



Proposed Units, Fallows Way, Prescott

Noise impact assessment

10457.2

17th February 2023

Revision A



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2 Summary

- 2.1 An assessment has been carried out in support of a planning application for erection of 5 no. new industrial buildings on land adjacent to an existing industrial park off Fallows Way, Prescott.
- 2.2 Noise impact assessment for the proposed scheme is provided within the report in response to the noise related pre-app advice for the scheme provided by Helen Bradshawe of Knowsley Council.
- 2.3 Noise assessment criteria are proposed for operational noise from Building E, based on considerations to the existing noise climate at the site, and for noise from fixed plant and machinery associated with all proposed new units.
- 2.4 Apex have carried out a noise survey at the proposed site to establish representative background noise levels at identified NSRs – dwellings directly to the east and south-east of the proposed site. The existing noise climate at the site is controlled by road noise from the M57 and from existing commercial / industrial premises on Fallows Way.
- 2.5 Internal noise levels within Building E are taken to be equal to the lower exposure action value in the Noise at Work Regulations, 2005. Based on the anticipated typical operation of the building based on the planning use sought, and a noise impact assessment for operational noise from Building E, the rated noise level does not exceed the representative background noise level during the daytime, indicating the likelihood of a low impact; on this basis no additional noise mitigation measures are considered necessary for daytime operation.
- 2.6 Based on the assessment and identified scope of requirements, in order to achieve a rating noise level which does not exceed the representative background noise level during the night-time, the following noise mitigation measures for Building E are required:
- External doors or windows to workshop type spaces or similar to normally be closed;
 - Up to two HGV movements accessing site per 15 minute period; and
 - Reversing alarms should not be used during the night-time.
- 2.7 Where internal operational noise levels for Building E may be lower than the basis used for the assessment, external doors and or windows can potentially be open during the night-time whilst meeting the identified noise impact criteria.
- 2.8 Proposed BS 4142 rating level limits at 1 m from the closest affected window of NSRs applicable to noise emissions from fixed plant and machinery associated with the development are provided.
- 2.9 As each individual unit is likely to be occupied separately and at differing times, upper noise limits for individual units have provided to provide compliance with the cumulative limit, identified as an $L_{Aeq,1hour}$ noise level limit due to plant & machinery at a distance of 10 m in the direction of the nearest NSR.
- 2.10 The noise breakout from the buildings is based on internal noise levels not exceeding the lower exposure action value in the Noise at Work Regulations of 80 dB(A). Should the future end users wish to operate within buildings at internal noise levels higher than 80 dB(A), lightweight building envelope sound insulation performance may need to be considered further with external doors and windows normally kept closed except when in use.
- 2.11 Based on the mitigation details and proposed limits set out in this report, the identified noise impact risks are suitably mitigated and in the context of the noise climate at and around the site, the site considered suitable for the proposed development with regards to the pre-app advice on noise provided and typically applied noise considerations.

3 Introduction

- 3.1 This report relates to the proposed development of 5 no. new industrial buildings on land off Fallows Way, Whinston, Prescott, L35 1RZ adjacent to an existing industrial park.
- 3.2 The description of the planning application is:
“Erection of 5 no. industrial buildings comprising of 12 no. units (use class E(g)) and 1 no. unit (use class B2) together with other associated works”.
- 3.3 Buildings A, B, C and D on the western part of the proposed site contain Units 1-12 for which planning use class E(g) is understood to be sought. Building E is the largest proposed and is located to the south-east of the site, contains Unit 13 for which use class B2 is understood to be sought. The proposed site plan is included in Appendix B.
- 3.4 Apex Acoustics have carried out a noise survey at the site. Background sound levels have been measured at a position considered representative of the nearest noise-sensitive receptors (NSR). The NSRs are identified as the nearest residential properties on Cronton Avenue and Halsnead Avenue, east of the site.
- 3.5 At this stage, end tenants and equipment specifications for the proposed units are unknown.
- 3.6 Pre-application advice received from Knowsley Council stipulates the assessment of noise associated with Building E, and appropriate control of noise emissions from fixed plant and machinery associated with the development.
- 3.7 Prior to carrying out the assessment, the proposed noise assessment methodology has been outlined to Helen Bradshawe of Knowsley Council’s Environmental Health department by email from Alun Williams of Apex Acoustics; No comments have been received on the proposed methodology.
- 3.8 A speculative operational noise impact assessment for Building E is undertaken to demonstrate whether limits could feasibly be achieved based on anticipated activities. The potential noise impact due to HGV movements, loading/unloading activities, noise breakout from the building, and vehicle movements within the car park is calculated and rated in accordance with BS 4142.
- 3.9 Noise limits for the cumulative impact of noise emissions from fixed plant and machinery associated with the development are proposed based on criteria set out in Knowsley Council Environmental Health pre-application advice. Noise limits for individual units have also been calculated to assist in implementing appropriate, practicable planning condition noise limits.
- 3.10 Noise propagation has been modelled with proprietary environmental noise modelling software CadnaA.

- 3.11 Should the proposed noise limits be adhered to, the requirements of the Local Planning Authority identified are understood to be met and on this basis the site considered suitable for the proposed development with respect to noise.



Figure 1: Extract from the proposed site plan overlaid on an aerial image of the site with site boundary (red), unattended 24-hour noise measurement position P1 (green) and nearest identified noise-sensitive receptors (NSR)(pink)

4 Planning policy and guidance

Pre-application advice

- 4.1 The Environmental Health & Consumer Protection Manager for Knowsley Council, Helen Bradshawe, provided the following comments relating to noise in the pre-application advice note (Reference 1):

1. Noise

The development (B2 use) shall not be in operation until a scheme has been submitted to and approved in writing by the local planning authority which specifies the provisions to be made for the control of noise emanating from the site. The scheme shall be based on the results of a noise assessment which suitably characterises the noise climate at nearby residential dwellings both prior to and following the operation of the development permitted.

All works which form part of the scheme shall be implemented in full in accordance with the scheme as agreed. Documentary evidence of the works shall be submitted to and approved in writing by the Local Planning Authority prior to first use of the development.

2. Fixed Plant Noise for E(g) Class Use

Fixed plant and machinery associated with the development shall be designed to a level that is at least 5 dB(A) below the existing LA90 background noise level as measured during the relevant time period. Any tonal, impulsive and/or irregular noise would be addressed by imposing a penalty as per the methodology set out in BS 4142:2014+A1:2019, Methods for Rating and Assessing Industrial and Commercial Sound. Noise limits for fixed plant are to apply at a position 1 metre from the closest affected window of the nearest noise sensitive property.

