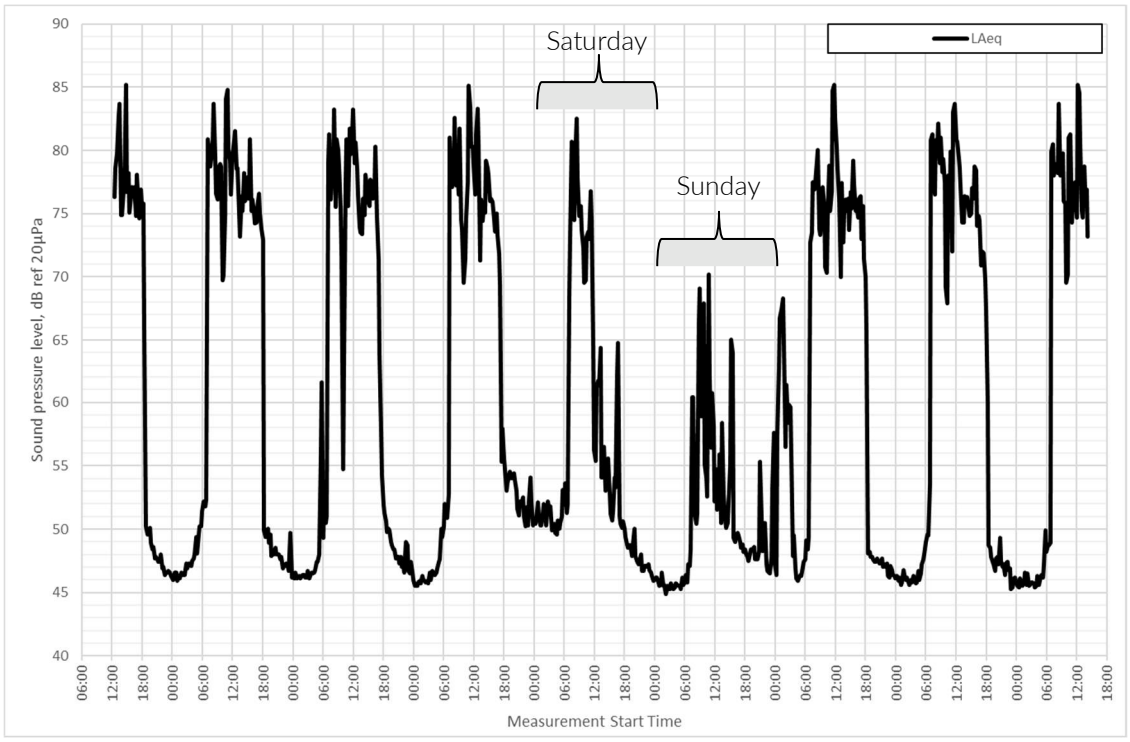
The typical lowest ambient and background sound level during the daytime was $L_{Aeq(15\text{-}min)}$ 40dB and $L_{A90(15\text{-}min)}$ 36dB respectively.

The typical lowest background sound level during the night was $L_{A90(15\text{-}min)}$ 33dB.

6.2 Detailed Monitoring within Production Building.

Detailed monitoring has recently been conducted at another existing FP McCann manufacturing site in Cambridgeshire, in order to determine the level of noise within an existing Production Building. It is expected that noise levels in the proposed new production building will be lower than these recorded levels, considering that the manufacturing processes of the tiles are less intense than that of processes within the existing production building. However, in the absence of specific data from the tiling manufacturing process, the higher production building noise levels will be used in the assessment to present a worst-case scenario.

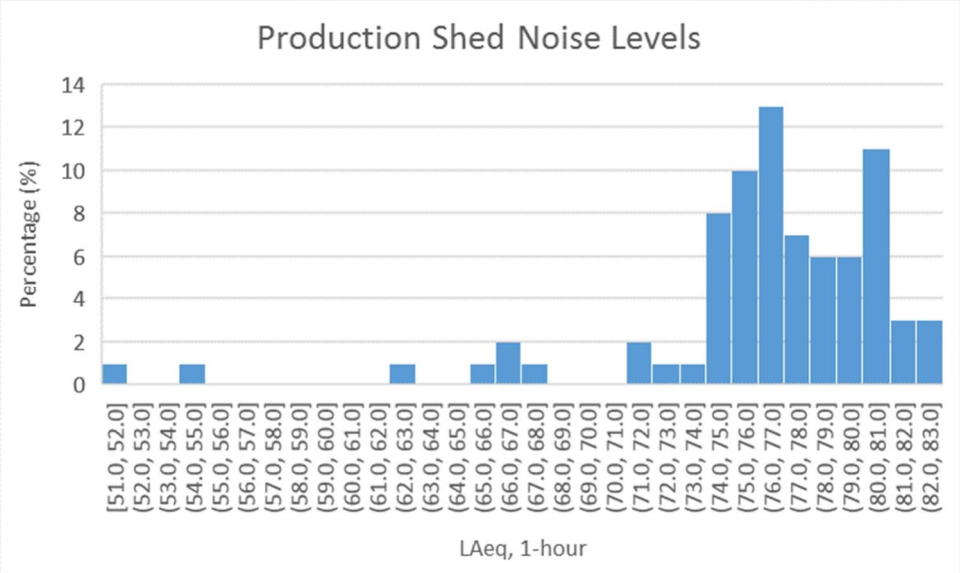
The following graph shows the variation in the noise climate over the survey period at the existing Cambridgeshire site.



The overall daytime sound levels during operational hours (Monday to Friday 07:00 – 19:00 and Saturday 07:00 – 12:00) were as follows:

Period	$L_{Aeq, T}$
Tuesday (13:00 – 19:00)	78.4
Wednesday (07:00 – 19:00)	78.4
Thursday (07:00 – 19:00)	77.6
Friday (07:00 – 19:00)	77.8
Saturday (07:00 – 12:00)	76.0
Monday (07:00 – 19:00)	77.2
Tuesday (07:00 – 19:00)	77.9
Wednesday (07:00 – 19:00)	79.3

A histography of the calculated hourly values shown below indicates that during working hours, a noise level of 76-77dB is most common. For the purposes of assessment, an internal noise level of 81dB is considered to be most representative of highest noise levels within the production shed, occurring for 11% of the working day.



