Proposal for a B8 Development at Lincs Gateway, Spalding, Lincolnshire

Noise Impact Assessment to Support Planning Application

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1. INTRODUCTION

Spectrum Acoustic Consultants has been commissioned by Knights Plc on behalf of Alcan Properties Limited, to carry out a noise impact assessment (NIA) for the purpose of establishing the potential impacts associated with the development of warehouse and distribution units (B8 use) at Lincs Gateway, Spalding.

This report is submitted with the intention of providing sufficient information to both inform and satisfy the requirements of the Local Planning Authority in relation to an outline planning application.

This report version (V3) follows a review of the draft report, by South Holland District Council, and includes some minor enhancements to the proposed noise mitigation.

2. SITE DESCRIPTION AND PROPOSALS

The site is located 2.6km to the south of Spalding town centre immediately to the north of the A16/A1175/B1173 roundabout.

Open agricultural land is to the north of the site. The A16 runs along the east of the boundary, the B1173 runs along the south of the boundary providing access to Spalding. On the west side of the site, there is established housing accessed via Fen End Lane.

A site location plan, parameters plan and an indicative site plan comprising three units, is included in Appendix A

3. POLICY AND GUIDANCE

The National Planning Policy Framework (NPPF) was first published in March 2012 and revised in February 2019 and July 2021. It sets out the Government's planning policies for England and how these should be applied by establishing a framework within which locally prepared plans for development can be produced.

The NPPF requires (174) prevention of new or existing development from contributing to, or being adversely affected, by unacceptable levels of noise pollution.

New development (185) should be appropriate to its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment. In doing so it is required to:

> *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 life[1];*
>
> *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*

[1] *See Explanatory Note to the Noise Policy Statement for England, paragraphs 2.23 and 2.24 , Department for Environment, Food & Rural Affairs,15 March 2010).*

Planning policies and decisions should also (187) *'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 Noise Policy Statement for England (NPSE)[2] sets out the long term vision of government noise policy which is to *'Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.'*

The aims of the NPSE are to (2.23-2.25):

- avoid significant adverse impacts on health and quality of life;
- mitigate and minimise adverse impacts on health and quality of life; and
- where possible, contribute to the improvement of health and quality of life

These aims are developed by reference (2.20-2.21) to the concepts of:

- NOEL (No Observed Effect Level). This is the level below which no effect can be detected;
- 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.

It recognises that there is no universally applicable objective threshold for these concepts. Consequently, the NOEL, LOAEL and SOAEL are likely to be different for different noise sources and receptors and at different times (2.22).

Situations of significant adverse effect (SOAEL) should be avoided (2.23). Where the impact is between LOAEL and SOAEL reasonable steps should be taken to minimise and mitigate adverse effects on health and quality of life, but does not mean that such adverse effects cannot occur (2.24). It is also implied that situations of NOEL would be acceptable in noise terms.

4. ASSESSMENT METHODOLOGY AND ACOUSTIC CRITERIA

4.1 TRAFFIC NOISE ON THE PUBLIC ROAD NETWORK

For consideration of the effects of noise from vehicles travelling on the public road network, to and from the development, procedures for the calculation of road traffic noise are set out in Calculation of Road Traffic Noise (CRTN), published by the Department of Transport, Welsh Office in 1988. CRTN is the required procedure for determination of entitlement under the Noise Insulation Regulations,

[2] *Noise Policy Statement for England (NPSE), DEFRA, 15 March 2010*

however, the procedure is also 'appropriate to the calculation of traffic noise for more general applications e.g., environmental appraise of road schemes, highway design and land use planning'.

The procedure uses traffic flow rates to derive a Basic Noise Level at a reference speed of 75km/hr (BNL, noise level at 10m from the nearside road edge), to which corrections can be applied to account for the percentage of heavy vehicles, average speed, and others factors such as road surface and gradient. Calculation procedures for the propagation of road traffic noise over distance are also described.

The noise level is calculated in terms of the statistical metric LA10,18hr, which represents the noise level that is exceeded for 10% of the time over the 18 hour period. Methods for the conversion of the LA10,T metric to LAeq,T are given in BS 8233, which also references the TRL report commissioned by DEFRA, Converting the UK Traffic Noise Index LA10,18hr to EU Noise Indices for Noise Mapping.

The Design Manual for Roads and Bridges (DMRB) consists of a set of volumes that collate previously separate Standards, Advice Notes and other documents, published by the Overseeing Organisations of England, Scotland, Wales and Northern Ireland, relating to Trunk Road works. Volume 11, Section 3, Part 7 is an Advice Note, which provides guidance on the assessment of noise and vibration impacts resulting from road projects. The latest revision to this part was published in November 2011, superseding previous versions. The assessment methodologies described may be applied to both new and existing roads.

The magnitude of impact resulting from road traffic noise is established by considering the change in the road traffic noise level that would arise as a result of the proposed development. It is considered that the relationship between the change in noise level and the magnitude of impact would be different for changes that occur over short term and long term periods. For example, a change of $L_{A10,18hr}$1dB is the smallest change that is considered perceptible in the short term. However, in the long term, perhaps 10-15 years after the opening of a development, the smallest perceptible change would be $L_{A10,18hr}$ 3dB.

4.2 OPERATING NOISE FROM THE PROPOSED DEVELOPMENT

To assess the environmental noise impact associated with a planned B8 development, it is generally accepted that the predicted noise levels from the development need to be compared with the existing background noise levels at the nearest noise sensitive receptor locations around the site. The potential noise impacts associated with the proposals are identified as follows:

- Noise from activity inside the new development buildings
- Noise from likely fixed external mechanical plant, (such as air conditioning, ventilation and chilling), associated with the development
- Noise from activity and vehicles within the service yards

This assessment starts with considering the principles set out in BS 4142:2014 *Methods for rating and assessing industrial and commercial sound*, by comparing the predicted noise levels from new sources associated with the proposals corrected for any particular characteristics (the Rating Level), with the existing background noise levels, as measured at locations representative of the nearby residential receptor locations.

Generally, the greater the difference by which the Rating Level exceeds the Background Sound Level, the greater the magnitude of impact. BS 4142 states that *'a difference of around +10 dB or more is*

likely to be an indication of a significant adverse impact […]. A difference of around +5 dB is likely to be an indication of an 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.'

However, BS 4142 also advises that *' when making assessments and arriving at decisions […] it is essential to place the sound in context'* so in each case, the context in which the sound is placed must be considered and the initial estimate of impact should be modified accordingly. For example, it advises '*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*.' At night, the noise is assessed in relation to intrusion into sensitive premises and the potential disturbance to sleep.

Context as allowed within BS 4142 can lead to consideration of resulting noise levels within dwellings. This is particularly useful when looking at the highest internal noise levels likely when windows are open, both during the day and night. When these windows are closed, the internal levels are naturally lower. So when evaluating noise impacts from external sources, on for example, new residential developments, the Standard considered is BS*8233:2014 Guidance on sound insulation and noise reduction for buildings*.

Internal noise criteria are advised in BS 8233 within dwellings relating to sources of external noise '"without a specific character". Noise has a specific character if it contains features such as a distinguishable, discrete and continuous tone, is irregular enough to attract attention, or has strong low-frequency content, in which case the Standard advises that lower noise limits might be appropriate'. The criteria advised are shown in table 1.

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

Table 1: BS8233 Indoor ambient noise criteria for dwellings for 'noise without character'

Whilst modern dwellings will have double glazed windows which will generally be particularly good at preventing the transmission of external noise into internal areas, older style dwellings may not and so a worst-case assumption of having a window partly open for ventilation purposes will mean in practice that the internal level may be around 12 dB below the external level (Annex G.1 para 4 of the Standard). With partly open windows, levels outside bedrooms at night for example should accordingly not exceed $L_{Aeq,T}$ 42 dB to comply with BS 8233 internal limits. If the noise includes the elements described above such as distinguishable tones, irregularity such as would attract attention, or strong low frequency content then limits should be lower.