BS 4142

- 4.2 The principal guidance for the assessment of industrial noise impact is BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound (BS 4142), Reference 2.
- 4.3 This method involves the determination of a rating sound level due to the source in question at the NSR.
- 4.4 According to BS 4142, typically, the greater this difference, the greater the magnitude of the impact:
- “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 source having a low impact”.
- 4.5 BS 4142 requires a rating level to be calculated based on the character of the specific sound.

- 4.6 The rating level is calculated by adding a character correction to the specific sound. The character correction can be determined in three different ways:

- Subjective method
- Objective method
- Reference method

- 4.7 The final noise impact is assessed based on the exceedance of the rating level over the background sound and the context.

National Planning Policy Framework (NPPF)

- 4.8 The National Planning Policy Framework (NPPF) Reference 3, sets out the Government’s planning policies for England and how these should be applied. It provides a framework within which locally prepared plans for housing and other development can be produced. In respect of noise, Paragraph 174, 185 and 187 of the NPPF states the following:

- 4.9 Paragraph 174:

“e) 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...”

- 4.10 Paragraph 185:

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

- a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life⁶⁵ [See Explanatory Note to the Noise Policy Statement for England],*
- 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;”*

- 4.11 Paragraph 187:

- 4.12 *“Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or ‘agent of change’) should be required to provide suitable mitigation before the development has been completed.”*

- Noise Policy Statement for England (NPSE)**
- 4.13 The Noise Policy Statement for England, Reference 4, states three policy aims as follows:
“Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:
- 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.”*
- 4.14 The NPSE defines adverse noise impact as follows:
- No Observed Effect Level (NOEL)
This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.
 - Lowest Observed Adverse Effect Level (LOAEL)
This is the level above which adverse effects on health and quality of life can be detected.
 - Significant Observed Adverse Effect Level (SOAEL)
This is the level above which significant adverse effects on health and quality of life occur
- 4.15 The first two aims of the NPSE require that no significant adverse impact should occur and that, where a noise level which falls between a level which represents the lowest observable adverse effect and a level which represents a significant observed adverse effect, then according to the explanatory notes in the statement:
- “... all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life whilst also taking into consideration the guiding principles of sustainable development. This does not mean that such effects cannot occur.”*

- Planning Practice Guidance – Noise**
- 4.16 Further Government guidance on how planning can manage potential noise impact in new development is outlined in Planning Practice Guidance (PPG-N) notes on the Government website: www.gov.uk/guidance/noise--2
- 4.17 The terminology and noise effect hierarchy are summarised Appendix A.

- Assessment criteria**
- 4.18 Noise assessment criteria are proposed as shown in Table 1.

Applicable to buildings	Noise source(s)	Assessment criteria
B2 Class use Building E	Operational noise	It is proposed that noise from operations associated with Building E, use class B2, assessed in accordance with BS 4142 are to be no greater than the background sound level at a position 1 metre from the closest affected window of the nearest identified NSRs. This is considered to be suitable given the existing noise climate at the site, the prevalence of road noise from the M57 and from existing commercial / industrial premises on Fallows Way.
E(g) Class use Buildings A, B, C, D & E	Due to fixed plant and machinery associated with the Units	Cumulative noise rating level due to noise emitted from fixed plant and machinery associated with the development when assessed in accordance with BS 4142 to be no greater than 5 dB below the background sound level at a position 1 metre from the closest affected window of the nearest identified NSRs.

Table 1: Proposed noise impact assessment criteria

5 Existing acoustic environment

Site context

5.1 The proposed site is located to the north of an existing industrial park with the M 57 motorway immediately to the west and residential development to the east.

Measurement positions

5.2 The existing acoustic environment was measured at an unattended measurements position, P1, on Halsnead Avenue, indicated in Figure 1. Measurement position P1 is considered representative of the sound environment at the nearest identified NSR.

5.3 A picture of the measurement in progress is shown in Figure 2.

5.4 The microphones were located 3.5 m above ground level away from other reflecting surfaces such that the measurements are considered free-field.

5.5 Data was recorded in third-octave band frequencies at one-second intervals throughout the measurement period.

5.6 The meter was equipped with audio recording to facilitate identification of noise sources.

5.7 Weather conditions were wet initially with light rain during the day prior to arrival on site, however, drier conditions prevailed with no further rain during the survey period noted. Based on local weather station data, wind speeds were between 0-7 m/s, with temperatures of between 2-8 °C.



Figure 2: Position P1

Measurement equipment

5.8 The equipment used is listed in Table 2.

Equipment	Model	Serial no.
Sound Level Meter	NTi XL2	A2A-19463E0

Table 2: Equipment used

5.9 The meter and calibrator have current calibration certificates traceable to national standards. At the time of measurement, sound level meters were calibrated within the last two years and calibrators within the last year in accordance with the guidance of BS 4142; calibration certificates are available on request.

5.10 The equipment was field-calibrated before and after the measurements with no significant drift in sensitivity noted.

Measured ambient and background sound levels

5.11 Statistical analysis of the measured $L_{A90,15min}$ levels has been carried out following the guidance of BS 4142, to determine a background sound level considered to be representative of the assessment periods. Results of the analysis are shown in Appendix E.

5.12 Based on the statistical analysis results, the background sound levels considered representative of the daytime and night-time assessment periods are shown in Table 3.

5.13 The measured existing daytime $L_{Aeq,T}$, night-time $L_{Aeq,8hr}$ and range of $L_{AFmax,1min}$ levels are also shown in Table 3.

Assessment period	Representative background sound level, dB L_{A90}	Residual sound level, dB $T_r L_{Aeq,T}$	Range of maximum sound levels, dB $L_{AFmax,1min}$	Notes
Daytime 07:00-23:00	51	52-58 ^[1]	49-88	Road traffic noise from the nearby M57 dominant with industrial related noise also audible
Night-time 23:00-07:00	38	43-50 ^[2]	43-77	
Notes: [1] range of $L_{Aeq,1hr}$ [2] range of $L_{Aeq,15min}$				

Table 3: Measured ambient and background sound levels representative of the assessment periods

5.14 Time history of measured levels is included in Appendix D.

6 Assessment of Operational Noise from Building E

6.1 Apex has undertaken a speculative operational noise impact assessment to demonstrate whether limits could feasibly be achieved based on potential activities that might occur at Building E.

Noise Sources

6.2 The following are considered as potential noise sources associated with the development:

- HGV and car movements;
- Loading/ unloading activities in the yard including reversing alarms;
- Activity noise breakout from the buildings; and
- Vehicles movements to and within the car parks

HGV movements

6.3 The potential number of HGV movements within the site has been estimated based on the proposed three roller shutter doors to Building E and five cab and trailer parking spaces indicated on the site plan and the assumption that eight HGVs arriving at site within a one-hour period, representing a likely worst case assessment.

