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Proposed Residential Development, Mill Green Road, Pinchbeck, PE11 3PU

Noise Assessment Report

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On behalf of
D Brown Building Contractors Ltd

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1.0 INTRODUCTION

1.1 Blue Tree Acoustics has been appointed by D Brown Building Contractors Ltd to carry out a noise assessment for a new residential development on land off Mill Green Road, Pinchbeck.

1.2 The development site is situated to the east of Mill Green Road. The site is currently in use as a nursery consisting of greenhouses, poly tunnels, a field, and 2no residential plots.

1.3 The site is to the west of a railway line serving the East Midlands, connecting Spalding to Sleaford.

1.4 The surrounding area is a mix of residential use, commercial use, and farmland, including Haughton Produce and Anglia UK Debt Management to the southwest of the site on Mill Green Road. There is also Highfield Kennels 200m northwest of the site along High Fields Lane.

1.5 This report has been updated from our previously issued version (report ref. 02828-110101, dated 06/04/2017) to consider the currently proposed site layout plan indicated in Figure 2. The development proposal is for 100 dwellings, to include a mixture of bungalows and 2-storey houses, with a new access road joining Mill Green Road at the northern end of the site.

1.6 The noise impact assessment has included:

i) Inspection of the site and surroundings.

ii) Noise monitoring surveys undertaken at locations on the site during daytime and nighttime.

iii) Evaluation of the site in accordance with relevant planning policy guidance.

iv) Consideration of noise control measures required to maintain acceptable noise levels within the proposed bedrooms and living rooms in accordance with *British Standard 8233: 2014, 'Guidance on sound insulation and noise reduction for buildings'* (BS8233).

2.0 EXISTING NOISE SOURCES

Road

2.1 Road traffic movements on Mill Green Road and the junction to High Fields Lane are audible at times on the development site. Road traffic noise is sporadic, but is the dominant noise source to the northwest side of the site.

Rail Noise

2.2 The railway line passing the site is the primary source of noise as experienced on the eastern side of the development site. The railway serves the East Midlands, connecting Spalding to Sleaford. The line is relatively busy, with both passenger and freight train movements passing the site. Passing trains are less frequent during nighttime hours and service stops on Sunday.

Commercial/Industrial Premises

2.3 There are some commercial premises in the vicinity of the development site, including Haughton Produce and Anglia UK Debt Management to the southwest of the site on Mill Green Road. There is also Highfield Kennels 200m northwest of the site along High Fields Lane. Noise produced by these commercial premises has negligible effect upon the development site, and therefore has no significant effect on the assessment.

3.0 NOISE SURVEY

3.1 Noise monitoring was undertaken by Blue Tree Acoustics in order to determine the existing ambient noise climate at the site. Measurements were taken during representative daytime and nighttime survey periods, such that 3 days' worth of data was collected.

3.2 Noise surveys were undertaken at the site in the afternoon on Friday 05/08/2016 and through to the early evening of Monday 08/08/2016.

3.3 Attended logging noise measurements were taken at various positions around the development site, as indicated in Figure 1 on Monday 08/08/2016.

3.4 The instrumentation used for the surveys was 2no Rion NL-32 sound level meters, 1no Rion NA-28 sound level meter, and 1no Svan 971 sound level meter. Each of these instruments is a Type 1/Class 1 Integrating Sound Level Meter. Each meter was within a valid period of laboratory calibration. A proprietary environmental windshield was fitted to the microphone in each case, and measurements were made with the meter mounted on a tripod at approximately 1.5m from local ground level. Calibration checks were carried out both before and after the measurements, with no variance observed.

3.5 Weather conditions were dry and calm between Friday 05/08/2016 and Monday 08/08/2016, with some wind on Sunday 07/08/2016. All data results affected by wind have been excluded from the present report. Weather data from a nearby weather station is shown in Appendix III.

3.6 The noise measurement results are detailed in Appendix II. Table 1 below sets out the averaged noise levels at measurement Location 1, Location 2, Location 3, and Location 4. Data was measured at Location 1 and Location 4 continuously over 4 days between Friday 05/08/2016 and Monday 08/08/2016. Data was measured at Location 2 and Location 3 in 15-minute measurements on a rotational basis during the afternoon of Monday 08/08/2016.

Table 1: Daytime and nighttime ambient noise levels

Location	Average dB L_{Aeq}
Location 1, Road side Daytime	49
Location 2 Daytime	41
Location 3 Daytime	42
Location 4, Railway side Daytime	59
Location 1 Nighttime	43
Location 4 Nighttime	60

3.7 As can be seen above, typical existing noise levels at edge of the site facing the railway at Location 4 are 59dB $L_{Aeq(16\ hours)}$ between 0700-2300 hours, 60dB $L_{Aeq(8\ hours)}$ between 2300-0700 hours. There is little difference between day and nighttime levels as passing trains are the dominant noise source and these occur during day and night periods. Measured L_{Amax} noise levels during the nighttime at Location 4 broadly ranged between 55-95dB L_{Amax}. All trains stopped running during the early evening of Saturday 06/08/2016, and resumed on Monday 08/08/2016. The first passenger train is at approximately at 0650 hours, with the last train approximately at 1700 hours. Freight trains can run sporadically with some cancellations and no set timetable, and are not present on Sundays. Measured noise levels at all other locations are relatively low. Location 1 and Location 4 are existing residential gardens.

