FORMER NESTLE FACTORY, HAYES

NOISE AND VIBRATION PLANNING STRATEGY REPORT
MAY 2017

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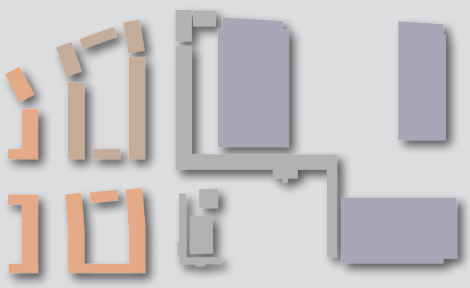
SEGRO
pba peterbrett

Two detailed planning noise and vibration reports have been prepared, one relating to the residential element (Residential Planning Noise and Vibration Report) and one relating to the industrial element (the Industrial Planning Noise Report).

This summary report has been prepared to present the conclusions of both the residential and industrial reports. This report groups the findings of the technical reports together into the following categories:

- The impact of noise generated by the development on existing sensitivities
- The impact of the existing noise and vibration climate on the development.
- The impact of the uses on each other.

Further details relating to each assessment can be found in each of the detailed reports.



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Former Nestlé Factory, Hayes

Noise and Vibration Planning Strategy Report

On behalf of **SEGRO & Barratt Homes Ltd**

Project Ref: 37205/3002 | Rev: AA | Date: February 2017

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Project Name: **Former Nestlé Factory, Hayes**

Project Ref: **37205/3002**

Report Title: **Noise and Vibration Planning Strategy Report**

Doc Ref: **FINAL/001**

Date: **May 2017**

	Name	Position	Signature	Date
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Reviewed by:	Matthew Barlow	Associate		May 2017
Approved by:	David Walker	Environment Director		May 2017
For and on behalf of Peter Brett Associates LLP				

Revision	Date	Description	Prepared	Reviewed	Approved
002	May 2017	Final comments from legal review included	DPW	DPW	DPW

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1 Introduction

1.1.1 It is proposed to redevelop the former Nestle site in Hayes for part residential, part industrial use. The proposed development will comprise a number of residential blocks on the western half of the application site, and 4 industrial units on the eastern portion.

1.1.2 As part of obtaining planning permission, it is required to demonstrate to the satisfaction of the local planning authority that both the impact of the existing noise and vibration climate on the development, and impact of the development on surrounding sensitivities has been properly considered.

1.1.3 To this end, Peter Brett Associates LLP (PBA) has been commissioned to undertake acoustic assessments relevant to both the residential and industrial elements of the scheme. These comprise assessing the impact of the existing noise and vibration climate on the proposed buildings and the impact of the development on existing sensitivities within the vicinity of the site. In addition, as there are two very different use types proposed within the same development, consideration has also been given to the impact on each other.

1.1.4 Two detailed planning noise and vibration reports have been prepared, one relating to the industrial element, and one to the residential element. This report summarises the assessments undertaken in each of these reports and groups them into the following categories:

- The impact of noise generated by the development on existing sensitivities
- The impact of the existing noise and vibration climate on the development
- The impact of the uses on each other