6.4 It is assumed that 25% of the daytime one-hour movements could occur during the night-time 15-minute assessment period. The number of HGV movements used in the assessment are shown in Table 4.

Period	No. of deliveries
Daytime (07:00-23:00)	8 per 1 hour
Night-time (23:00-07:00)	2 per 15 minutes

Table 4: Number of HGV trips

6.5 The noise from HGV movements is assessed based on Apex' library of previously measured representative data.

6.6 Noise measurements used are shown in Appendix F, and the calculated sound power is shown in Table 5 below.

HGV movement	Single-octave band centre frequency (Hz) A-weighted sound power levels (dB)							dB(A)
	63	125	250	500	1k	2k	4k	
Sound power level	75	77	83	86	91	87	80	93

Table 5: HGV sound power

6.7 The resulting sound power for the 1-hour and 15-minute assessment periods are calculated in the noise model as a moving point source along the access roads and yards based on a travel speed of 10 km/h.

Car movements

6.8 Car movements on the site are included in the assessment. The potential number of car movements within the site has been estimated based on the number of spaces indicated on the site plan for Building E, i.e. 48.

6.9 The number of daytime car movements is based on one movement for each car parking space per one-hour period. It is assumed that 25% of the daytime one-hour movements could occur during the night-time 15-minute assessment period. The number of car movements used in the assessment are shown in Table 4.

Period	No. of car movements
Daytime (07:00-23:00)	48 per 1 hour
Night-time (23:00-07:00)	12 per 15 minutes

Table 6: Number of LGV and car trips

Loading/ unloading activities

6.10 Noise from forklift loading/unloading activities is assessed based on Apex' library of previously measured representative data at a warehouse yard.

6.11 Noise measurements used are shown in Appendix F, and the calculated sound power is shown in Table 7 below.

Loading/unloading	Single-octave band centre frequency (Hz) A-weighted sound power levels (dB)							dB(A)
	63	125	250	500	1k	2k	4k	
Sound power level	69	80	81	82	83	81	75	89

Table 7: Loading/ unloading activities sound power

6.12 The calculated sound power level is attributed to point sources in the noise model, placed at worst-case locations with respect to the nearest NSRs. Three point sources are used for the daytime 1-hour assessment (based on the number of roller shutter doors proposed) and one point source is used for the night-time 15-minute assessment. The loading/unloading activities are assumed to be continuous throughout the daytime and night-time assessment periods; this is a prudent assumption.

Reversing alarms

- 6.13 Reversing alarms should not be used during the night-time; this will need to be a management mitigation measure.
- 6.14 Reversing alarms associated with the HGVs and forklifts are not separately modelled. A 4 dB penalty for tonality is applied in the BS 4142 daytime assessment, for a likely clearly perceptible tone. The tonality is unlikely to be highly perceptible at the NSRs during the daytime considering the existing residual noise levels.

Noise breakout from the buildings

- 6.15 End users and internal layout of the buildings are not known at this stage.
- 6.16 For the assessment of feasibility, it is considered that the maximum noise level inside the building will be 80 dB(A), which corresponds to the lower exposure action value in the Noise at Work Regulations, 2005.
- 6.17 The noise breakout from the building is calculated using the following equation:

$$SPL_{ext} = SPL_{int} - SRI - 6$$

where,

SPL_{ext} is the external free-field sound pressure level after breakout through the building element;

SPL_{int} is the internal reverberant sound pressure level;

SRI is the sound reduction index of the building element; and

6 dB is the correction between an internal diffuse field and external free field.

- 6.18 The noise breakout from the buildings is modelled as area sources to represent potential roller shutter locations. The area sources are modelled at worst-case locations with respect to the NSRs.
- 6.19 There roller shutters are considered open during the daytime 1-hour assessment, and one roller shutter is considered open during the night-time 15-minute assessment. The sound reduction index, SRI = 0 dB, simulating the openings.
- 6.20 The noise breakout from the building is considered to be continuous throughout the daytime and night-time assessment periods; this is a prudent assumption.
- 6.21 Should the future end users wish to operate with noise levels within buildings of higher than 80 dB(A), lightweight building envelope constructions sound insulation performance may need to be considered, and rollers shutters kept closed except when in use.

Vehicles in car parks

- 6.22 The noise emission from the car parks associated with Building E have been calculated using the RLS-90 calculation method, Reference 5, which is implemented using Cadna/A software.

- 6.23 This guidance describes the method for calculating the noise emitting from a car park based on:

- the type of the parking area, i.e. for car or bus parking;
- number of vehicle movements at daytime or night-time;
- number of parking spaces; and
- ground absorption and barrier shielding effect.

- 6.24 The Emission Level L^*_{mE} is calculated using the following equation:

$$L^*_{mE} = 37 + 10 \cdot \log(N \cdot n) + D_p$$

Where N is the number of vehicle movements per space per hour according to Table 5 of the standard, unless more precise figures are present (arrival and departure count as one movement each);

n is the number of spaces within the area or sub-area; and

D_p is an additional correction for different vehicle types.

- 6.25 It is assumed that all parking bays are accessed once in a 1-hour daytime assessment period, i.e. $N=1$.

- 6.26 During the night-time, it is assumed that 25% of the bays may be accessed during the BS 4142 night-time 15-minute assessment period, i.e. $N=0.25$.

Plant

- 6.27 As the end users are speculative, plant specifications and locations are not known at this stage.
- 6.28 Plant noise limits are proposed in Section 8.

Noise transmission and propagation

- 6.29 Noise transmission and propagation is modelled to the NSRs based on the noise source data detailed, using proprietary software, CadnaA, Reference 6.
- 6.30 This models noise propagation outdoors according to ISO 9613, Reference 7.
- 6.31 The model parameters and assumptions are summarised in Appendix F.

7 Assessment of Operational Noise due to B2 use, Building E – Results

- 7.1 Sound level contours, at 4.5 m representative of worst-affected first floor window heights, showing the daytime $L_{Aeq,1hr}$ and night-time $L_{Aeq,15min}$ specific sound levels due to potential B2 use operation of Building E are shown in Figure 3 and Figure 4.
- 7.2 BS 4142 assessment for the site, with the proposed noise mitigation measures (see Section 8) is presented in Table 8.