3.8 Some data has been excluded due to adverse weather conditions on Sunday 7th August. However, this does not significantly affect the assessment and sufficient data has been collected during the Friday, Saturday, and Monday survey periods to enable suitable assessment.

3.9 Data for trains passing Pinchbeck typically show 8no freight movements in the day (0700-2300 hours) and 8no freight movements at night (2300–0700 hours). Passenger train movements are shown as being 16no in the day and 1no at night. These figures tally with scheduled train times passing through the area. The freight movements in the day can vary depending on the weekly schedule and cancellations.

4.0 NOISE ASSESSMENT

4.1 The National Planning Policy Framework came into force in 2012. This document replaced a great many planning guidance documents that previously informed the planning system in England. The new framework states that:

The planning system should contribute to and enhance the natural and local environment by:

- *protecting and enhancing valued landscapes, geological conservation interests and soils;*
- *recognising the wider benefits of ecosystem services;*
- *minimising impacts on biodiversity and providing net gains in biodiversity where possible, contributing to the Government's commitment to halt the overall decline in biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures;*
- *preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability;*

  and

- *remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.*

Planning policies and decisions should aim to:

- *avoid noise from giving rise to significant adverse impacts[27] on health and quality of life as a result of new development;*
- *mitigate and reduce to a minimum other adverse impacts[27] on health and quality of life arising from noise from new development, including through the use of conditions;*
- *recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established;[28]*

  and

- *identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.*

[27] *See Explanatory Note to the Noise Policy Statement for England (Department for the Environment, Food and Rural Affairs).*

[28] *Subject to the provisions of the Environmental Protection Act 1990 and other relevant law.*

4.2 In addition, the Noise Policy Statement for England (NPSE) 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.

4.3 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.

4.4 Unfortunately, the above guidance gives no objective, tangible standards or criteria that enable planning decisions to be made. In the absence of such guidance, quantification of noise impact in terms of guidance such as BS8233, which presents noise limits and criteria based on World Health Organisation recommendations, 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 and NPSE. Therefore, if a site meets the recommendations of BS8233 and any associated Local Authority noise requirements, it can be considered as being below the level where there is no detectable adverse effect on health and quality of life due to noise, and this meets the NOEL (No Observed Effect Level) set out in the NPSE.

4.5 *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.

4.6 BS8233:2014 provides guidance regarding indoor ambient noise criteria for residential accommodation, as presented below.

Table 2: BS8233:2014 Guidance Criteria for Indoor Ambient Noise Levels

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

4.7 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.

4.8 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.

4.9 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."

4.10 The following general noise mitigation advice is based on achieving the BS8233:2014 indoor noise level criteria to ensure a suitable level of protection for the future occupants of the development. Noise ingress calculations have been carried out in accordance with BS8233:2014. To provide additional protection from train noise, calculations have been undertaken to limit noise ingress to 50dB L_{Amax} within bedrooms. Calculations are based on the typical noise events occurring at the site; however, it must be acknowledged that there will always remain potential for atypical events, such as emergency sirens, police/ambulance helicopter, etc., that could result in L_{Amax} noise levels exceeding 50dB within bedrooms.

5.0 NOISE MITIGATION MEASURES

5.1 There are a variety of proportionate and reasonable techniques that could be introduced to mitigate the effects of noise, such as:

- **Engineering:** reduction of noise at source (e.g. use of quiet machinery and working methods), containment of generated noise, and protection of noise-sensitive buildings (e.g. by sound insulation and/or screening them by purpose-built barriers);
- **Layout:** adequate distance between source and noise-sensitive building; screening by natural barriers, other buildings or non-critical rooms in a building;
- **Administrative:** limiting operating time of source, restricting activities on site, specifying an acceptable noise limit.

5.2 Ambient noise levels across the site are generally of relatively low magnitude, i.e. ranging between 41-59dB L_{Aeq} during daytime and 43-60dB L_{Aeq} at night. The greatest noise levels are measured at the positions closest to the eastern boundary with the nearby railway. Rail noise is therefore dominant along the eastern edge of the site and the building envelope of dwellings nearest to the railway will require enhanced specification in order to reduce noise levels sufficiently.

Dwelling Protection

5.3 It is beneficial to consider noise impact in the design of the internal layout of the new dwellings. In this case, consideration should be given to positioning bedrooms to the north-facing elevations such that they are less exposed to any potential noise from the nearby railway.

5.4 The measured 59dB L_{Aeq} daytime noise level is above the desirable 55dB L_{Aeq} limit for garden areas defined in BS8233, and therefore a noise barrier is recommended in order to reduce levels by a minimum of 4dB(A). This shall be achieved by providing a 2m high barrier along the eastern site boundary with the railway, as indicated in Markup 1 below. A barrier of that height is predicted to provide at least 4dB(A) sound reduction, and therefore will enable gardens to be sufficiently shielded from rail traffic noise.