5. BASELINE SURVEY

5.1 NOISE MEASUREMENT LOCATIONS (NML)

Noise measurement locations (NMLs) aligned with potential noise sensitive receptors are shown in the map in Appendix B.

The four locations are:

- NML 1 - At the west edge of the development site in the vicinity of the nearest residential receptor in Fen End Lane. (Unattended noise logger). 250m northwest of the centre of the site
- NML 2 – Close to Burr Lane Cottage, Burr Lane. 490m to the north of the site centre
- NML 3 – Drain Bank 680m east of the centre of the site
- NML 4 - Marston's hotel 350m southwest of the centre of the site.

5.2 NOISE SURVEY DETAILS AND INSTRUMENTATION

Attended measurement were taken at NML 2-4 during day, evening and early night on 2 February 2023 and during the day on 3 February 2023. Wind speeds were 2-4 m/s which is within the acceptable levels for noise measurement.

An unattended noise monitor measuring continuously day, evening and night was located at NML 1 to establish the diurnal changes in noise over each 24 hour period. This was in place for 1 day/night period. The wind direction during this period, at a nearby weather station (RAF Wittering)), showed wind direction W/SW during the whole survey (Appendix B).

The parameters recorded during the measurement survey included $L_{Aeq,T}$ (energy average level) and $L_{A90,T}$ (level exceeded for 90% of the measurement period). In accordance with BS4142 guidance, $L_{A90,T}$ is used for describing background noise and, as such, and will be used for the purpose of the noise impact assessment. $L_{Aeq,T}$ is used to describe the ambient noise level.

The following instrumentation was used during the noise measurement survey:

For the attended measurements:

- Bruel & Kjaer Type 2250 Sound Level Meter s/n 3009933
- Bruel & Kjaer Type 4189 Microphone s/n 3043744
- Bruel & Kjaer Type 4231 Acoustic Calibrator s/n 2115516

And for the unattended measurements:

- Bruel & Kjaer Type 2250 Sound Level Meter s/n 3000713
- Bruel & Kjaer Type 4189 Microphone s/n 2780512
- Bruel & Kjaer Type 4231 Acoustic Calibrator s/n 3001598
- Graphite extendable mic pole and mic extension cable
- Weatherproof Pelicase with Lithium battery packs

Before and after the survey, the sound level meters were field-calibrated in accordance with the manufacturer's guidelines, and no significant drift was observed. The meters, microphones and field

calibrators are laboratory calibrated biennially in accordance with UKAS procedures or to traceable National Standards.

5.3 NOISE SURVEY RESULTS

Full details of the results from the noise measurement survey are included in Appendix B. Table 2 shows a summary of the measured attended levels at NML 2- NML 4.

Noise Location (NML)	Ambient noise level L_{Aeq} (dB)			Background sound level L_{A90} (dB)			Comment
	Day (07:00-19:00)	Eve (19:00-23:00)	Night (23:00-07:00)	Day (07:00-19:00)	Eve (19:00-23:00	Night (23:00-07:00)	
NML 2 – Burr Lane	60	50	46	48	43	38	Road traffic from B1173 and A16
NML 3 – Drain Bank	57	54	54	54	46	47	A16 road traffic dominant
NML 4 - Marston's Hotel	55	49	41	51	49	40	Road traffic from A1175, B1173 and A16

Table 2: Summary of typical attended measurement values at NML 2-4

Table 2 shows that the key metric for background noise ($L_{A90,T}$) during the day, is broadly consistent (48 – 51 dB) around the site. During the evening, the background noise levels reduce slightly (43-49dB) with levels at Burr Lane lower due to reduced flows on the B1173. The A16 noise, is dominant, with the large number of HGVs travelling at speed being particularly noticeable. Finally at the early part of the night the noise levels reduce at receptors upwind of the A16 but remain high at NML 3 which is downwind of this major road. Wind direction is a significant factor in the baseline noise levels, with the dominant noise source in the area at all times being road traffic noise from the A16.

The results from the unattended logger positioned at NML 1, are included in Appendix B. In Figure 1 below, the green curve represents the changing $L_{A90,T}$ background level at this location over a period of 24 hours. The night period from 11pm to 1am is considered the relevant period for assessment being the period during which many people will fall asleep, and is coloured red.

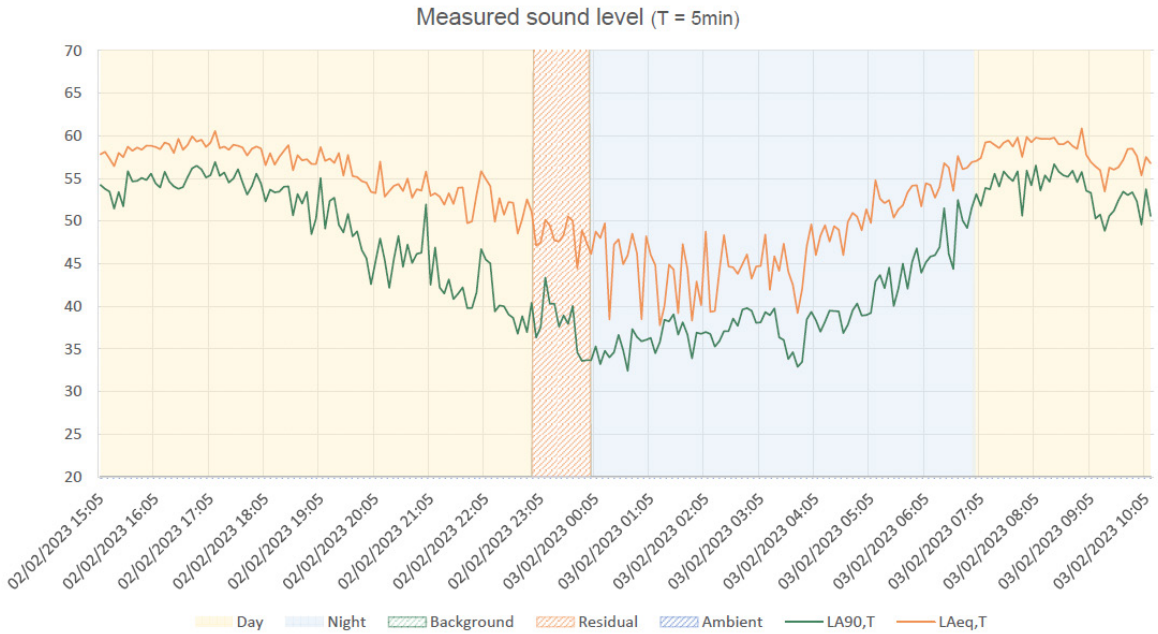


Figure 1: Background (green) sound levels at NML 1 measured over 24 hours period 2-3 February 2023

This graph shows the background sound level $L_{A90,T}$ during the day being typically around 52 dB; during the evening it drops to around 45 dB, and at the early part of the night to 38 dB (see appendix B for data). Table 3 shows these values.

Noise Location (NML)	Background sound level L_{A90} (dB)			Comment
	Day (07:00-19:00)	Eve (19:00-23:00	Night (23:00-07:00)	
NML 1 (unattended monitor over 24 hours)	52	45	38	Levels are low due to prevailing upwind propagation conditions with respect to the dominant source in the area, the A16

Table 3: Summary of NML 1 data over continuous 24 hour period

The values in table 3 are consistent with the spot readings taken at other receptors NML 2-4 in particular reflecting the lower baseline level condition associated at this location when the wind is west/southwest and upwind propagation conditions apply in relation to the dominant noise source in the area, the A16 road.

The values of baseline noise levels shown in tables 2 and 3 can be considered to be representative of the lowest levels typically arising during the early part of the night (23:00-01:00) when people are getting to sleep, as most receptors are upwind of the A 16. Assuming a low baseline means that the assessment of noise impact of the proposed development will cover the worst case scenario and therefore will be robust assessment. With other wind directions, the level of noise impact will be less.

6. POTENTIAL NOISE IMPACTS

6.1 NOISE IMPACT OF DEVELOPMENT TRAFFIC ON PUBLIC ROAD NETWORK

Access from the public road network to the site for all vehicles including HGVs will be via the roundabout on the A16 to the south of Spalding where it connects to the A1175 (towards the A15) and the B1173 (to Spalding town centre).

