Noise Impact Assessment

Site Address: Proposed Development, Birdwell, Barnsley S70 5SZ

Client Name: Carnell Management Services Ltd

Project Reference No: NP-009288

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01	--

Disclaimer

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Delivering sustainable development by promoting good health and well-being through effective management of noise.

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1. Introduction

NOVA Acoustics Ltd has been commissioned to provide a noise assessment for the erection of 7 no. industrial units ('the Proposed Development') at Birdwell, Barnsley S70 5SZ ('the Site').

The applicant is preparing a planning application ('the Application') to be submitted to Barnsley Council. This technical report has been prepared to support the planning application to be submitted to Barnsley Council.

A noise survey has been undertaken to establish the prevailing background sound levels at the closest Noise Sensitive Receptors ('NSR'). The report details the existing background sound climate and provides a plant noise limit level for the noise emissions associated with the Proposed Development.

This noise assessment is necessarily technical in nature; therefore, a glossary of terms is included in Appendix A to assist the reader.

1.1 Standards, Legislation, Policy & Guidance

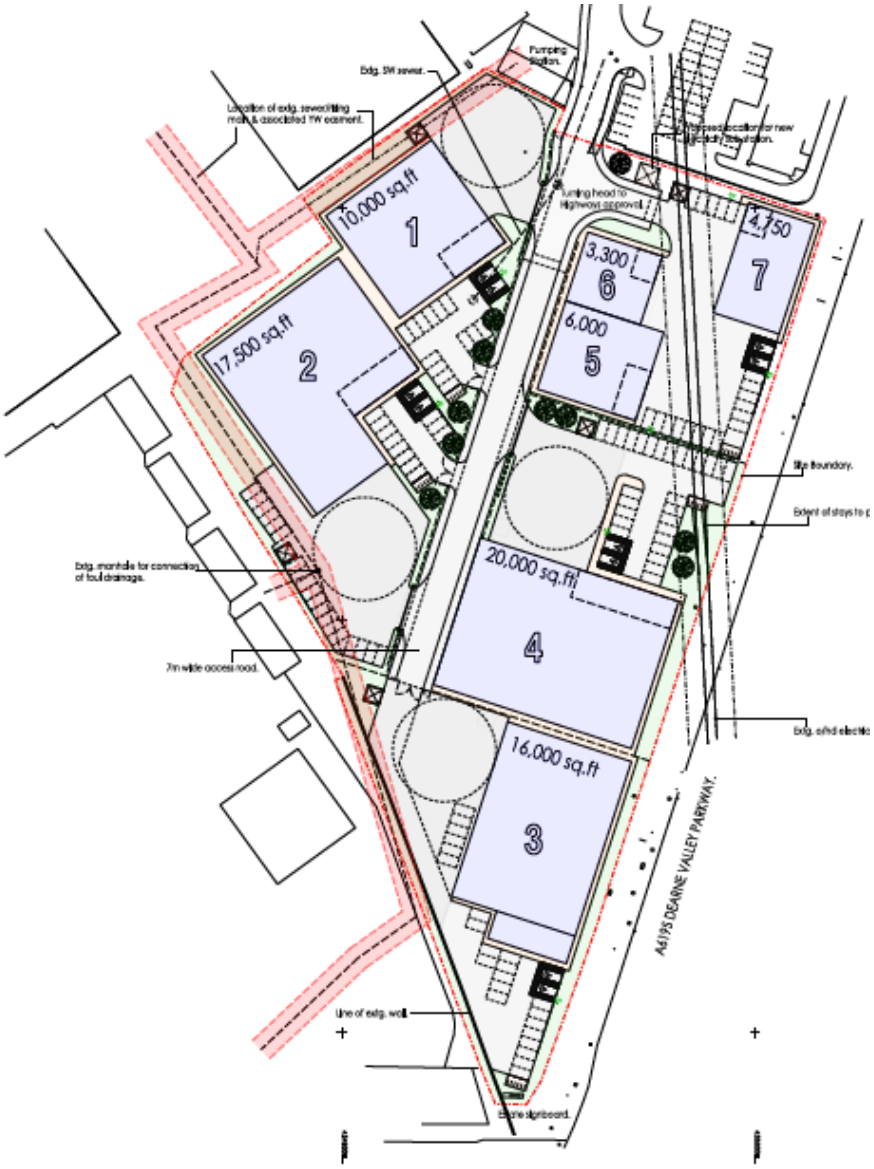
The following performance standards, legislation, policy and guidance have been considered to ensure good acoustic design in the assessment:

- National Planning Policy Framework (2021)
- Noise Policy Statement for England (2010)
- British Standard BS4142:2014+A1:2019 – 'Methods for rating and assessing industrial and commercial sound'

Further information on the legislation can be found in Appendix B.

1.2 Proposal Brief

The proposal is to erect 7 no. new industrial units. There are currently no details regarding the future tenants however, to provide maximum flexibility, it is assumed that the industrial units can operate 24 hours a day. The figure below shows the proposed development.