During operational hours, the doors were typically open for 50% of the time. To present a worst-case scenario, it is assumed that the roller-shutter doors at the new Cadeby production building will be open at all times. For all other times, when the doors are closed, levels of noise break-out are expected to will be significantly lower as detailed in the following assessment.

7. Calculations.

7.1 Noise Break-out from the Production Building.

7.1.1 Roller Shutter Doors Closed.

Noise break out from the production building can be calculated using an accepted method as follows:

$$spl_{ext} = spl_{int} - TL - 20\log r + 10\log s - 14dB$$

...where r is the distance and s is wall area

Noise is expected to break out of each of the facades, the roof and the doors (when open). However, due to the size and position of each of the elements, it is expected that noise break-out from these facades will be reasonably directional and, therefore, those facades which do not directly overlook the adjacent dwellings will impact significantly less.

It is understood that the main building fabric will be constructed from steel frame with an outer cladding. As a worst case, it is assumed that this is composite thermal panels with a minimum manufacturer's rated sound reduction of R_w 27/mean 25dB(A).

Taking into account each of the factors above, the resultant noise break-out level to the nearest dwelling is as follows:

	Naneby Hall Cottage
spl_{int}	81dB(A)
-TL	-25
$-20\log r$	-41.2 (115m)
$+10\log s$	+29.5 (900m^2)
-14	-14
spl_{ext} dBA	30.3dB

7.1.2 Roller Shutter Doors Open.

The calculations above are based upon doors being closed at all times. When the roller shutter doors are fully open, the break-out sound level just outside the building would, from theory, be approximately L_{Aeq} 65dB assuming a 10dB reduction across the door opening.

The current proposals for the site are for two roller-shutter doors on the north eastern façade overlooking Naneby Hall Cottage as shown in Appendix 1. These roller-shutter doors are 5m x 5m and 3m x 3m in size.

For positions close to the doors, there will be plane source attenuation, whilst at distance, this will increase to point source. Over the separating distance of 115m, it would normally be expected noise levels would be further reduced from both additional air attenuation and ground absorption and there is likely to be 2-3dB reduction from atmospheric absorption, particularly at the higher frequencies, although this has not been relied upon in the calculations.

The resultant break-out sound levels at the dwelling for the two open roller-shutter doors with consideration of the above are as follows:

	Door 1 (5m x 5m)	Door 2 (3m x 3m)
Spl at Open Door	71	71
Distance attenuation	-41.2	41.2
Total per Door	29.8	29.8
Overall Total	32.8dB	

It is assumed that the dominant noise source will be the roller-shutter doors directly overlooking the dwelling. It is not expected that overall noise levels for open doors on other facades will increase levels due to the directivity of the noise break-out with significant screening provided by the Production Building itself.

Section 7.1.1 above indicates that noise levels will be in the order of 2-3dB lower when the roller shutter doors are closed.

The total noise level at the nearest dwelling from the production shed with all doors open at highest levels of internal activity is L_{Aeq} 33dB. This is below the lowest typical ambient noise level at the nearest dwelling and, therefore, low levels of character correction are deemed appropriate. With a character correction of +3 for intermittency, this suggests a rating level of 36dB.

	Daytime	Night Time
Production Shed Total Noise at receiver (Doors open)	33	33
Character Correction:	+3	+3
Rating Level	36	36
Typcal lowest $L_{A90,T}$	36	33
Difference	0	+3
BS4142 Assessment	'Low Impact'	Marginally above 'Low Impact'

The typical lowest background noise level as measured in the late hours of the night (typically 00:00 to 01:00) was $L_{A90,15\text{-}min}$ 33dB which indicates a level difference of +3. In accordance with BS4142, this indicates a level marginally above 'low' level of impact from noise break-out from the new production building, with lower levels throughout the remainder of the night and day when background noise levels are significantly higher.

In addition to the above, the following factors have not been included in the assessment but will add further attenuation to the noise break-out from the Production Shed:

- Internal Noise Levels: For the majority of time, internal noise levels are 4 to 5dB lower than that presented above with an equivalent 4 to 5dB lower level of noise break-out at these times.
- Roller Shutter Doors Closed: The calculations above assume that the roller-shutter doors are open 100% of the working day. When the roller-shutter doors are closed, the noise break-out will be in the order of 2-3dB lower.
- Barrier Screening: Between the production building and the nearest residential dwelling lies a storage area which is likely to provide a degree of barrier screening when then roller shutter doors are open.
- Façade construction: It has been assumed that the main building fabric will be constructed from steel frame with an outer cladding with a reasonably low manufacturer's rated sound reduction. In practice, a higher performance can be expected leading to lower levels of noise break-out.

Inclusion of the factors above will further reduce the level of noise break-out from the Production Building which will lead to a corresponding reduction in noise impact when assessed in accordance with BS4142.

However, these factors have not been relied upon to enable a level of 'low impact' at the nearest residential dwellings for the majority of the time.

Furthermore, it is considered that any noise break-out from the new Production Building will be similar to that of the former Tarmac activities, and that of the existing production buildings on the adjacent FP McCann site. Noise from this building will, therefore, not constitute a new noise source to the site.

On the basis of the above, no further mitigation measures are deemed necessary for the design and layout of the proposed Production Building.

7.2 Storage Yard Activity Noise Levels.

An early morning noise impact assessment of the operation of the forklifts within the storage yard has been conducted using the following assumptions:

- Distance attenuation has been applied assuming point source attenuation (i.e. a small noise source relative to the distance between source and receiver).
- An on-time has been applied based upon two forklifts each manoeuvring for 5-minutes in this area in any one hourly period. When forklift trucks are not in operation or are waiting for another activity to occur, engines will be turned off as per standard on-site procedure.
- Activities within the storage yard will take place at a typical distance of 200 metres from Naneby Hall Cottage
- Specific measurements have been recorded at the FP McCann site in Byley, Cheshire.

The assessment periods are taken as one hour for the daytime period in accordance with BS 4142. From on-site discussions regarding the typical usage of the proposed storage yard, it has been taken for the purposes of calculation that for a typical one-hour period, on-site activities will be as follows:

Activities	Operation
16-ton stacker truck	77.4dB (highest measured noise level) @ 3 metres
Number of stacker trucks operating (2)	+3.0
On time	10 x (300 / 3600) = -10.8
$L_{Aeq,\ 1\text{-hour}}$	69.6dB @ 3m

The calculated noise levels of the forklift at the nearest residential dwellings are detailed below.

