BlueTreeAcoustics

11 Colley Road • Sheffield • S5 9GT

Potential impact of established industrial use upon proposed adjacent residential development, Rowley Mills, Penistone Road, Huddersfield

Indicative Sound Assessment Report

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On behalf of
Reliance RG Ltd

Prepared by

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1.0 INTRODUCTION

1.1 Blue Tree Acoustics has been appointed by Reliance RG Ltd to carry out an assessment of potential operational noise impact upon a proposed residential development on land adjacent to the Reliance RG Ltd premises at Rowley Mills, Penistone Road, Huddersfield.

1.2 The purpose of this assessment is to consider the potential noise impact of current operations at the Rowley Mills site upon the proposed new residential development, as well as possible future works that could occur within the existing permitted operation of the site.

1.3 The Rowley Mills site is situated off the A629 Penistone Road between the villages of Fenay Bridge/Lepton and Highburton. There are existing nearby residential properties at Ashford Manor to the south of the site, and Woodsome Park to the northeast of the site, as shown in Figure 2. Other commercial premises are situated on Penistone Road opposite the site. The remaining surrounding area primarily comprises open fields.

1.4 We understand that Reliance RG Ltd acquired the Rowley Mills site in the 1980s, and that operation of the site, along with job creation, is long-established in the area.

1.5 The proposed new residential development is situated in an adjoining field to the north of the Rowley Mills site. At time of writing, the development proposal is for 67no new dwellings comprising 2-storey and 3-storey units, as indicated in Figure 1. The nearest new dwelling to the Rowley Mills operation is situated at around 38m distance from the boundary between the sites.

1.6 The indicative sound impact assessment presented in this report has included:

a) Inspection of the Rowley Mills site and surroundings.

b) Review of publicly available plans and documentation relating to the proposed residential development, including a noise assessment prepared by Miller Goodall Ltd (report ref. 102384-3v3 dated 09/04/2024) on behalf of the developer.

c) Review of drawings and other documentation provided by the Client/Design Team relating to the Rowley Mills proposed building extensions and potential operational expansions.

d) Review of background sound monitoring surveys undertaken by others at the proposed residential development site.

e) Measurement and consideration of source sound level data collected at Rowley Mills and other similar facilities to provide data on current and potential future operations onsite.

f) Consideration of noise impact and sound control measures required to reduce sound impact in accordance with *British Standard 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound'* (BS4142:2014) and other relevant planning and acoustic guidance documents.

1.7 A glossary of technical terminology and parameters used in this report is provided in Appendix 1.

2.0 RELEVANT STANDARDS AND GUIDANCE

National Planning Policy Framework (NPPF)

2.1 First published in March 2012, and most recently updated in December 2023, the *National Planning Policy Framework* (NPPF) sets out the Government's planning policies for England and how these are expected to be applied. Reference to noise is made at Paragraph 180 of the NPPF Section 15 'Conserving and enhancing the natural environment', stating that:

> *"180. Planning policies and decisions should contribute to and enhance the natural and local environment by:*
>
> *[…]*
>
> *(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. 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"*

2.2 Noise is also referenced within the ground conditions and pollution subsection within Section 15 of the NPPF at Paragraph 191, which states:

> *"191. 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 life [69],*
>
> *(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.*
>
> *[…]*
>
> *[69] See Explanatory Note to the Noise Policy Statement for England (Department for the Environment, Food and Rural Affairs, 2010)."*

2.3 Paragraph 193 of NPPF states:

> *"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."

2.4 Department for Environment, Food and Rural Affairs, Noise Policy Statement for England (NPSE), 2010 states:

Noise Policy Vision

Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.

Noise Policy 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; and**
- **where possible, contribute to the improvement of health and quality of life.**

Guiding principles of sustainable development

Ensuring a Strong Healthy and Just Society – Meeting the diverse needs of all people in existing and future communities, promoting personal wellbeing, social cohesion and inclusion, and creating equal opportunity for all.

Using Sound Science Responsibly – Ensuring policy is developed and implemented on the basis of strong scientific evidence, whilst taking into account scientific uncertainty (through the precautionary principle) as well as public attitudes and values.

Living Within Environmental Limits – Respecting the limits of the planet's environment, resources and biodiversity – to improve our environment and ensure that the natural resources needed for life are unimpaired and remain so for future generations.

Achieving a Sustainable Economy – Building a strong, stable and sustainable economy which provides prosperity and opportunities for all, and in which environmental and social costs fall on those who impose them (polluter pays), and efficient resource use is incentivised.

Promoting Good Governance – Actively promoting effective, participative systems of governance in all levels of society – engaging people's creativity, energy and diversity.

Source: Securing the future – delivering UK sustainable development strategy, HM Government, March 2005.

2.5 The Noise Policy Statement for England Explanatory note states that:

Noise is an inevitable consequence of a mature and vibrant society. For some the noise of city life provides a desirable sense of excitement and exhilaration, but for others noise is an unwanted intrusion that adversely impacts on their quality of life, affecting their health and well being.

The management of noise has developed over many years as the types and character of noise sources have altered and as people's attitude to noise has changed. The Noise Abatement Act came into law in 1960 and the Report from the Committee on the Problem of Noise was published in 1963 (the Wilson report). Since then, examples of noise management can be found in many areas including reducing noise at source; the use of the land use and transport planning systems, compensation measures, the statutory nuisance and licensing regimes and other related legislation.

Furthermore, the broad aim of noise management has been to separate noise sources from sensitive noise receivers and to 'minimise' noise. Of course, taken in isolation and to a literal extreme, noise minimisation would mean no noise at all. In reality, although it has not always been stated, the aim has tended to be to minimise noise as far as reasonably practical. This concept can be found in the Environmental Protection Act 1990, where, in some circumstances, there is a defence of 'best practicable means' in summary statutory nuisance proceedings.

By describing clear policy vision and aims the NPSE provides the necessary clarity and direction to enable decisions to be made regarding what is an acceptable noise burden to place on society.

The intention is that the NPSE should apply to all types of noise apart from noise in the workplace (occupational noise). For the purposes of the NPSE, "noise" includes:

- *"environmental noise" which includes noise from transportation sources;*
- *"neighbour noise" which includes noise from inside and outside people's homes; and*
- *"neighbourhood noise" which includes noise arising from within the community such as industrial and entertainment premises, trade and business premises, construction sites and noise in the street.*

The application of the NPSE should mean that noise is properly taken into account at the appropriate time. In the past, the opportunity for the cost effective management of noise has often been missed because the noise implications of a particular policy, development or other activity have not been considered at an early enough stage.

In addition, the application of the NPSE should enable noise to be considered alongside other relevant issues and not to be considered in isolation. In the past, the wider benefits of a particular policy, development or other activity may not have been given adequate weight when assessing the noise implications.

In the longer term, the Government hopes that existing policies could be reviewed (on a prioritised basis), and revised if necessary, so that the policies and any noise management measures being adopted accord with the vision, aims and principles of the NPSE.

Noise management is a complex issue and at times requires complex solutions. Unlike air quality, there are currently no European or national noise limits which have to be met, although there can be specific local limits for specific developments. Furthermore, sound only becomes noise (often defined as 'unwanted sound') when it exists in the wrong place or at the wrong time such that it causes or contributes to some harmful or otherwise unwanted effect, like annoyance or sleep disturbance. Unlike many other pollutants, noise pollution depends not just on the physical aspects of the sound itself, but also the human reaction to it. Consequently, the NPSE provides a clear description of desired outcome from the noise management of a particular situation.

The guiding principles of Government policy on sustainable development should be used to assist in its implementation. The development of further principles specifically to underpin implementation of noise management policy will be kept under review as experience is gained from the application of the NPSE.

There are several key phrases within the NPSE vision and these are discussed below.

Health and quality of life

The World Health Organisation defines health as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity, and recognises the enjoyment of the highest attainable standard of health as one of the fundamental rights of every human being.

It can be argued that quality of life contributes to our standard of health. However, in the NPSE it has been decided to make a distinction between 'quality of life' which is a subjective measure that refers to people's emotional, social and physical well being and 'health' which refers to physical and mental well being.