Drawing Ref No. 12215.10003 from 'William Saunders'

Figure 1 – Proposed Development

2. Environmental Noise Survey

2.1 *Measurement Methodology*

The following table outlines the measurement dates and particulars.

Location	Survey Dates	Measurement Particulars
MP1	14/04/2023 – 17/04/2023	Equipment mounted on a lamp post at a height of 3.5m on Wood View.
MP2	14/04/2023 – 17/04/2023	Equipment mounted on a lamp post at a height of 3.5m on Locksley Gardens.

Table 1 – Measurement Methodology

The figure below outlines the site surroundings and measurement locations.

Imagery ©2023 Infoterra Ltd & Bluesky, Maxar Technologies, The GeoInformation Group, Map data ©2023

Figure 2 – Measurement Locations and Site Surroundings

2.2 *Context & Subjective Impression*

The proposed development Site is located on land adjacent to A6195, Barnsley. The area surrounding the development site is mixed in nature, with commercial/industrial buildings adjacent to the site to the north and south-west and residential dwellings just beyond these.

The most affected Noise Sensitive Receptors ('NSRs') are considered to be the bedroom windows located on the first-floor of residential buildings on Wood View and Locksley Gardens.

The acoustic environment is deemed to be moderate in level and the noise profile is dominated by road traffic noise emissions from the A6195 to the east.

2.3 Environmental Noise Survey Results

Background Sound Level Analysis

The following section outlines the measured background sound levels that have been used as the baseline for the subsequent BS4142 noise assessment. The figures below show histogram graphs of the background sound levels measured during daytime (07:00 – 23:00) and night-time (23:00 – 07:00) hours throughout the entire measurement period. The time history results can be found in Appendix D.