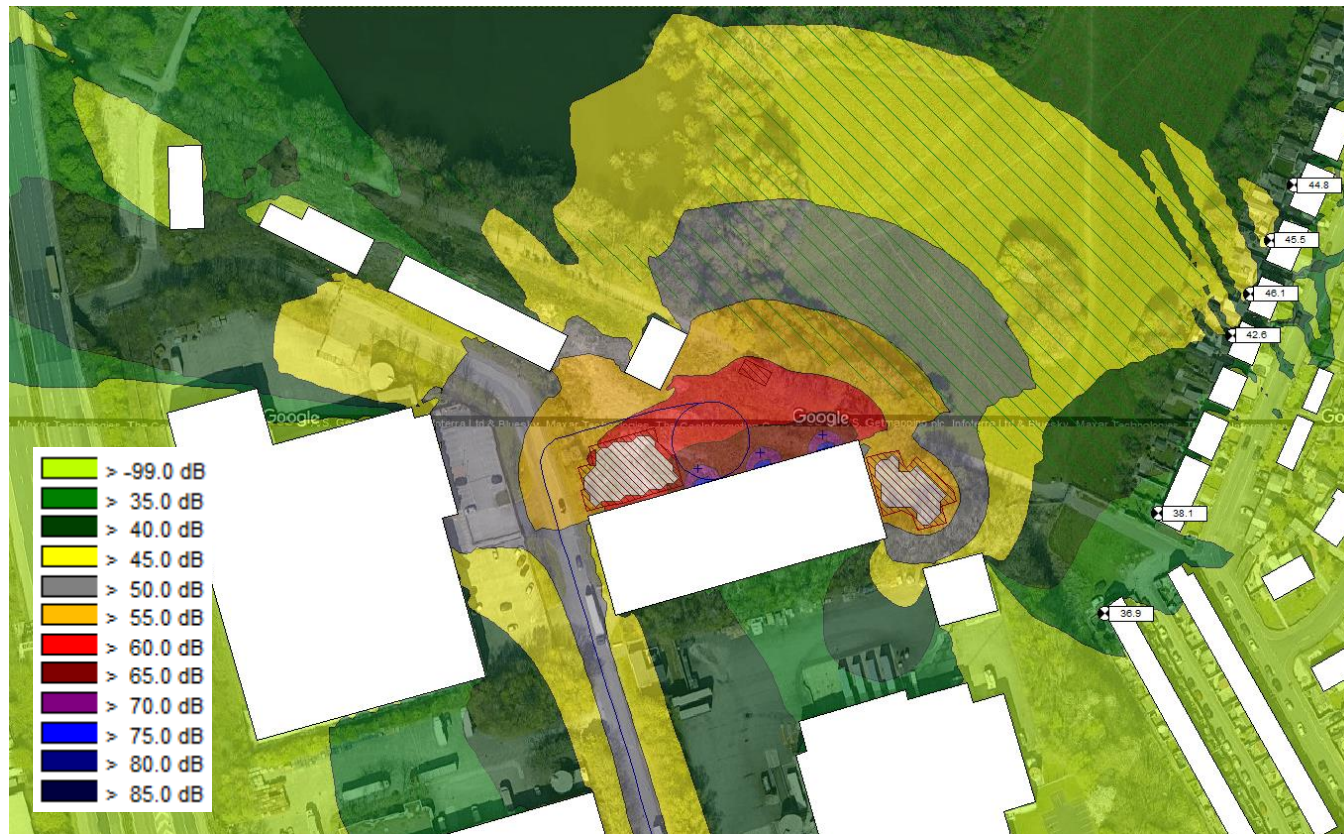


Figure 3: Sound contours at 4.5 m, showing the calculated specific sound level, $L_{Aeq,1hr}$ during the daytime

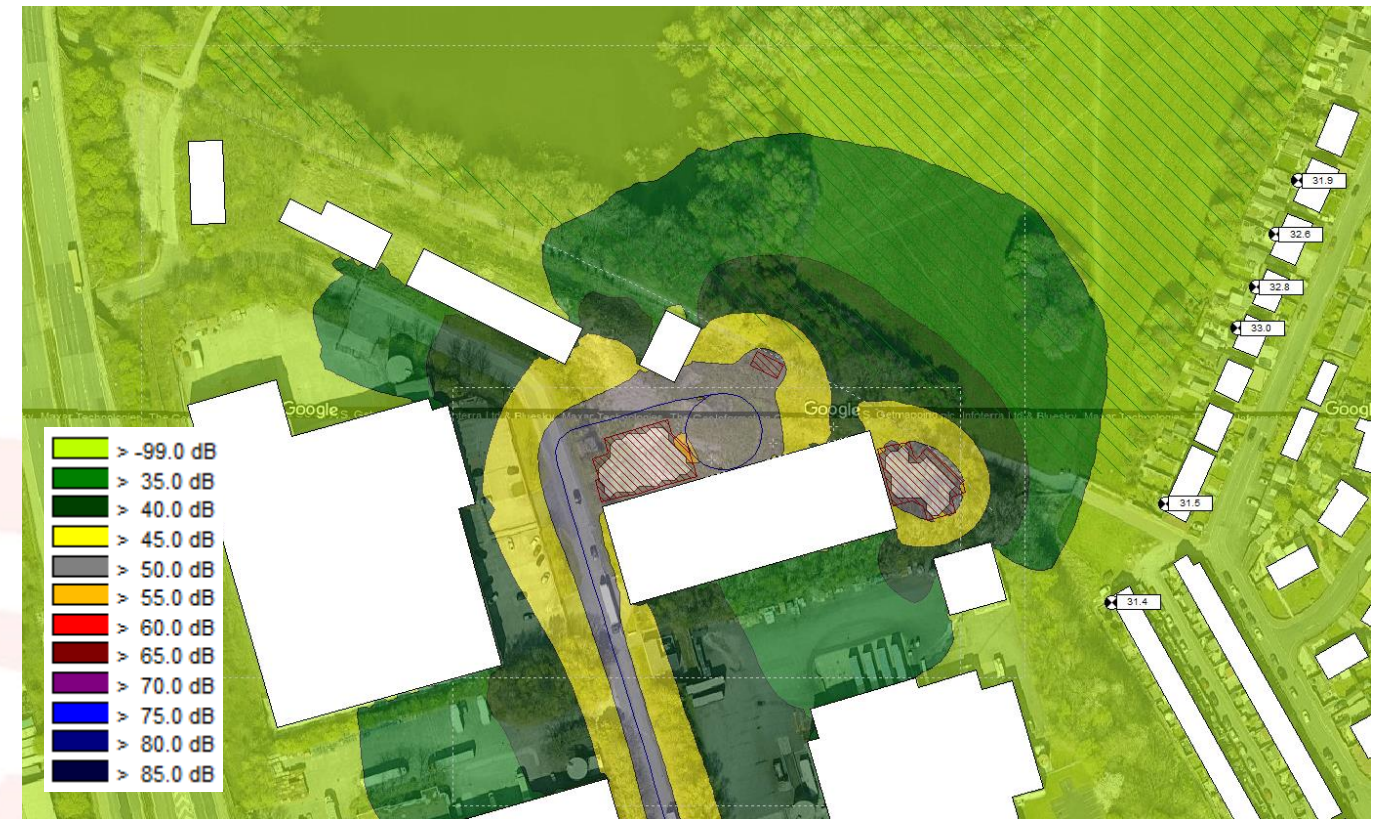


Figure 4: Sound contours at 4.5 m, showing the calculated specific sound level, $L_{Aeq,15min}$ during the night-time