5.5 The acoustic barrier can be constructed from any material as long as it creates an unbroken, airtight/impervious barrier in the approximate position shown. Barriers could be constructed of earth bund, brick, block or weather-treated timber (or ply) of at least 15mm minimum thickness. Timber fence joints must be tight-butted with timber cover strips or tongue and groove boards

used to ensure there are no air gaps. Gravel boards shall be used to close the gap at the base of timber fencing.

5.6 The design of the building envelope of the new dwellings shall incorporate suitable sound insulation to satisfy the internal noise criteria set out above. Noise ingress calculations have been carried out in accordance with BS8233:2014 in order to determine appropriate sound insulation measures to satisfy the acoustic criteria set out above. The calculations are based on the measured sound levels at the site and architectural plans provided for the proposed house types shown in Figure 2. Based on the noise ingress calculations, the following sound insulation measures are recommended.

5.7 A traditional pitched tile/slate construction should provide suitable sound insulation. Ceilings in bedrooms or habitable rooms immediately below the roofspace should comprise minimum 2 layers of solid gypsum-based board (total minimum mass per unit area 20kg/m^2), overlaid with mineral fibre insulation of minimum 200mm thickness. Any flat roof constructions should be of suitably dense construction, with ceilings to rooms below comprising a minimum of 2 layers of solid gypsum-based board as described above.

5.8 External walls should be of cavity masonry construction, or inner timber frame with an external masonry leaf. If any lightweight framed sections of outer wall are proposed within the dwellings, these should be designed to achieve acoustic performance comparable to a masonry construction; typically, this will require inclusion of suitable mass layers within the wall build-up. Similarly, any opaque windows or spandrel panels will require a suitable boxing behind, e.g. comprising 2no layer 15mm SoundBloc plasterboard and fully filled with mineral wool insulation.

5.9 Assuming suitable barriers are provided as above in order to reduce daytime noise levels to no more than 55dB L_{Aeq}, then no enhanced noise mitigation measures are required for ground floor living rooms and dining rooms in order to meet the BS8233 internal noise criteria, e.g. standard double glazing of minimum 6mm glass / 12mm cavity / 6mm glass (minimum sound insulation performance 33dB R_w), with passive trickle vent of minimum 30dB $D_{n,e,w}$ sound insulation performance.

5.10 Our calculations indicate that enhanced acoustic glazing and ventilation specification is required for bedrooms, depending on the precise location of the dwellings, in order that BS8233 internal noise levels can be met. The L_{Amax} criterion is the most onerous criterion for the bedrooms, and this is the dictating factor in the acoustic specification for these rooms.

5.11 Glazing acoustic performance specifications are given in the following table, based on acoustic data used in the BS8233 noise ingress calculations. We recommend that the following be used in all noise-sensitive rooms throughout the development.

Table 3: Glazing Minimum Octave Band Sound Reduction

Glazing Configuration	Octave Band Minimum Sound Reduction Indices (dB)						
	63	125	250	500	1k	2k	4k
Double-glazed outer comprising minimum 10mm glass / minimum 12mm airgap / 6mm glass with inner secondary 6mm glass in separate frame with minimum 100mm void between frames (nominal R_w 56dB)	26	35	46	55	60	60	65
10mm glass / 12mm airgap / 6.8mm acoustic laminate glass (nominal R_w 40dB)	22	27	28	36	45	53	59
6mm glass / 12mm airgap / 6mm glass (nominal R_w 33dB)	20	24	22	29	38	33	38

5.12 The following table summarises suitable example glazing and ventilator configurations for the marked building facade areas shown in Markup 1 below.

Table 4: Recommended Bedroom Glazing & Ventilation Specification

Facade	Glazing Configuration	Ventilator Type
▬▬▬	Double-glazed outer comprising minimum 10mm glass / minimum 12mm airgap / 6mm glass with inner secondary 6mm glass in separate frame with minimum 100mm void between frames	Acoustic ventilator minimum 55dB $D_{n,e,w}$
▬▬▬	Double-glazing comprising minimum 10mm glass / minimum 12mm airgap / 6.8mm acoustic laminate glass	Acoustic ventilator minimum 44dB $D_{n,e,w}$
Unmarked	Double-glazing comprising minimum 6mm glass / minimum 12mm airgap / 6mm glass	Acoustic ventilator minimum 30dB $D_{n,e,w}$

5.13 Examples of acoustic ventilators capable of minimum 55dB $D_{n,e,w}$ performance are Greenwood MA3051 or Titon Sonair F+. Examples of acoustic ventilators capable of minimum 44dB $D_{n,e,w}$ performance are Simon Largo 20, Greenwood EHA574, or Titon V75 with C75 canopy. Alternatively, to avoid penetrations of the external building façade, a 'whole house'/MEV

ventilation system or mechanical ventilation could be provided to each dwelling. Such a system should be designed such that there are no external wall terminations exposed to habitable rooms, and any external terminations should be positioned such that they are shielded from the rail noise, e.g. on west-facing elevations.

