

REPORT TITLE:

Former Bellmore Allotments, Hayes, UB40EJ - Noise Survey and Assessment Report

CLIENT DETAILS:

Hillingdon Council

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Document Status and Revision Schedule

Issue/Revision	Description/Comments	Date	Prepared by	Approved by
-	Checked & Authorised	30/11/17	MJ	JCB
A	Updated report with latest info	20/12/18	JCB	MJ

1. Executive Summary

The prevalent noise levels at the former Bellmore Allotments site, Hayes have been measured over a typical weekday and weekend period to assess the impact of the existing noise sources. The potential noise effects of the proposed development on surrounding areas are also considered.

The site is currently a vacant green field site surrounded on south east and west sides by existing residential dwellings. To the north is further open field land.



The site is affected by road traffic noise from the A312 and A4020, with input of school activity from Grange Park School which is close by to the west.

It is considered that using guidelines from the World Health Organisation alongside levels provided in BS8233 and ProPG for noise conditions within dwellings will ensure that 'significant adverse impacts on health and quality of life' are avoided as required by the Noise Policy Statement for England.

Consequently, an adequate level of noise mitigation measures will be required to ensure that future residents of the site are protected from the existing ambient noise. Specifications are given for the building envelope in relation to wall, glazing, roof and background ventilation measures.

If mitigation measures are included to achieve the specified internal noise levels, future residents of the proposed development will be protected from the dominant noise sources. Mitigation measures should include the use of appropriate acoustic glazing coupled with acoustically rated background ventilation.

2. Introduction

Pace Consult was commissioned by Baily Garner and Hillingdon Council to undertake an assessment of the noise impacts associated with the proposed development of the former Bellmore allotments site, Hayes.

There is a potential for road traffic noise to have an impact on the proposal. Therefore, the impact of the existing noise levels has been considered in assessing the site's suitability for residential use. It should be noted that the site is currently surrounded by residential dwellings.

The assessment was undertaken in accordance with national standards and guidelines for residential dwellings.

3. The Site

3.1 Location and Description

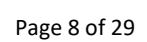
The site is positioned away from major traffic routes. The main road traffic noise source affecting MP1 apart from sporadic local traffic is a more distant contribution from the relatively busy A312 to the north and east. The site is shown below



3.2 Proposed Development

The proposal is to construct 111 dwellings on the site in apartments over 5 blocks. The proposed site layout is shown overleaf.

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4. Assessment Methodology

National Planning Policy Framework

The National Planning Policy Framework (NPPF) 2018 sets out the general requirements for gaining planning permission. Comments regarding noise found within the document are as follows.

S15. Para 170

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.

S15. Para 180

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

- a) mitigate and reduce to a minimum potential adverse impact resulting from noise from the new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;
- b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and

See Explanatory Note to the Noise Policy Statement for England (Department for Environment, Food & Rural Affairs, 2010).

Noise Policy Statement for England

The NPPF references the Noise Policy Statement for England (NPSE) which in turn references two concepts used by the World Health Organisation (WHO) which can be used to ascertain relevant noise levels for individual sites. The concepts are LOAEL (Lowest Observed Adverse Effect Level) and SOAEL (Significant Observed Adverse Effect Level). The NPPF then gives three aims to adhere to:

Aim 1 – 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.

Aim 2 – Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy of sustainable development.

Aim 3 – 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.

To avoid 'significant adverse impacts on health and quality of life', by creating a situation where the impact of noise lies below the SOAEL we will refer to BS8233BS, World Health Organisation (WHO) 'Guidelines for Community Noise', and 4142: 2014 'Methods for rating and assessing industrial and commercial sound'.

British Standard BS8233:2014– Sound Insulation and Noise Reduction for Buildings – Code of Practice

The scope of BS8233 is the provision of recommendations for the control of noise in and around buildings. It suggests appropriate criteria and limits for different situations, which are primarily intended to guide the design of new or refurbished buildings undergoing a change of use rather than to assess the effect of changes in the external noise climate.