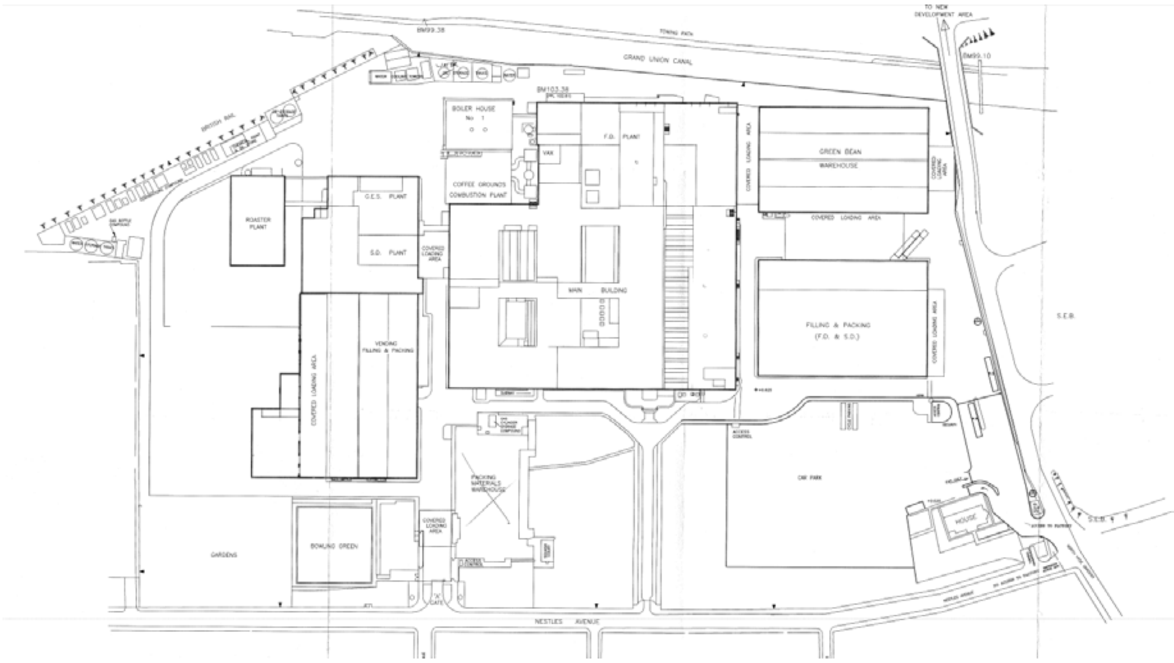
1.1.5 Whilst every effort has been made to ensure that this report is easy to understand, it is technical in nature. To assist the reader, an explanation of the terminology used in this report is contained in **Appendix A**.

2 Site Layout

2.1 General

2.1.1 The site is located on Nestles Avenue in Hayes, as illustrated in the following Figure.

Figure 2.1: Existing Site Layout



2.2 Site Context

2.2.1 The site is bound to the north by railway lines entering Hayes & Harlington Station. Beyond the railway lines is High Point Village, a large residential development comprising numerous 5-7 storey buildings. The Grand Union Canal forms the north eastern site boundary, beyond which is an industrial area.

2.2.2 To the east, the site is bound by North Hyde Gardens, an access road for the North Hyde Electricity Substation east of the site, and the industrial area north east of the site. Beyond the substation is the A312 - The Parkway, a busy dual carriageway.

2.2.3 To the south, the site is bound by Nestles Avenue, a single carriageway road used to access the residences on the opposite side of Nestles Avenue from the site.

2.2.4 Industrial units and a trading estate accessed from Viveash Close run along the western site boundary

2.3 Noise Climate

2.3.1 Generally speaking the ambient noise climate across the site is dominated by road traffic from local roads close to the site, and main roads within the vicinity such as the A312 around 230m to the east, and the M4, around 700m to the south.

2.3.2 Heathrow airport lies around 2.4km south of the site. Being due south, the contribution from air traffic is minimal owing to the east - west orientation of the runways. Easterly departures

heading northeast after take-off remain around 3km from the site. As no other departure or arrival passes closer to the site than this, aircraft are closest while at the airport.