Parameter	NSR		Relevant clause of BS 4142	Commentary
	Daytime	Night-time		
Background sound level	51 dB $L_{A90,1hr}$	38 dB $L_{A90,15min}$	8.1.2 8.1.4	Considered representative of the assessment period based on statistical analysis detailed in Appendix E.
Specific sound level L_s , due to all sources for the required assessment interval	46 dB $L_{Aeq,1hr}$	33 dB $L_{Aeq,15min}$	7.2 7.3.6	The calculated L_s contours across the site due to all sources during the assessment period are shown in Figure 3 and Figure 4; the L_s assessed is the highest calculated level at the NSRs.
Acoustic feature correction	+ 4 dB	+ 3 dB	9.2	A subjective assessment to determine acoustic features is undertaken, and the following penalties are considered applicable: • Tonality – 4 dB (reversing alarms – daytime only, see paragraph 6.13); • Impulsivity – 0 dB; • Intermittency – 0 dB during the day, 3 dB during the night; and • Other – 0 dB. Predicted specific sound levels at NSRs during the day are at such a level that noise will not be readily distinguishable against the existing residual acoustic environment. On this basis, corrections for impulsivity, intermittency or ‘other’ have not been applied to the daytime rating level. Predicted specific sound level at NSRs during the night are at such a level that noise may be readily distinctive against the existing residual acoustic environment. On this basis, a + 3 dB correction shall be applied to the night time rating level to account for intermittency which may be readily distinctive.
Rating level, $L_{Ar,Tr}$	50 dB	36 dB		
Uncertainty of assessment	-	-	10	As the end users are not known at this stage, the assessment is based on a number of prudent assumptions for the type and location of potential noise sources. Uncertainty in the calculated impact has been reduced by the use of a calculation method in accordance with ISO 9613-2.
Excess of $L_{Ar,Tr}$ over background sound level	-1 dB	-2 dB	11	Daytime The rated noise impact does not exceed the representative daytime background sound levels at all identified NSRs. Typical, worst-case anticipated operational conditions and source locations have been used in the assessment for prudence. The rated noise impact also does not exceed the residual noise level during the daytime of 58 dB $L_{Aeq,T}$, or the existing lowest 1 hr residual daytime level of 52 dB $L_{Aeq,1hr}$ measured between 22:00-23:00. This is a positive indication that the specific levels due to the noise sources associated with the new development are unlikely to be significantly distinguishable against existing road traffic and commercial / industrial noise at NSRs. The assessment result indicates the likelihood of a low impact. Night-time The rated noise impact predicted does exceed the representative night-time background sound level at NSRs on Halsnead Avenue with a predicted line of sight to roller shutter door openings. However, it is noted that the rated noise impact does not exceed the existing lowest residual night-time level of 43 dB $L_{Aeq,15min}$. In the context of the existing noise climate, and when incorporating the mitigation measures set out in Section 8, the assessment result indicates the likelihood of a low impact.

Table 8: B2 use operational noise BS 4142 assessment results, with proposed mitigation measures

8 Noise mitigation measures

- 8.1 Based on the assessment included within this report, no additional noise mitigation measures are considered necessary for the anticipated B2 use daytime operation of the site – i.e. Building E.
- 8.2 Based on the assessment, if a roller shutter door to Building E is open during the night-time, with noise levels of 80 dB(A) inside the building, then the break-out of noise via the door opening would result in noise levels similar to the identified representative night-time background noise levels at the rear façade of a limited number of residential premises to the north of the development site that back onto the proposed site and that are predicted to have a line of sight to the proposed roller shutter doors of Building E. When acoustic feature corrections are added, this results in a rating level which exceeds the representative night-time background noise level increasing noise impact risks.
- 8.3 On this basis, noise mitigation measures recommended for night-time operation of B2 uses incorporated in the night-time 15-minute assessment are as follows:
- No roller shutter doors open;
 - Up to two HGV movements accessing site per 15 minute period; and
 - Reversing alarms should not be used during the night-time.
- 8.4 It is acknowledged that internal noise levels are taken to be 80 dB(A), corresponding to the lower exposure action value in the Noise at Work Regulations, 2005, and that in use, where internal noise levels are lower, roller shutter door(s) could potentially be open during the night-time whilst maintaining the identified noise control limits.

9 Fixed Plant & Machinery Noise Limits

- 9.1 The proposed noise limits at 1 m from the closest affected window of NSRs are presented in Table 9 with regards to assessment identified to be required for all E(g) class uses:

Period	Representative background sound level, dB L_{A90}	BS 4142 Rated noise level limit, dB $L_{Ar,Tr}$
Daytime 07:00-23:00	51	46
Night-time 23:00-07:00	38	33

Table 9: Calculated upper noise limits for noise from fixed plant and machinery associated with the development

- 9.2 Existing background noise levels measured in the area are relatively high due to the proximity of the M 57 and with the existing commercial / industrial use of plots along Fallows Way and the wider area.
- 9.3 Given the proposed site layout, distance from identified NSRs and in the context of the existing noise climate, the identified Rating limits for plant & machinery are not anticipated to be a significant constraint for the proposed scheme use classes.
- Individual noise limits for units**
- 9.4 As each individual unit is likely to be occupied separately and at differing times, it would not be feasible to practicably demonstrate compliance with the identified cumulative noise impact limit in-situ.
- 9.5 In order to provide suitable limits for use in a planning condition, upper noise limits for individual units have been calculated that where met provide compliance with the overall cumulative limit identified for the development.
- 9.6 Moving from east to west across the site: residual noise levels due to the proximity to the M 57 increase; distance to the NSRs identified to be those most exposed to adverse noise impact due to the proposed development, i.e. dwellings to the east of the site, increases, with additional mitigation provided where relevant, by screening of the new building massing. On these bases, building/units located to the west of the site require less onerous plant noise limits than those to the east, located closer to those NSRs most exposed to potential noise impact due to the proposed development.
- 9.7 Limits are identified as a $L_{Aeq,1hour}$ noise level at a distance of 10 m from each individual unit in the direction of the most exposed / nearest identified NSR.