There are four segments of road considered within the Transport Assessment and as there are some residential sensitive receptors on each of these segments there is a need to consider noise impact from increased road vehicles for each.

The road segments considered are:

- A16 north of Cowbit Road (B1173)
- A16 south of Cowbit Road (B1173)
- B1173 (Cowbit Road to Spalding town centre)
- A1175 (Towards A15)

Road traffic flows are taken from the Transport Assessment. The trips rates used are values that are 25% above those expected. This means that the assessment of noise from road traffic on public roads is particularly robust. The baseline flows are taken to be as at 2025.

Appendix C shows a CRTN calculation of the potential change in noise level from road traffic. The increase in Basic Noise Level is in the range: 0.2 dB – 0.5dB. DMRB advises that a change of 1 dB is the smallest change that is considered perceptible in the short term.

The noise impact from changes in road traffic on public road network will therefore be negligible.

6.2 NOISE IMPACT FROM OPERATIONS ON THE SITE

The proposed development site will comprise a number of B8 units. An illustration of a possible arrangement of warehousing is included in Appendix A. This shows an arrangement of three warehouses with yard areas of the nearest to sensitive receptors, well shielded by the warehouses themselves, in the direction of the nearest noise sensitive receptors in Fen End Lane. This configuration acoustically optimises the layout.

The noise assessment is carried out assuming a potential use of the units for food distribution or similar. This is a B8 use that incorporates a substantial allowance of chilling and cooling mechanical services plant, which has the potential to generate additional noise. This therefore represents a robust noise assessment approach, covering worst case noise scenario.

Typical use of the premises will involve some sound sources that are mobile and some that are fixed. These sources will be distributed about sites and subject to varying degrees of shielding, distance attenuation, directivity and reflection, relative to the nearest noise sensitive location. Accordingly, the analysis method which will most accurately represent this situation is a numerical noise model of the buildings and service yard and fixed mechanical chilling and cooling plant. HGV movements to and from loading dock positions are accounted for, as is a substantial number of HGV mounted chilling units, many assumed to be diesel engine driven, but most assumed to be hooked up to electric supply whilst loading and unloading.

The prediction model that has been used for this analysis is SoftNoise GmbH Predictor-LimA V2021.1 (Predictor) software. The analysis uses Predictor to implement the procedures set out in ISO 9613-2:1996 “Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation to determine noise levels”, and is Quality Assured to all parts of ISO 17534:2015 “Acoustics – Software for the calculation of sound outdoors”. The model takes account of the following features in its calculation procedure:

- Source sound power level (for point, line and area sources)
- Reflection from nearby structures and source directivity
- Distance from noise source (geometric spreading)
- Atmospheric absorption
- Acoustic screening of intervening structures and topography
- Ground absorption
- Ground effects (which includes the height of ground relative to the noise source)

The contribution of each individual noise source to combined noise levels at the receptor location is then computed using detailed noise calculations. The proposed on-site buildings are modelled as solid bodies, around which sound can diffract. The intervening ground areas are modelled as reflective ground, according to the ISO 9613 method.

The following assumptions have been made based on information provided by other technical professionals on the project. This is a prediction with no additional noise mitigation measures.

- All sound sources, both fixed and mobile aggregated and modelled simultaneously
- Internal reverberant sound pressure level incident on the underside of the roof and on the inside of external walls of $L_{Aeq,T}$ 75 dB on average inside the B8 units.
- The walls and roof of the building constructed using composite insulated cladding panels with an Rw of 30dB and 24 dB respectively. .
- 12% of all roller shutter vehicle doors assumed to be open with no HGV vehicles in place.
- 2 HGVs idling in larger unit yards, one in smaller unit yards.
- 2 HGVs moving in larger units yards, one in smaller unit yards
- 2 large mechanical plant zones at ends of yard facing into the yard of each larger warehouse with a sound power level of LwA 100 dB each. One plant zone for smaller units.
- 4 HGV mounted chiller units operating in diesel mode in each larger unit yard. 2 in smaller yards.
- 12 HGV mounted chiller units operating hooked up in electric mode in larger yards. 6 in smaller.
- 3 diesel and 1 electric/gas forklifts in each larger yard. 2 diesel forklifts in smaller yard.
- Typically, 10 roof top low noise micro wind turbine power generators on each large warehouse roof with sound power levels LwA of 70 dB each. 5 wind turbines on roofs of smaller units

The locations of these noise sources within the site can vary, however the locations in Figure 2 show a section of the site with some of the sources indicated. This is a typical worst case, with most of the activity at the ends of the yards where acoustic screening beneficial effects are lowest.



Figure 2: Section of the noise propagation model showing location of sources assumed

The locations of the nearest noise sensitive receptors NSR 1- NSR 4 are shown on the plan in Figure 3.



Figure 3: Discrete receptor positions NSR1 – NSR4 at which noise levels are calculated.

The sound power levels used have been taken from Spectrum's library data of representative equipment on equivalent sites. The exact noise source levels modelled as part of these scenarios are shown in detail in the Equipment List Sound Power Levels included in Appendix D. Where sources do not operate for the full reference period, levels have been adjusted for on-time as described in Section 7 of BS4142.

The full simulation results of noise from the development (with no additional noise mitigation), for both daytime and nightime periods are given as a noise contour map, and also tabular results in appendix D. It should be noted that although the activity from the site is the same during the day as during the night, the height of the assessment positions is 1.5m during the daytime and 4.0m (reflecting typical bedroom window height) during the night. The levels at 4.0m are generally higher as they can have a clearer line of sight to noise sources. A summary of the results is shown in table 4.

Noise Sensitive Receptor, NSR	$L_{Aeq,16hr}$ – daytime at 1.5 m	$L_{Aeq,8hr}$ – nightime at 4.0m
NSR 1	38	40
NSR 2	47	47
NSR 3	48	48
NSR 4	44	45

Table 4: Predicted modelling of noise (unmitigated) at receptors NSR 1 – NSR 4.

The results show a range of levels of $L_{Aeq,T}$ 38 - 48 dB during the day, with the highest noise levels being experienced at NSR 3 due primarily to activity noise in the unshielded yard of Unit 200 in an easterly direction. During the night, the range of levels is $L_{Aeq,T}$ 40-48 again with the highest levels in an easterly direction.

The number and variety of sources of noise is large, so individual sources are unlikely to be discernible. However, the audibility and potential character of any noise will also depend upon the level of the background noise at each position.

7. ASSESSMENT

7.1 ASSESSMENT OF NOISE IMPACT OF INCREASE IN ROAD TRAFFIC ON PUBLIC ROADS

A calculation of the potential increase in road traffic noise associated with the development, at 4 separate road segments identified within the Transport Assessment, is included in full in appendix C in accordance with CRTN[3] procedures. The results show that the increase in noise level is in the range 0.2 dB – 0.5dB. DMRB advises that a change of 1 dB is the smallest change that is considered perceptible in the short term and so the noise impact is considered to be low.

[3] *Calculation of Road Traffic Noise, Department of Transport and Welsh Office, 1988*

7.2 ASSESSMENT OF NOISE IMPACT FROM THE DEVELOPMENT SITE – UNMITIGATED

Section 4 discusses the methodology and acoustic criteria that apply to operational noise from the proposed development. In general, BS 4142 applies, although in considering the context of the noise, sections of BS 8233 are also relevant and will also be considered.

BS 4142 deals with, as outlined within section 4, the assessment and impacts in the following way.

Generally, the greater the difference by which the Rating Level exceeds the Background Sound Level, the greater the magnitude of initially established potential impact. BS 4142 states that *'a difference of around +10 dB or more is likely to be an indication of a significant adverse impact […]. A difference of around +5 dB is likely to be an indication of an 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.'* However, BS 4142 also advises that *' when making assessments and arriving at decisions […] it is essential to place the sound in context'* so in each case, the context in which the sound is placed must be considered and the initial estimate of impact should be modified accordingly.