It is recognised that noise exposure can cause annoyance and sleep disturbance both of which impact on quality of life. It is also agreed by many experts that annoyance and sleep disturbance can give rise to adverse health effects. The distinction that has been made between 'quality of life' effects and 'health' effects recognises that there is emerging evidence that long term exposure to some types of transport noise can additionally cause an increased risk of direct health effects. The Government intends to keep research on the health effects of long term exposure to noise under review in accordance with the principles of the NPSE.

Promote good health and good quality of life

This statement expresses the long term desired policy outcome, but in the use of 'promote' and 'good' 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.

Effective management of noise

This concept confirms that the policy applies to all types of 'noise' (environmental, neighbour and neighbourhood) and that the solution could be more than simply minimising the noise.

Within the context of Government policy on sustainable development

Sustainable development is a core principle underpinning all government policy. For the UK Government the goal of sustainable development is being pursued in an integrated way through a sustainable, innovative and productive economy that delivers high levels of employment and a just society that promotes social inclusion, sustainable communities and personal wellbeing. The goal is pursued in ways that protect and enhance the physical and natural environment, and that use resources and energy as efficiently as possible.

There is a need to integrate consideration of the economic and social benefit of the activity or policy under examination with proper consideration of the adverse environmental effects, including the impact of noise on health and quality of life. This should avoid noise being treated in isolation in any particular situation, i.e. not focussing solely on the noise impact without taking into account other related factors.

There are several key phrases within the NPSE aims and these are discussed below.

"Significant adverse" and "adverse"

There are two established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation. They are:

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.

LOAEL . Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected.

Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse effect level.

SOAEL . Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur.

It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not

having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available.

The first aim of the Noise Policy Statement for England

Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

The first aim of the NPSE states that significant adverse effects on health and quality of life should be avoided while also taking into account the guiding principles of sustainable development.

The second aim of the Noise Policy Statement for England

Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

The second aim of the NPSE refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur.

The third aim of the Noise Policy Statement for England

Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

This aim seeks, where possible, positively to improve health and quality of life through the pro-active management of noise while also taking into account 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.

Planning Practice Guidance – Noise (PPG)

2.6 Published in March 2014 and updated in July 2019, the Department for Communities and Local Government (DCLG) 2019 *Planning Practice Guidance – Noise* (PPG) is a web-based resource to support the NPPF. In relation to planning and noise, the guidance states that noise needs to be considered when development may create additional noise, or would be sensitive to the prevailing acoustic environment, including any permitted changes to that environment that have not yet commenced. It states that there may be opportunities to improve the acoustic environment when preparing plans or taking decisions about new development, and that good

acoustic design must be considered early in the planning process to ensure that the most appropriate and cost-effective solutions are identified from the outset.

2.7 PPG advises that planning and decision-making need to consider:

a) whether or not a significant adverse effect is occurring or likely to occur;

b) whether or not an adverse effect is occurring or likely to occur; and

c) whether or not a good standard of amenity can be achieved.

2.8 This guidance also refers to the concepts of NOAEL, LOAEL, and SOAEL, and states, "*Although the word 'level' is used here, this does not mean that the effects can only be defined in terms of a single value of noise exposure. In some circumstances adverse effects are defined in terms of a combination of more than one factor such as noise exposure, the number of occurrences of the noise in a given time period, the duration of the noise and the time of day the noise occurs."*

2.9 The PPG noise exposure hierarchy is reproduced in the table below.

Table 1: PPG noise exposure hierarchy

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

2.10 Whilst the guidance suggests that planning decisions must take account of the economic and social benefit of the activity causing or affected by the noise, the planning process should also be used to avoid SOAEL occurring and prevent unacceptable adverse effects.

2.11 It clarifies that noise can override other planning concerns where justified, but states that it is important to look at noise in the context of the wider characteristics of a development proposal, its likely users, and its surroundings, as these can have an important effect on whether noise is likely to pose a concern.

2.12 PPG states, *"The subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any particular situation."* These factors include the absolute noise level of the source, the existing ambient and background noise climate, time of day, frequency of occurrence, duration, spectral content and general character of the noise, cumulative impacts, as well as the local arrangement of buildings, surfaces and green infrastructure, and the extent to which they reflect and absorb noise.

2.13 PPG provides some outline guidance on measures to address adverse noise effects, and also for identifying, protecting, and enhancing areas of tranquillity. As well as mitigation of noise from proposed new development, PPG also considers the 'agent of change' principle, and that new development in the vicinity of existing businesses, community facilities, and other activities may need to incorporate suitable noise mitigation to avoid existing activities having significant adverse effect on residents or users of the proposed development.

2.14 PPG additionally mentions BS8233:2014, IEMA Guidelines for Environmental Noise Impact Assessment, and ProPG, but it also states, "*Some of these documents contain numerical criteria. These values are not to be regarded as fixed thresholds and as outcomes that have to be achieved in every circumstance."*

2.15 NPPF, NPSE, and PPG advise that the effect of noise should be assessed on the basis of adverse and significant adverse effect, but they do not limit sound levels or provide any specific guidance on assessment methods. This lack of numeric limitation of sound levels is a direct consequence of the advice presented in the NPSE, which is that it is not possible to have *"a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations,"* and that the sound level at which a significant adverse effect occurs is *"likely to be different for different noise sources, for different receptors and at different times."* In

the absence of specific guidance within the national planning policy guidance for the assessment of environmental noise, it is considered appropriate to base assessment on any specific local planning policy requirements, relevant British Standards, or professional guidance.

2.16 On balance, quantification of noise impact in terms of guidance such as BS8233:2014 and BS4142:2014 can be considered as appropriately assessing the potential noise impact with regard to toxicology concepts, and hence in line with the principles of the NPPF, NPSE, and PPG. For example, when assessing industrial noise with regard to BS4142:2014 and the Rating Level of the industrial noise is found to be below the background sound level, then such impact could be considered as being below the level where there are observed adverse effects on health and quality of life due to noise, and therefore below the LOAEL (Lowest Observed Adverse Effect Level) set out in the NPSE and PPG.

BS8233:2014

2.17 *British Standard 8233: 2014, 'Guidance on sound insulation and noise reduction for buildings'* (BS8233:2014) provides information on the design of internal acoustics in buildings. It deals with control of noise from outside the building, noise from plant and services within it, and room acoustics for non-critical situations.

2.18 BS8233:2014 provides guidance regarding indoor ambient noise criteria for residential accommodation, as presented in the following table.

Table 2: BS8233:2014 Guidance criteria for indoor ambient noise levels in dwellings

Activity	Location	0700-2300 hours	2300-0700 hours
Resting	Living rooms	35dB $L_{Aeq\ (16hour)}$	-
Dining	Dining room/area	40dB $L_{Aeq\ (16hour)}$	-
Sleeping (daytime resting)	Bedroom	35dB $L_{Aeq\ (16hour)}$	30dB $L_{Aeq\ (8hour)}$

2.19 BS8233:2014 does not stipulate any criteria for maximum noise levels within rooms in terms of dB L_{Amax}, but does state that, *"Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$, depending on the character and number of events per night. Sporadic noise events could require separate values."*

2.20 Other published guidance on implementing limiting L_{Amax} criteria in bedrooms (e.g. *ProPG: Planning and Noise* and *WHO Community Noise Guidelines*) advises that individual noise events should not normally exceed 45dB L_{Amax} more than 10no times per night, as this represents a threshold below which the effects of individual noise events on sleep can be regarded as negligible. ProPG also refers to the BS8233:2014 L_{Aeq} criteria set out above.

2.21 It is noted that BS8233:2014 also states that, where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5dB and reasonable internal conditions still achieved. This is also acknowledged in ProPG, which adds that, where internal L_{Aeq} levels exceed the target levels by more than 10dB, they are highly likely to be regarded as 'unacceptable' by most people, particularly if such levels occur more than occasionally.

2.22 The sound level criteria shown in Table 2 above are based on the existing guidelines issued by the WHO, and assume normal diurnal fluctuations in external noise. In cases where local conditions do not follow a typical diurnal pattern (for example, on a road serving a port with high levels of traffic at certain times of the night), an appropriate alternative period (e.g. 1 hour) may be used, but the level should be selected to ensure consistency with the levels recommended in the table. These levels are based on annual average data and do not have to be achieved in all circumstances; for example, it is normal to exclude occasional events, such as fireworks night or New Year's Eve.