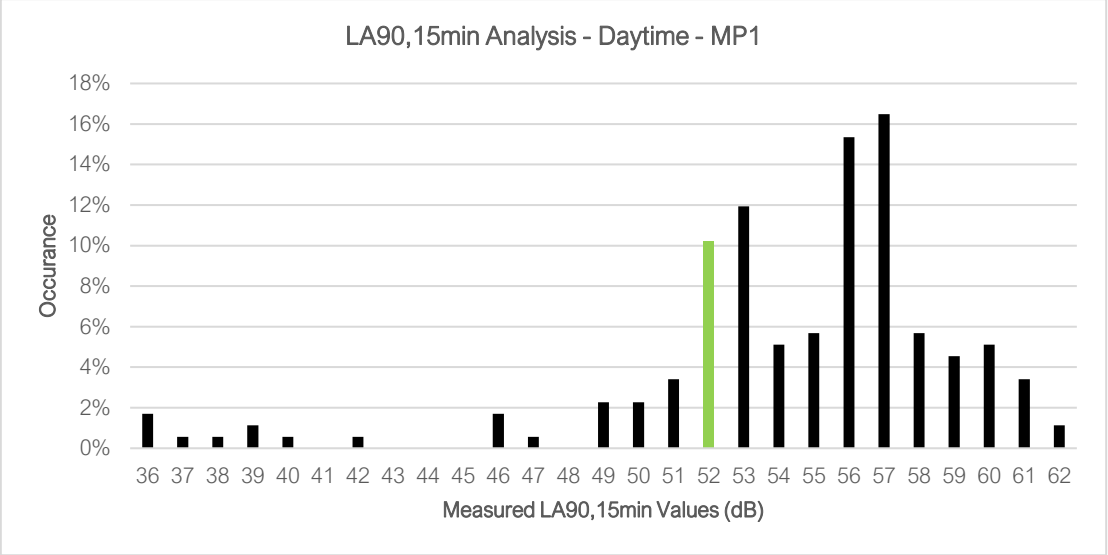


Figure 3 – MP1 Daytime Background Sound Level Analysis

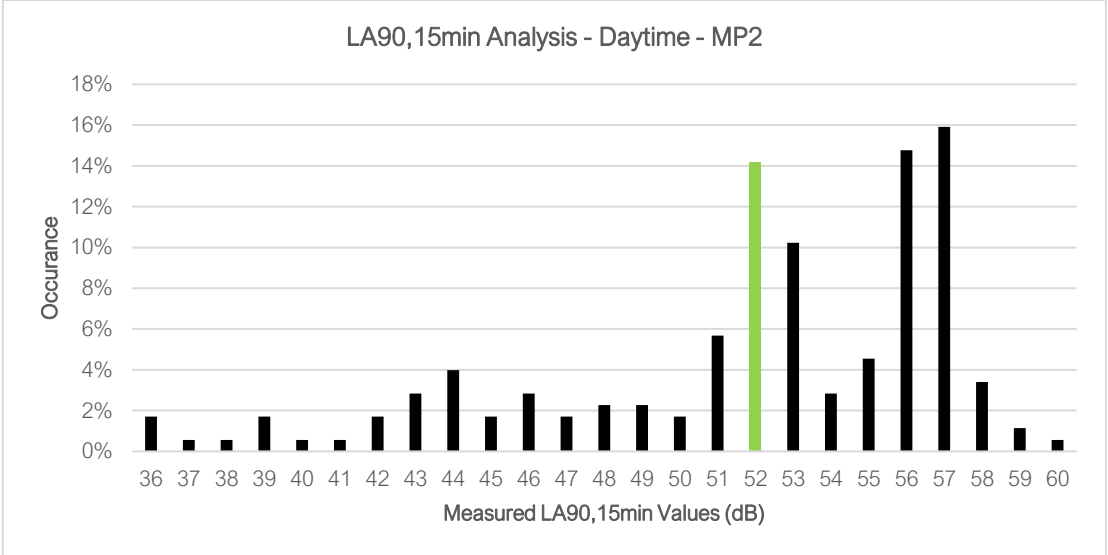


Figure 4 – MP2 Daytime Background Sound Level Analysis

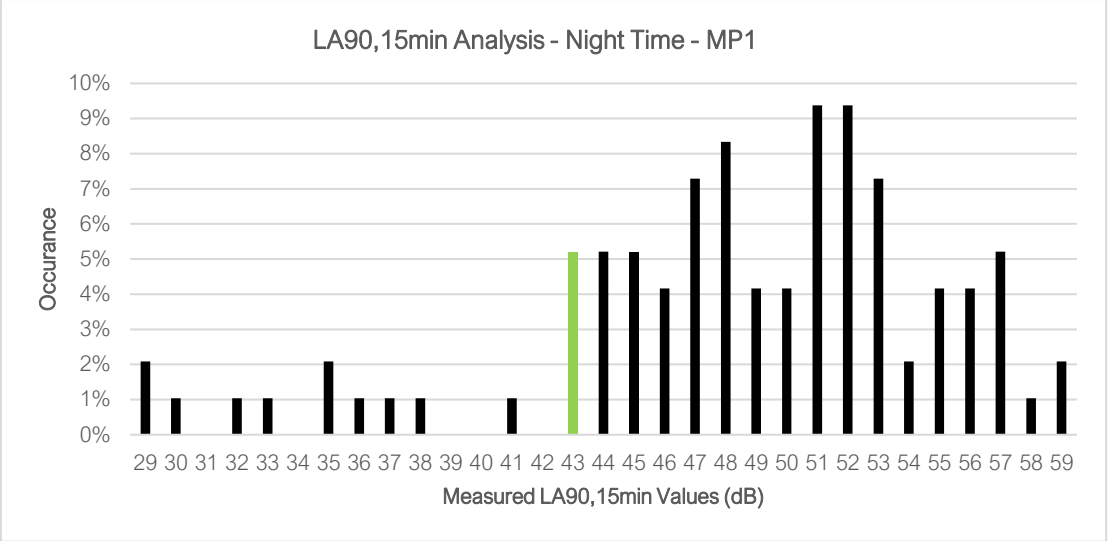


Figure 5 – MP1 Night-time Background Sound Level Analysis

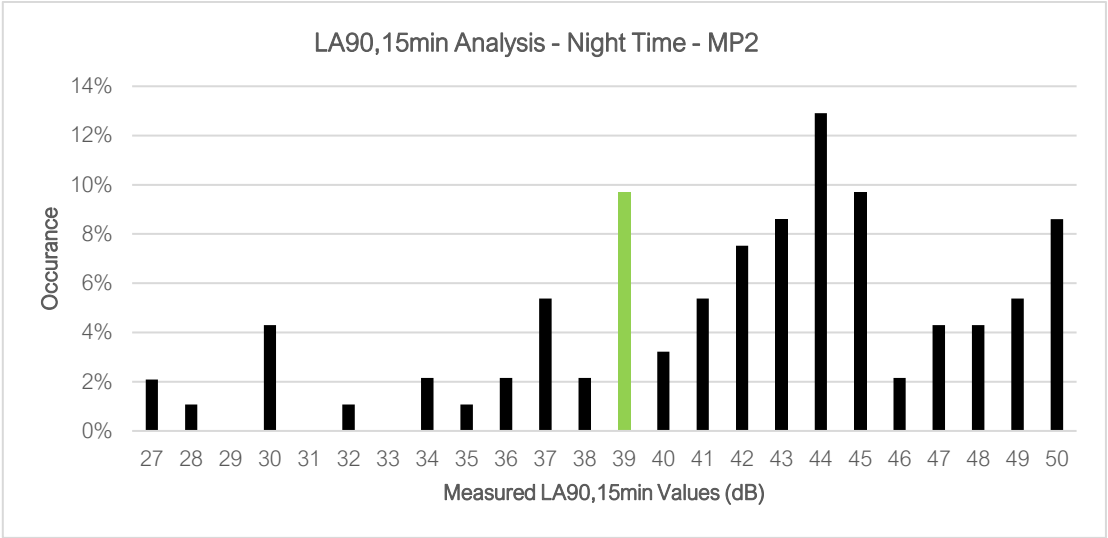


Figure 6 – MP2 Night-time Background Sound Level Analysis

As seen in the figures above, the modal $L_{A90,15min}$ values measured are 57dB during the daytime hours for MP1 and MP2, respectively, and 51dB and 44dB during the night-time hours. However, the lowest 'typical' measured values are 52dB during the daytime at MP1 and MP2. During the night-time, the lowest 'typical' values are 43dB and 39dB at MP1 and MP2. Given the distribution of background sound levels, these values are considered representative and will be used in the following assessment.