Table 5 shows the formal assessment in accordance with BS 4142 which concludes the 'initial indicative impact'. This is before the context has been considered.

Noise Sensitive Receptor	Specific sound level, Ls (dB)	Rating level, LAr,Tr (dB)	Background sound level LA90 (dB)	Difference or Rating minus Background levels(dB)	Initial Impact defined within BS 4142
Daytime					
NSR1	36	36	52	(-16)	Low
NSR2	45	45	48	(-3)	Low
NSR3	46	46	54	(-8)	Low
NSR4	34	34	51	(-17)	Low
Nightime					
NSR1	39	42[4]	38	+4	Adverse
NSR2	46	49[4]	38	+11	Significant adverse
NSR3	46	46	47	(-1)	Low
NSR4	35	35	40	(-5)	Low

Table 5: BS 4142 assessment of initial noise impact of the proposed development before considering context (unmitigated).

The results of the BS4142 assessment show an initial indication of low impact during the day at all receptors.

The impact during the night is potentially much greater as background sound levels are much lower. BS 4142 considers night levels to be potentially significant at NSR 2 (Burr Lane), and potentially adverse at NSR 1 (Fen End Lane) but a low impact at NSR 3 (Drain Bank) and NSR 4 (Marston's Hotel). BS 8233 suggests levels at NSR 2 and NSR 3 at 46 dB exceed the limit of 42 dB consistent with good levels within bedrooms, when windows are open. At NSR 1 and 4, the levels unmitigated do not exceed the BS 8233 limits.

[4] *There is likely very little character in the noise, however where Ls>$L_{A90,T}$ a small correction of +3 dB is applied*

Where the noise impact is adverse there is an obligation in planning terms, to consider further noise mitigation measures that might minimise noise impact, and this course of action is recommended

7.3 ASSESSMENT OF NOISE IMPACT FROM THE DEVELOPMENT SITE – WITH MITIGATION

Additional noise modelling has been undertaken in order to predict the noise impact at the nearest residential receptors NSR1-NSR4 with additional noise mitigation. The full results are shown in Appendix E. The additional noise mitigation proposed is:

- Installing a 2m high close boarded timber fence on top of the existing bunding just inside the northwest site boundary
- Upgrading the sound insulation of the west/north walls and roof of the nearest unit to NSR 1 to Rw 38 and 30 respectively.
- A noise attenuation package of a combination of acoustic screening/acoustic louvres/silencers/acoustic lagging for each of the large mechanical plant zones to reduce sound power level from LwA 100dB to 90 dB.
- Consideration of an extensive arrangement of effective acoustic bunding and barriers. Outline initial designs show these will be highly effective to the north and east in particular. These might comprise up to 8m total heights between the north facades of units close to the northern boundary of the site. Up to 5m high reducing to 3m on the north section of the eastern boundary (with the A16) and a barrier between the units on the west of the site at 6m in height increased from 5m after consulting South Holland District Council..

This arrangement of noise mitigation has been tested in noise models, the full results in terms of noise contours and usefully tabulated list of noise source contributions at each NSR are shown in appendix E. However, table 6 shows the assessment of this noise mitigated scheme in accordance with BS 4142.

Noise Sensitive Receptor	Specific sound level, Ls (dB)	Rating level, LAr,Tr (dB)	Background sound level LA90 (dB)	Difference or Rating minus Backgroun d levels(dB)	Initial Impact defined within BS 4142
Daytime					
NSR1	33	33	52	(-19)	Low
NSR2	40	40	48	(-8)	Low
NSR3	44	44	54	(-10)	Low
NSR4	35	35	51	(-16)	Low
Nightime					
NSR1	36	36	38	(-4)	Low
NSR2	40	43[4]	38	+5	Adverse
NSR3	44	44	47	(-3)	Low
NSR4	36	36	40	(-4)	Low

Table 6: BS 4142 assessment of initial noise impact of the proposed development before considering context (with mitigation package).

With the proposed mitigation, during the day, the level of noise impact has reduced substantially at all locations. However, BS4142 has no lower impact rating than low; it was low without mitigation.

During the night, the levels of noise have reduced by 3-6 dB at NSR 1, NSR 2 and NSR 3 which may be considered a substantial reduction in noise impact. At NSR 4, the noise impact has increased by 1dB. At 3 of the receptors the initial indication of noise impact is now low, however at NSR2 it is adverse, having previously been significant adverse. Part of this is due to the specific sound level being slightly above the background level, and a +3 dB character correction has been applied in the assessment. Importantly however, the potential noise impact will not be significant.

Context has to be considered as part of the BS 4142 assessment process.

8. CONTEXT IN BS 4142:2014

BS 4142 describes a methodology for assessing noise impact, however it states clearly this is only an 'initial indication' of noise impact. Other factors need also to be considered before a final assessment can be concluded.

There are relevant context issues that should now be considered especially in relation to the noise impact to NSR 2 (Burr Lane)

1) The character of the noise from the proposed development will not contain tonal or impulsive elements, especially once yards are well acoustically shielded through the incorporation of acoustic bunding and barriers on the north boundary of the site. The current (2014) version of BS 4142 considers:

> *Where the specific sound features characteristics that are neither tonal nor impulsive, nor intermittent, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.*

2) The application of a +3dB penalty in this instance is precautionary and it is unlikely in practice that the noise at night at NSR2 will be 'readily distinctive'. Without this penalty, the Rating minus Background Sound Levels would be +2dB, just 2 dB above the threshold of initial indication being a 'low impact'

3) NSR 2 is a property directly located on Burr Lane and its south façade is already subject to high short term noise from occasional passing vehicles. The existing ambient (energy average) noise levels ($L_{Aeq,T}$) at night at NSR 2 takes into account the effects of occasional passing vehicles (unlike the background sound level), and at 46 dB, this ambient is well above the 40 dB $L_{Aeq,T}$ predicted from the development. The total ambient noise level will rise by no greater than 1dB. This is very small. Also the rear facade of this dwelling facing north will not be affected by the noise from the potential development to its south.

4) The predicted sound pressure level at NSR 2 at night is reduced through noise mitigation from $L_{Aeq,T}$ 46 dB to 40 dB which takes it below the 42 dB threshold immediately outside bedrooms advised in BS 8233 resulting in acceptable internal levels for sleeping with windows open.

Taking note of the above context points the final assessment according to BS 4142 will conclude that both during the day and the night periods, the proposal with noise mitigation as outlined in this report, will give rise only to a 'low' noise impact.

9. UNCERTAINTY

A noise impact assessment, carried out in accordance with BS 4142, must consider and report the level of the effect that uncertainty in measurements and calculations, has on the assessment's overall conclusions. This will typically be expressed in qualitative rather than quantitative terms. The amount of effort put into minimising such uncertainties should be proportionate to the noise impact risk that the site presents,

With this project, uncertainty both in measurement data and also calculations, has been considered and minimised in the following way:

Reductions in uncertainty of measurement data

Measurements made have been post processed to ensure all data then used in the assessment has been obtained in appropriate weather conditions. That is in wind speeds less than 5m/s and other adverse weather conditions not significantly affecting data.

- All single measurements used to quantify particular noise sources have, where possible, been made in the acoustic far-field to avoid nearfield effects arising.
- Where measurements have been made at particular locations, distances have either been directly measured on site, or identified precisely from maps or site plans, rather than being estimated.
- The noise sources arising and the potential time variations of noise level have been specifically investigated and accounted for in planning the times and durations of measurements made, and to ensure particular events and operating conditions are measured and assessed.
- Consistency in sound field description is achieved through all measurements being made under free-field conditions, unless specifically expressed as façade measurements.
- The instrumentation used to measure sound levels on this project is all classified class 1 (Precision Grade) to IEC 61672-1:2002/ BS EN 61672-1:2003. This offers lower uncertainty in measurement than class 2 (survey grade) instrumentation.
- All instrumentation is fully calibrated, and independently verified by external auditors and global certification body, NQA, to ISO 90001:2015 as part of Spectrum's Quality System. Records are kept of dates of calibration. Results of field calibration tests are reported where drift over the duration of the survey is found to have exceeded 0.5dB at 1kHz.