2.23 In addition, the BS8233:2014 guidance relating to gardens makes reference to external noise levels in gardens and balconies, etc., as follows:

> *"For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.*

Other locations, such as balconies, roof gardens and terraces, are also important in residential buildings where normal external amenity space might be limited or not available, i.e. in flats, apartment blocks, etc. In these locations, specification of noise limits is not necessarily appropriate. Small balconies may be included for uses such as drying washing or growing pot plants, and noise limits should not be necessary for these uses. However, the general guidance on noise in amenity space is still appropriate for larger balconies, roof gardens and terraces, which might be intended to be used for relaxation. In high-noise areas, consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels. Achieving levels of 55 dB $L_{Aeq,T}$ or less might not be possible at the outer edge of these areas, but should be achievable in some areas of the space."

2.24 Published guidance on implementing limiting L_{Amax} criteria in bedrooms (e.g. *ProPG: Planning and Noise* and *WHO Community Noise Guidelines*) commonly advises that individual noise events should not normally exceed 45dB L_{Amax} more than 10no times per night, as this represents a threshold below which the effects of individual noise events on sleep can be regarded as negligible. Such an approach is commonly accepted by Local Authorities.

BS4142:2014+A1:2019

2.25 *British Standard 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound'* (BS4142:2014) requires the level of sound radiating from the proposed, new, modified or additional source(s) of sound of an industrial and/or commercial nature (in L_{Aeq}) to be compared with the existing Background Sound Level (L_{A90}) at any nearby residential property.

2.26 The scope of BS4142:2014 states:

"1.1 This British Standard describes methods for rating and assessing sound of an industrial and/or commercial nature, which includes:

a) sound from industrial and manufacturing processes;

b) sound from fixed installations which comprise mechanical and electrical plant and equipment;

c) sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and

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

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

1.2 This standard is applicable to the determination of the following levels at outdoor locations:

a) rating levels for sources of sound of an industrial and/or commercial nature;

and

b) ambient, background and residual sound levels, for the purposes of:

1) investigating complaints;

2) assessing sound from existing, proposed, new, modified or additional source(s) of sound of an industrial and/or commercial nature; and

3) assessing sound at proposed new dwellings or premises used for residential purposes.

1.3 The determination of noise amounting to a nuisance is beyond the scope of this British Standard.

Sound of an industrial and/or commercial nature does not include sound from the passage of vehicles on public roads and railway systems.

The standard is not intended to be applied to the rating and assessment of sound from:

a) recreational activities, including all forms of motorsport;

b) music and other entertainment;

c) shooting grounds;

d) construction and demolition;

e) domestic animals;

f) people;

g) public address systems for speech; and

h) other sources falling within the scopes of other standards or guidance.

The methodology set out in Clauses 7, 8, and 9 of this standard is not intended to be used to assess the extent of the impact at indoor locations. Internal sound levels can be taken into account as outlined in Clause 11.

The standard is not intended to be applied to the assessment of indoor sound levels.

The standard is not applicable to the assessment of low frequency noise."

2.27 The standard describes various methods for determining whether a correction or corrections should be applied to reflect the prominence of characteristic features in the industrial/commercial specific sound experienced at the assessment location. In subjective assessment, if the industrial/commercial sound has a tonal element that is just perceptible at the receptor, a 2dB penalty can be applied. If the tone is clearly perceptible, a 4dB penalty can be applied. If the tone is highly perceptible, a 6dB penalty can be applied. The standard also describes two objective methods for assessing tonal sound, which may apply a penalty of up to 6dB.

2.28 Similarly, a penalty of 3dB can be applied for a sound that has impulsivity that is just perceptible. If the impulsivity is clearly perceptible, a 6dB penalty can be applied. If the impulsivity is highly perceptible, a 9dB penalty can be applied. The standard also describes an objective method for assessing impulsivity which may apply a penalty of up to 9dB.

2.29 If the sound has clearly identifiable on/off conditions during the reference period and this is readily distinctive against the residual acoustic environment during the reference period, a 3dB penalty for intermittency can be applied. No objective method is given in the standard for assessing intermittency.

2.30 Where characteristic features of the specific sound are neither tonal nor impulsive, nor intermittent, but are readily distinctive against the residual acoustic environment, a 3dB subjective penalty can be applied.

2.31 Therefore, depending on the circumstances, a total penalty of between 0 and 18dB could potentially be applied to allow for characteristic features of the industrial/commercial sound. However, BS4142:2014 does state that if any single feature is dominant to the exclusion of others, it may then be appropriate to apply a reduced or 'zero' correction for the minor characteristic. The subjective prominence of the character of the specific sound at the noise-sensitive receptor should be also considered, and the extent to which such characteristics will attract attention and/or be masked by residual sound at that location.

2.32 The level of the industrial/commercial sound measured or calculated in L_{Aeq} terms, plus any penalty as described above, provides the Rating Level.

2.33 BS4142:2014 states that:

"The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs. An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context.

Obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level (…) from the rating level (…).

NOTE 1. More than one assessment might be appropriate.

a) Typically, the greater this difference, the greater the magnitude of the impact.

b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.

c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.

d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

NOTE 2. Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact.

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

1) The absolute level of sound. For a given difference between the rating level and the background sound level, the magnitude of the overall impact might be greater for an

acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low.

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

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

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

   NOTE 3. Consideration ought to be given to evidence on human response to sound and, in particular, industrial and/or commercial sound where it is available. (…)

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

   i) facade insulation treatment;

   ii) ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and

   iii) acoustic screening."

3.0 NOISE SURVEYS

3.1 The assessment of sound from industrial and commercial sources (including BS4142 assessment) typically requires quantification and consideration of the following key aspects:

a) Specific sound source – This is the sound source to be assessed.

b) Specific sound level – This is the sound level of the specific sound source at the assessment location, which is typically the nearest noise-sensitive receptor, such as a nearby dwelling. The specific sound level can be derived by direct measurement of the specific sound sources, or from manufacturer's data. Described in terms of L_{Aeq}.

c) Ambient sound level – This is the totally encompassing sound at the assessment location at a given time. This usually comprises many sources, near and far, as well as the specific sound where present. Described in terms of L_{Aeq}.

d) Residual sound level – This is the ambient sound remaining at the assessment location in the absence of the specific sound, e.g. when the specific sound source is turned off or suppressed to such a degree that it does not contribute to the ambient sound. Residual sound levels can be used to correct ambient sound levels as a means of removing the other sound levels from the total, so as to derive the specific sound level. Described in terms of L_{Aeq}.

e) Background sound level – This is the sound pressure level during the quietest times, in the absence of the specific sound source. It is the level exceeded for 90% of the measurement time during the period to be assessed. Described in terms of L_{A90}.

f) Reference time interval – This is the specified interval over which the specific sound is assessed. BS4142 defines this as 1 hour during daytime (0700-2300 hours) and 15 minutes during nighttime (2300-0700 hours).

3.2 The Miller Goodall Ltd report for the proposed residential development included unattended background sound level monitoring undertaken at a location on the boundary between the Rowley Mills site and the residential development site. The findings from this monitoring are summarised in Chart 1 and Table 6 of the Miller Goodall Ltd report (reproduced below).