5.14 The following markup shows the bedroom glazing and ventilator facade requirements around the development in order to achieve suitable sound insulation. Bedrooms at 1st floor level in these house plots will be more exposed to the railway than the ground floor level bedrooms in the bungalows, and therefore these house plots require a greater acoustic specification. The dashed green line in Markup 1 indicates the positioning of the acoustic barrier along the site boundary.

Markup 1: Bedroom Glazing & Ventilation Requirements



5.15 It is the case that the required specifications are reduced where dwellings are more remote from the railway line, e.g. toward the western and southern sections of the site where measured noise levels are notably less, or with bedrooms facing away from the railway line. As well as increasing distance attenuation, new dwellings located toward the western boundary of the development site will experience additional scattering and shielding of train noise provided by the intervening new house plots.

5.16 Glazing and ventilators to non-habitable rooms or spaces do not require special acoustic measures, and these spaces may have standard trickle ventilation. (For the purposes of noise assessment, separate kitchens, bathrooms, WCs, etc., are considered as non-habitable spaces.)

5.17 Equivalent acoustic performance may be achieved by other materials or products, but acoustic performance data for all proposed systems should be checked by a competent acoustic consultant in order to ensure adequate acoustic performance will be achieved.

5.18 It should be acknowledged that careful design and close attention to detail, along with high standards of site supervision and workmanship, are essential in achieving the required acoustic performance, particularly in relation to controlling flanking sound transmission paths, air gaps, and use of suitable materials. Therefore, effective work management plans will be needed to ensure all contractors and tradesmen are aware of the acoustic performance requirements and details to ensure works are implemented to the necessary standard.

5.19 All recommendations given above are for acoustic purposes only. Any other requirements, such as structural, thermal, fire safety, etc., should be checked by suitably qualified specialists.

6.0 SUMMARY AND CONCLUSIONS

6.1 A noise assessment has been carried out on behalf of D Brown Building Contractors Ltd for a new residential development on land off Mill Green Road, Pinchbeck.

6.2 The assessment has included measurements of the prevailing ambient noise levels at the site during representative daytime and nighttime periods. Rail and road traffic noise were found to be the dominant noise sources at the development site.

6.3 Calculations indicate that the stated BS8233 noise criteria can be met with high specification ventilation and glazing being provided to dwellings most exposed to the railway noise. A 2m high acoustic barrier along the eastern site boundary shall also be provided to reduce the railway noise impact.

6.4 The site is considered suitable for residential development in planning and noise terms, as acceptable noise levels in accordance with BS8233:2014 can be achieved following the design and implementation of suitable noise mitigation measures.

6.5 The above conclusions are also corroborated somewhat by the fact that there are existing residential properties in the immediate vicinity that will experience broadly the same degree of noise exposure as at the development site.

6.6 In addition, the assessment has been undertaken in accordance with the *National Planning Policy Framework* (NPPF) and the *Noise Policy Statement for England* (NPSE). Appropriate noise assessment and design targets for internal noise levels have been used to quantify noise impact and determine suitability for residential development with due regard to effects on health and quality of life as set out in the NPSE. On this basis, we consider that the noise assessment methodology and conclusions meet the principles set out in the NPPF and NPSE.