BS8233 suggests suitable internal noise levels within different types of buildings, including residential dwellings. It suggests an internal noise level of 35 dB $L_{Aeq,T}$ during day time, and 30 dB $L_{Aeq,T}$ during night time within bedrooms. In the daytime, the standard recommends 35 dB $L_{Aeq,T}$ in living rooms and in 40 dB $L_{Aeq,T}$ dining rooms. Table 4 below is extracted from this document.

Table 4 Indoor ambient noise levels for dwellings

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

World Health Organisation (WHO) 'Guidelines for Community Noise'

This document states that, in dwellings, the critical effects of noise are on sleep, annoyance and speech interference. According to this document, to protect the majority of people from being seriously annoyed during the daytime, the sound pressure level on balconies, terraces and outdoor living areas should not exceed 55 dB L_{Aeq} for a steady, continuous noise. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound pressure level should not exceed 50 dB L_{Aeq} . To avoid any possibility of sleep disturbance, indoor guideline values for bedrooms are 30 dB L_{Aeq} for continuous noise and 45 dB L_{Amax} for single sound events. These indoor noise levels correspond to sound pressure levels at the outside façades of the living spaces of 45 dB L_{Aeq} and 60 dB L_{Amax} . These values have been obtained by assuming that the noise reduction from outside to inside with the window partly open is 15 dB.

BS4142:2014 Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas

BS4142 has recently been revised and the 1997 edition has been replaced. The standard sets out a methodology for the assessment of whether noise from factories, industrial premises or fixed installations and sources of an industrial/commercial nature.

The procedure contained in BS4142 for assessing the likelihood of complaints is to compare the measured or predicted noise level from the source in question, the 'specific noise level', at the assessment position with the correct background noise level for the worst case time of operation.

Where the noise contains a 'distinguishable, discreet, continuous note (whine, hiss, screech, hum etc.) or if there are distinct impulses in the noise (bangs, clicks or clatters), or if the noise is irregular enough to attract attention' then a range of correction factors can be added to the specific noise level as appropriate to obtain the 'rating level'.

As this is a prescriptive report prior to plant installation, overall rating noise levels will be specified for the new installation. Compliance with the rating value will be necessary to provide evidence that significant adverse impact has been avoided as required by the NPSE.

To assess the likelihood of complaints, the measured background noise level is subtracted from the rating noise level. BS4142 states:

The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs. An 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 assessment 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 (See Clause 8) from the rating level (see Clause 9) and consider the following.

- a) Typically the greater the difference, the greater the magnitude of the impact.*
- b) A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
- c) A difference of around 5dB 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.*

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.*
- 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) Façade sound 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.*

In summary, the BS4142: 2014, 'Methods for rating and assessing industrial and commercial sound' would indicate that compliance with the wider aims of the NPSE is achieved when a rating level does not exceed the background sound level for the given time of operation.

ProPg: Planning & Noise, Professional Practice Guidance on Planning & Noise

The following figure is taken from ProPG (May 2017) which summarises the acoustic criteria which can be considered to represent a good acoustic design process.

ACTIVITY	LOCATION	07:00 – 23:00 HRS	23:00 – 07:00 HRS
Resting	Living room	35 dB $L_{Aeq,16\text{ hr}}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16\text{ hr}}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16\text{ hr}}$	30 dB $L_{Aeq,8\text{ hr}}$ 45 dB $L_{Amax,F}$ (Note 4)

NOTE 1 The Table provides recommended internal L_{Aeq} target levels for overall noise in the design of a building. These are the sum total of structure-borne and airborne noise sources. Ground-borne noise is assessed separately and is not included as part of these targets, as human response to ground-borne noise varies with many factors such as level, character, timing, occupant expectation and sensitivity.