Buildings / Units	Upper limit due to E(g) class use fixed plant & machinery noise - sound pressure level at 10m in direction of the NSR dB $L_{Aeq,1hr}$	
	Daytime 07:00-23:00	Night-time 23:00-07:00
Buildings A, B & C Units 1-11	57	44
Buildings D & E Units 12 & 13	62	49

Table 10: Calculated upper noise limits for individual units

- 9.8 Should all units be occupied and compliant with the above limits, the cumulative noise impact criterion as proposed by the Local Planning Authority Environmental Health in their pre-app advice for the scheme is calculated to be satisfied.
- 9.9 Note that in the context of the existing noise climate, no inclusion has been made for distinguishing acoustic characteristics due to E(g) use class fixed plant & machinery on the basis of the existing residual noise levels and character.
- 9.10 Where relevant, given the potential industrial nature of the proposed E(g) uses, to mitigate the increased impacts from fixed machinery sources with more significant character, it is recommended that individual buildings, allow to meet the above identified sound pressure limits at 10 m including BS 4142 acoustic character penalties as appropriate. For typical fixed building services type plant, this is not anticipated to normally be required.

10 Conclusion

- 10.1 Noise assessment criteria are proposed for operational noise from B2 uses, i.e. Building E, based on considerations to the existing noise climate at the site, and for E(g) uses, noise from fixed plant and machinery associated with all the proposed buildings based on local authority pre-application advice.
- 10.2 Apex Acoustics have carried out a noise survey at the site to establish representative background noise levels at identified NSRs. The existing noise climate at the site is controlled by road noise from the M 57 and from existing commercial / industrial premises on Fallows Way and wider surrounding area.
- 10.3 Based on a speculative noise impact assessment for operational noise from Building E, the rated noise is calculated to not exceed the representative background noise level during the daytime indicating the likelihood of a low impact; on this basis no additional noise mitigation measures are considered necessary for B2 use daytime operation.
- 10.4 Based on the assessment included within this report, where a roller shutter door is open during the night-time there is an increased risk of an adverse noise impact at a limited number of residential premises that back onto the park north of the development site with line of sight to the roller shutter doors. On this basis, the following noise mitigation measures are required for night-time operation:
- No roller shutter doors open;
 - Up to two HGV movements accessing site per 15 minute period; and
 - Reversing alarms should not be used during the night-time.
- 10.5 Proposed BS 4142 rating level limits at 1 m from the closest affected window of NSRs are provided.
- 10.6 As each individual unit is likely to be occupied separately and at differing times, suitable upper noise limits for individual units have been provided to maintain compliance with the overall cumulative noise limit, identified as a $L_{Aeq,1hour}$ noise level at a distance of 10 m in the direction of the nearest NSR.
- 10.7 Based on the identified noise control requirements provided by the Local Planning Authority and the assessment, mitigation measure details and proposed noise limits set out in this report, the anticipated noise risks due to the proposed B2 and E(g) uses are calculated to be mitigated and the site is considered suitable for the proposed development.

11 References

- 1 Knowsley Council Planning Consultation Response Environmental Health and Consumer Protection Service pre-application advice note, reference 22/00537/FUL, 22/045858/PLANNI.
- 2 BS 4142:2014:A1+2019, Method for rating and assessing industrial and commercial sound
- 3 National Planning Policy Framework, Ministry of Housing, Communities & Local Government, February 2021.
- 4 Noise Policy Statement for England, Department for Environment, Food and Rural Affairs, March 2010.
- 5 RLS-90: Richtlinien für den Lärmschutz an Straßen, 1990.
- 6 CadnaA environmental noise modelling software, version 2017, Datakustik GmbH.
- 7 ISO 9613: Acoustics - Attenuation of sound during propagation outdoors.
- 8 DEFRA LIDAR height data, 2017
<https://environment.data.gov.uk/DefraDataDownload/?Mode=survey>

Appendix A Glossary of terms

Term	Meaning
Ambient Noise	The total sound at a given place, usually a composite of sounds from many sources near and far. Should not be confused with “background noise”.
Attenuation	Noise reduction
A-weighting	The sensitivity of the human ear is frequency dependent. The weighting of a signal with the A-weighting network approximates the frequency response of the human ear at moderate noise levels. Although other networks, such as C-weighting, better approximate the response of the human ear at higher noise levels, in practice the A-weighting network is still used for convenience.
Background noise	Typically the noise due to sources other than that under specific consideration. Usually quantified in standards using L_{90} statistical data.
Decibel, dB	A description of level, ten times the logarithm of the ratio between the value of a quantity and a reference value. For sound pressure, L_p , the reference quantity is $2 \times 10^{-6} \text{ N/m}^2$. Although sound pressure has units of N/m^2 , the decibel has no dimensional units.
Free sound field	Sound field in a homogeneous isotropic medium where boundaries exert a negligible effect on the sound waves.
$L_{Aeq,T}$	Continuous equivalent A-weighted sound pressure level, $L_{Aeq,T}$ The value of the A-weighted sound pressure level in decibels (dB) of a continuous, steady sound that within a specified time interval, T , has the same mean squared sound pressure as the sound under consideration that varies with time.
L_{90}	L_{A90} is the sound level just exceeded for 90% of the time and is often used to measure background sound as recommended in BS 4142.
Rating level, $L_{Ar,Tr}$	Specific sound level plus any adjustment for the characteristic features of the sound.
Reference time interval, T_r	Specified interval over which the specific sound level is determined.
Residual sound	Ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound.
Specific sound	Sound from the source, or sources being assessed.