Calculation	Day	Night
Source noise level at 3 metres, $L_{Aeq,\ T}$	77.4dB	77.4dB
Number of stacker trucks operating (2)	+3.0	+3.0
Distance correction 20.log(3/XX)	-36.5 (200m)	-36.5 (200m)
Barrier correction	0	0
On-time correction (as above)	-10.8	-4.8
Receiver noise level, $L_{Aeq,\ 1\text{-hour},T}$	33.1	39.1

From the above, the BS 4142 assessment for vehicle movements at the nearest dwellings to the north east can be calculated as follows:

Parameter	Naneby Hall Cottage	
	Day	Night
Storage Yard Activity	33	39
character correction (intermittent +3, tonal +2)	+5	+5
Rating Level at dwelling - L_{Aeq}	38	44
Typical lowest background	36	33
Difference	+2	+11
BS4142 Assessment	Marginally above 'low impact'	'significant adverse impact'

The calculated rating sound levels from vehicle movements at the nearest residential dwellings to the north east are above the typical lowest measured day and night-time background sound levels which indicate a BS 4142 condition of 'adverse impact' during the day and 'significant adverse impact' during the night.

On this basis, it is recommended that barrier screening be considered to screen the service yards from the dwelling to the north east.

Barrier screening has been calculated in accordance with the principles of CRTN for a range of barrier heights with the following assumptions:

- A source height of 1 metre.
- A receiver height of 4.5 metres (i.e. 1st floor windows).
- A typical distance of 60 metres from the activities within the service yard to the barrier.
- A typical distance of 100 metres from the barrier to the nearest residential dwellings.

On the basis of the above, a 2.0-metre-high barrier would provide in excess of 5dB attenuation at the upper floor windows of the nearest dwelling, resulting in a BS4142 assessment of 'low impact' during the daytime.

Alternatively, a 4-metre-high barrier would provide in the order of 8dB attenuation at the nearest dwellings which would result in a reduced BS4142 assessment of marginally above 'low impact' during the night. If further measures are deemed appropriate, then reducing activity in the storage yard during the quieter periods of the night should be considered.

Notwithstanding the above, it is noted that activities in the southern half of the storage yard will be obscured from view from Nanemby Hall Cottage at all times due to barrier screening provided by the new production building. This is likely to provide a large degree of barrier attenuation (>10dB) which in addition to additional distance propagation to this section of the yard, is likely to result in a significant reduction in noise levels when this section of the yard is in use.

7.3 HGV Impact.

Based upon the current proposed site layout shown in Appendix 1, vehicles for the new site will enter the site from the north west from Brascote Lane. The layout indicates that with open propagation, a section of access road will be visible from Naneby Hall Cottage.

An assessment of the noise from HGV movements and at the development on the nearest dwelling to the north east has been based upon the following assumptions:

- Circa 50 HGVs per day to deliver raw materials and circa 35 Articulated lorries out per day delivering finished goods, approximating 4 vehicles per hour or 1 vehicle per 15-minutes.
- HGVs a typical distance of 100 metres from Nanemby Hall Cottage.
- HVGs to take 85 seconds to travel along the section of access road visible to the dwellings
- HGVs will circle the production building and so will not require use of reversing alarms
- Source noise data from HLA archived measurements
- Point source attenuation

	Naneby Hall Cottage	
Parameter	Day	Night
Archive HGV noise level ($L_{Aeq,T}$ at 2m)	75.1	75.1
On time correction *(85 seconds)*	-16.3	-10.
Specific Noise Level – $L_{Aeq,T}$ dB	58.8	64.9
movements in assessment period (dB)	+6.0 (4)	+0.0 (1)
Distance Attenuation	-34.0(100m)	34.0(100m)
Level at Dwelling - L_{Aeq}	30.9	30.9

From the above, the BS 4142 assessment for vehicle movements at the nearest dwellings to the north east can be calculated as follows:

Parameter	Naneby Hall Cottage	
	Day	Night
HGV Movements	31	31
character correction (intermittent +3, tonal +2)	+5	+5
Rating Level at dwelling - L_{Aeq}	36	36
Typical lowest background	36	33
Difference	0	+3
BS4142 Assessment	**'low impact'**	**Marginally above 'low impact'**

The calculated rating sound levels from vehicle movements at the nearest residential dwellings to the north east are below the typical lowest measured night-time background sound levels and indicate a BS 4142 condition of 'low impact' during the day and marginally above 'low impact' during the night.

As detailed in Section 7.2 above, if barrier screening is considered to screen the service yards from the dwellings to the north east then a 2.0-metre-high barrier would provide in excess of 5dB attenuation at the upper floor windows of the nearest dwellings. This would result in a BS4142 assessment of 'low impact' at all times.

7.4 Mechanical Services plant.

Mechanical services installations associated with the development are not yet known and, consequently, BS 4142 assessment cannot be carried out. However, noise limit criteria for the development can be determined from the measured background sound levels and the guidance in BS 4142.

The maximum allowable total cumulative plant noise level associated with the development can be determined in accordance with BS4142 and based upon a Rating Level no greater than the background sound level. This is equivalent to a BS 4142 assessment of 'low impact'.

The typical lowest L_{A90} values measured during the survey have been used as the basis of the assessment.

The total cumulative plant noise limits are derived as follows:

Parameter	Day	Night
Lowest typical L_{A90} level (1-hour day, 15-min night)	36	33
Noise character correction (BS4142 Annex 1)	-3	-3
Plant noise limit level at any dwelling - L_{Aeq}	**33**	**30**

The above limit criteria are the cumulative levels for all plant operating at rated output.

It is noted that these noise levels would achieve the requirements of the outline planning condition attached to the development site.

Noise control measures may be required to achieve these levels and it will be necessary to review plant selections and locations during the construction phase.

8. Discussion.

8.1 Existing Noise Climate.

The general ambient noise climate across the site is attributable to traffic flows on the roads in the local vicinity including Ashby Road to the south west and Brascote Lane to the west. The majority of noise from the roads is attributable to tyre 'roar' which has a characteristic mid-frequency tonal peak. There was audible noise from existing activities associated with the FP McCann site and it is deemed likely that noise from all of these activities would have been accounted for in the baseline noise survey. Prior to the closure of the Tarmac site, it is envisioned that noise from this site would have been prominent at the nearest residential dwellings.