NOTE 2 The internal L_{Aeq} target levels shown in the Table 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 internal L_{Aeq} target levels recommended in the Table.

NOTE 3 These internal L_{Aeq} target 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.

NOTE 4 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. In most circumstances in noise-sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45dB $L_{Amax,F}$ more than 10 times a night. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number, distribution, predictability and regularity of noise events (see Appendix A).

NOTE 5 Designing the site layout and the dwellings so that the internal target levels can be achieved with open windows in as many properties as possible demonstrates good acoustic design. Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the "open" position and, in this scenario, the internal L_{Aeq} target levels should not normally be exceeded, subject to the further advice in Note 7.

NOTE 6 Attention is drawn to the requirements of the Building Regulations.

NOTE 7 Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal L_{Aeq} target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved. The more often internal L_{Aeq} levels start to exceed the internal L_{Aeq} target levels by more than 5 dB, the more that most people are likely to regard them as "unreasonable". Where such exceedances are predicted, applicants should be required to show how the relevant number of rooms affected has been kept to a minimum. Once internal L_{Aeq} levels exceed the target levels by more than 10 dB, they are highly likely to be regarded as "unacceptable" by most people, particularly if such levels occur more than occasionally. Every effort should be made to avoid relevant rooms experiencing "unacceptable" noise levels at all and where such levels are likely to occur frequently, the development should be prevented in its proposed form (see Section 3.D).

Figure 2. ProPG Internal Noise Level Guidelines (additions to BS8233:2014 shown in blue)

BS5228: Code of practice for noise and vibration on construction and open sites (Part 1 & 2): 2009

This standard refers to the need for the protection against noise and vibration of persons living and working in the vicinity of, and those working on, construction and open sites.

A practical method of construction noise monitoring is the ABC method which is promoted by BS5228: 2009 (Part 1). This suggests that the significance of construction noise impact should be limited by introducing thresholds which are considered appropriate through the consideration of the pre-existing ambient noise conditions in the area.

The thresholds provide noise limits which can be simply monitored against and which cover activity at a range of times which consider the potential sensitivity to noise of surrounding dwellings to the construction site.

Annex E of BS5228 shows an example of the threshold of significant effect (SOAEL) at dwellings when the total noise level, rounded to the nearest decibel, exceeds the listed value.

Table 4.1 ABS Method thresholds

BS5228-1 Table E.1 Example threshold of significant effect at dwellings			
Assessment category and threshold value period (L_{Aeq})	Threshold value, in decibels (dB)		
	Category A	Category B	Category C
Night-time (23.00–07.00)	45	50	55
Evenings and weekends ^{D)}	55	60	65
Daytime (07.00–19.00) and Saturdays (07.00–13.00)	65	70	75
NOTE 1:	A significant effect has been deemed to occur if the total L_{Aeq} noise level, including construction, exceeds the threshold level for the Category appropriate to the ambient noise level.		
NOTE 2:	If the ambient noise level exceeds the threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a significant effect is deemed to occur if the total L_{Aeq} noise level for the period increases by more than 3 dB due to construction activity.		
NOTE 3:	Applied to residential receptors only.		
19.00–23.00 weekdays, 13.00–23.00 Saturdays and 07.00–23.00 Sundays.			

Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.

Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values

Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values

The standard also provides guidance on method of measuring vibration and assessing its effects on the environment. It provides guidance on human response to vibration and response limits of building to ground-borne vibration which are detailed below.