3. BS4142 Noise Limit Level

The proposed uses of the industrial units, number of deliveries and plant specifications are not yet finalised. Therefore, it is considered appropriate to define a noise limit level for each individual unit to ensure that the noise emissions do not exceed the background sound levels at the closest NSRs. The limit levels are inclusive of any rating penalties that should be applied to account for audible characteristics of the noise which could be deemed to cause increased annoyance, such as intermittency, impulsivity, or tonality. The limit levels have been calculated for the daytime and night-time periods and are shown in the table below.

NSR	Description	Daytime Period (dB)	Night-time Period (dB)
NSR1	Typical Background Sound Level	52	43
	Cumulative Noise Limit Level (per unit when measured at the NSR)	43	34
NSR2	Typical Background Sound Level	52	39
	Cumulative Noise Limit Level (per unit when measured at the NSR)	43	30

Table 2 – External Noise Limit Levels

Discussion:

The above noise limits are derived so that the cumulative limit level from all units does not exceed the typical background sound level at the NSRs. When assessed in accordance with BS4142 this indicates 'Low Impact', and when assessed with the NPPF and NPSE this is classed as 'No Observed Effect Level' (NOEL).

The future tenants of each unit should undertake a noise impact assessment to ensure that the above limits are not exceeded due to their operation.

To provide an indication on the feasibility of the proposed development, an indicative assessment of noise breaking out of a typical unit is presented below. The calculations have been conducted assuming the following:

- Calculations have been undertaken for noise breaking out of the roof of the closest unit to NSR2 (Unit 1) during the night-time, where the background sound levels are lowest.
- The internal noise level of the proposed unit is 80dB, which is considered to be representative of industrial process premises (Use Class B2) and will provide a robust assessment.
- The proposed building will be a steel-framed structure comprising of composite cladding panels on each façade. Due to the distance to the nearest NSRs, any composite panels used will need to provide an enhanced acoustic performance (e.g. 100mm Europanel F5, 32dB R_w).
- The sound power of the façade has been calculated using the formula: $L_{W,rad} = L_{P,rev} + 10*LOG(S) - C_d + SRI$, where; S is the surface area of the element (30m x 30m for the roof of Unit 1), C_d is the correction for the difference between reverberant internal conditions and non-reverberant

external conditions (-3), and SRI is the sound reduction index associated with the façade elements.

- A +3dB correction for potential readily distinctive characteristics at the NSR.
- The planar propagation loss from the roof has been calculated from the point source region.

Description	Octave Frequency Band (Hz, dB)							L_{pA} (dB)
	63	125	250	500	1k	2k	4k	
Total Internal Noise Level (L_{eq})	78	77	76	75	74	73	71	80
Cladding SRI (R')	19	23	27	32	34	28	53	-
Internal to External Correction	-3							-
Sound Power Level of Façade (L_w)	86	81	76	70	67	72	45	76
Distance Correction (95m, Q=2)	-48							-
Screening Correction	-5							-
Total External Noise Level at NSR (L_{eq})	33	28	23	17	14	19	-8	23
Rating Level (+3dB)								26
External Noise Criteria (Night-time L_{90})								30
Exceedance of Criteria								**-7**

Table 3 – Noise Breakout Assessment – Unit 1 to NSR2

From the above assessment, it is seen that the predicted rating level associated with the roof of the nearest unit to NSR2 is below the specified night-time noise limits. Therefore, it is considered that appropriate noise levels can be achieved at the NSRs to reduce the likelihood of adverse impact and the development site is suitable for development into an industrial complex.

Due to the proximity of existing residential receptors to the site, the construction of the building fabric will need to be considered depending on the use and noise levels associated with the future tenants.

It is anticipated that screening along the site boundary will not provide significant acoustic benefits from noise breaking out of the building but may provide some level of screening from any externally mounted plant, depending on the resulting noise levels at the NSRs. However, it is considered best practice to first limit the noise levels from plant at source through plant selection, use of silencers, enclosures etc.

As deliveries will occur to the front of the units, the building envelope will provide some level of screening for noise at the receptors. The following table outlines an indicative assessment of delivery noise associated with a unit at the nearest receptors. Source noise levels have been taken from previous on-site measurements undertaken by NOVA Acoustics of a HGV being loaded by a forklift.

A distance of 100m from the delivery area to the NSRs is assumed, with a -10dB correction for full shielding provided by the building envelope. For the purposes of the assessment, it is assumed that 1 no.

delivery will occur at any particular unit in a 15-minute period during the night-time. Therefore, no on-time correction is included. A +3dB impulsivity correction is also included in the rating level.