8.2 BS 4142 Assessment.

The calculations shown in Section 7 above indicate that a standard building construction using lightweight thermal panels would achieve a BS 4142 condition marginally above 'low impact' at the nearest dwellings at the quietest times of the night. This is applicable to the nearest dwelling at Naneby Hall Cottage which, with an open view of the site would have a direct view of the two roller shutter doors. However, it is considered likely that for the majority of time, stored materials in the storage yard would obscure this direct line-of-sight and provide barrier screening, thus reducing the level of noise break-out at the nearest dwellings.

In addition to the above, it is probable that operational noise levels will normally be lower than those assumed in the assessment, which would result in a further reduction in impact upon the dwellings. During the day when background noise levels are significantly higher, the overall impact of the new production building will be naturally lower as a result.

In the case of forklifts in the storage yard, these would achieve a BS4142 condition of 'low impact' during the day if consideration is made for barrier screening along the site perimeter. Additional barrier screening or a restriction on the hours of operation will need to be considered to enable a level of 'low impact' during the night.

The calculations shown in Section 7 indicate that all HGV movements on the access roads at the proposed new development would achieve a BS 4142 condition of 'low impact' at the nearest dwellings at all times of the day and night if consideration for barrier screening is included.

Any noise break-out from the site is considered to be similar to that of the former Tarmac site and will, therefore, not constitute a new noise source to the site.

8.3 BS8233 Assessment.

British Standard BS 8233:2014 provides guidance on acceptable sound levels in and around dwellings and advises a night time internal noise level of L_{Aeq} 30dB. It must be assumed that windows may be open for ventilation and BS 8233 advises that an open window provides a sound reduction of 15dB. Other available measurement data together with Napier University report NAN R116:2013 indicates that mid-frequencies (500Hz-2kHz) will be reduced by a further 5dB for room effect. From this information, the allowable external level to achieve the BS 8233 internal requirement would be L_{Aeq} 50dB.

The highest calculated immission level for break-out from the production building is L_{Aeq} 33dB at the nearest dwelling. The calculated levels would readily achieve the BS 8233 internal criteria with open windows.

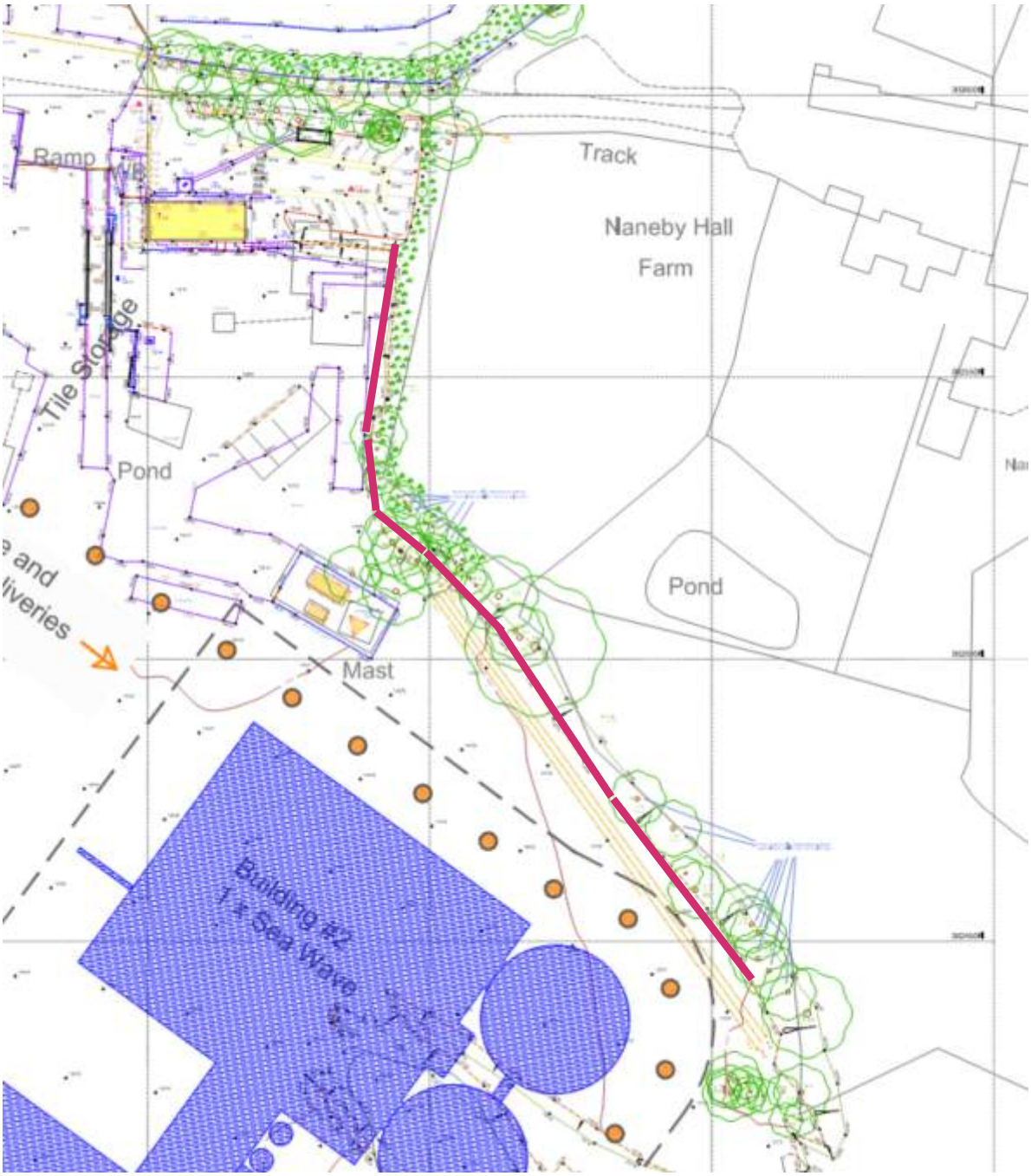
The calculated levels for forklift activity within the storage yard at dwellings to the north east are below L_{Aeq} 33dB. These levels would readily achieve the BS8233 internal criteria when windows are open. If consideration is made for a barrier as detailed in Section 7.2 then noise levels would be at least 5dB lower than those presented above at the first floor windows.