Table 4.2 BS5228: 2009 (Part 2) Vibration Criteria

BS5228-2 Table B.1 Guidance on the effects of vibration levels		
0.14mm.s ⁻¹	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies people are less sensitive to vibration.	
0.3 mm.s ⁻¹	Vibration might be just perceptible in residential environments	
1.0 mm.s ⁻¹	It is likely that vibration of this level in residential environments will cause complaints but can be tolerated if prior warning and explanation has been given to residents.	
10.0 mm.s ⁻¹	Vibration is likely to be intolerable for any more than a very brief exposure to this level.	
BS5228-2 Table B.2 Transient vibration guide values for cosmetic damage		
Type of building	Peak component particle velocity in frequency range of predominant pulse	
	4Hz to 15Hz	15Hz and above
Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	50mm/s at 4 Hz and above
Unreinforced or light framed structures Residential or light commercial buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

5. Survey Method and Equipment

5.1 Survey

The noise survey was carried out between Thursday 23rd and Monday 27th November 2017 to measure representative noise levels at the site of the proposed development during a typical weekday and weekend period.

The noise survey comprised a single unattended monitoring location on site which is shown and described below;

- MP1 Southern boundary: Unattended continuous monitoring position recorded the noise levels in a position representative of the proposed residential facades and gives data indicative of the noise climate at the existing dwellings. The sound level meter was positioned at a height of approximately 1.5m



Noise measurements were made with a calibrated precision grade sound level meter which achieves the requirements of BS EN 61672:2003. Svantek 971 (serial number 34931), Norsonic Nor1251 calibrator & an environmental wind shield.

The sound level meter was calibrated before and after the survey. No significant drift was noted between the two reference checks.

The survey was carried out in accordance with the principles of BS 7445:1997 Parts 1-3, 'Description and Measurement of Environmental Noise', British Standard BS4142: 1997, Method for Rating Industrial Noise affecting Mixed Residential and Industrial Areas.

5.2 Measurement Parameters

Human ears are able to respond to sound over the frequency range of about 20 Hz to 20 kHz and over the audible range of 0 dB (the threshold of perception) to 140 dB (the threshold of pain). The ear does not respond equally to different frequencies of the same magnitude, and is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates to the response of the human ear, a weighting mechanism is used. This reduces the importance of lower and higher frequencies, in a similar manner to the human ear. The most widely used weighting mechanism that corresponds to the response of the human ear is the A-weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or L_{Aeq} , L_{A90} , etc., according to the parameter being measured.

The decibel scale is logarithmic rather than linear, and hence a 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective, but as a general guide a 10 dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB(A) of a steady source is generally regarded as the minimum difference needed to perceive a change.

Environmental noise has been measured in the following indices;

$L_{Aeq, T}$ - The A-weighted equivalent continuous sound pressure level. A representation of a continuous sound level containing the same amount of sound energy as the measured varying noise levels over the measurement period, t.

$L_{A90, T}$ - The A-weighted sound pressure level that is exceeded for 90% of the measurement period, t. This is commonly used as the 'Background Noise Level' for assessing the effects of industrial noise in the UK.

L_{Amax} - The highest A-weighted noise level recorded during a noise measurement period.

5.3 Weather

The climatic conditions during the noise surveys were cold 6-10 Degrees Centigrade with strong winds on 23rd November. These abated to light winds (<5m/s) for the remainder of the survey leaving conditions generally considered conducive to environmental noise measurement.

6. Survey Results

The measurement survey at all monitoring locations comprised of consecutive measurement periods in terms of the most relevant standards and guidelines.

The tables below show the period noise levels measured at all monitoring locations. These have subsequently been used as the basis for establishing the dominant noise levels across the site. The full set of survey data is available on request.

Table 6.1: Summary of measured continuous noise levels at MP1 (dB)

Dates	Times	LAeq (SR) [dB]	LAFmax (SR) [dB]	LAf90
23112017	Day	49.2	76.2	38.6
23112017	Night	39.6	63.7	29.6
24112017	Day	47.6	74.4	32.2
24112017	Night	44.2	64.4	38.4
25112017	Day	47.3	72.8	41.1
25112017	Night	43.0	62.2	36.1
26112017	Day	46.6	71.5	40.5
26112017	Night	43.6	67.9	37.1
27112017	Day	49.3	71.0	43.7

Note. Full noise data records are available on request. A full graph of recorded noise data is given as Appendix 1.