A.1 For a complete glossary of terms, see www.apexacoustics.co.uk

Appendix B Site Plan



Appendix C Noise exposure hierarchy

Planning Practice Guidance - Noise				Significant adverse effect Adverse effect Low Impact + 10 dB + 5 dB 0 dB An initial estimate of the impact of the specific sound may be obtained by subtracting the measured background sound level from the rating level. Typically, the greater this difference, the greater the magnitude of impact
Noise	Example of outcomes	Increasing effect level	Action	
Present and very distributive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent	
Present and distributive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid	
Significant Observed Adverse Effect Level (SOAEL)				
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum	
Lowest Observed Adverse Effect Level (LOAEL)				
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	No specific measures required	
No Observed Adverse Effect Level (NOAEL)				
Not present	No effect	No Observed Effect	No specific measures required	
No Observed Effect Level (NOEL)				

Table 11: PPG-N Noise Exposure Hierarchy and BS 4142 initial estimate of impact

Appendix D Time History

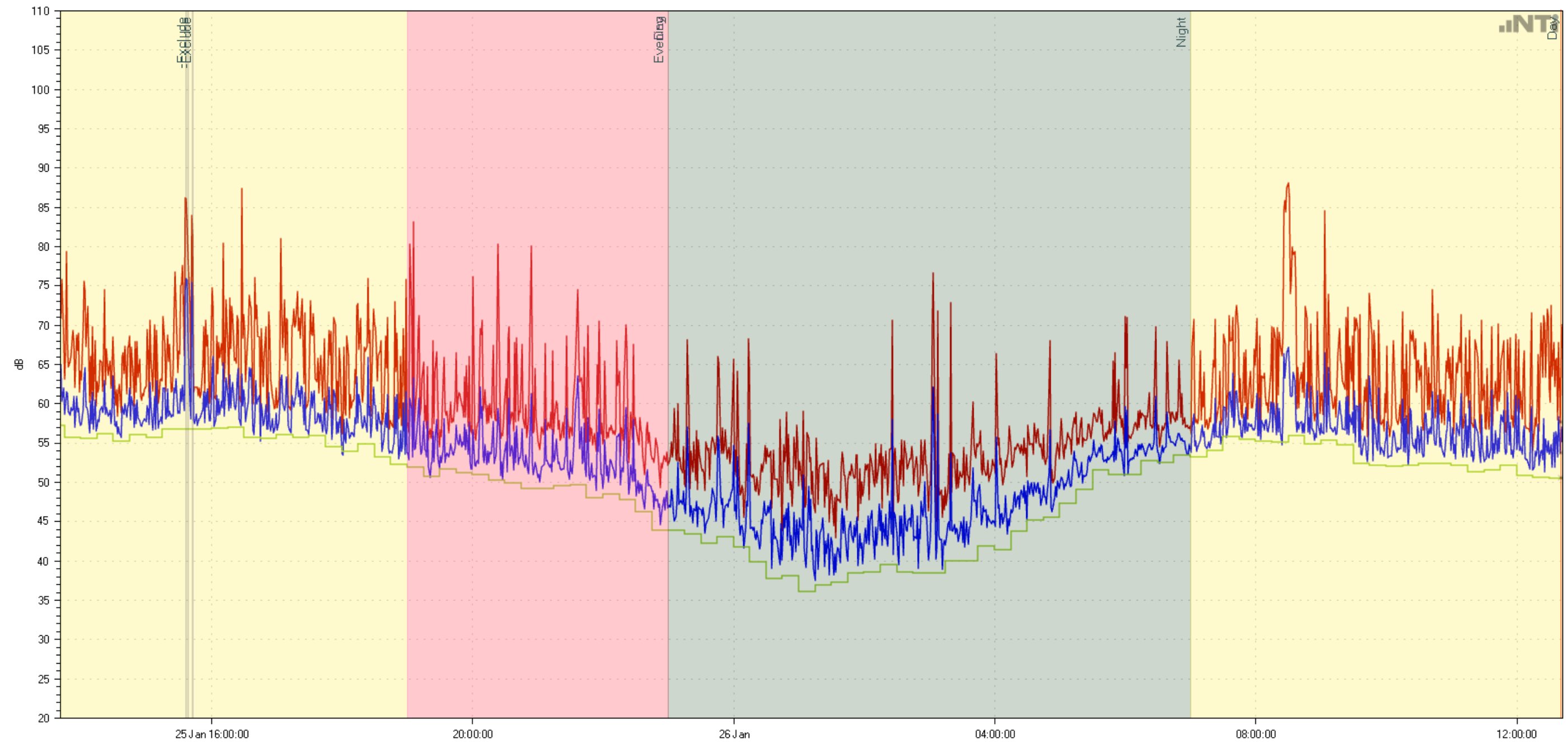


Figure 5: Time history of the measured $L_{Aeq,1min}$ (blue), $L_{AFmax,1min}$ (red) and $L_{A90,15min}$ (green) levels – Position P1

Appendix E Background Sound Levels

- E.1 The statistical analysis of the typical background sound levels at the four measurement positions are shown from Figure 6 to Figure 7. The represented background sound level is highlighted in red.
- E.2 The measured noise levels are available on request.