Chart 1: Noise Monitoring Results

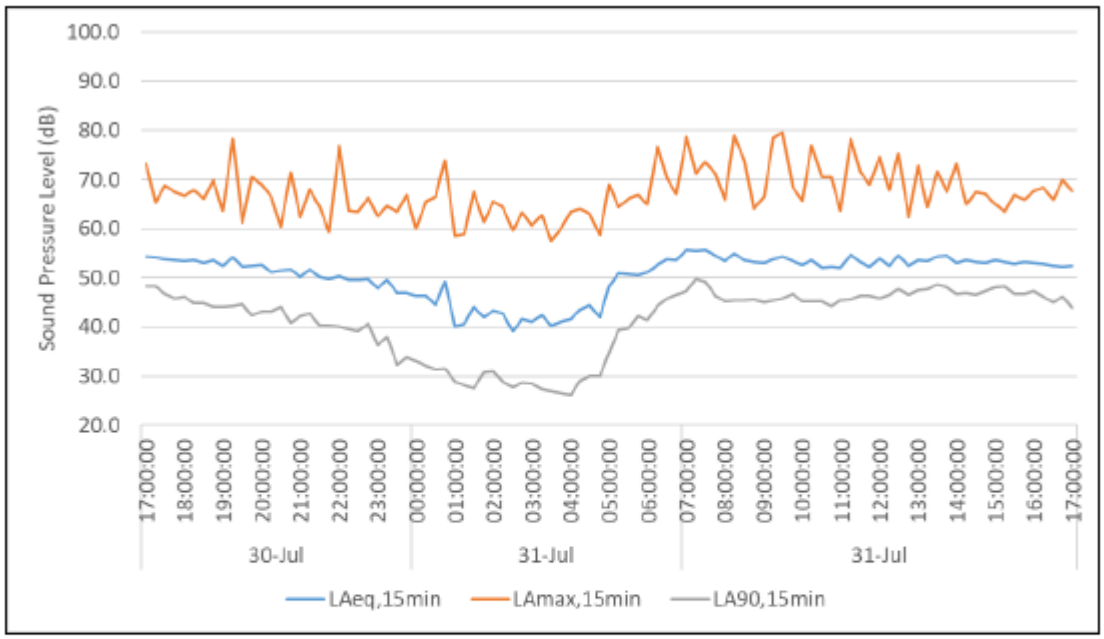


Table 6: Noise Monitoring Results

Monitoring Period	Average $L_{Aeq,T}$ Level (dB)	Modal $L_{A90,T}$	L_{AFmax} Range
30/07/20 17:00-23:00-31/07/20 07:00-17:00 (daytime average)	53	48	59-80
30/07/20 23:00 – 31/07/20 07:00 (night-time)	48	29	58-77

3.3 The stated daytime and nighttime modal $L_{A90,T}$ values are taken as being representative of the background sound levels at the new residential development during the daytime and nighttime assessment periods. With regard to BS4142 assessment, the following background sound levels have been considered.

a) Representative daytime background sound level (0700-2300 hours): 48dB L_{A90}

b) Representative 2100-2300 hours background sound level: 40dB L_{A90}

c) Representative nighttime background sound level (2300-0700 hours): 29dB L_{A90}

3.4 Source sound level measurements were taken at Rowley Mills on Thursday 07/11/2024 by Blue Tree Acoustics to establish typical sound levels of works currently undertaken at the premises.

3.5 Source sound level measurements were also taken in September 2024 and October 2024 at other facilities to obtain sample data of similar works that could occur at Rowley Mills in future, e.g. operation of hammer stamping/power press machinery. (Specific details of third-party facilities are withheld for confidentiality.)

3.6 The instruments used during the 2024 Blue Tree Acoustics sound surveys were 2no Rion NL-52 Type 1/Class 1 integrating sound level meters and 2no Rion NA-28 Type 1/ Class 1 integrating sound level meters. Each meter was within a valid period of laboratory calibration. Calibration checks were carried out both before and after the measurements, with no variance observed, and with all calibration results being within 0.1dB of the stated reference value. A proprietary environmental windshield was fitted to each microphone, with each microphone being mounted on a tripod at approximately 1.5m height above local ground level.

3.7 Weather conditions throughout the survey periods were mainly dry and calm, with wind speeds <5m/s.

4.0 NOISE ASSESSMENT

4.1 Specialist proprietary acoustic modelling software (CadnaA) has been used to simulate a number of indicative sound impact outcome scenarios based on measured source sound level data and Rowley Mills site operations.

4.2 An acoustic model has been created, into which source sound levels, locations, vehicle routes, topography data, etc. have been input. The acoustic model output plots and details are presented in Appendix 2.

4.3 The acoustic modelling has considered the following different scenarios:

Scenario A: Existing buildings with existing operation

Scenario B: Proposed building extensions with existing operation

Scenario C: Existing buildings with potential future expanded operations

Scenario D: Proposed building extensions with potential future expanded operations

4.4 Potential future building works at Rowley Mills involve extending the main manufacturing workshop area at the rear of the building with a new 2-storey extension providing manufacturing space at ground floor level and office space at 1st floor level.

4.5 A new 3-storey extension to the front (west) of the building would also be proposed to provide office, conference, and canteen spaces. Internal sound levels in these areas will be low, i.e. sound levels typically expected of office/administrative areas rather than of manufacturing or production areas. As such, there will be minimal sound breakout from this part of the new extension works, and the proposed building construction incorporating double glazing will provide sufficient sound insulation.

4.6 The existing workshop construction comprises a masonry base of approximately 2.5m height with insulated cladding panels on steel frame above. There are GRP-style rooflights in the existing workshop building. We have presumed that the new rear extension and central expansion will be of a similar construction using insulated metal cladding panels (e.g. Kingspan or similar).

4.7 Indicative calculations have been undertaken to predict the breakout of workshop noise from the buildings, noise from external plant items, and noise from activities in the yard areas. The most prominent likely noise-generating activities have been considered. The sound sources

considered in the calculations are not exhaustive, but they provide a reasonable basis for assessment of impact at the proposed new residential development.

4.8 The topography of the Rowley Mills site is such that there is a steep slope up to the rear carpark at the eastern site boundary, and the carpark overlooks the roof of the existing main production workshop. The existing banking to the carpark will be dug out and retaining works will be undertaken to provide space for the new extension, which will be built to the same height as the existing building. The acoustic model plots noise levels at the proposed new dwellings at 1.5m height (to represent ground floor level windows), and at 4.0m height (to represent 1st floor level windows).

4.9 We understand that the current normal working hours at the Rowley Mills site are typically 0530-2300 hours, with some nightshift work also taking place on weekdays. Permitted operating hours are unrestricted, and therefore potential future works could take place during full dayshift and nightshift patterns (e.g. depending on workload, order requests, emergency production, etc.).

4.10 The boundary treatment plan (drawing ref. 2307-SI-03) for the proposed residential development indicates provision of a 1.8m high ‘screen fence’ along the site boundary with Rowley Mills. We have interpreted this as being a close-boarded acoustic fence, and this structure has been included in the acoustic modelling.

4.11 Based on the above, the indicative calculated sound levels at the worst-affected dwellings in the proposed new development are summarised in the following table.

Table 3: Highest operational sound levels predicted at nearest proposed new dwelling

Scenario	Acoustic model plot height	dB $L_{Aeq,1hour}$ Daytime (0700-2300 hours)	dB $L_{Aeq,15min}$ Nighttime (2300-0700 hours)
A: Existing buildings with existing operation	1.5m	34	37
	4.0m	34	37
B: Proposed building extensions with existing operation	1.5m	35	37
	4.0m	35	37
C: Existing buildings with potential future expanded operations	1.5m	38	40
	4.0m	38	40
D: Proposed building extensions with potential future expanded operations	1.5m	40	41
	4.0m	40	41

4.12 It can be seen from initial observation that the same magnitude of impact is predicted at ground floor level height and at 1st floor level height at the proposed new residential receptors – i.e. the predicted operational sound levels for each scenario are the same both at 1.5m height and at 4.0m height in all cases.

4.13 In terms of BS4142 impact, Table 4 below summarises the indicative BS4142:2014 outcome for each scenario presented in Table 3 above. An acoustic feature correction of +6dB has been included to allow for characteristic features in the industrial specific sound. The values consider the full daytime and nighttime background sound levels defined in the Miller Goodall Ltd report, and also impact during late evening works.