Description	Octave Frequency Band (Hz, dB)							L_{pA} (dB)
	63	125	250	500	1k	2k	4k	
Specific Sound Level at 7m (L_{eq})	74	74	72	66	60	59	54	69
Distance Correction (100m, Q=2)	-48							-
Screening Correction	-10							-
Total External Noise Level at NSR (L_{eq})	33	33	31	25	19	18	13	27
Rating Level (+3dB)								30
External Noise Criteria (Night-time L_{90})								30
Exceedance of Criteria								**0**

Table 4 – Delivery Noise Assessment

The above assessment indicates that noise from deliveries will likely fall below the specified night-time limits at NSR2. Therefore, it is considered that appropriate noise levels can be achieved at the NSRs from delivery noise during the night-time. However, for the purpose of good acoustics design, it is recommended that deliveries are generally targeted during daytime hours to further reduce the likelihood of adverse impact at the NSRs.

4. Conclusions

The proposed development has been assessed against the requirements of BS4142. The assessment indicates a low likelihood of adverse impact from noise breaking out of the units and for delivery noise during night-time hours. However, it is anticipated that the majority of noisy activities will be undertaken during the daytime.

Noise from fixed plant has not been assessed as this will be dependent on the final tenant of the units. Therefore, it is recommended that future tenants should commission a noise impact assessment to ensure the noise limit levels provided in this report are adhered to.

The findings of this report will require written approval from the Local Authority prior to work commencing.

Appendix A – Acoustic Terminology

A-weighted sound pressure level, L_{pA}	Quantity of A-weighted sound pressure given by the following formula in decibels (dBA). $L_{pA} = 10 \log_{10} (pA/p_0)^2$. Where: pA is the A-weighted sound pressure in pascals (Pa) and $p0$ is the reference sound pressure (20 µPa)
Background Sound	Underlying level of sound over a period, T, which might in part be an indication of relative quietness at a given location
Equivalent continuous A-weighted sound pressure level, $L_{Aeq,T}$	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
Facade level	Sound pressure level 1 m in front of the facade
Free-field level	Sound pressure level away from reflecting surfaces
Indoor ambient noise	Noise in a given situation at a given time, usually composed of noise from many sources, inside and outside the building, but excluding noise from activities of the occupants
Noise Criteria	Numerical indices used to define design goals in a given space
Noise Rating (NR)	Graphical method for rating a noise by comparing the noise spectrum with a family of noise rating curves
Octave Band	Band of frequencies in which the upper limit of the band is twice the frequency of the lower limit
Percentile Level, $L_{AN,T}$	A-weighted sound pressure level obtained using time-weighting “F”, which is exceeded for N% of a specified time interval
Rating Level, $L_{Ar,Tr}$	Equivalent continuous A-weighted sound pressure level of the noise, plus any adjustment for the characteristic features of the noise
Reverberation time, T	Time that would be required for the sound pressure level to decrease by 60 dB after the sound source has stopped
Sound Pressure, p	root-mean-square value of the variation in air pressure, measured in pascals (Pa) above and below atmospheric pressure, caused by the sound
Sound Pressure Level, L_p	Quantity of sound pressure, in decibels (dB), given by the formula: $L_p = 10\log_{10}(p/p_0)^{2.}$ Where: p is the root-mean-square sound pressure in pascals (Pa) and $p0$ is the reference sound pressure (20 µPa)
Weighted sound reduction index, R_w	Single-number quantity which characterizes the airborne sound insulating properties of a material or building element over a range of frequencies

Appendix B – Standards, Legislation, Policy, and Guidance

This report is to be primarily based on the following standards, legislation, policy and guidance.

B.1 – National Planning Policy Framework (2021)

Government policy on noise is set out in the National Planning Policy Framework (NPPF), published in 2021. This replaced all earlier guidance on noise and places an emphasis on sustainability. In section 15, Conserving and enhancing the natural and local environment, paragraph 174e, it states:

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. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans;

Paragraph 185 states:

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

a) *Mitigate and reduce to a minimum potential adverse impact resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*
b) *Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and*
c) *Limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.*

B.2 – Noise Policy Statement for England (2010)

Paragraph 185 of the NPPF also refers to advice on adverse effects of noise given in the Noise Policy Statement for England (NPSE). This document sets out a policy vision 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.

To achieve this vision the Statement identifies the following three aims:

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;
- Where possible, contribute to the improvement of health and quality of life.

In achieving these aims the document introduces significance criteria as follows:

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur. It is stated that "significant adverse effects on health and quality of life should be avoided while also considering the guiding principles of sustainable development".

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected. It is stated that the second aim above lies somewhere between LOAEL and SOAEL and requires that: "all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also considering the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur."

NOEL – No Observed Effect Level

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. This can be related to the third aim above, which seeks: "where possible, positively to improve health and quality of life through the pro-active management of noise while also considering the guiding principles of sustainable development, recognising that there will be opportunities for such measures to be taken and that they will deliver potential benefits to society. The protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim."