The calculated levels for HGV activity within the service yard at dwellings to the north east are below L_{Aeq} 31dB during both the day and night time. These levels would readily achieve the BS8233 internal criteria when windows are open. Again, if consideration is made for a site perimeter barrier then noise levels would be at least 5dB lower than those presented above at the first floor windows.

In the case of gardens during daytime, BS 8233 advises a preferred limit level of L_{Aeq} 50dB. All of the calculated noise levels for the development are below this level by a significant margin.

9. Recommendations.

It is recommended that solid barrier be provided to follow along the north eastern site boundary as indicated in RED below.



The height of the barrier fence is discussed in Section 7.

The fencing element of the barrier should be continuous with no significant gaps and of minimum density of 10kg/m^2. In practice, these requirements can be achieved with close boarded timber panels and concrete gravel boards.

It is recommended that all fixed mechanical services plant associated with the new development be selected and specified to achieve the noise limit criteria derived at Section 7.4 of this report. It will be necessary to review plant selections and locations during the construction phase to ensure compliance with the criteria.

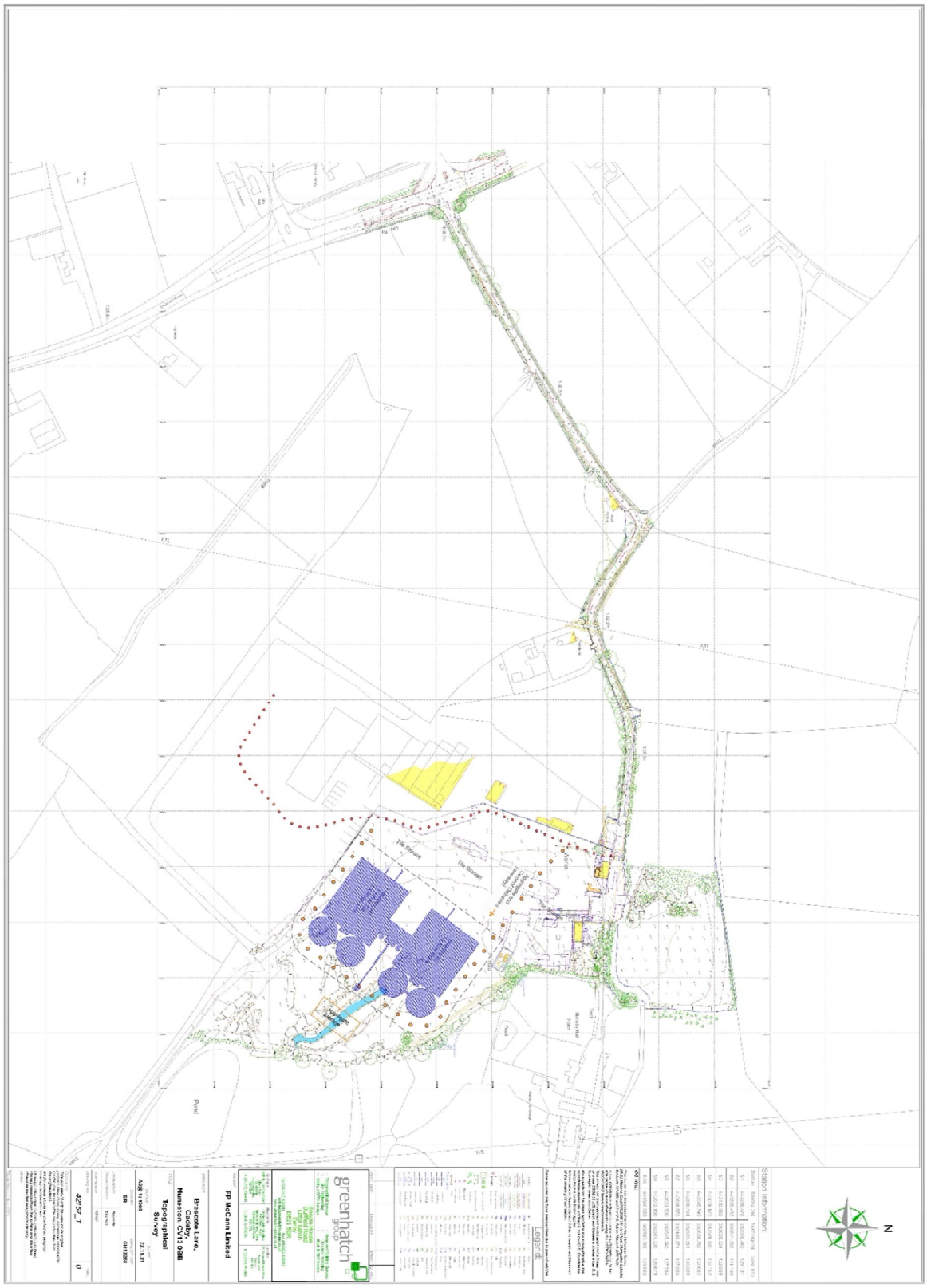
10. Conclusions.