Table 4: Calculated operational sound levels at nearest noise-sensitive receptor

Scenario	Daytime (0700-2300 hours)		Nighttime (2300-0700 hours)		Evening (2100-2300 hours)	
A: Existing buildings with existing operation	Specific Sound Level:	34dB(A)	Specific Sound Level:	37dB(A)	Specific Sound Level:	34dB(A)
	Feature Correction:	+6	Feature correction:	+6	Feature correction:	+6
	Rating Level:	40dB	Rating Level:	43dB	Rating Level:	40dB
	Background:	48dB L_{A90}	Background:	29dB L_{A90}	Background:	40dB L_{A90}
	Result:	**-8dB**	**Result:**	**+14dB**	**Result:**	**+0dB**
B: Proposed building extensions with existing operation	Specific Sound Level:	35dB(A)	Specific Sound Level:	37dB(A)	Specific Sound Level:	35dB(A)
	Feature correction:	+6	Feature correction:	+6	Feature correction:	+6
	Rating Level:	41dB	Rating Level:	43dB	Rating Level:	41dB
	Background:	48dB L_{A90}	Background:	29dB L_{A90}	Background:	40dB L_{A90}
	Result:	**-7dB**	**Result:**	**+14dB**	**Result:**	**+1dB**
C: Existing buildings with potential future expanded operations	Specific Sound Level:	38dB(A)	Specific Sound Level:	40dB(A)	Specific Sound Level:	38dB(A)
	Feature correction:	+6	Feature correction:	+6	Feature correction:	+6
	Rating Level:	44dB	Rating Level:	46dB	Rating Level:	44dB
	Background:	48dB L_{A90}	Background:	29dB L_{A90}	Background:	40dB L_{A90}
	Result:	**-4dB**	**Result:**	**+17dB**	**Result:**	**+4dB**
D: Proposed building extensions with potential future expanded operations	Specific Sound Level:	40dB(A)	Specific Sound Level:	41dB(A)	Specific Sound Level:	40dB(A)
	Feature correction:	+6	Feature correction:	+6	Feature correction:	+6
	Rating Level:	46dB	Rating Level:	47dB	Rating Level:	46dB
	Background:	48dB L_{A90}	Background:	29dB L_{A90}	Background:	40dB L_{A90}
	Result:	**-2dB**	**Result:**	**+18dB**	**Result:**	**+6dB**

4.14 Table 4 indicates that impact during normal current daytime working hours is predicted to be low – i.e. the BS4142:2014 Rating Level of the industrial noise is below the background sound level in each scenario. However, the scenarios with potential future expanded operations during late evening working hours (Scenario C and Scenario D) could result in a BS4142:2014 impact determined as being of adverse effect.

4.15 Predicted impact during nighttime is much greater due to the lower background sound level and shorter assessment time period. The predicted nighttime impact indicated in each scenario is above the threshold considered to be of significant adverse effect by BS4142:2014, and therefore considered to be SOAEL in planning framework terms.

4.16 BS4142:2014 requires some consideration of the context of noise impact. However, in the context of a new residential receptor being introduced near existing industrial noise, this is not deemed likely to significantly alter the outcome of the assessment. Emphasis should be placed on the 'agent of change' principle set out in the planning framework, which places the onus on the applicant/developer to ensure that suitable mitigation is provided where the operation of an existing business could have a significant adverse effect on new development, and planning decisions should ensure that the new development can be integrated effectively with existing businesses. Additionally, the planning process should be used to minimise adverse impacts created by new development, and to prevent SOAEL from occurring.

5.0 ACOUSTIC MITIGATION

5.1 The acoustic model assumes that the 1.8m boundary fencing proposed for the new residential development is in place. Given the potential for future noise impact to be of adverse or significant adverse effect, it is concluded that this proposed mitigation measure is insufficient. A more substantial barrier, of greater height and positioned nearer to the new dwellings, is likely to be more effective (e.g. earth bunding with an acoustic fence on top).

5.2 The Miller Goodall Ltd report concludes that road traffic is the dominant environmental noise source impacting upon the proposed residential development site. While it does acknowledge potential for industrial noise impact from the Rowley Mills site, the report concludes that this is not a risk, and the assessment of noise impact is only considered in terms of BS8233:2014. The Miller Goodall Ltd report therefore underestimates the potential for adverse impact from industrial noise sources.

5.3 As such, the acoustic mitigation proposed for the new dwellings in terms of enhanced acoustic glazing and ventilation is relatively minimal, i.e. double glazing of 27dB $R_w + C_{tr}$ sound reduction performance, ventilators of 27dB $D_{n,e,w} + C_{tr}$ sound reduction in ground floor living rooms, and ventilators of 35dB $D_{n,e,w} + C_{tr}$ sound reduction in 1st floor level bedrooms. These performances are only specified for new dwellings directly facing the Rowley Mills site, and dwelling plots behind these will have lesser, or no, enhanced acoustic mitigation. Significantly greater sound insulation is expected to be necessary for the glazing and ventilation performance, potentially requiring mechanical ventilation such that windows can remain closed and maintain sufficient ventilation and overheating mitigation.

5.4 Considering the above, it is likely that operation of the Rowley Mills site will result in disturbance and possible complaints in terms of adverse noise impact upon the proposed new residential development, particularly during the late evening and nighttime. Therefore, greater acoustic mitigation is necessary for the proposed new residential development.

5.5 Notwithstanding the above, Reliance RG Ltd acknowledges its obligations to control and minimise noise emissions, and will incorporate suitable noise mitigation measures within best practical means (BPM), where appropriate. There are existing residential properties near the Rowley Mills site, and operational noise impact will be designed to adequately control impact at these receptors, although it should be noted that these are not subject to the same environmental conditions as the proposed new residential development to the north. E.g., The existing dwellings

at Ashford Manor to the south of Rowley Mills experience greater background sound levels due to sound generated by flowing water from Beldon Brook, which runs adjacent to the site boundary. In addition, operations in the southwest portion of the site near Ashford Manor do not involve manufacturing or nightshift work. Fully detailed noise impact assessments in accordance with the BS4142:2014 assessment and reporting methodology will be undertaken at the time for any future new machinery or processes proposed within the Rowley Mills site.

5.6 In addition, we understand that the nearby dwellings at Ashford Manor, and at Woodsome Park (to the northeast of the site), were also built after operation of the Rowley Mills site had commenced. Noise of an industrial character has therefore long been part of the established soundscape around the site, and existing operational noise is a recognised component of the acoustic environment at these receptors when assessing impact upon these receptors in context.

6.0 SUMMARY AND CONCLUSIONS

6.1 An assessment has been carried out on behalf of Reliance RG Ltd to consider potential operational noise impact upon a proposed residential development on land adjacent to the Reliance RG Ltd premises at Rowley Mills, Penistone Road, Huddersfield.

6.2 The results of the assessment indicate that the permitted operational impact of the Rowley Mills site could result in noise impact upon the proposed new residential dwellings being of adverse effect during daytime, and of significant adverse effect during nighttime.

6.3 The noise mitigation measures proposed by the developer for the new residential development are not considered adequate to sufficiently control industrial noise impact, and this could result in disturbance to new residents and subsequent generation of complaints.

6.4 Considering the guidance provided in the NPPF, NPSE, and PPG, the planning process can be used to minimise potential adverse effects, and to ensure that appropriate noise mitigation is incorporated into the new residential development, and that unreasonable burden is not placed upon the Rowley Mills operation.

7.0 DISCLAIMER

7.1 This document is limited to addressing the specific acoustic issues contained herein, and its content is based on drawings and information provided to date by our Client/their Design Team.

7.2 All findings, comments, recommendations, etc., in this document are for acoustic purposes only; any and all other considerations and requirements, e.g. structural, airflow, thermal, fire safety, CDM compliance, determination of whether materials are dangerous, hazardous, deleterious, etc. (non-exhaustively), are the responsibility of other such suitably qualified specialists to check and advise on.

7.3 All findings, comments, recommendations, etc., in this document have been prepared with reasonable skill and care by BTA, within the scope of our Client's brief and timescales. Calculations and estimates upon which BTA's findings are elaborated are based on reasonable assumptions and industry practice that, by their nature, involve uncertainties that could cause future onsite results to differ materially from those predicted. BTA does not guarantee or warrant any calculation or estimate made, especially those based on data measured by third parties or information provided by third parties to BTA or otherwise relied upon by third parties. Any third-party information required and/or provided for the purpose of completing this document should not be considered as verified by BTA.