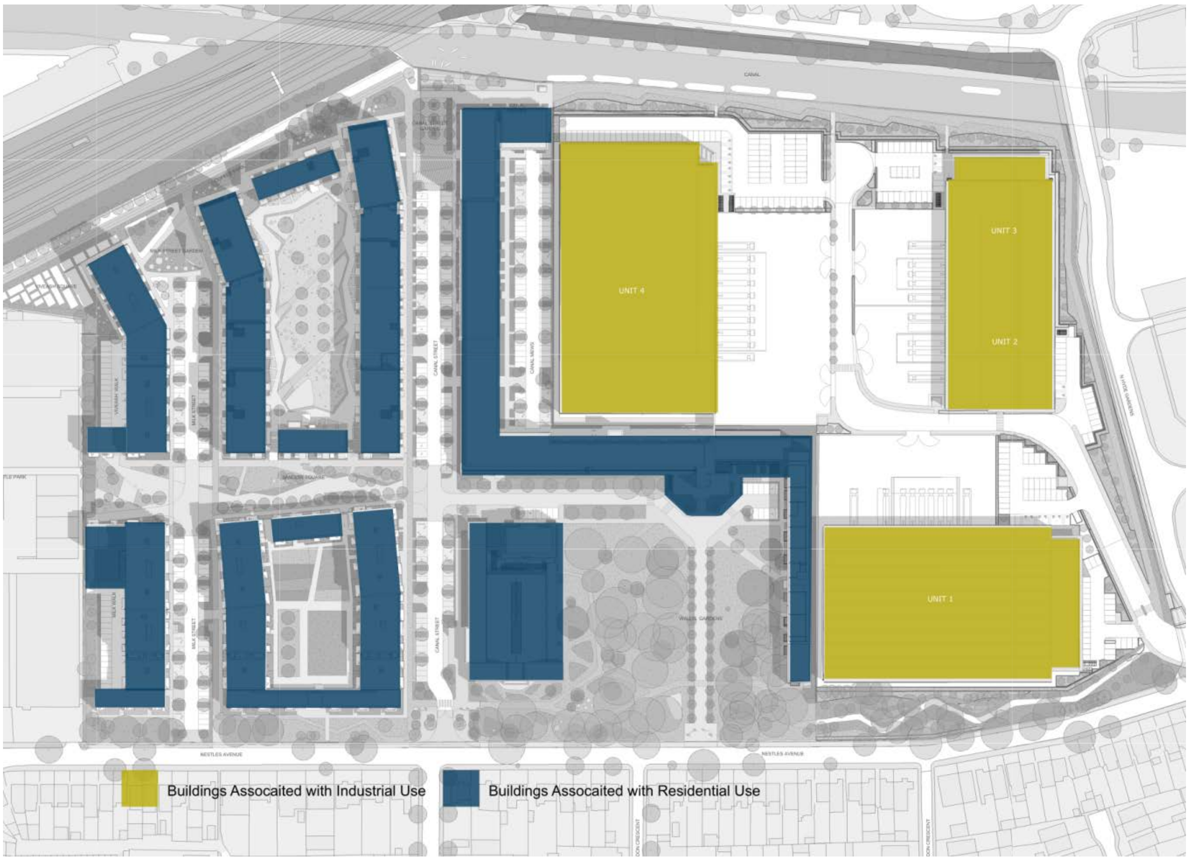
2.3.3 Given the size of the site, there are sources local to various parts of the site that contribute to the respective area. Most notably, the substation to the east, the railway lines to the north, and plant serving industrial units to the west.

2.3.4 It is worth noting that the operation of the Nestle factory would previously have been a source of a reasonable amount of industrial noise within the area, which is no longer present at the time of baseline noise surveying.

2.4 Proposals

2.4.1 The following figure illustrates the residential and industrial aspects of the proposed development.

Figure 2.2: Proposed Site Layout



2.4.2 As the above figure illustrates, the industrial element of the site comprises four units on the eastern portion of the site, and the residential buildings occupy the western portion of the site.

3 Impact of Noise Generated by the Development on Existing Sensitivities

3.1 General

3.1.1 This section sets out the assessments undertaken to determine the impact of noise generated by the development on existing sensitivities within the vicinity of the site.

3.2 Impact of Noise from Service Yard Activities within Industrial Element

3.2.1 Baseline noise data collected as part of an environmental noise survey carried out at the development site was used to establish background sound levels to which existing sensitivities are currently exposed.

3.2.2 The background sound data was used to establish rating limits at existing sensitivities for operational noise generated as part of the proposed development.

3.2.3 Using the established limits as a basis, a service yard noise assessment was undertaken in order to determine the impact on existing residences of activities taking place within the service yards of the proposed industrial units.

3.2.4 Specific numbers of vehicle movements are not known at this stage. As such, in order to ensure a worst-case assessment, what we understand to be a worst case assumption of 1 HGV arrival, idle, and departure along with associated activities (e.g. unloading) at each industrial unit in a 15-minute period during the night has been used to facilitate the assessment.

3.2.5 Based on this, the rating levels are predicted to be at least 10dB below the existing background. Under the current version of BS 4142, the context of the development needs to be considered to determine whether this will have any bearing on the quantitative assessment. In this case, given the previous industrial use of the site and industrial nature of the area, it is expected that further consideration of the noise levels to reflect the context is not necessary, and the assessment as reported is expected to stand. As such, activities from the service yards of the industrial units are not expected to give rise to a significant impact at existing residences.