FIGURE 1 – SITE AERIAL VIEW AND APPROXIMATE NOISE MONITORING LOCATIONS

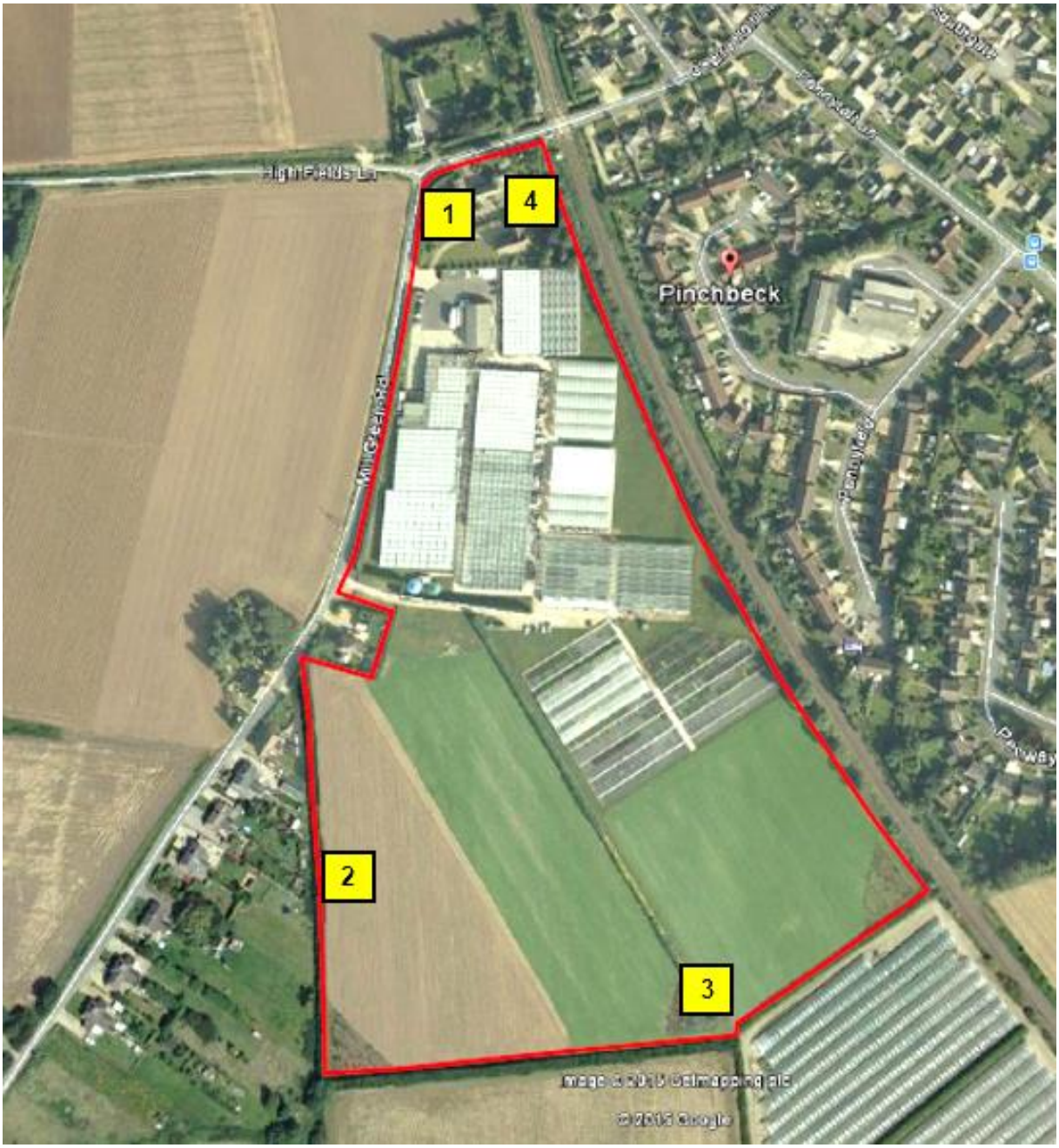


FIGURE 2 – PROPOSED DEVELOPMENT PLAN



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APPENDIX I – NOISE 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.

SEL This is the Single Event Level or Sound Exposure Level. The SEL is the total energy measured over the event, compressed into 1 second. SEL= L_{Aeq}+10log(t), where t is time in

seconds. Also L_{Aeq} = SEL - 10log(t) + 10log(n) where t is time in seconds and n is the number of events in the time period.

R_w A measure of the airborne sound insulation performance of a separating element, when tested in laboratory conditions.

APPENDIX II – NOISE SURVEY DATA

Chart 1: Location 1 – Northwestern edge of Development Site Facing Mill Green Road