7.4 BTA's work may occasionally involve provision of acoustic performance advice and acoustic design recommendations that others may choose to regard as a "specification" under CDM 2015 (and thus others may occasionally choose to regard BTA to be a "Designer" under CDM 2015). Notwithstanding this, it is always the responsibility of others (Principal Designer) to approve/incorporate into their final design – or not – their final specification selections; although these may be based on BTA's acoustic performance advice, as BTA neither has control over how or whether BTA's acoustic advice is incorporated into the final design by others, nor any power to enforce that any such final specification selections made by others based on BTA's advice are appropriate in any regard beyond their acoustic performance qualities, it also remains the responsibility of others under CDM 2015 to ensure that any ancillary (non-acoustic) considerations in the course of selection, installation, maintenance, etc. of final specifications are advised upon by such relevantly qualified specialists (non-acoustic, and therefore non-BTA), and that any safety precautions identified in the course of their consideration by others are taken by others (the Principal Designer, Designers, Contractors, Client, etc.).

7.5 Products and materials that perform well acoustically tend to be heavier than standard products. Use of these products and materials may increase the weight of the element, and the CDM

Principal Designer, Client, etc. must take care to ensure that this risk is mitigated as far as possible with appropriate changes to their design, and the Client, Principal Contractor, Contractor, Installer, Fitter, etc. must ensure that appropriate and safe lifting and installation techniques, maintenance, etc. are used to reduce any remaining risk. Wherever BTA advises that works such as acoustic barriers are desirable to attenuate noise, care must be taken by the CDM Principal Designer, Client, etc. to ensure that the risks associated with constructing and maintaining bunds, walls, fences, etc. are mitigated as far as possible with appropriate changes to their design, and the Client, Principal Contractor, Contractor, Installer, Fitter, etc. must ensure that appropriate and safe construction and installation techniques, maintenance, etc. are used to reduce any remaining risk.

7.6 This document has been prepared for the sole use, benefit, and information of our direct Client (named on the title page and headers of this document), for the purposes agreed at the time of their formal instruction, and the information contained herein is the sole property of, and confidential to, our direct Client. The liability of BTA in respect of the information contained herein will not extend to any third party.

FIGURE 1 – PROPOSED NEW RESIDENTIAL SITE LAYOUT

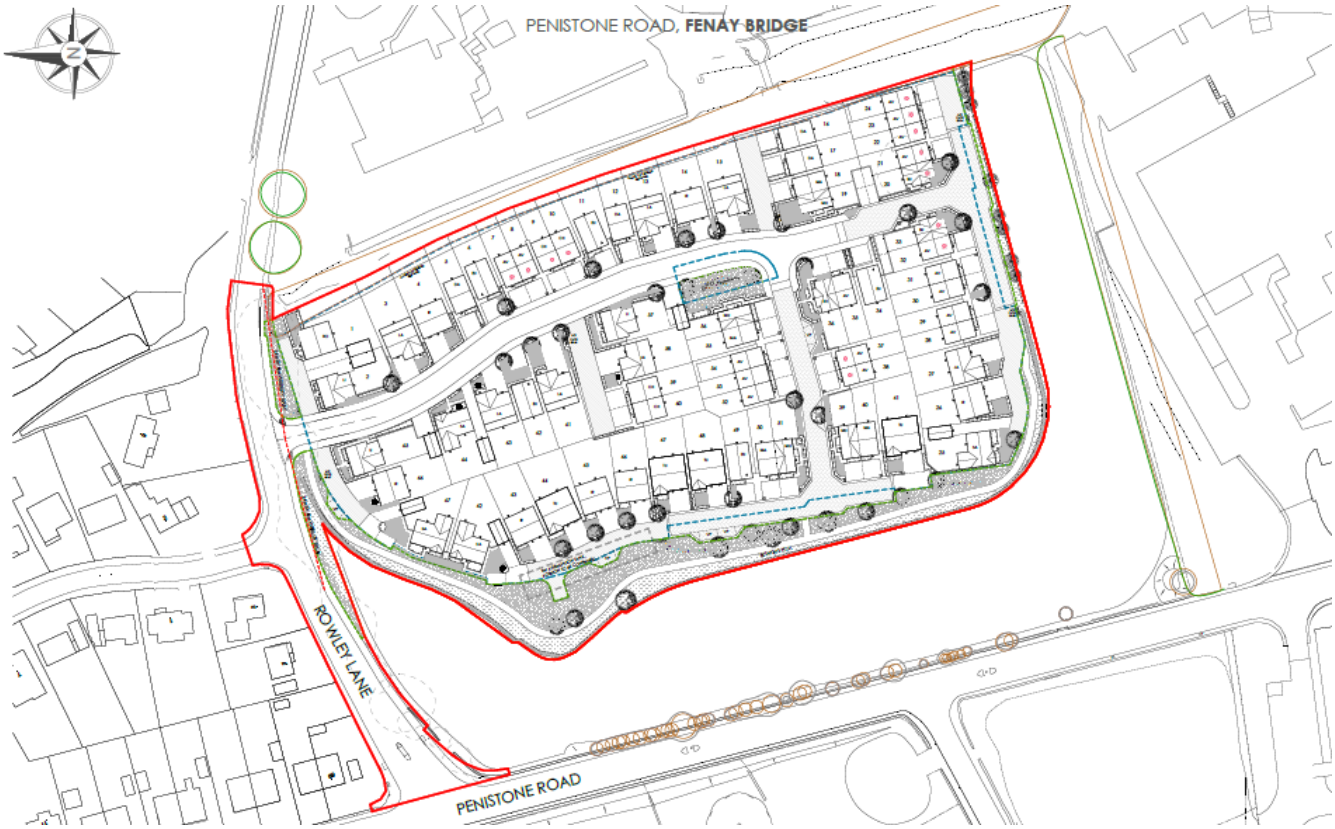


FIGURE 2 – AERIAL VIEW WITH PROPOSED NEW RESIDENTIAL SITE LAYOUT OVERLAY

APPENDIX 1 – TECHNICAL UNITS AND INDICES

a) Sound Pressure Level and the decibel (dB)

A sound wave is a small fluctuation of pressure in air. The human ear responds to these variations in pressure, producing the sensation of hearing. The ear can detect a very wide range of pressure variations. Due to the wide range of pressure variations detectable by the ear, a logarithmic scale is used to convert the values into manageable numbers. The dB (decibel) is the logarithmic unit used to describe sound (or noise) levels. The usual range of sound pressure levels is from 0 dB (threshold of hearing) to 120 dB (threshold of pain).

b) Frequency and Hertz (Hz)

Frequency is a measure of the rate of fluctuation of a sound wave. The unit used is cycles per second, or Hertz (Hz). Sometimes large frequencies are often written as kilohertz (kHz), where 1kHz = 1000Hz.

Young people with normal hearing can hear frequencies in the range 20Hz to 20kHz. However, the upper frequency limit gradually reduces as a person gets older.

As the ear hears some frequencies better than others, the A-weighting scale is used to mimic human hearing. A-weighing applies a correction to the sound level at a given frequency depending on how well the ear hears that frequency.

c) Glossary of Terms

In order to describe noise where the level is continuously varying, a number of other indices, including statistical parameters, are used. The indices used in this report are described below.

L_{Aeq} This is the A-weighted equivalent continuous sound level which is an average of the total sound energy measured over a specified time period. In other words, L_{Aeq} is the level of a continuous noise which has the same total (A-weighted) energy as the real fluctuating noise, measured over the same time period.

L_{Amax} This is the maximum A-weighted sound level that was recorded during the monitoring period.

L_{A90} This is the A-weighted sound level exceeded for 90% of the time period. L_{A90} is used as a measure of background noise.

L_{A10} This is the A-weighted sound level exceeded for 10% of the time period and is often used in the assessment of road traffic noise.

NR Measured noise levels in each octave band are compared to the NR curve reference values. The overall NR value is the lowest NR curve that has not been exceeded.

$D_{nT,w}$ Weighted standardised level difference, a single figure generated by comparing the D_{nT} with a reference curve. The reference curve is shifted in 1dB steps until the sum of adverse deviation of the test curve, compared to the reference curve, is as large as possible, but no more than 32.0 dB. The value of the shifted reference curve at 500Hz is taken as the $D_{nT,w}$. N.B. As $D_{nT,w}$ for airborne transmission represents a level difference, an improvement generates a larger figure – used in airborne tests.