Note. The average of all daytime LAeq values is 48.1, this indicates that for living rooms and non habitable rooms, natural ventilation via opening windows is possible (48.1dB -15dB for a partially open window = 33dBA internally). Background ventilation is achievable by non-acoustically rated trickle ventilators with basic thermal double glazing. This site as a whole is considered a low risk in terms of the external noise levels present.

7. Site Suitability for Residential Development

7.1 Noise Assessment

External noise levels have been predicted for the sensitive façades of the proposed development that will be exposed to the highest levels of noise. All calculations are based on the results of the noise monitoring exercise.

The site is of low risk in terms of external noise, however for bedrooms in particular it will be important to construct the envelope of the building using materials with adequate sound insulating properties as to provide good internal noise conditions.

The octave spectrums used in the building envelope assessment are shown below; these have been adjusted to assess the facade requirements across the site. The night-time maximum noise levels are based on a typical maximum of the levels measured during the survey, applying the 95th percentile value for a robust assessment; this is expected to ensure that the internal maximum night-time noise level requirements are not exceeded more than 10-15 times per night as per WHO & ProPG guidance.

Table 7.1 – Example noise level octave spectra used for building envelope calculation (MP1)

Freq. Hz	63	125	250	500	1 k	2 k	4 k	dBA
Day-time L_{eq}	58	51	44	44	44	43	32	49
Night-time L_{eq}	57	50	43	42	41	34	23	45
Night-time $L_{max(fast)}$	78	70	62	64	63	64	57	69

7.2 Building Envelope Sound Insulation

The envelope construction at the façades of the proposed development could achieve appropriate internal ambient noise levels through a combination of measures such as those presented below. Due to the site being remote from directly incident noise sources, a single specification is suitable for the entire site.

Table 7.3 – Specification for the building envelope

Freq. Hz	63	125	250	500	1 k	2 k	4 k	Weighted Value dB
Glazing	17	20	22	28	36	39	31	R _w 33 dB
Ventilator	28	27	29	30	30	28	28	D _{n,e,w} 30 dB
Solid Wall	33	35	44	48	50	50	50	R _w 50 dB
Roof	42	41	42	50	58	65	70	R _w 54 dB

Table 7.3 presents the calculated sound reduction requirements for each façade element which are expected to achieve appropriate internal ambient noise levels. The specifications represent basic thermal double glazing only with simplistic background trickle ventilators. This provides more than adequate control to day and night noise across the site and calculations for living rooms and bedrooms are provided in Appendix 2 which indicate the predicted internal noise levels in compliance with BS 8233: 2014 '*Guidance on sound insulation and noise reduction for buildings*'.

During the day it is possible to achieve internal ambient noise criteria by open windows.

The calculations are based on typical room dimensions of 6x4x2.4m for living rooms and 4x3x2.4 for bedrooms.

The external wall used in the calculations was a 102mm brick outer face with internal dry lining. As apartments it is likely that this detail will be significantly improved upon in order to prevent flanking noise between dwellings. Wall types must be assessed prior to construction approval. This is also the case for glazing, ventilators and roof build-up. Potential suppliers of construction elements must be able to satisfy the design team that the acoustic performance information supplied relates to the products on offer for this project and should show laboratory test acoustic information measured in accordance with BS EN ISO 140-3.

8. Noise from Fixed Installations and Mechanical Plant

Noise levels generated by mechanical plant and experienced by local receptors depends upon a number of variables, the most significant of which are considered to be as follows.

- Noise generated by plant or equipment used on site, generally expressed as sound power levels (SWL)
- Distance between the noise source and the receptor
- Attenuation due to ground absorption, atmospheric and barrier effects
- Periods of operation of the plant on the site, known as its “on-time”

It is possible that the proposal will include installations of ventilation and mechanical plant. However, at this stage, no information is available with regard to the fixed installations and mechanical plants that are to be installed as part of the proposed development.