The NPSE recognises that it is not possible to have a single objective noise-based measure that is mandatory and applicable to all sources of noise in all situations and provides no guidance as to how these criteria should be interpreted. It is clear, however, that there is no requirement to achieve noise levels where there are no observable adverse impacts but that reasonable and practicable steps to reduce adverse noise impacts should be taken in the context of sustainable development and ensure a balance between noise sensitive and the need for noise generating developments.

Any scheme of noise mitigation outlined in this report will, therefore, aim to abide by the above principles of the NPPF and NPSE whilst recognizing the constraints of the site.

B.3 – BS4142:2014+A1:2019 – 'Methods for rating and assessing industrial and commercial sound'

Overview

BS4142 sets out a method to assess the likely effect of sound from factories, industrial premises or fixed installations and sources of an industrial nature in commercial premises, on people who might be inside or outside a dwelling or premises used for residential purposes in the vicinity.

The procedure contained in BS4142 for assessing the effect of sound on residential receptors is to compare the measured or predicted sound level from the source in question, the $L_{Aeq,T}$ 'specific sound level', immediately outside the dwelling with the $L_{A90,T}$ background sound level.

Where the sound contains a tonality, impulsivity, intermittency and other sound characteristics, then a correction depending on the grade of the aforementioned characteristics of the sound is added to the specific sound level to obtain the $L_{Ar,Tr}$ 'rating sound level'. A correction to include the consideration of a level of uncertainty in sound measurements, data and calculations can also be applied when necessary.

Rating Penalty

Section 9 of BS4142 describes how the rating sound level should be derived from the specific sound level, by deriving a rating penalty.

BS4142 states:

"Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such features are present at the assessment location, add a character correction to the specific sound level to obtain the rating level. This can be approached in three ways:

a) subjective method;
b) objective method for tonality;
c) reference method."

Due to the nature of the development the subjective method has been adopted to derive the rating sound level from the specific sound level. This is discussed in Section 9.2 of BS4142, which states:

"Where appropriate, establish a rating penalty for sound based on a subjective assessment of its characteristics. This would also be appropriate where a new source cannot be measured because it is only proposed at that time, but the characteristics of similar sources can subjectively be assessed. Correct the specific sound level if a tone, impulse or other characteristics occurs, or is expected to be present, for new or modified sound sources."

BS4142 defines four characteristics that should be considered when deriving a rating penalty, namely; tonality; impulsivity; intermittency; and other sound characteristics, which are defined as:

a) Tonality

A rating penalty of +2 dB is applicable for a tone which is "just perceptible", +4 dB where a tone is "clearly perceptible", and +6 dB where a tone is "highly perceptible".

b) Impulsivity

A rating penalty of +3 dB is applicable for impulsivity which is "just perceptible", +6 dB where it is "clearly perceptible", and +9 dB where it is "highly perceptible".

c) Other Sound Characteristics

BS4142 states that where "the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distance against the residual acoustic environment, a penalty of +3 dB can be applied."

d) Intermittency

BS4142 states that when the "specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time ... if the intermittency is readily distinctive against the residual acoustic environment, a penalty of +3 dB can be applied."

Background Sound Level

The background sound level is the underlying level of sound over a period, T, and is indicative of the relative quietness at a given location. It does not reflect the occurrence of transient and/or higher sound level events and is generally governed by continuous or semi-continuous sounds.

To ensure the background sound level values used within the assessment are reliable and suitably represent both the particular circumstance and periods of interest, efforts have been made to quantify a 'typical' background sound level for a given period. The purpose has not been to simply select the lowest measured value. Diurnal patterns have also been considered as they can have a major influence on background sound levels, for example, the middle of the night can be distinctly different (and potentially of lesser importance) compared to the start or end of the night time period for sleep purposes.

Since the intention is to determine a background sound level in the absence of the specific sound that is under consideration, it is necessary to understand that the background sound level can in some circumstances legitimately include industrial and/or commercial sounds that are present as separate to the specific sound.

Assessment of Impact

BS4142 states: "The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs". An estimation of the impact of the specific sound can be obtained by the difference of the rating sound level and the background sound level and considering the following:

- "Typically, the greater this difference, the greater the magnitude of the impact."
- "A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context."
- "A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context."
- "The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a negligible impact, depending on the context."

Interpreting the guidance given in BS4142, with consideration of the guidance given in the NPSE and NPPG Noise, an estimation of the impact of the rating sound is summarised in the following text:

- A rating sound level that is +10 dB above the background sound level is likely to be an indication of a Significant Observed Adverse Effect Level;
- A rating sound level that is +5 dB above the background sound level is likely to be an indication of a Lowest Observed Adverse Effect Level;
- The lower the rating sound level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating sound level does not exceed the background sound level, this is an

indication of the specific sound source having a negligible impact and would therefore classified as No Observed Adverse Effect Level.

During the daytime, the assessment is carried out over a reference time period of 1-hour. The periods associated with day or night, for the purposes of the Standard, are 07.00 to 23.00 and 23.00 to 07.00, respectively.