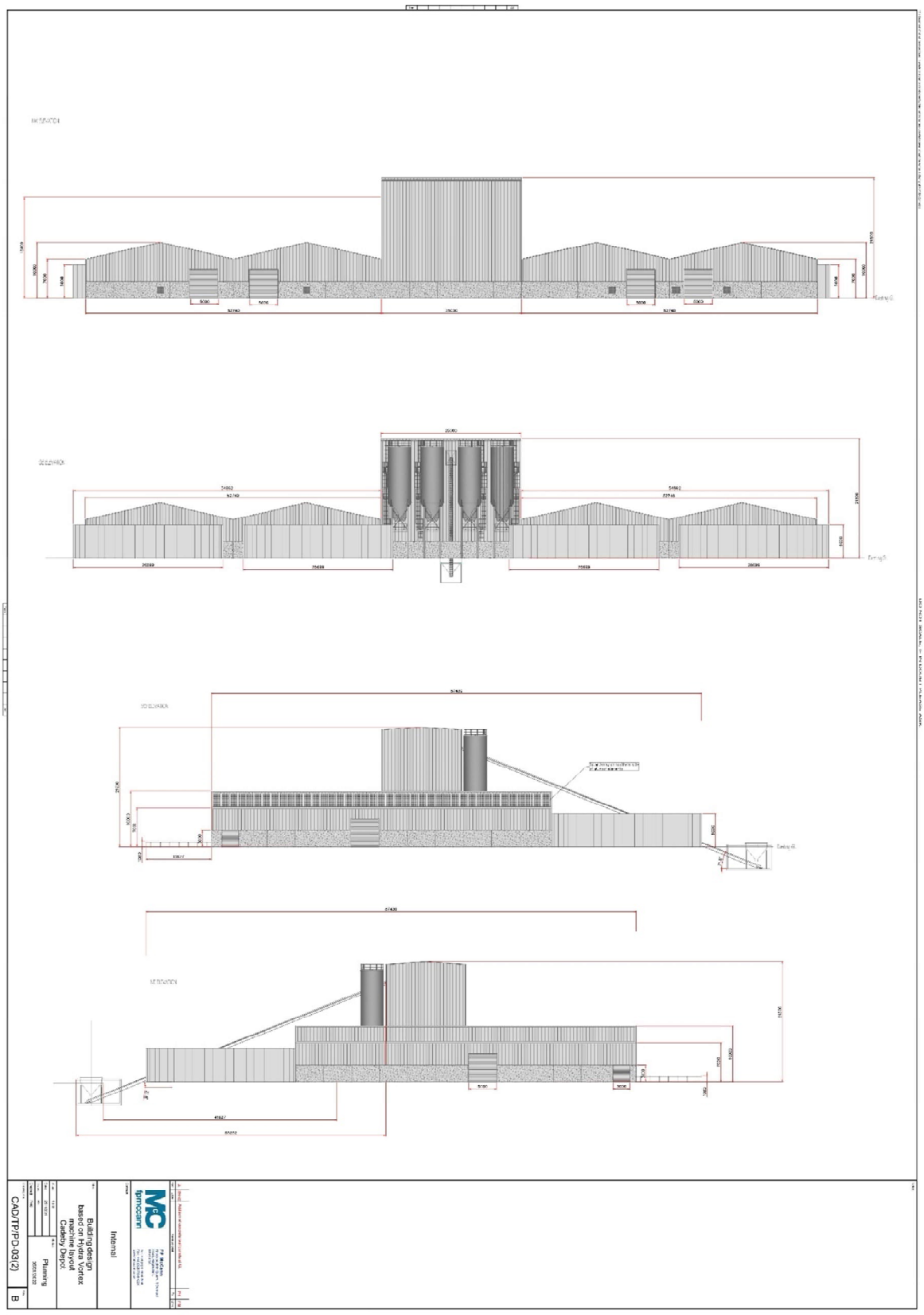
Assessment carried out for this report indicates that the noise climate in the vicinity of the proposed development site is attributable to road traffic noise in the local area. It is considered that this noise will determine background sound levels at existing dwellings nearest to the site to the north east at Naneby Hall Cottage.

Assessment of activity noise levels for the proposed development indicates that daytime and night time BS 8233 internal criteria would readily be achieved at the nearest residential when windows are open.

Assessment of activity noise levels in accordance with BS 4142 indicates that the noise impact of the proposed development would achieve a condition of 'low impact' during proposed operational hours if consideration is made to barrier screening along the north eastern site boundary. Furthermore, it is noted that overall noise levels are deemed particularly low in relation to the general ambient noise level in the local vicinity and so noise from the site would be unlikely to give rise to noise disturbance.

Appendix 1 – Proposed Site Layout.




Building design
basic with indicative
machine layout
Cadeby Depot
Planning
Internal
CAD/TP/PD/03(2)
B

Appendix 2 – Measured Sound Pressure Levels.

Position L –Northern Site Boundary

Date	Day	From:	To:	$L_{eq,1hr}$	$L_{max,F}$	$L_{10,1hr}$	$L_{90,1hr}$
09/12/2021	Thursday	12:00	12:59	55.1	75.7	57.0	49.9
		13:00	13:59	56.3	73.1	59.7	46.7
		14:00	14:59	51.7	75.2	53.3	48.2
		15:00	15:59	56.1	78.7	55.3	47.5
		16:00	16:59	52.5	75.4	54.3	47.6
		17:00	17:59	51.1	72.5	50.4	42.3
		18:00	18:59	41.3	60.1	42.5	38.5
		19:00	19:59	39.6	55.1	41.2	37.4
		20:00	20:59	41.7	64.4	43.8	38.2
		21:00	21:59	43.4	61.8	45.1	37.9
		22:00	22:59	43.1	63.5	43.2	36.6
		23:00	23:59	40.9	62.5	43.1	34.6
10/12/2021	Friday	00:00	00:59	41.8	65.1	43.5	35.3
		01:00	01:59	47.2	67.8	48.2	37.4
		02:00	02:59	45.7	67.8	47.9	39.7
		03:00	03:59	49.1	63.5	52.2	43.8
		04:00	04:59	51.7	69.0	54.3	47.1
		05:00	05:59	50.1	62.1	52.8	44.8
		06:00	06:59	51.7	68.6	54.0	48.0
		07:00	07:59	55.2	73.6	56.5	49.9
		08:00	08:59	54.1	68.1	56.2	50.9
		09:00	09:59	52.7	73.0	54.9	49.4
		10:00	10:59	53.3	73.8	55.0	49.5
		11:00	11:59	54.7	71.6	57.2	51.1
		12:00	12:59	55.4	71.1	58.0	51.6
		13:00	13:59	56.1	75.7	58.1	50.6
		14:00	14:59	55.9	86.9	57.6	51.4
		15:00	15:59	53.5	72.3	55.7	48.8