Reductions in uncertainty of calculations

- Where sound levels are extrapolated out to sensitive receptors, this has been done using appropriate algorithms having uncertainty reflecting the degree of risk the site presents[5].
- Where assessments include consideration of transmission of sound through building elements, account has been taken of flanking path sound transmission, and other factors rather than relying solely on laboratory test data such as R_w values.

Assessor Competency

- The uncertainty in the assessment conclusions is also minimised as it has been carried out by a competent person as defined within BS 4142. This is someone who is a qualified acoustician and can demonstrate competency in environmental noise work

The measures taken to reduce uncertainty on this project along with the numerical difference between the Rating Level and Background Sound Level indicate a level of uncertainty that will have no significance in relation to the outcome of the assessment.

10. CONCLUSIONS

A Noise Impact Assessment (NIA) has been completed for a proposed B8 development at Lincs Gateway, Spalding.

Consideration has been given to the change in noise from increases in vehicle numbers on the public road network, resulting from operations of the proposed development. The increases are small and the increase in noise level is <0.5 dB, which is a negligible effect.

Predictions of noise from activities arising at the site, show that the potential for significant adverse effects may arise during night operations unless suitable noise mitigation measures are included within the scheme.

BS 4142 has been used as primary basis of the assessment with context relating to this particular site, being considered in order to come to an overall conclusion on noise impact.

In order to further reduce the noise levels for night operation, the following mitigation measures have been tested out in the noise model and are now recommended:

- Installing a 2m high close boarded timber fence on top of the existing bunding just inside the northwest site boundary
- Upgrading the sound insulation of the west/north walls and roof of the nearest unit to NSR 1 to Rw 38 and 30 respectively.

[5] For critical sites extrapolation calculations may be undertaken using computer modelling adopting ISO 1996-2:2007 *Acoustics – Description, measurement and assessment of environmental noise – Part 2: Determination of environmental noise levels.* For less critical site, simpler spreadsheet calculations may be appropriate. For temporary construction noise, calculations can be made in accordance with BS 5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Part 1: Noise*

- A noise attenuation package of a combination of acoustic screening/acoustic louvres/silencers/acoustic lagging for each of the large mechanical plant zones to reduce sound power level from LwA 100dB to 90 dB.
- Consideration of an extensive arrangement of effective acoustic bunding and barriers. Outline initial designs show these will be highly effective to the north and east in particular. These might comprise up to 8m total heights between the north facades of units close to the northern boundary of the site. Up to 5m high reducing to 3m on the north section of the eastern boundary (with the A16) and a barrier between the units on the west of the site at 6m in height increased from 5m after consulting South Holland District Council.

These mitigation measures designed to deal specifically with noise during night-time operation will further reduce noise levels by 3-6 dB at critical locations. This is a large reduction.

In conclusion, based upon an illustrative layout of 3 warehouse units and a recommended noise mitigation scheme, the levels of noise impact to these and other sensitive receptors will be 'low'. This is both for daytime and importantly nightime operation. This would therefore mean that with this typical arrangement adopted there would be no justification for the hours of operation to be restricted through a planning condition.

This is amply demonstrated in Figure 4 which is an extract from Appendix E and visualises the potential impact at night showing noise to be well contained within the site.

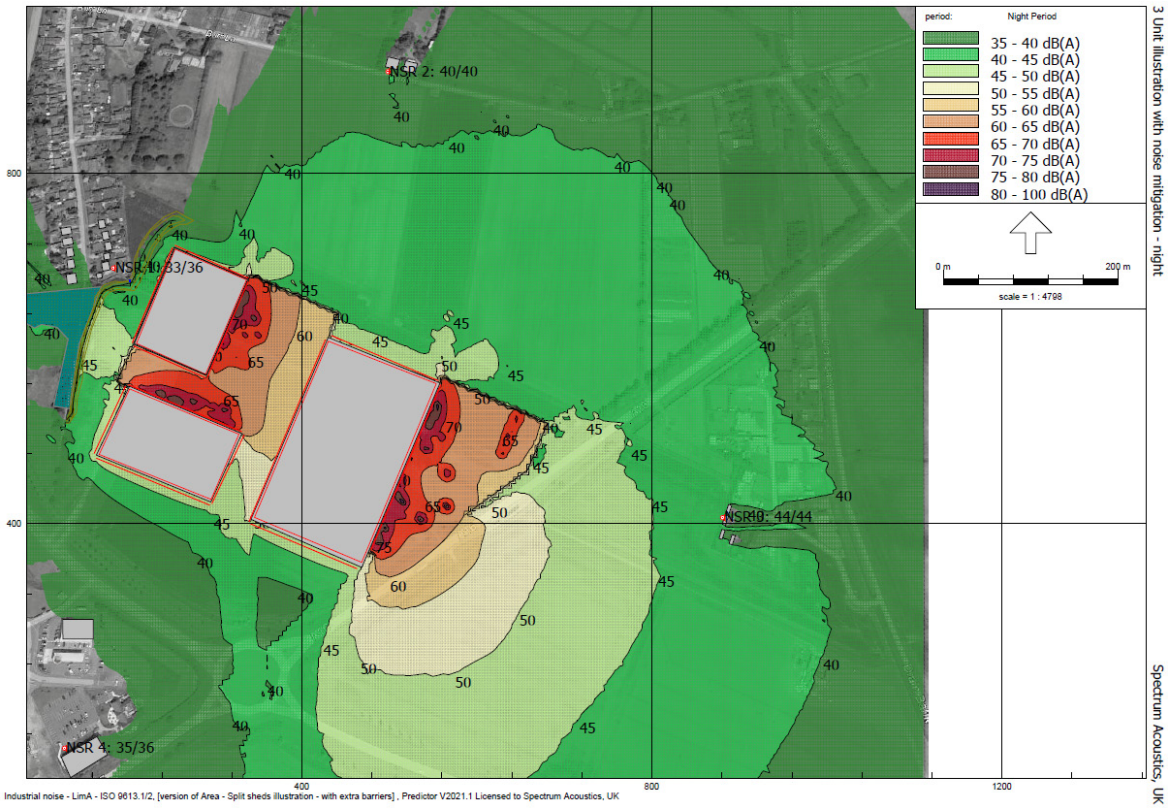


Figure 4: Noise contour map during the nightime period - with recommended noise mitigation

Where residential areas are relatively close to warehouse units, such as in this case, it is always considered good practice to orientate the buildings and yards in an optimal way such that the impact

from activity in the yards is shielded. In this case, this is supplemented with an extensive package of noise mitigation including acoustic barrier / earth bunding arrangements.

The scheme in this 3-unit configuration, and potentially similar configurations, should adopt these good practice design principles where possible which will ensure the potential noise impact to residents both during daytime and at nightime, is low.