Appendix C – Proposed Development Plans

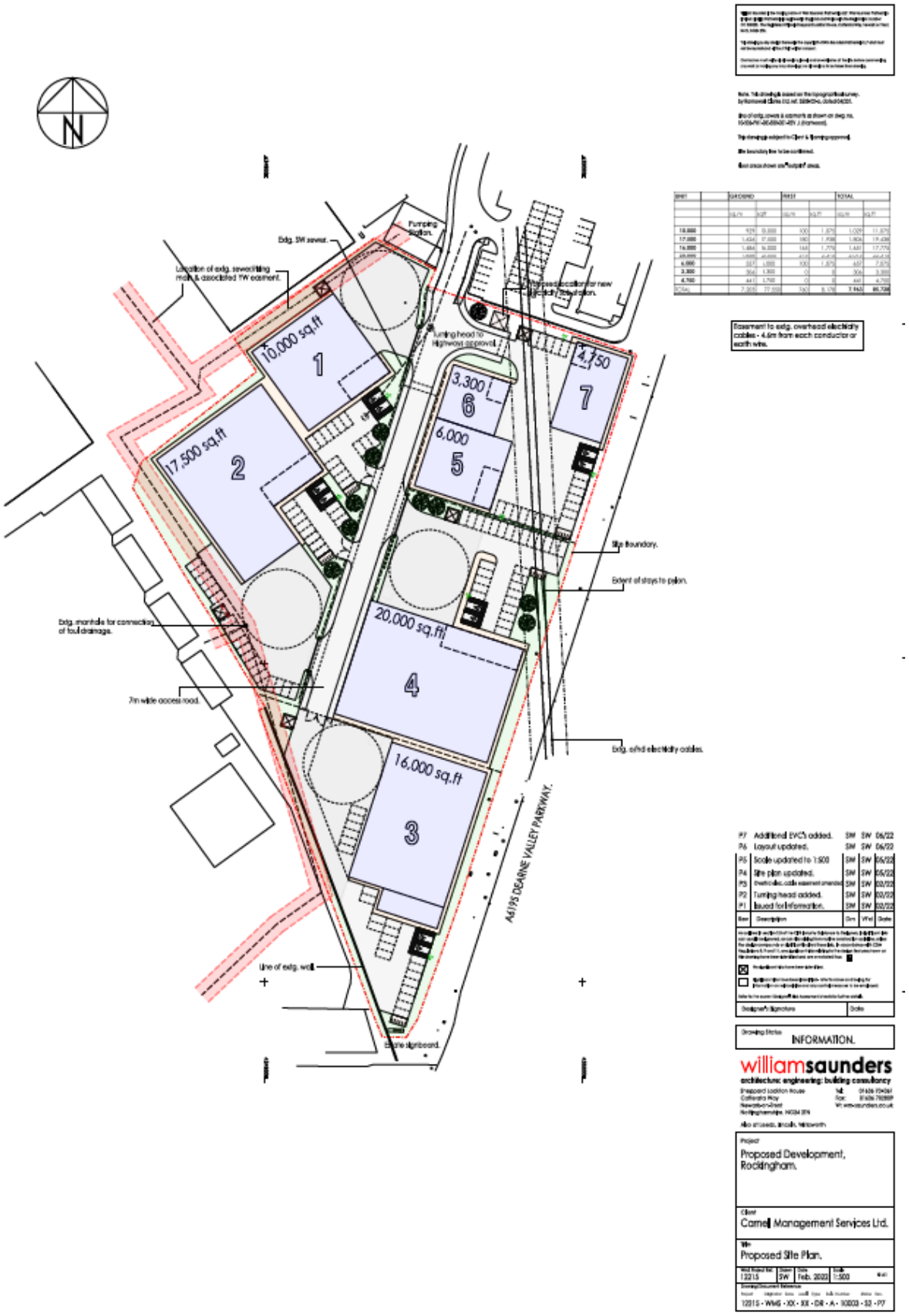


Figure 7 – Site Plans – Existing

Appendix D – Environmental Survey

D.1 – Time History Noise Data

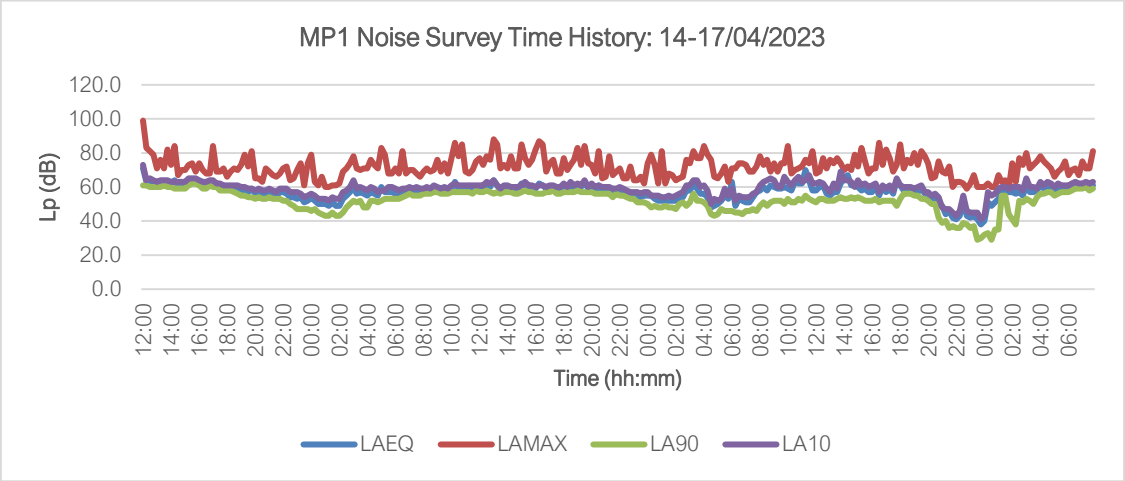


Figure 8 – MP1 Noise Survey Time History

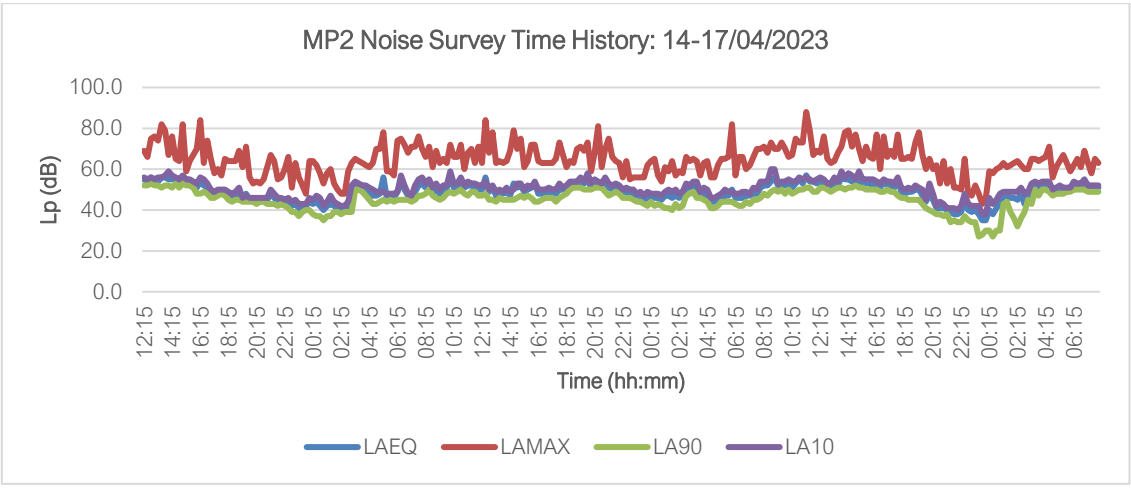


Figure 9 – MP2 Noise Survey Time History

D.2 – Surveying Equipment

Piece of Equipment	Serial No.	Calibration Deviation
Svantek SV307 Class 1 Sound Level Meter	70884	≤0.3
CESVA CB006 Class 1 Calibrator	901911	
Svantek SV307 Class 1 Sound Level Meter	101030	≤0.3
CESVA CB006 Class 1 Calibrator	901911	
Svantek 971A Class 1 Sound Level Meter	77796	≤0.5
CESVA CB006 Class 1 Calibrator	901911	

Table 5 – Surveying Equipment

All equipment used during the survey was field calibrated at the start and end of the measurement period with negligible deviation noted. All sound level meters are calibrated every 24 months and all calibrators are calibrated every 12 months by a third-party calibration laboratory. All microphones were fitted with a protective windshield for the entire measurements period. Calibration certificates can be provided upon request.

D.3 – Meteorological Conditions