Rion NL-32 sound level meter, all values dB(A), 15-minute duration

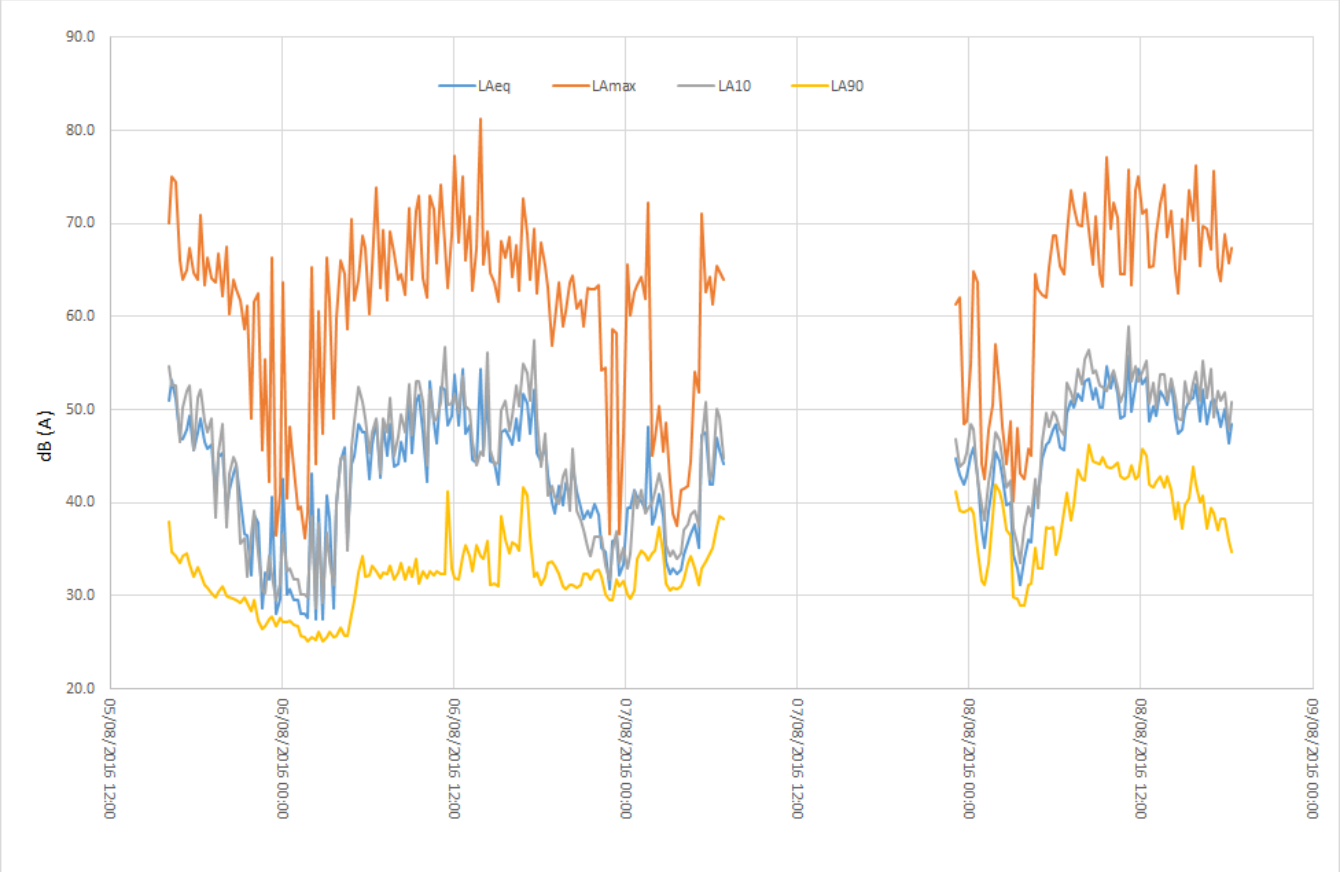
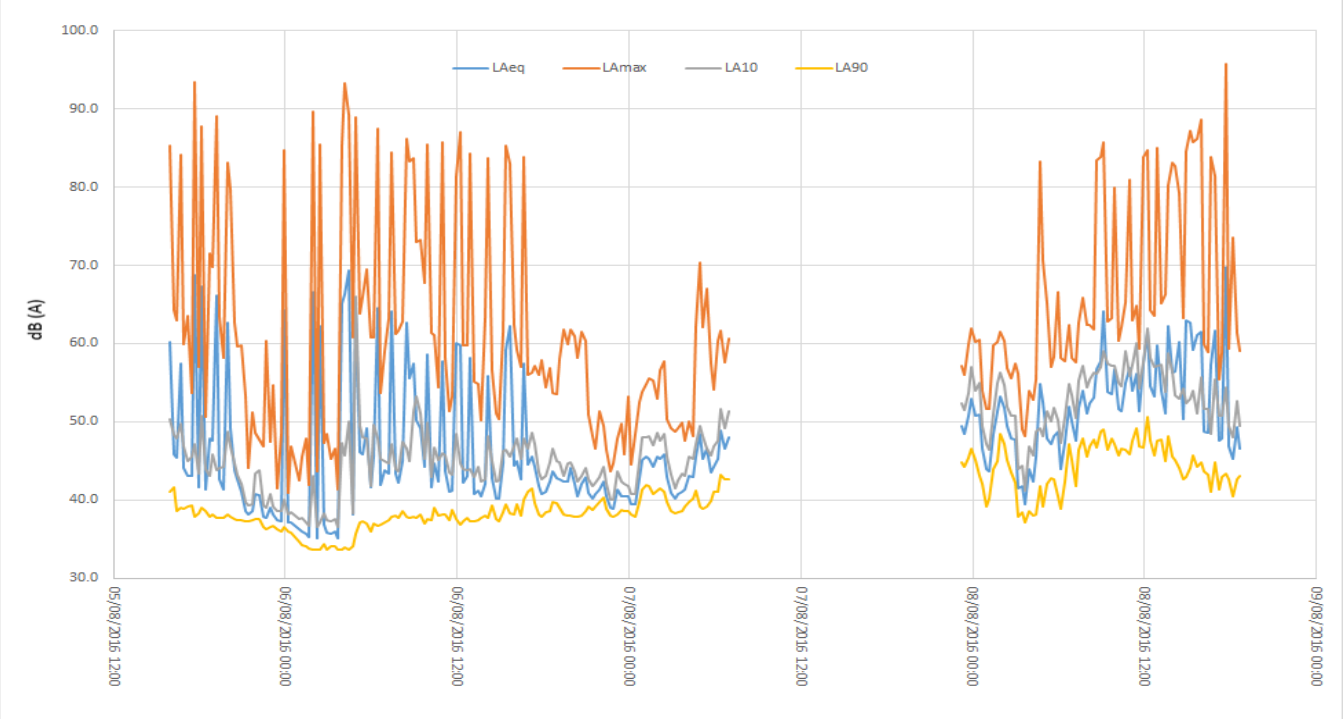