APPENDIX A

Site Location Plan, Parameters Plan and Illustrative Layout


Proposed
Development Site


SUDS
Landscaping
Retain Landscaping
Landscaping
SUDS
Development Area
Active Frontage
Active Frontage
SUDS
Access
Active Frontage
B1173
SUDS
Landscaping
A16
umc architects



- Dimensions are in millimeters, unless stated otherwise
- Scaling of this drawing is not recommended
- It is the recipient's responsibility to print this document to the correct scale
- All relevant drawings and specifications should be read in conjunction with this drawing

Schedule of Accommodation

Total GIA	-	**673,991 ft²**	**(62,615 m²)**
Site Area	-	46.02 ha	18.62 ha
Site Density GIA	-		33.62%
Unit 100			
Warehouse Area	-	118,776 ft²	(11,035 m²)
Office Area (incl. GF core)	-	6,212 ft²	(577 m²)
Transport Office	-	2,500 ft²	(232 m²)
Unit 100 GIA	-	**127,488 ft²**	**(11,844 m²)**
Unit 200			
Warehouse Area	-	374,467 ft²	(34,789 m²)
Office Area (incl. GF core)	-	19,708 ft²	(1,831 m²)
Transport Office	-	2,500 ft²	(232 m²)
Gatehouse	-	300 ft²	(28 m²)
Unit 200 GIA	-	**396,975 ft²**	**(36,880 m²)**
Unit 300			
Warehouse Area	-	138,792 ft²	(12,894 m²)
Office Area (incl. GF core)	-	8,236 ft²	(765 m²)
Transport Office	-	2,500 ft²	(232 m²)
Unit 300 GIA	-	**149,528 ft²**	**(13,891 m²)**

rev	amendments	by	chd	date
P 01	Initial Issue	JMB	CA	14.02.23

Lincs Gateway, Spalding, Lincolnshire

Masterplan

Information Container LOD	LOD 100

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RIBA PoW Stage:	1 - Preparation & Brief
Document Suitability:	S1
Drawn / Checked:	JMB / CA
Date:	24/03/2023
Scale:	1:1000 @ A1
UMC Project Number:	22119

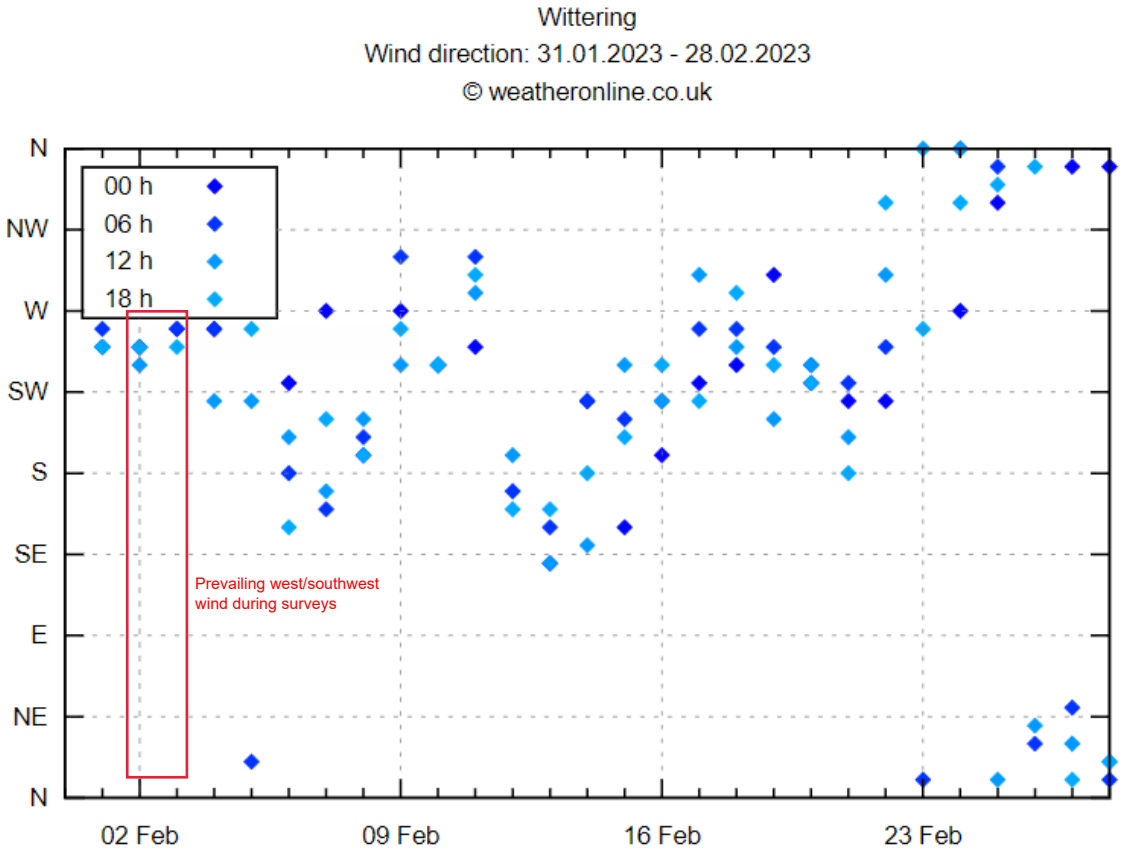
Document Reference:	Drawing no:	Revision:
22119 - UMC - ZZZZ - SI - DR - A	0010	P02

APPENDIX B

Noise Survey Details

- Noise Measurement Locations NML1 – NML 4
- Wind Direction Chart
- Results (attended and unattended)
- Photos of NMLs


NML 2
NML 1
NML 3
NML 4


Wittering
Wind direction: 31.01.2023 - 28.02.2023
© weatheronline.co.uk
N
NW
W
SW
S
SE
E
NE
N
00 h
06 h
12 h
18 h
Prevailing west/southwest
wind during surveys
02 Feb
09 Feb
16 Feb
23 Feb

Project Name	Position	Start Time	Elapsed Time	LAeq	LAF90.0
Project 001	NML 4	02/02/2023 15:22	00:05:23	55	50
Project 002	NML 2	02/02/2023 15:40	00:04:45	57	49
Project 003	NML 3	02/02/2023 16:03	00:05:03	57	54
Project 004	NML 2	02/02/2023 22:13	00:05:01	50	43
Project 005	NML 3	02/02/2023 22:38	00:04:48	54	46
Project 006	NML 4	02/02/2023 22:48	00:04:55	49	41
Project 007	NML 2	02/02/2023 23:02	00:05:08	46	38
Project 008	NML 3	02/02/2023 23:11	00:05:22	54	47
Project 009	NML 4	02/02/2023 23:23	00:04:40	49	40
Project 010	NML 2	03/02/2023 09:22	00:04:53	62	47
Project 011	NML 3	03/02/2023 09:38	00:04:55	56	53
Project 012	NML 4	03/02/2023 09:52	00:04:33	55	51



Nearest receptor located close to NML1



Nearest receptor to NML 1 showing earth bunding



NML 1 on earth bunding with view of nearest receptor



NML 4 at Marston's hotel

APPENDIX C

Traffic Noise on Public Roads

- CRTN Calculation

Revision	Date	Comments
	29/03/2023	From TA but including 25% trip enhancement for sensitivity test

Road Link Reference	DM yr1	DS yr1	DM yr10	DS yr10	Short term change (DS yr1 - DM yr1)	Long term change (without development) (DM yr10 - DM yr1)	Long term change (with development) (DS yr10 - DM yr1)
	BNL	BNL	BNL	BNL			
A16 North	74.1	74.6			0.5		
A16 South	74.1	74.5			0.4		
A1175	70.0	70.3			0.2		
B1173	68.9	69.1			0.2		