3.2.6 Full details of this assessment are set out in the Industrial Planning Noise Report (ref 37205/3002/FINAL002).

3.3 Impact of Increase in Noise Levels as a result of additional Vehicles on Road

3.3.1 In order to determine the impact of any change in noise levels arising from additional vehicles on the road as a result of the development, a traffic noise assessment was undertaken. Based on a percentage change approach, with the exception of North Hyde Gardens, the highest percentage increase would equate to an increase in noise level of 2.4 dB.

3.3.2 Looking at noise levels predicted when considering the impact of all surrounding roads, the highest increase in noise levels for residents on North Hyde Gardens was calculated to be 2.1 dB.

3.3.3 With the highest predicted increase in noise levels of 2.4 dB, this falls within the ‘No Observed Adverse Effect’ range for which the corresponding action according to relevant Planning Practice Guidance is ‘no specific measures required’.

3.3.4 With regards to the traffic noise impact assessment, it should be noted that the baseline figures assume no contribution from the development site (i.e. there are currently no vehicle movements associated with it, and the baseline figures assume this remains the case). This would not have been the case when the site was previously operational, and in reality if the development were not to proceed, the use of the site would inevitably resume in some capacity under its existing permission, which would give rise to a significant number of vehicle movements. As such, the traffic noise impact assessment can be considered very much a worst case with regards to the impact on existing residences.

3.3.5 Full details of this assessment are set out in both the Industrial Planning Noise Report (ref 37205/3002/FINAL002) and Residential Planning Noise Report (ref 37205/3002/FINAL003).

3.4 Impact of Noise from Mechanical Services Plant installed as part of the Development

3.4.1 It will be important to ensure noise from mechanical services plant installed as part of the development is suitably controlled such that it does not give rise to a significant adverse impact on existing sensitivities in the vicinity of the site.

3.4.2 To this end, existing background noise levels at the site have been quantified, and plant noise limits established, which would be used to form the basis of a BS 4142 assessment. The details of these can be found in both the Industrial Planning Noise Report (ref 37205/3002/FINAL002) and Residential Planning Noise Report (ref 37205/3002/FINAL003).

3.4.3 Given the current stage of development, outline details only are available regarding the mechanical services strategy, with locations of plant types that could give to atmospheric noise emissions not yet known.

3.4.4 It is therefore expected to be appropriate to attach a condition to planning permission to require a plant noise assessment to be carried out at the appropriate stage of development, once more details regarding the mechanical services scheme are available. An example of the type of condition is given below:

"Noise arising from mechanical services plant installed as part of the development shall not give rise to a rating level higher than the existing background sound levels (given in terms of $L_{A90,15min}$*) at the nearest noise-sensitive premises. The measurements, assessment and reporting shall be carried out according to BS 4142:2014. To demonstrate that this will be achieved, a noise assessment prepared by a suitably qualified acoustician must be submitted to and approved by the local planning authority prior to operation of the mechanical services plant".*

4 Impact of the Existing Noise and Vibration Climate on the Development

4.1 General

4.1.1 This section sets out the assessments undertaken to determine the impact of existing noise and vibration climate at the site on future residents. Full details of these can be found in the Residential Planning Noise Report (ref 37205/3002/FINAL003).

4.1.2 Several baseline noise and vibration surveys have been undertaken at the development site since October 2014. Using these, ambient and transient acoustic indices have been determined, such as $L_{Aeq,16h}$ for the daytime, $L_{Aeq,8h}$ for the night, and average and 10th highest L_{AFMax} levels.

4.1.3 Noise levels around the site were measured to be 52 dB – 70 dB $L_{Aeq,16h}$ during the day, and 50 dB – 64 dB $L_{Aeq,8h}$ during the night, with noise levels varying primarily with proximity to environmental sources, such as roads to the south of the site, and railway lines to the north.

4.1.4 Using the baseline noise data, and a noise model of the proposed site layout, external noise levels were determined.

4.2 External Noise Levels within Amenity Spaces

4.2.1 It is expected that the distance and screening provided by the proposed buildings from the dominant environmental sources will produce amenity spaces with noise levels within the BS 8233 target range of 50dB - 55dB $L_{Aeq,16hour}$. As such, no specific acoustic mitigation measures to control noise to external amenity areas beyond those already inherent in the scheme are expected to be necessary.