Chart 2: Location 4 – Northeastern edge of Development Site Facing Railway

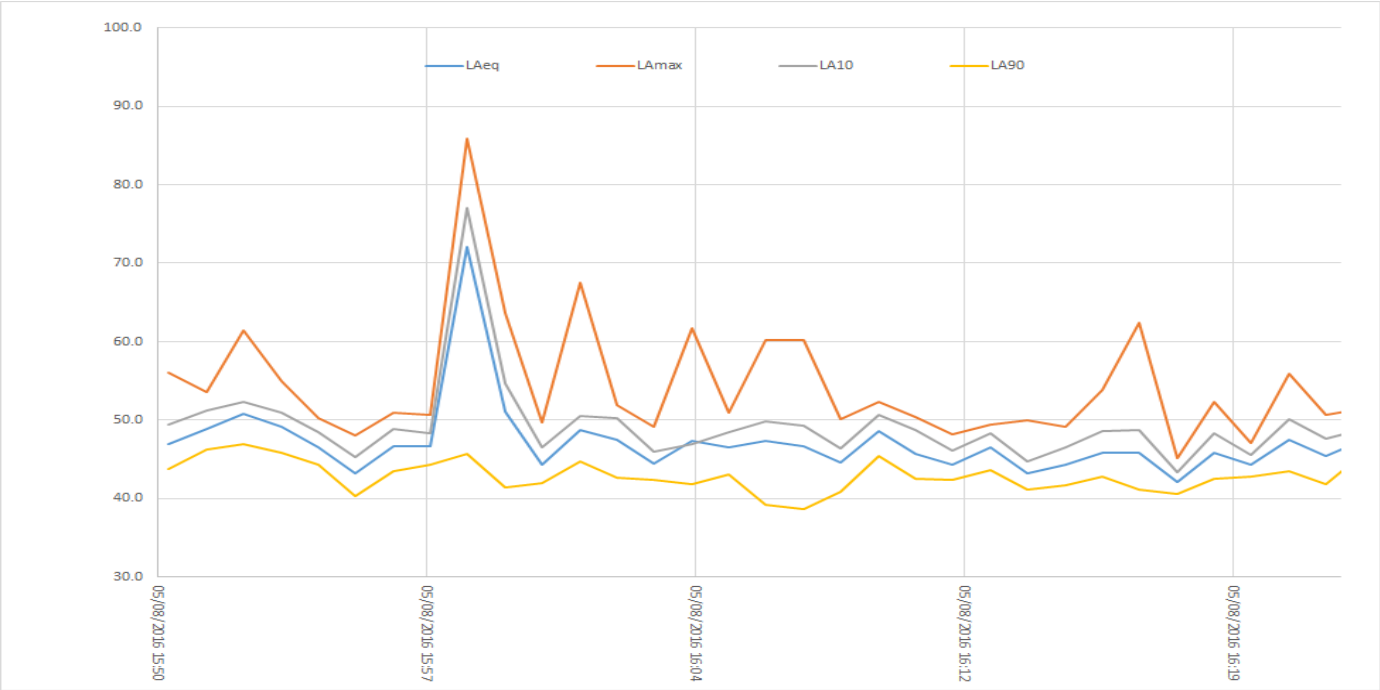
Rion NL-32 sound level meter, all values dB(A), 15-minute duration



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Chart 3: Location 4 – Northeastern edge of Development Site Facing Railway

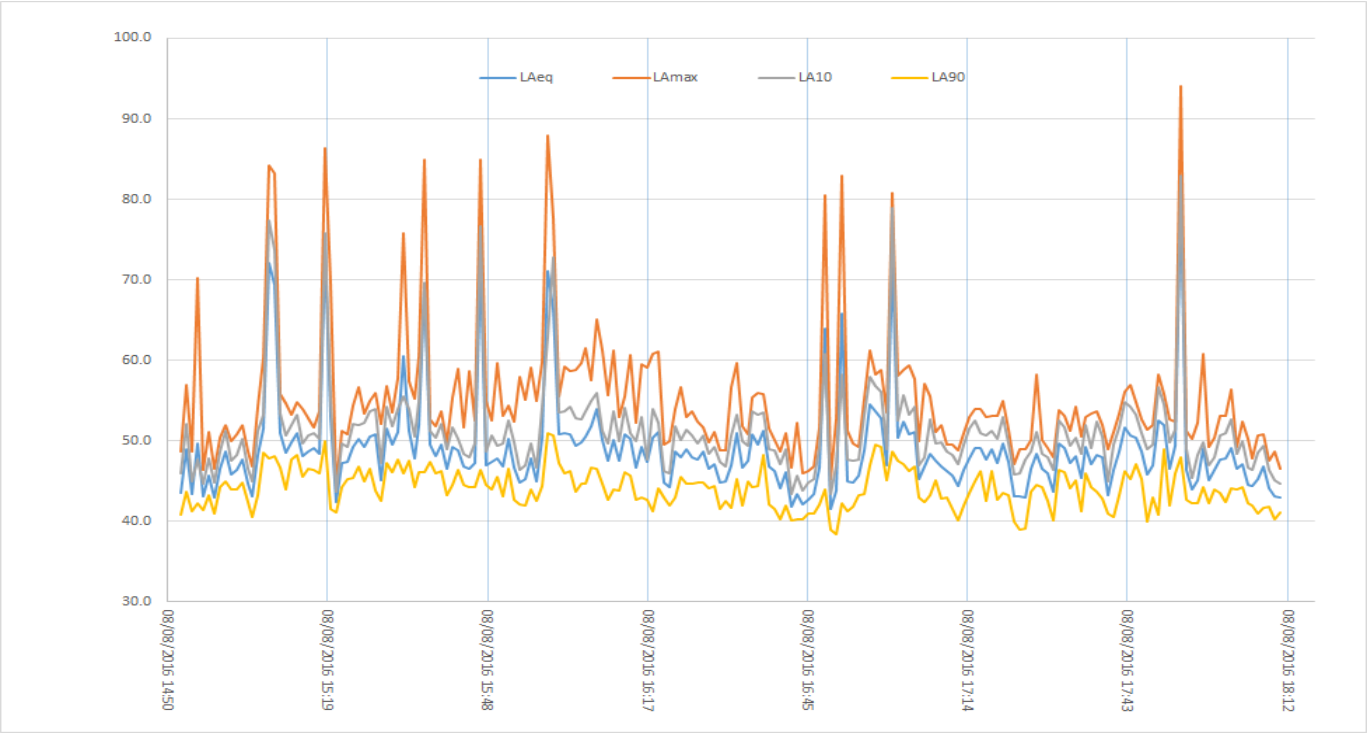
Rion NA-28 sound level meter, all values dB(A), 1-minute duration