R_w Similar to the $D_{nT,w}$ term, but a measure of the airborne sound insulation performance of a separating element, when tested in laboratory conditions. As such the build is essentially perfect, and has no flanking noise routes. $D_{nT,w}$ values measured onsite will always be of a significantly lower value than the R_w value for a structure.

APPENDIX 2 – ACOUSTIC MODEL PLOTS OF PREDICTED SOUND LEVEL SCENARIOS

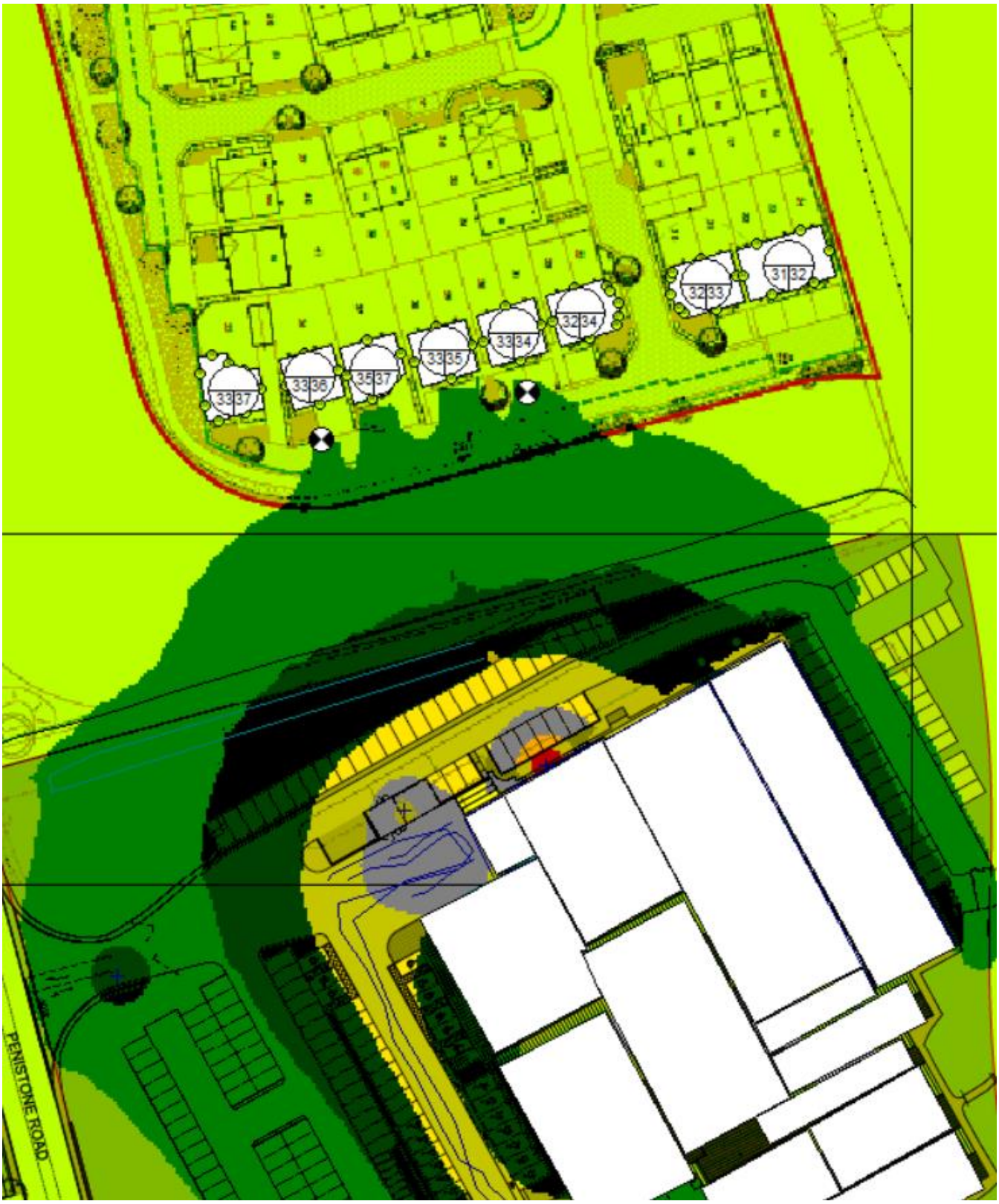
The model plots presented below show dB L_{Aeq} levels plotted at 1.5m height and 4.0m height above local ground level for different scenarios. All colour contour plots show the predicted daytime sound levels. The circles at each residential receptor show the calculated sound levels for that receptor, with the lefthand value in each circle being the daytime (0700-2300 hours) level, and the righthand value in each circle being the nighttime (2300-0700 hours) level.

Scenario A: Existing buildings with existing operation – 4.0m plot height

Scenario A: Zoomed-in view of sound levels at nearest new dwellings – 1.5m plot height

Scenario A: Zoomed-in view of sound levels at nearest new dwellings – 4.0m plot height

Scenario B: Proposed building extensions with existing operation – 4.0m plot height

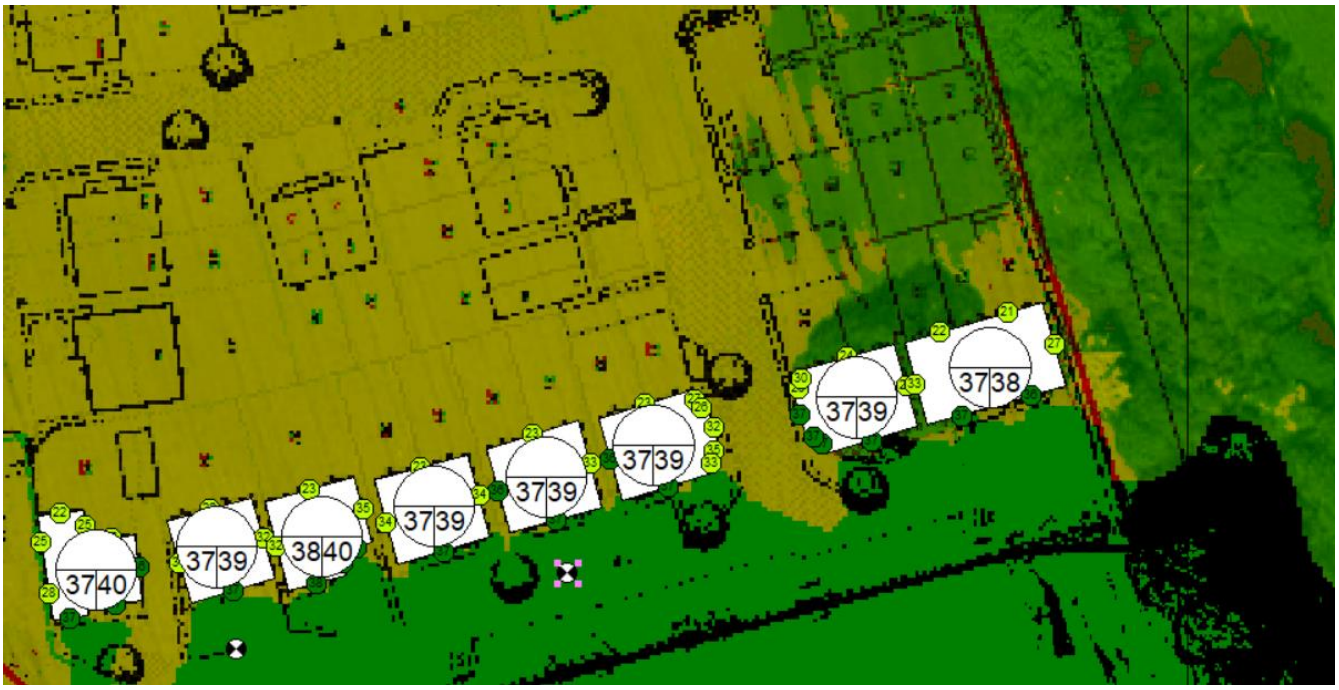


Scenario B: Zoomed-in view of sound levels at nearest new dwellings – 1.5m plot height

Scenario B: Zoomed-in view of sound levels at nearest new dwellings – 4.0m plot height

Scenario C: Existing buildings with potential future expanded operations – 4.0m plot height

Scenario C: Zoomed-in view of sound levels at nearest new dwellings – 1.5m plot height