4.3 Internal Noise Levels

4.3.1 In order to address the issue of providing an appropriate internal noise climate within future residences, an assessment of the acoustic requirements of the building envelope was undertaken. The assessment used the noise survey data and noise model developed for the site as a basis, along with relevant guidance from BS 8233.

4.3.2 Based on the assessment, the acoustic requirements of the glazing were grouped into three types. The example configurations for these types ranged from 6/6-16/6 double glazing to 10/6-16/4 double glazing.

4.3.3 With regards to ventilation, areas requiring the highest specification of glazing will need to provide a means of ventilation that does not require a penetration through the façade (i.e. a vent) or opening windows, and as such need to be mechanically ventilated. For areas with a lower glazing requirement, it is feasible to use a natural ventilation strategy in the form of a trickle vent capable of providing the acoustic performance set out in the report.

4.4 Internal Vibration Levels

4.4.1 Using vibration data measured as part of the site survey as the basis for an assessment of internal vibration levels, along with guidance contained within BS 6472, it was concluded that the expected internal vibration would fall into the range corresponding to 'Low probability of adverse comment'. As such, no specific measures to the building foundations are expected to be necessary to control vibration.

5 Impact of Industrial and Residential Uses on Each Other

5.1 General

5.1.1 This section sets out the assessments undertaken to determine the impact of noise generated as a result of the operation of the industrial element of the site on future residents. Full details of these can be found in both the Industrial Planning Noise Report (ref 37205/3002/FINAL002) and Residential Planning Noise Report (ref 37205/3002/FINAL003).

5.2 Internal Noise Criteria

5.2.1 Ordinarily, design standards set out in BS 8233 are used to determine appropriate internal noise levels within habitable rooms of residences. However, these relate to anonymous noise sources, such as transportation. Where the source is not anonymous, such as from an adjacent site, or contains a distinct character, there is the potential for the source to give rise to a greater disturbance at the same level.

5.2.2 To address this concern, the design target of NR20 within bedrooms during the night-time from industrial noise incident on future residences has been put forward. The rationale behind the use of a Noise Rating curve as the basis for the criteria is that where there is a concern of a disproportionate amount of energy at one part of the frequency spectrum – e.g. tonal components from industrial sources, the use of an NR criterion is seen as a good solution. This is because the NR calculation process penalises a greater proportion of energy at any part of the spectrum as it is the closest point at any frequency to the curve that determines the entire NR value. This is different from the L_{Aeq} calculation procedure, which could allow higher energy at one part of the spectrum to be compensated by little energy at other parts.

5.3 Impact of Noise from Service Yard Activities on Proposed Residences

5.3.1 The protection of future occupants of proposed residences in close proximity to the service yards of the industrial element has been a principal consideration in the design of the residential building envelope and layout.

5.3.2 In order to allow for the appropriate design of the proposed building envelopes, façade incident levels generated as part of the service yard assessment described in **Section 3.2** have been fed into the proposed residential building envelope design.

5.3.3 Using the more stringent internal noise criteria of NR20 set out above as a basis, along with calculated façade incident levels, and subsequent noise break-in calculations, a glazing and ventilation strategy has been put forward which is expected to be capable of delivering the internal noise criteria.

5.3.4 By following this strategy, it is expected that future residents will be suitably protected from noise arising as a result of operation of the industrial service yards.

5.4 Impact of Operational Noise on Proposed Residences

5.4.1 Fixed operational noise sources, such as any mechanical services plant installed as part of the industrial element of the site, will need due consideration in the future to ensure these do not give rise to a disturbance for future residents.

5.4.2 To this end, as with the approach set out in **Section 3.4**, existing noise levels have been quantified around the site and it is expected that these could be used to form the basis of future BS 4142 assessments which should be carried out at the appropriate stage.