Date	Day	From:	To:	$L_{eq,1hr}$	$L_{max,F}$	$L_{10,1hr}$	$L_{90,1hr}$
		16:00	16:59	55.1	83.0	56.0	47.5
		17:00	17:59	48.7	70.5	50.2	46.1
		18:00	18:59	44.9	55.5	46.7	42.7
		19:00	19:59	45.6	67.5	45.9	40.7
		20:00	20:59	42.4	58.6	44.3	38.6
		21:00	21:59	42.8	69.8	45.1	38.4
		22:00	22:59	44.5	62.7	46.3	37.5
		23:00	23:59	42.8	61.4	45.2	37.2
11/12/2021	Saturday	00:00	00:59	40.5	59.0	43.8	34.2
		01:00	01:59	40.3	58.9	42.0	33.3
		02:00	02:59	41.1	62.7	43.4	34.8
		03:00	03:59	46.5	59.0	50.2	41.4
		04:00	04:59	47.7	58.6	50.7	42.5
		05:00	05:59	49.3	68.0	52.3	43.9
		06:00	06:59	48.4	64.8	51.1	43.6
		07:00	07:59	50.8	79.6	52.5	46.0
		08:00	08:59	52.0	71.8	53.1	47.7
		09:00	09:59	53.3	83.6	52.8	48.7
		10:00	10:59	48.5	66.9	50.6	43.5
		11:00	11:59	46.2	69.3	47.9	41.7
		12:00	12:59	44.2	64.4	45.3	40.8
		13:00	13:59	44.1	62.6	45.5	41.3
		14:00	14:59	43.3	63.4	44.5	40.2
		15:00	15:59	44.6	68.0	46.2	41.7
		16:00	16:59	43.1	58.9	44.7	41.0
		17:00	17:59	42.9	60.4	44.2	40.5
		18:00	18:59	42.3	58.7	43.8	39.2
		19:00	19:59	38.9	51.2	41.0	36.0
		20:00	20:59	40.2	50.8	42.1	37.4
		21:00	21:59	43.1	66.7	43.6	37.8

Date	Day	From:	To:	$L_{eq,1hr}$	$L_{max,F}$	$L_{10,1hr}$	$L_{90,1hr}$
		22:00	22:59	41.9	64.5	42.1	37.2
		23:00	23:59	40.5	52.1	42.6	37.6
12/12/2021	Sunday	00:00	00:59	38.4	52.1	40.5	35.5
		01:00	01:59	36.5	53.1	38.5	33.2
		02:00	02:59	34.5	49.8	35.9	32.1
		03:00	03:59	38.9	60.9	38.4	31.6
		04:00	04:59	40.3	61.6	43.3	34.3
		05:00	05:59	44.4	69.5	45.4	36.3
		06:00	06:59	44.5	65.3	46.6	39.3
		07:00	07:59	45.8	73.5	46.9	39.0
		08:00	08:59	46.4	67.7	48.3	41.3
		09:00	09:59	46.0	66.5	48.3	41.5
		10:00	10:59	46.2	68.9	48.3	42.5
		11:00	11:59	44.1	59.7	45.6	42.1
		12:00	12:59	44.5	63.1	45.6	41.5
		13:00	13:59	44.4	56.7	46.2	41.8
		14:00	14:59	44.9	59.7	46.6	42.3
		15:00	15:59	45.5	59.4	47.3	42.8
		16:00	16:59	44.3	59.1	46.3	41.4
		17:00	17:59	41.8	53.6	43.5	38.9
		18:00	18:59	38.6	57.1	40.1	35.3
		19:00	19:59	39.2	63.9	39.4	34.9
		20:00	20:59	39.2	65.0	39.9	35.2
		21:00	21:59	37.7	52.2	39.5	35.0
		22:00	22:59	39.7	51.9	41.7	36.6
		23:00	23:59	38.6	51.8	40.7	35.2
13/12/2021	Monday	00:00	00:59	38.7	55.4	41.3	34.9
		01:00	01:59	39.6	50.6	41.6	35.8
		02:00	02:59	44.8	65.0	47.0	40.1
		03:00	03:59	43.7	70.4	46.5	37.2

Date	Day	From:	To:	$L_{eq,1hr}$	$L_{max,F}$	$L_{10,1hr}$	$L_{90,1hr}$
		04:00	04:59	48.1	67.4	50.6	42.5
		05:00	05:59	49.7	61.7	52.2	45.5
		06:00	06:59	50.7	66.9	53.1	46.0
		07:00	07:59	50.2	73.0	51.7	46.0
		08:00	08:59	61.2	85.2	60.3	48.4
		09:00	09:59	62.3	86.3	62.0	50.9
		10:00	10:59	55.3	74.6	56.4	48.7
		11:00	11:59	50.8	69.9	52.9	46.5
		12:00	12:59	53.2	75.5	55.8	46.4
		13:00	13:59	51.7	67.6	53.6	46.8
		14:00	14:59	54.3	72.1	56.9	47.0
		15:00	15:59	57.6	85.3	57.3	45.2
		16:00	16:59	50.7	69.5	52.1	41.5
		17:00	17:59	43.1	59.3	45.0	39.8
		18:00	18:59	40.8	61.8	42.2	37.5
		19:00	19:59	38.8	56.4	40.0	36.1
		20:00	20:59	37.1	57.5	38.4	35.0
		21:00	21:59	40.4	60.0	42.0	35.3
		22:00	22:59	42.4	63.0	42.5	34.3
		23:00	23:59	39.8	61.8	40.1	32.7
14/12/2021	Tuesday	00:00	00:59	38.9	62.3	38.8	31.9
		01:00	01:59	37.2	59.5	36.7	31.7
		02:00	02:59	38.2	62.9	39.0	32.3
		03:00	03:59	42.4	66.1	44.6	35.3
		04:00	04:59	44.2	61.0	46.8	38.6
		05:00	05:59	44.7	56.1	47.1	40.8
		06:00	06:59	46.5	60.2	48.5	42.1
		07:00	07:59	51.0	64.6	53.3	46.3
		08:00	08:59	52.4	71.1	54.3	48.5
		09:00	09:59	51.5	70.7	53.4	47.1