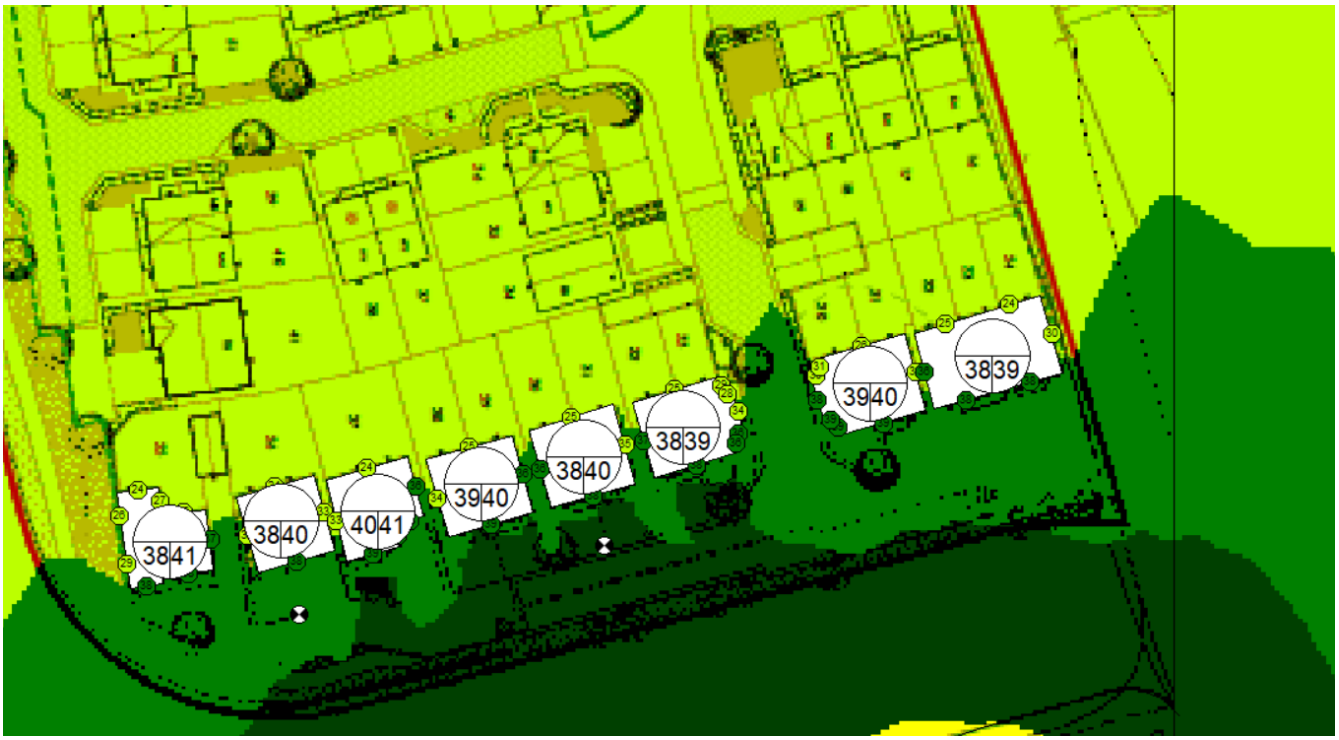


Scenario C: Zoomed-in view of sound levels at nearest new dwellings – 4.0m plot height

Scenario D: Proposed building extensions with potential future expanded operations – 4.0m plot height

Scenario D: Zoomed-in view of sound levels at nearest new dwellings – 1.5m plot height

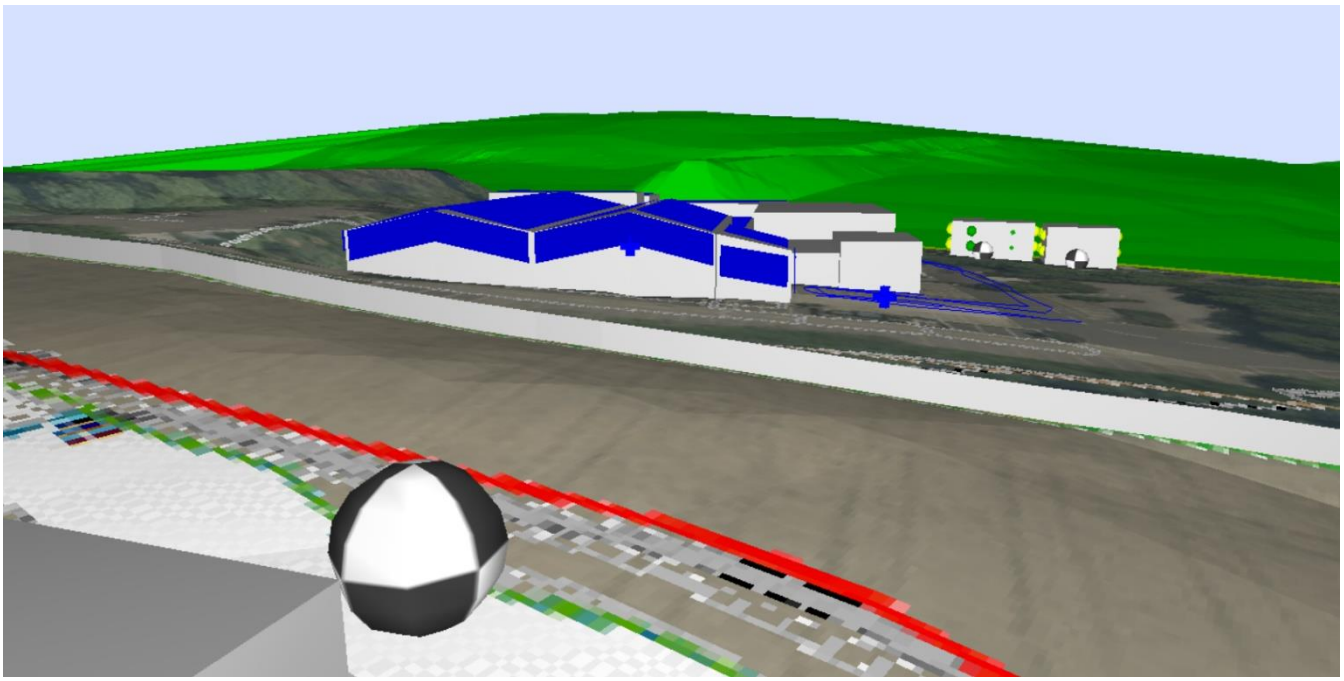
Scenario D: Zoomed-in view of sound levels at nearest new dwellings – 4.0m plot height



Source sound level data assumed in CadnaA acoustic model

Name	ID	Type	Oktave Spectrum (dB)											
			Weight.	31.5	63	125	250	500	1000	2000	4000	8000	A	lin
extract	extract	Lw (c)			79.5	75.0	71.9	70.1	72.8	69.9	65.7	58.0	76.5	82.5
fork lift	forklift1	Lw (c)		17.0	78.0	76.0	78.6	83.3	79.3	81.7	73.2	67.5	86.3	88.1
gate	gate	Lw (c)		11.0	69.2	65.0	66.2	66.6	71.0	76.1	73.4	51.3	79.9	79.8
fork reverse	forkreverse	Lw (c)		17.0	74.8	69.8	68.3	70.9	71.6	82.9	87.5	55.7	90.0	89.2
workshop	workshop	Li		0.0	73.0	75.0	72.0	71.0	71.0	69.0	69.0	0.0	76.2	80.4
skip	skip	Lw (c)		11.0	81.3	90.6	92.1	89.4	88.2	86.0	82.1	74.9	93.2	97.0
forge	forge	Li		0.0	80.6	85.8	86.2	86.2	82.3	82.7	80.8	78.2	89.5	92.7
chp	chp	Lw (c)		-2.0	63.0	66.0	66.0	58.0	56.0	56.0	56.0	56.0	64.3	70.8
toolroom	toolroom	Li		0.0	58.0	62.2	65.4	68.2	66.0	62.6	56.3	52.1	70.3	72.7

3D model view 1: Existing sound sources (Scenario A) and boundary fence line



3D model view 2: Extension sound sources (Scenario D) and boundary fence line