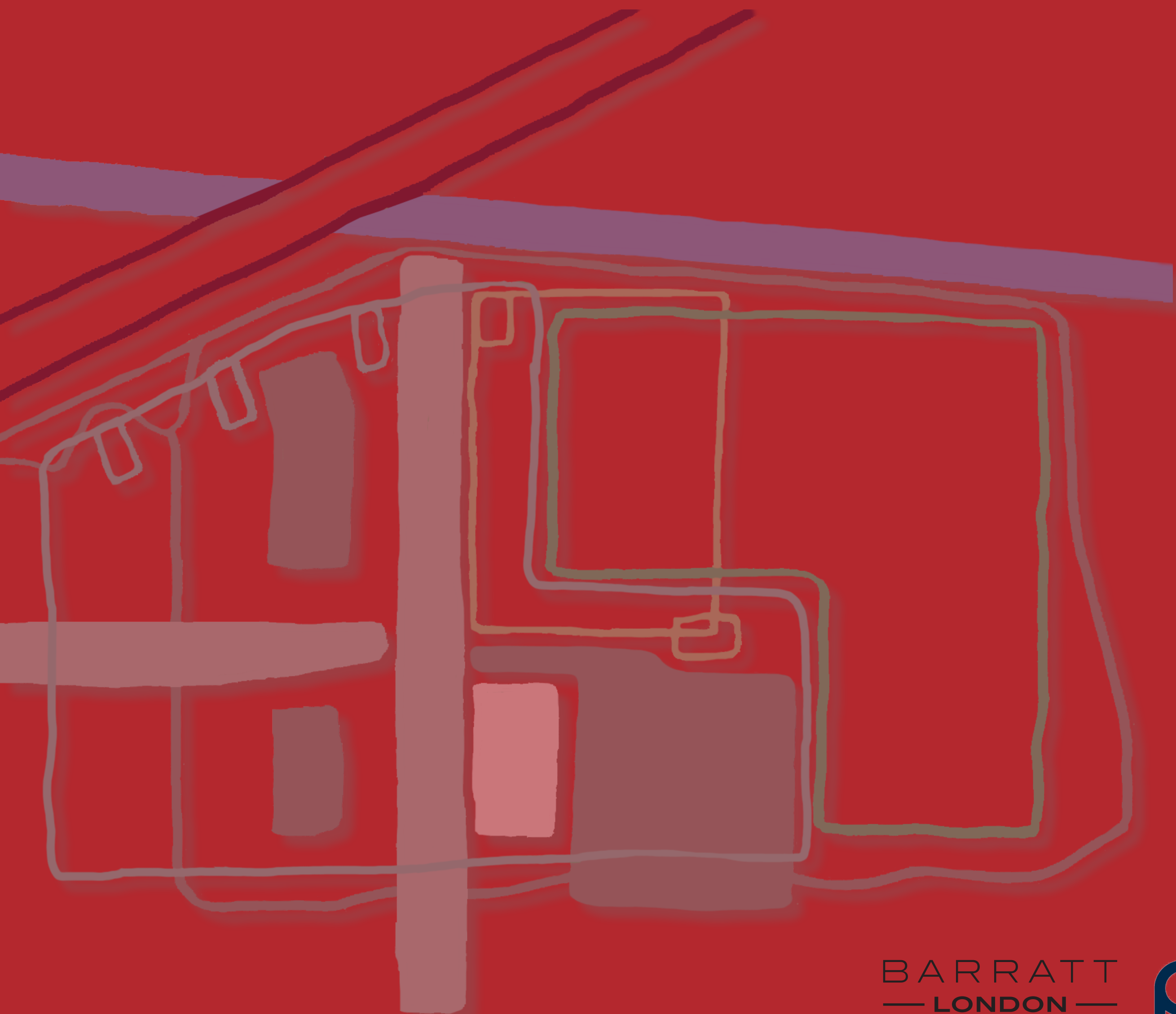
Appendix A Acoustic Terminology

Parameter	Description
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near ($L_{Aeq,T}$).
Daytime	The period 07:00-23:00 hours.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s_1 and s_2 is given by 20 $\log_{10}$ (s_1/s_2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa. The threshold of normal hearing is in the region of 0 dB and 140 dB is the threshold of pain. A change of 1 dB is only perceptible under controlled conditions.
dB(A), L_{Ax}	Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).
Fast Time Weighting	Setting on sound level meter, denoted by a subscript F that determines the speed at which the instrument responds to changes in the amplitude of any measured signal. The fast time weighting can lead to higher values than the slow time weighting when rapidly changing signals are measured. The average time constant for the fast response setting is 0.125 (1/8) seconds.
Free-field	Sound pressure level measured outside, far away from reflecting surfaces (except the ground), usually taken to mean at least 3.5 metres
Façade	Sound pressure level measured at a distance of 1 metre in front of a large sound reflecting object such as a building façade.
Insertion Loss	Insertion loss is the difference in sound pressure level at a single fixed position before and after a noise control element (e.g. enclosure, barrier etc.) is installed.
L_{AE} or SEL	A noise level which, if maintained for a period of 1 second, would cause the same A-weighted sound energy to be received as is actually received from a given noise event.
$L_{Aeq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level recorded during a noise event with a period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described