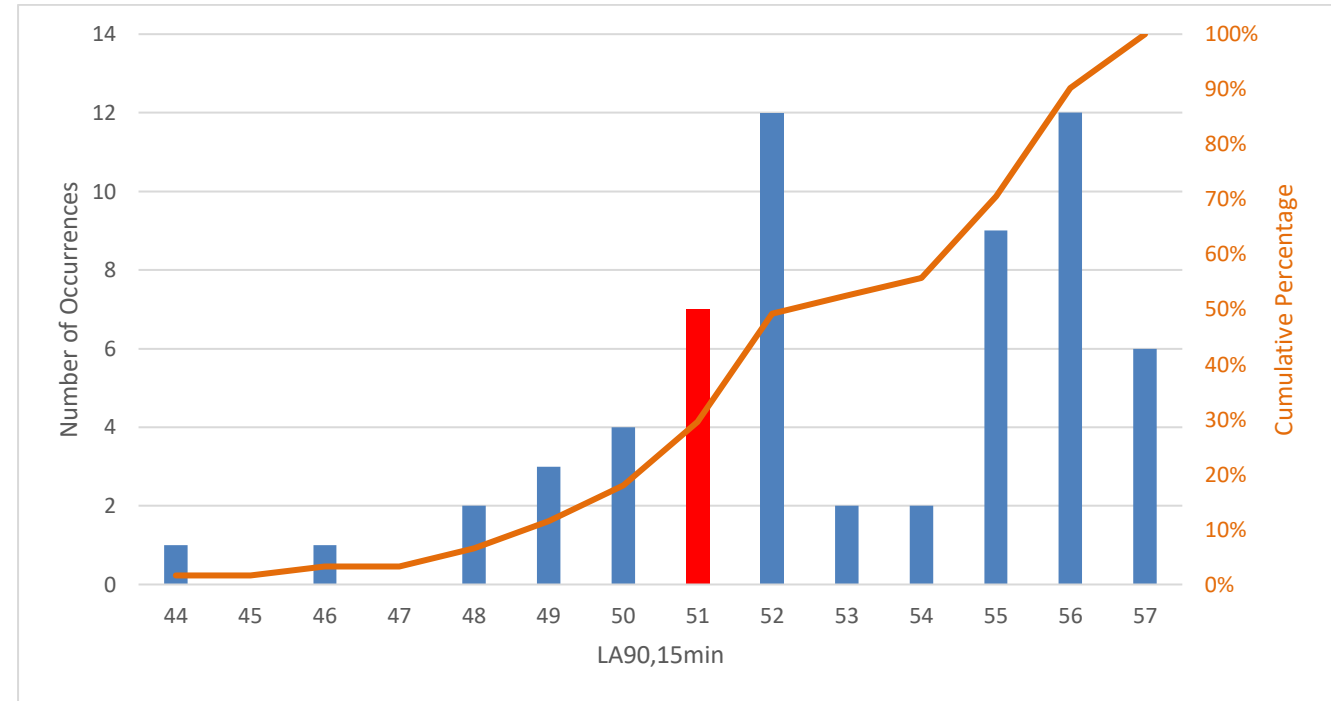


Figure 6: Statistical analysis of the background sound levels measured during daytime (07:00-23:00) – Position P1

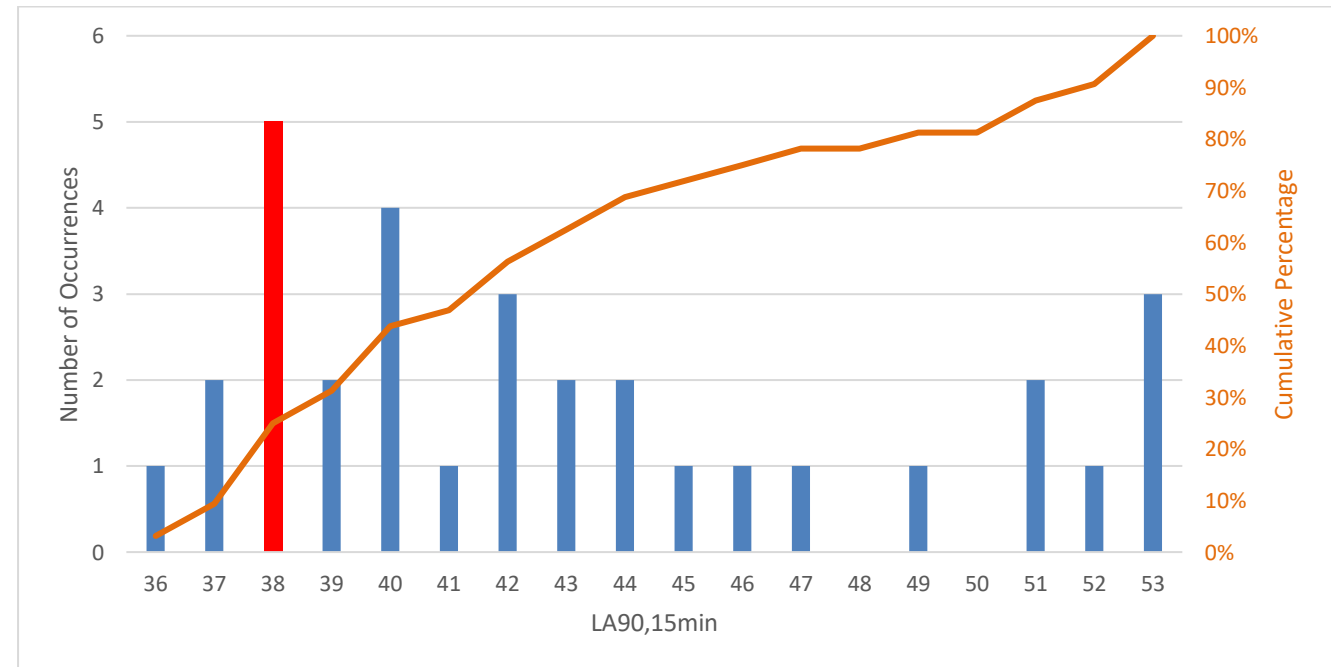


Figure 7: Statistical analysis of the background sound levels measured during night (23:00-07:00) – Position P1

Appendix F Representative noise measurements

- F.1 The below measurements have been undertaken previously by Apex Acoustics, and sources are considered representative of those proposed.

Source	Data type	Single-octave band centre frequency (Hz)							dB(A)
		A-weighted sound pressure levels at 8 m, free field (dB)							
		63	125	250	500	1k	2k	4k	
HGV movements	L _p @ 8 m	49	51	57	60	64	61	54	67

Table 12: Measured HGV movements at 8 m



Figure 8: Measurement of HGV movements at 8 m

Source	Data type	Single-octave band centre frequency (Hz)							dB(A)
		A-weighted sound pressure levels at 8 m, free field (dB)							
		63	125	250	500	1k	2k	4k	
Forklift loading/ unloading	L_p @ 8 m	43	54	55	56	57	55	49	63

Table 13: Measured loading/ unloading activities at 8 m



Figure 9: Measurement of forklift loading/ unloading

Appendix G Noise transmission and propagation

G.1 The parameters used in modelling of RLS 90 are shown in Table 10.

Parameter	Details
Model dimensions	British Transverse Mercator coordinates
Site location and layout	Architect’s drawings, Reference Error! Reference source not found.
No. of vehicle movement	1 car per car parking space per hour during the daytime 0.25 cars per space per 15 minutes during the night-time
D_p , correction for different parking types	Car park: +0 dB
D_B , shielding	Within RLS 90 calculation method
Source height	0.5 m

Table 14: Modelling parameters and assumptions – RLS 90

G.2 Noise transmission and propagation is modelled using proprietary software, CadnaA (Reference 6). This models noise propagation outdoors according to ISO 9613 (Reference 7). The parameters used, source of data and details are described in Table 15.

Parameter	Source	Details
Model dimensions	Google Earth	British Transverse Mercator coordinates
Site location and layout	Reference Error! Reference source not found.	Architect’s drawings
Topography – within and outside site	Reference 8	Modelled with changes in topography
Building heights – proposed buildings	-	Provided by client
Building heights – outside of site	Site observations and Google Street view	3 m per storey + 2 m roof (residential properties)
Receptor positions	Site observations and Google Street view	On the NSR façade closest to the source at a height of 1.5 and 4 m to represent ground and floor window heights respectively
Building and barrier absorption coefficient	ISO 9613-2	0.21 to represent a reflection loss of 1 dB
G, Ground factor	ISO 9613-2	Generally ground absorption set as G = 0.5, meaning semi-reflective, or G = 1 (locally on model for vegetated areas of the park to the north)
Max. order of reflections	Apex Acoustics	Three

Table 15: Modelling parameters and assumptions - CadnaA