Consequently, it is not possible to present an inclusive assessment of the noise effects of such plant. However, in order to ensure that background noise levels at the nearest noise sensitive receptors do not increase significantly as a result of the development, design noise limits for electrical and mechanical plant have been provided.

The noise limits have been based on achieving the quietest background noise level recorded during the noise survey in order to meet the requirements of BS4142:2014.

Table 8.1 : Boundary Noise Limit for Fixed Installations of Mechanical Plant, $L_{A,Tf}$ (dB)	
Daytime	Night-time
32	30

If fixed installations and mechanical plant are designed to achieve the above mentioned noise limits at the nearest residential receivers complaints will be minimised.

There are a number of measures that can be introduced to control noise from the mechanical and fixed plant installation associated with the proposed development. Consideration should be given to reducing noise at point of generation (e.g. by selecting quieter plant) or containment of noise.

9. Construction Noise

Existing noise sensitive receptors surround the proposed development and therefore may be affected by the construction noise.

The prediction techniques for assessing the likely noise and vibration effects from construction operations are contained within British Standard BS5228: 2009 (Part 1 and 2): Noise and Vibration Control on Construction and Open Sites. However, the methodology is based on detailed information on the type and numbers of plant that is being used during construction, as well as their location and the length of time they are in operation. The exact information required including construction phasing, duration or equipment types is not currently available.

It is appropriate to control noise during construction. A Construction Environmental Management Plan is proposed to control general working practices. In respect of noise this could include measures such as those below:

- Procedures for minimising the noise from construction related traffic on the existing road network.
- Procedures for ensuring that all works are carried out according to the principle of 'Best Practicable Means' as defined in the Control of Pollution Act 1974
- General induction training for site operatives and specific training for staff having responsibility for particular aspects of controlling noise and vibration from the site, making them aware of the need to minimise impact to the surrounding neighbours etc.
- A monitoring / auditing programme, particularly during any piling operations and construction of access roads or phases particularly close to neighbouring noise sensitive boundaries.
- A commitment to on-going Liaison with the Local Authority and the community

The adoption of 'Best Practicable Means' is usually the most effective means of controlling noise and vibration from construction sites, such as:

- Consideration of off-site fabrication to reduce the need for noisy assembly on site
- Keeping construction access roads well maintained to reduce noise and vibration from construction traffic
- Avoidance of unnecessary idling of engines and local generator units.
- Minimising drop height into hoppers, lorries, etc.

- Use of screening to residential boundaries.
- Where possible and safe to do so, mains electric powered plant should be used rather than diesel or petrol driven plant

Working hours will be controlled to the standard hours during weekdays and Saturdays. Noise limits for construction noise at dwellings should be set using category A to receptors in accordance with BS 5288:2009.

Table 9.1 Construction noise limits at the nearest residential properties

Noise limits for construction work at dwellings	Threshold value, in decibels (dB)
Assessment category and threshold value period (L_{Aeq})	Category A
Night-time (23.00–07.00)	45
Evenings and weekends	55
Daytime (07.00–19.00) and Saturdays (07.00–13.00)	65

Construction noise impact assessments can be undertaken for various construction methods on receipt of the plant details.