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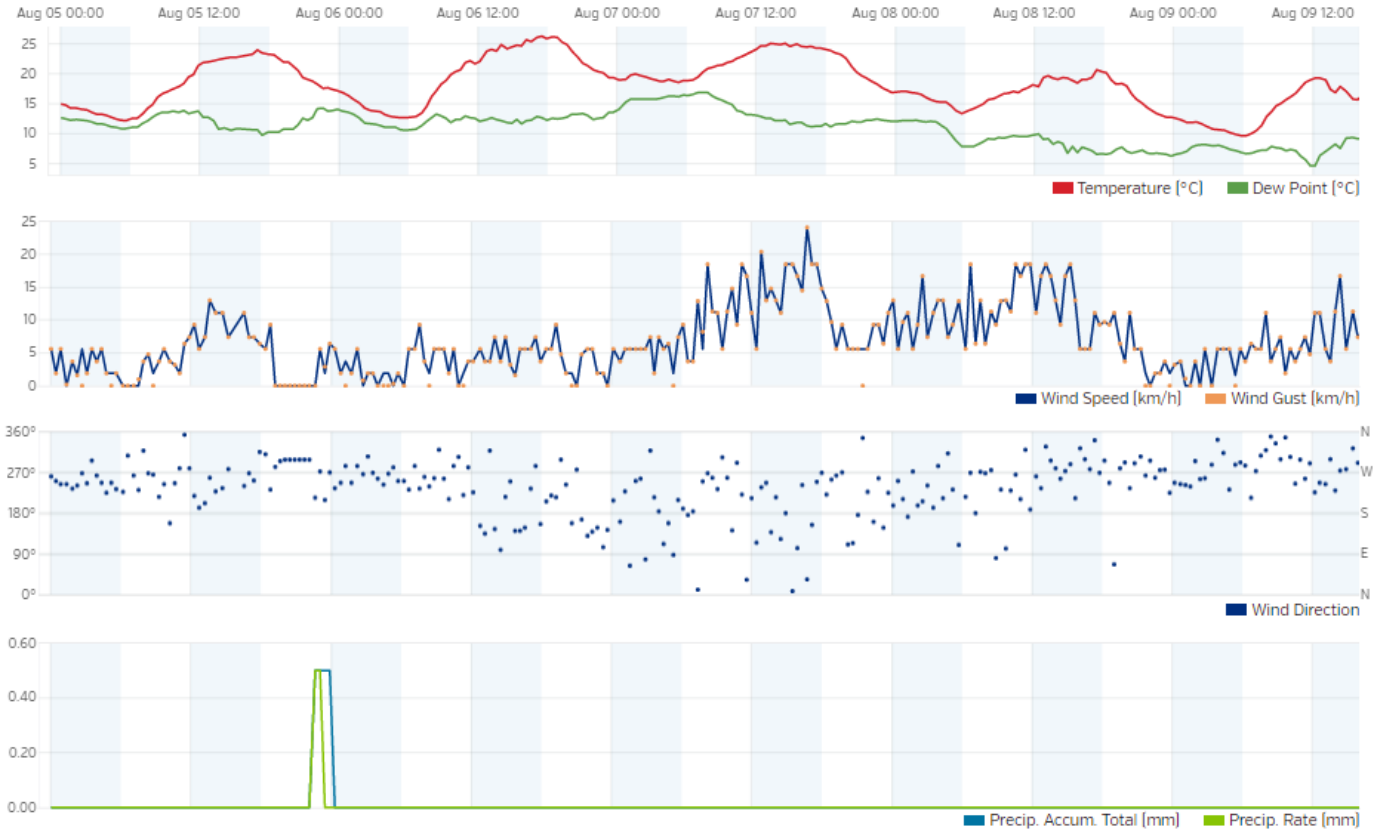
Chart 4: Location 4 – Northeastern edge of Development Site Facing Railway

Svan 971 sound level meter, all values dB(A), 1-minute duration



APPENDIX III – WEATHER DATA

Archival weather data from a weather station in Spalding between Friday 05/08/2016 and Tuesday 09/08/2016.



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