Date	Day	From:	To:	$L_{eq,1hr}$	$L_{max,F}$	$L_{10,1hr}$	$L_{90,1hr}$
		10:00	10:59	53.4	72.0	55.6	49.2
		11:00	11:59	52.3	77.1	54.1	49.0
		12:00	12:59	56.9	85.4	57.9	50.7
		13:00	13:59	53.9	88.5	53.7	48.0
		14:00	14:59	51.5	67.9	53.1	48.2
		15:00	15:59	50.3	66.0	52.1	47.1
		16:00	16:59	51.5	69.2	53.5	46.2
		17:00	17:59	45.2	62.3	46.5	42.7
		18:00	18:59	44.6	60.9	46.5	41.6
		19:00	19:59	43.9	63.4	45.0	40.2
		20:00	20:59	40.6	56.2	42.5	37.4
		21:00	21:59	40.1	53.6	42.2	36.8
		22:00	22:59	40.6	57.0	42.7	37.0
		23:00	23:59	37.5	54.0	39.9	33.5
15/12/2021	Wednesday	00:00	00:59	35.3	48.7	37.6	32.1
		01:00	01:59	37.4	56.0	39.8	33.7
		02:00	02:59	40.5	75.8	40.8	34.0
		03:00	03:59	44.7	62.7	46.3	39.1
		04:00	04:59	45.2	57.4	48.1	38.8
		05:00	05:59	45.7	55.0	48.6	40.1
		06:00	06:59	47.4	62.9	49.8	43.8
		07:00	07:59	52.0	68.8	53.7	48.2
		08:00	08:59	53.2	68.3	55.0	49.9
		09:00	09:59	50.5	74.8	52.0	46.0
		10:00	10:59	50.4	72.8	52.0	46.0
		11:00	11:59	51.5	68.2	53.3	48.0
		12:00	12:59	53.4	71.9	55.7	48.7
		13:00	13:59	51.9	69.9	54.2	47.4
		14:00	14:59	53.1	74.4	55.7	47.6
		15:00	15:59	51.2	68.9	54.0	45.7

Date	Day	From:	To:	$L_{eq,1hr}$	$L_{max,F}$	$L_{10,1hr}$	$L_{90,1hr}$
		16:00	16:59	49.1	77.8	50.4	45.6
		17:00	17:59	46.8	70.8	48.4	42.8
		18:00	18:59	42.8	58.7	44.7	40.1
		19:00	19:59	40.1	48.3	42.0	37.8
		20:00	20:59	42.3	60.7	43.4	38.0
		21:00	21:59	40.4	54.8	42.6	36.6
		22:00	22:59	42.1	59.6	44.4	36.1
		23:00	23:59	41.6	57.0	43.8	34.6
16/12/2021	Thursday	00:00	00:59	37.5	57.9	40.0	33.6
		01:00	01:59	39.2	58.5	40.7	33.0
		02:00	02:59	44.1	56.8	47.2	34.5
		03:00	03:59	46.9	57.3	50.1	40.0
		04:00	04:59	46.8	53.9	49.6	41.8
		05:00	05:59	48.0	58.7	50.5	43.2
		06:00	06:59	47.8	58.8	49.8	44.4
		07:00	07:59	51.5	70.3	53.6	47.6
		08:00	08:59	50.2	64.2	51.8	47.5
		09:00	09:59	48.6	60.9	50.7	45.2
		10:00	10:59	48.8	63.6	50.5	45.9
		11:00	11:59	49.6	65.6	51.7	45.9
		12:00	12:59	48.9	69.4	50.5	44.1
		13:00	13:59	49.2	65.3	51.3	44.4
		14:00	14:59	50.1	69.1	51.5	45.4
		15:00	15:59	49.1	65.3	50.1	45.7
		16:00	16:59	49.8	70.8	51.4	45.3
		17:00	17:59	43.7	61.5	45.2	41.0
		18:00	18:59	40.9	57.1	42.5	38.6
		19:00	19:59	38.6	60.9	40.4	35.5
		20:00	20:59	38.6	58.5	39.7	34.9
		21:00	21:59	36.3	54.2	37.9	33.4

Date	Day	From:	To:	$L_{eq,1hr}$	$L_{max,F}$	$L_{10,1hr}$	$L_{90,1hr}$
		22:00	22:59	37.1	59.4	37.0	32.3
		23:00	23:59	37.6	55.9	40.1	32.8
17/12/2021	Friday	00:00	00:59	33.1	47.6	34.3	31.6
		01:00	01:59	37.5	58.3	37.5	31.8
		02:00	02:59	35.3	52.6	37.1	32.6
		03:00	03:59	35.5	59.1	36.5	32.8
		04:00	04:59	36.3	62.5	37.5	33.5
		05:00	05:59	40.1	65.4	40.6	35.4
		06:00	06:59	40.1	54.1	41.9	37.2
		07:00	07:59	49.7	77.0	50.5	42.4
		08:00	08:59	49.5	73.2	50.8	45.4
		09:00	09:59	48.2	75.1	49.9	44.0

Appendix 3 – Glossary of Terms.

Decibel (dB)

The decibel is the unit used to quantify sound pressure levels. The human ear has an approximately logarithmic response to acoustic pressure over a very large dynamic range (typically 20 micro-Pascals to 100 Pascals). Therefore, a logarithmic scale is used to describe sound pressure levels and also sound intensity and power levels. The logarithm's are taken to base 10. Hence an increase of 10 dB in sound pressure level is equivalent to an increase by a factor of 10 in the sound pressure level (measured in Pascals). Subjectively, this increase would correspond to a doubling of the perceived loudness of sound.

A-Weighting

The 'A' weighting is a correction term applied to the frequency range in order to mimic the sensitivity of the human ear to noise. It is generally used to obtain an overall noise level from octave or third octave band frequencies. An 'A' weighted value would be written as dB(A).

$L_{Aeq,T}$

The A-Weighted equivalent continuous sound level – the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period (T). $L_{Aeq,T}$ is used to describe many types of noise and can be measured directly with an integrating sound level meter.

$L_{A90,T}$

The A-Weighted noise level exceeded for 90% of the specified measurement period (T). This is generally taken to indicate the prevailing background noise level.

L_{Amax}

The highest A-Weighted noise level recorded during a noise event.

Appendix 4 – List of measurement equipment.

Measurements

Rion type NL-28 Sound Level Meter	S/N 01260202
Rion type NH-23 pre-amplifier	S/N 60105
Rion type UC-59 Microphone	S/N 282

Additional Equipment

Rion Type NC-74 Calibrator	S/N 34172706

The above equipment fulfils IEC 61672 Class 1 and is traceable to calibration under BS7580:Part 1:1997.

The equipment was calibration-checked before and after measurement – no adverse deviation was observed.

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