	otherwise, it is measured using the 'fast' sound level meter response.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise. $L_{A10,18h}$ is the A –weighted arithmetic average of the 18 hourly $L_{A10,1h}$ values from 06:00-24:00.
$L_{90,T}$ or Background Noise Level	A noise level index. The noise level exceeded for 90% of the time over the period T. L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise.
LOAEL	Lowest Observed Adverse Effect Level. This is the noise level above which adverse effects on health and quality of life can be detected.
Night-time	The period 23:00-07:00 hours.
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.
Noise Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
SOAEL	Significant Observed Adverse Effect Level. This is the level above which significant adverse effects on health and quality of life occur.
Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level, L_p	The sound pressure level, L_p is the sound pressure relative to a standard reference pressure of 20μPa ($20x10^{-6}$ Pascals) on a decibel scale.
Specific Noise Level	The noise source under investigation for assessing the likelihood of complaints, measured as and $L_{Aeq,T}$
Rating Noise Level	The specific noise source plus any adjustment for the characteristic features of the noise, denoted by $L_{Ar,T}$.

FORMER NESTLE FACTORY, HAYES

PLANNING NOISE AND VIBRATION REPORT
(Residential Scheme)
MAY 2017



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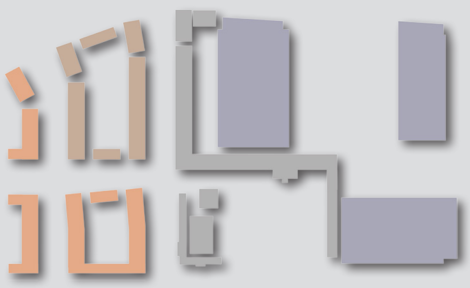
This report relates to the potential noise impacts associated with the residential elements of the scheme including impacts of surrounding noise sources on the residential development and the proposed residential units.

The report summarises baseline noise surveys carried out at the site, the subsequent assessment undertaken using the data collected and proposals for the development as a basis, and conclusions drawn from the assessment.



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Residential Planning and Vibration Noise Report

On behalf of **Barratt Homes Ltd**

Project Ref: 37205/3002 | Rev: AA | Date: February 2017

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Document Control Sheet

Project Name: **Former Nestlé Factory, Hayes**

Project Ref: **37205/3002**

Report Title: **Residential Planning Noise and Vibration Report**

Doc Ref: **FINAL/003**

Date: **May 2017**

	Name	Position	Signature	Date
Prepared by:	Derek Nash	Associate		May 2017
Reviewed by:	Matthew Barlow	Associate		May 2017
Approved by:	David Walker	Environment Director		May 2017
For and on behalf of Peter Brett Associates LLP				

Revision	Date	Description	Prepared	Reviewed	Approved

Contents

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Appendices

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1 Introduction

1.1.1 It is proposed to redevelop the former Nestle site in Hayes for part residential, part industrial use. The proposed development will comprise a number of residential blocks on the western half of the application site, and 4 industrial units on the eastern portion.

1.1.2 As part of obtaining planning permission, it is required to demonstrate to the satisfaction of the local planning authority that both the impact of the existing noise and vibration climate on the development, and impact of the development on surrounding sensitivities has been properly considered.

1.1.3 To this end, Peter Brett Associates LLP (PBA) has been commissioned by Barratt Homes Limited to undertake acoustic assessments of the residential element of the development in order to identify any measures necessary and practicable to provide a suitable internal noise climate for future residents, suitable external climate within amenity spaces, and minimize the impact on existing sensitivities.

1.1.4 Two detailed planning noise and vibration reports have been prepared, one relating to the industrial element (Industrial Planning Noise Report ref 37205/3002/FINAL002), and this report relating to the residential element. In addition, a summary report has been prepared that summarises the conclusions of both residential and industrial reports (Noise and Vibration Planning Strategy Report ref 37205/3002/FINAL001).