10. Conclusions

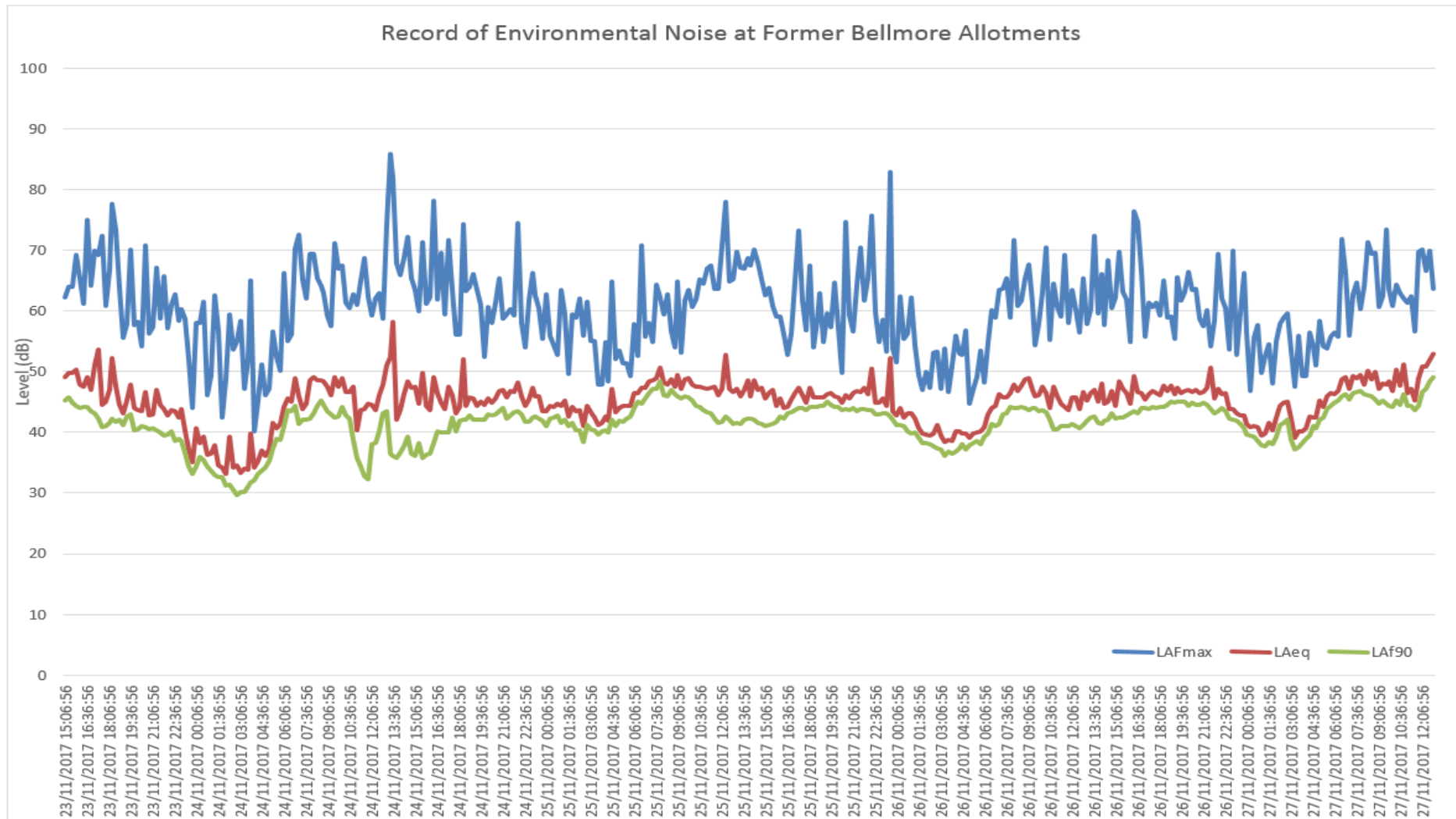
The impact of noise associated with the proposed development of Land currently vacant at the former Bellmore Allotments, Hayes has been assessed. Throughout, the assessment has been undertaken with reference to British Standards and national and international guidance on noise impacts.

The noise levels have been assessed with consideration to the National Planning Policy Framework and the Noise Policy Note for England. Following these policies, figures from the WHO's 'Guidelines for Community Noise', BS8233 'Sound Insulation and Noise Reduction for Buildings' and ProPg 2017 have been used to assure that 'significant adverse impacts on health and quality of life' are avoided.