APPENDIX D

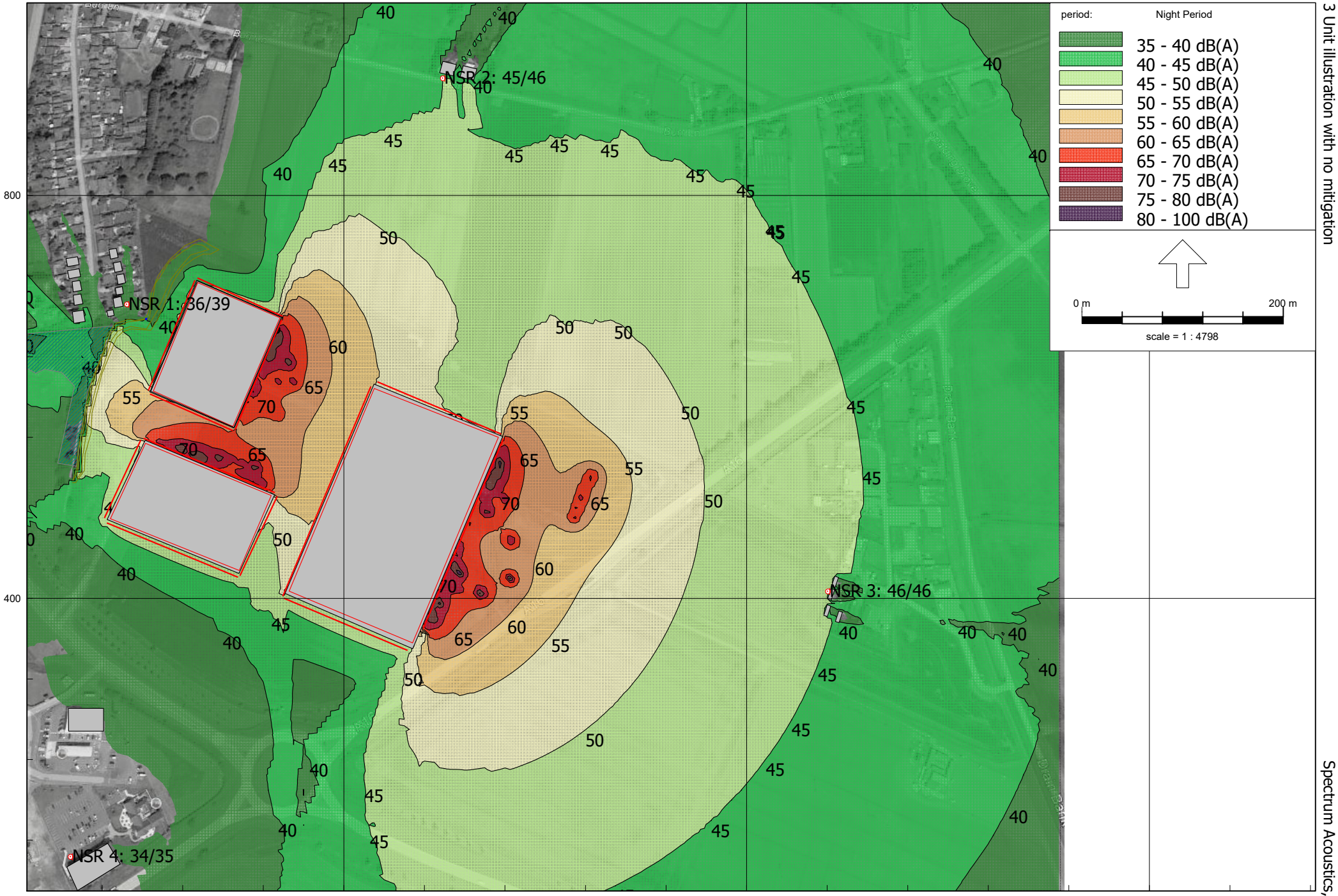
Noise Modelling - unmitigated

- Equipment List Sound Power Levels
- Noise Contour Map – Day and night
- Table of results
- Contributions at NSR 1

Lincs Gateway - On-Site Operation - Equipment List Sound Power Levels

Revision	Date	Comment
0	15/03/2023	Generic noise data for assumed sources - chilled food distribution

HGV manoeuvring/arriving/ departing	105	100	93	96	95	93	89	79	**100**		1.2m high. Articulated road HGV measured by Spectrum (slow moving HGV at DIRFT II). On time per 15 minute period	9	**89**	4
HGV idling	107	93	91	92	90	88	83	76	**95**		1.2m high. Articulated road HGV measured by Spectrum at an Advanced Manufacturing Facility in Nottingham.	100	**95**	4
Chiller mounted on HGV – standard diesel operation (as used temporariily until electrical hook-up)	100	98	94	91	90	87	83	80	**95**		4m high. Based on average of noise data provided by Hubbard, 70-78dB(A) at 7.5m depending on size/power	100	**95**	8
Chiller mounted on HGV – electric operation (hooked up at loading or parking)	81	86	86	83	83	81	78	76	**88**	M	4m high. Based on average of noise data provided by Hubbard, 62-68dB(A) at 7.5m depending on size/power.	100	**88**	20
Small general purpose diesel forklift manoeuvring	105	100	93	88	84	83	80	71	**92**		2m high. 56KW operating diesel forklift measured by Spectrum at an Advanced Manufacturing Facility in Nottingham.	100	**92**	6
Small general purpose electric forklift manoeuvring	81	78	80	83	80	85	87	68	**91**		2m high. Operating electric forklift measured by Spectrum at manufacturing facility in Newcastle.	100	**91**	4
Unit mechanical ventilation and chilling/cooling plant zone (without mitigation)	93	98	98	95	95	93	90	88	**100**	M	2 per unit at high level. Assumed LwA 100 dB.	100	**100**	4
Unit mechanical ventilation and cooling plant zone (with mitigation)	83	88	88	85	85	83	80	78	**90**	M	2 per unit at high level. Assumed LwA 90 dB.	100	**90**	4
Roof cladding - standard	60	60	55	50	45	42	38	35	**53**		One section of roof with Rw = 25 dB. LwA/m2 to apply			
Roof wind turbine	63	68	68	65	65	63	60	58	**70**	M	Calculated noise assuming 2m dia axial impellerand and 150-200 rpm			
Wall cladding - upgraded - 2	54	49	40	33	28	28	26	23	**38**		Further upgraded	100	**38**	1



3 Unit illustration with no mitigation

Spectrum Acoustics, UK

Report: Table of Results
Model: 3 unit llustration - without mitigation
LAeq: total results for receivers
Group: (main group)
Group Reduction: No

Name Receiver	Description	Height	Night
NSR 1_A	NSR 1	1.50	36
NSR 1_B	NSR 1	4.00	39
NSR 2_A	NSR 2	1.50	45
NSR 2_B	NSR 2	4.00	46
NSR 3_A	NSR 3	1.50	46
NSR 3_B	NSR 3	4.00	46
NSR 4_A	NSR 4	1.50	34
NSR 4_B	NSR 4	4.00	35

All shown dB values are A-weighted

Report: Table of Results
Model: 3 unit llustration - without mitigation
LAeq: by Source/Group for receiver NSR 1_B - NSR 1
Group: (main group)
Group Reduction: No