As the environmental noise survey was carried out over a long un-manned period no localised records of weather conditions were taken. However, all measurements have been compared with met office weather data of the area, specifically the closest weather station, and the data from the weather station is outlined in the table below. When reviewing the time history of the noise measurements, any scenarios that were considered potentially to be affected by the local weather conditions have been omitted. The analysis of the noise data includes statistical and percentile analysis and review of minimum and maximum values, which aids in the preclusion of any periods of undesirable weather conditions. The weather conditions were deemed suitable for the measurement of environmental noise in accordance with BS7445 Description and Measurement of Environmental Noise. The table below presents the average temperature, wind speed and rainfall range for each 24-hour period during the entire measurement.

Weather Conditions – DB-Barnsley (Approx. 5.7km SW of Site)				
Time Period	Air Temp (^{0}C)	Rainfall (mm/h)	Prevailing Wind Direction	Wind Speed (m/s)
14/04/23 – 00:00 – 23:59	1.1 – 8.8	0.0 – 4.8	SSE	0.0 – 1.4
15/04/23 – 00:00 – 23:59	4.3 – 13.9	0.0	SW	0.0 – 1.0
16/04/23 – 00:00 – 23:59	5.8 – 15.1	0.0	SE	0.0 – 1.8
17/04/23 – 00:00 – 23:59	6.0 – 16.5	0.0	SSE	0.0 – 0.6

Table 6 – Weather Conditions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