To achieve appropriate internal noise levels, building envelope sound reduction specifications have been suggested, these are considered minimal and thermal/airtightness/apartment acoustic flanking control requirements of the scheme may provide acoustic separation greater than is called for in this report.

External plant and construction noise limits have been specified to limit noise impact from the development of the site to nearby sensitive receivers.

Appendix 1 – Global noise record



Appendix 2 – Noise Break-in Calculations

Living Room LAeq (Daytime)

BS8233: Calculation of Sound transmission into a building								
Project:		Bellmore Allotments			Date:	05-Dec-17		
Client:		LB Hillingdon			Consultant:	MJ		
Building elements & Areas				Total M ²				
S _{ext} - External Wall Area				5.10				
S _w - Area of Windows within Room				4.50				
S _c - Area of Ceiling within Room				24.00				
Total Façade Area:				9.60				
Total Area of transmitting elements:				33.60				
				W	L	H	V	Rt (s)
Room Data				6	4	2.4	57.6	0.5
Constructions & Performance Data:								
Construction	63	125	250	500	1K	2K	4K	
Window:	17	20	22	28	36	39	31	
Vent:	28	27	29	30	30	28	28	
Wall:	33	35	44	48	50	50	50	
Ceiling:Resi floor above	33	35	44	48	50	50	50	
Source Noise & Element Contributions								
	63	125	250	500	1K	2K	4K	
Source Lp	58	51	44	44	44	43	32	
Window	-25.7	-28.7	-30.7	-36.7	-44.7	-47.7	-39.7	
Vent	-30.3	-29.3	-31.3	-32.3	-32.3	-30.3	-30.3	
Wall	-41.2	-43.2	-52.2	-56.2	-58.2	-58.2	-58.2	
Ceiling	-34.5	-36.5	-45.5	-49.5	-51.5	-51.5	-51.5	
Cumulative SRI	-23.9	-25.5	-27.9	-30.9	-32	-30.1	-29.8	
Plus 10log S/A	2.6	2.6	2.6	2.6	2.6	2.6	2.6	
Façade Effect	2.5	2.5	2.5	2.5	2.5	2.5	2.5	
RESULT	39.6	30.8	20.9	18.3	17.2	18.2	7.3	
A weighted Internal Level					24.1			
Notes								
Noise level used illustrates low site noise level. Site is suitable for opening windows and basic background vents only.								

Bedroom LAeq (Night-time)

BS8233: Calculation of Sound transmission into a building																																																																																															
Project:	Bellmore Allotments				Date:	05-Dec-17																																																																																									
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Bedroom LAmx (Night-time)

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				15.36			
				No. Vents			
				1			
		W	L	H	V	Rt (s)	
Room Data		3	4	2.4	28.8	0.3	
Constructions & Performance Data:							
Construction	63	125	250	500	1K	2K	4K
Window:	17	20	22	28	36	39	31
Vent:	28	27	29	30	30	28	28
Wall:	33	35	44	48	50	50	50
Ceiling:Resi floor above	33	35	44	48	50	50	50
Source Noise & Element Contributions							
	63	125	250	500	1K	2K	4K
Source Lp	78	70.3	61.5	64.3	63	63.6	57
Window	-26.3	-29.3	-31.3	-37.3	-45.3	-48.3	-40.3
Vent	-30.9	-29.9	-31.9	-32.9	-32.9	-30.9	-30.9
Wall	-38.8	-40.8	-49.8	-53.8	-55.8	-55.8	-55.8
Ceiling	-35.1	-37.1	-46.1	-50.1	-52.1	-52.1	-52.1
Cumulative SRI	-24.5	-26.1	-28.5	-31.5	-32.6	-30.7	-30.4
Plus 10log S/A	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Façade Effect	2.5	2.5	2.5	2.5	2.5	2.5	2.5
RESULT	57.0	47.7	36.5	36.3	33.9	36.4	30.1
A weighted Internal Level					41.8		
Notes							

Appendix 3 – ANC Accreditation