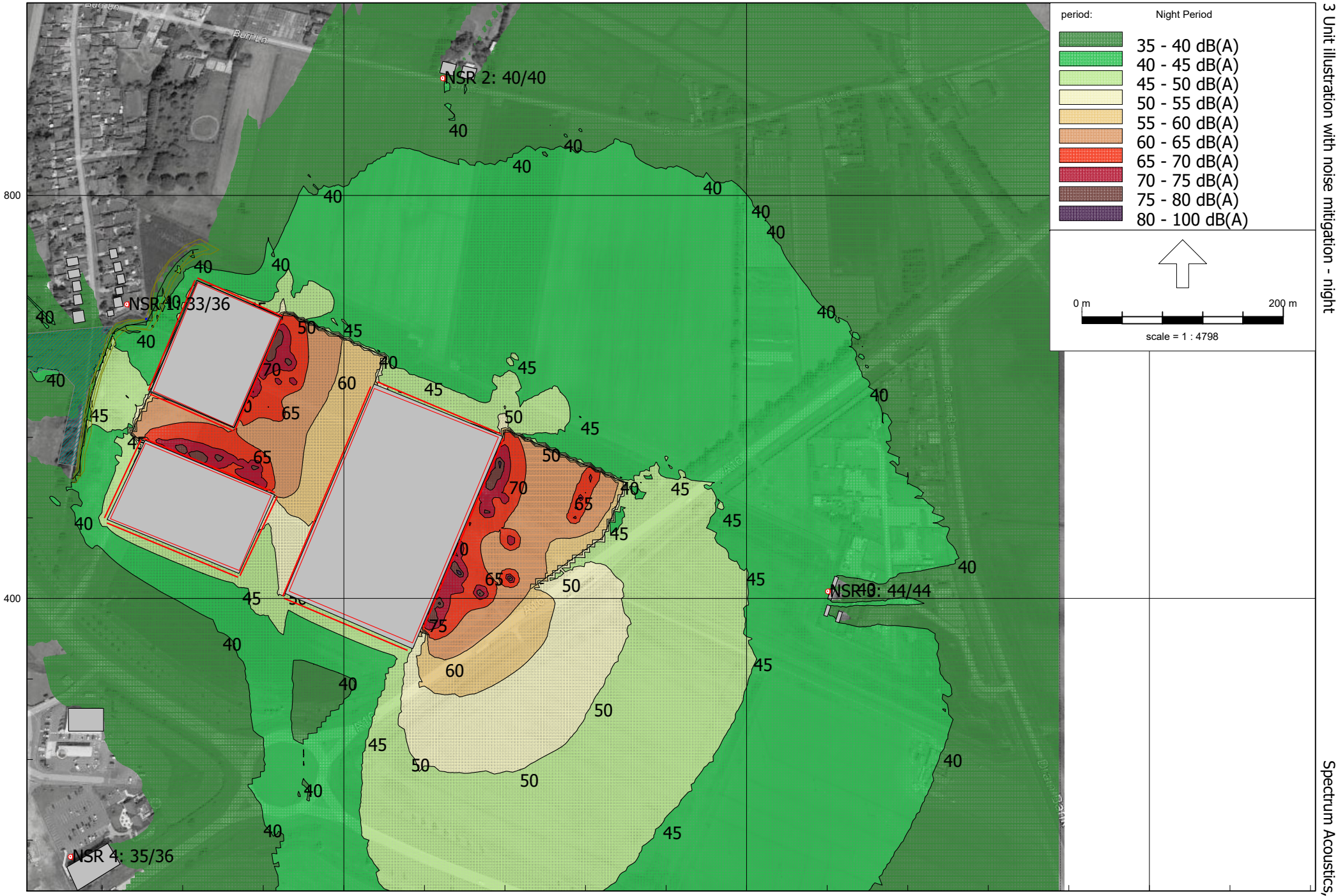
Name Source/Group	Description	Height	Night
NSR 1_B	NSR 1	4.00	39
	U100 north wall	0.00	34
Group	Vehicle doors - open	0.00	33
Group	HGV chillers - electric	0.00	32
Group	HGV chillers - diesel	0.00	29
	U100 south roof	0.10	28
Group	Diesel forklifts	0.00	26
	U100 north roof	0.10	25
Group	HGV idling	0.00	24
		0.00	21
	U 200 roof	0.10	20
		0.00	19
Group	HGV moving	0.00	15
Group	Mech plant zone unmitigated	0.00	13
	U100 north wall	0.00	10
Group	Electric forklifts	0.00	10
	Wall cladding	0.00	7
		0.00	--
		0.00	--
	U100 north wall	0.00	--
	U100 north wall	0.00	--
	Wall cladding	0.00	--
	Wall cladding	0.00	--
Remainder		0.00	--

All shown dB values are A-weighted

APPENDIX E

Noise Modelling – with noise mitigation

- Noise Contour Map – Day and Night
- Table of results
- Contributions at NSR 1
- Contributions at NSR 2
- Contributions at NSR 3
- Contributions at NSR 4



3 Unit illustration with noise mitigation - night

Spectrum Acoustics, UK

Industrial noise - LimA - ISO 9613.1/2, [version of Area - Split sheds illustration - with extra barriers] , Predictor V2021.1 Licensed to Spectrum Acoustics, UK

Report: Table of Results
Model: Split sheds illustration - with extra barriers
LAeq: total results for receivers
Group: (main group)
Group Reduction: No

Name Receiver	Description	Height	Night
NSR 1_A	NSR 1	1.50	33
NSR 1_B	NSR 1	4.00	36
NSR 2_A	NSR 2	1.50	40
NSR 2_B	NSR 2	4.00	40
NSR 3_A	NSR 3	1.50	44
NSR 3_B	NSR 3	4.00	44
NSR 4_A	NSR 4	1.50	35
NSR 4_B	NSR 4	4.00	36

All shown dB values are A-weighted

Report: Table of Results
Model: Split sheds illustration - with extra barriers
LAeq: by Source/Group for receiver NSR 1_B - NSR 1
Group: (main group)
Group Reduction: No

Name Source/Group	Description	Height	Night
NSR 1_B	NSR 1	4.00	36
Group	HGV chillers - diesel	0.00	29
	U100 north wall	0.00	28
Group	Diesel forklifts	0.00	26
	U100 south roof	0.10	26
Group	Vehicle doors - open	0.00	26
Group	HGV chillers - electric	0.00	26
	U100 north roof	0.10	25
Group	HGV idling	0.00	24
	U 200 roof	0.10	20
		0.00	19
		0.00	16
Group	HGV moving	0.00	15
Group	Mech plant zone unmitigated	0.00	13
Group	Electric forklifts	0.00	10
	U100 north wall	0.00	8
	Wall cladding	0.00	7
		0.00	--
		0.00	--
	U100 north wall	0.00	--
	U100 north wall	0.00	--
	Wall cladding	0.00	--
	Wall cladding	0.00	--
Remainder		0.00	--

All shown dB values are A-weighted

Report: Table of Results
Model: Split sheds illustration - with extra barriers
LAeq: by Source/Group for receiver NSR 2_B - NSR 2
Group: (main group)
Group Reduction: No

Name Source/Group	Description	Height	Night
NSR 2_B	NSR 2	4.00	40
Group	HGV chillers - diesel	0.00	36
Group	Diesel forklifts	0.00	33
Group	HGV chillers - electric	0.00	32
	U 200 roof	0.10	30
Group	Vehicle doors - open	0.00	27
Group	Mech plant zone unmitigated	0.00	25
Group	HGV idling	0.00	25
	Wall cladding	0.00	24
	U100 south roof	0.10	24
	U100 north roof	0.10	23
Group	Electric forklifts	0.00	22
Group	HGV moving	0.00	21
	Wall cladding	0.00	19
	U100 north wall	0.00	18
	U100 north wall	0.00	14
		0.00	12
		0.00	--
		0.00	--
		0.00	--
	U100 north wall	0.00	--
	U100 north wall	0.00	--
	Wall cladding	0.00	--
Remainder		0.00	--

All shown dB values are A-weighted

Report: Table of Results
Model: Split sheds illustration - with extra barriers
LAeq: by Source/Group for receiver NSR 3_B - NSR 3
Group: (main group)
Group Reduction: No

Name Source/Group	Description	Height	Night
NSR 3_B	NSR 3	4.00	44
Group	HGV chillers - diesel	0.00	41
Group	Diesel forklifts	0.00	36
Group	HGV chillers - electric	0.00	33
Group	HGV idling	0.00	33
Group	Vehicle doors - open	0.00	31
Group	Mech plant zone unmitigated	0.00	29
Group	HGV moving	0.00	28
	U 200 roof	0.10	27
Group	Electric forklifts	0.00	27
	Wall cladding	0.00	21
	U100 south roof	0.10	19
	U100 north roof	0.10	14
	Wall cladding	0.00	11
		0.00	1
		0.00	--
		0.00	--
		0.00	--
	U100 north wall	0.00	--
	U100 north wall	0.00	--
	U100 north wall	0.00	--
	U100 north wall	0.00	--
	Wall cladding	0.00	--
Remainder		0.00	--

All shown dB values are A-weighted

Report: Table of Results
Model: Split sheds illustration - with extra barriers
LAeq: by Source/Group for receiver NSR 4_B - NSR 4
Group: (main group)
Group Reduction: No

Name Source/Group	Description	Height	Night
NSR 4_B	NSR 4	4.00	36
Group	HGV chillers - diesel	0.00	30
	U 200 roof	0.10	29
	U100 south roof	0.10	27
Group	Diesel forklifts	0.00	25
	Wall cladding	0.00	23
Group	HGV idling	0.00	23
	Wall cladding	0.00	22
		0.00	22
Group	HGV chillers - electric	0.00	21
	U100 north roof	0.10	19
Group	Mech plant zone unmitigated	0.00	15
Group	Vehicle doors - open	0.00	15
Group	HGV moving	0.00	12
Group	Electric forklifts	0.00	8
	U100 north wall	0.00	6
		0.00	0
		0.00	--
		0.00	--
	U100 north wall	0.00	--
	U100 north wall	0.00	--
	U100 north wall	0.00	--
	Wall cladding	0.00	--
Remainder		0.00	--

All shown dB values are A-weighted

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