1.1.5 This report summarises baseline noise and vibration surveys carried out at the site, the subsequent assessment undertaken using the data collected and proposals for the development as a basis, and conclusions drawn from the assessment.

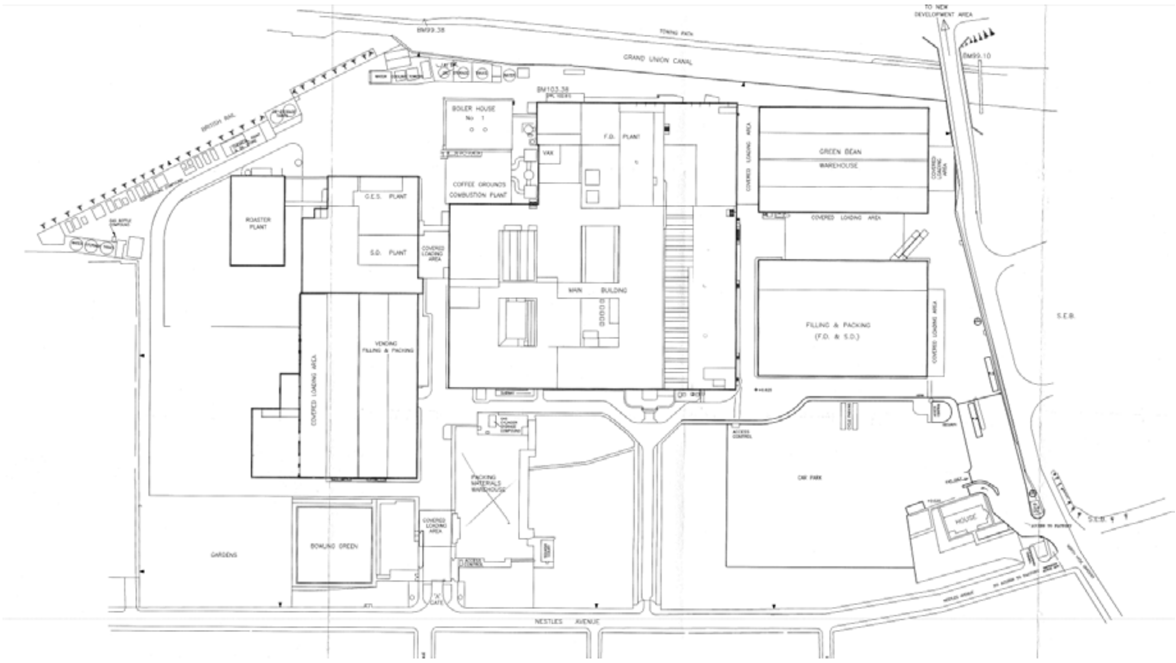
1.1.6 Whilst every effort has been made to ensure that this report is easy to understand, it is technical in nature. To assist the reader, an explanation of the terminology used in this report is contained in **Appendix A**.

2 Site Layout

2.1 General

2.1.1 The site is located on Nestles Avenue in Hayes, as illustrated in the following Figure.

Figure 2.1: Existing Site Layout



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2.2.1 The site is bound to the north by railway lines entering Hayes & Harlington Station. Beyond the railway lines is High Point Village, a large residential development comprising numerous 5-7 storey buildings. The Grand Union Canal forms the north eastern site boundary, beyond which is an industrial area.

2.2.2 To the east, the site is bound by North Hyde Gardens, an access road for the North Hyde Electricity Substation east of the site, and the industrial area north east of the site. Beyond the substation is the A312 - The Parkway, a busy dual carriageway.

2.2.3 To the south, the site is bound by Nestles Avenue, a single carriageway road used to access the residences on the opposite side of Nestles Avenue from the site.

2.2.4 Industrial units and a trading estate accessed from Viveash Close run along the western site boundary

2.3 Noise Climate

2.3.1 Generally speaking the ambient noise climate across the site is dominated by road traffic from local roads close to the site, and main roads within the vicinity such as the A312 around 230m to the east, and the M4, around 700m to the south.

2.3.2 Heathrow airport lies around 2.4km south of the site. Being due south, the contribution from air traffic is minimal owing to the east - west orientation of the runways. Easterly departures

heading northeast after take-off remain around 3km from the site. As no other departure or arrival passes closer to the site than this, aircraft are closest while at the airport.

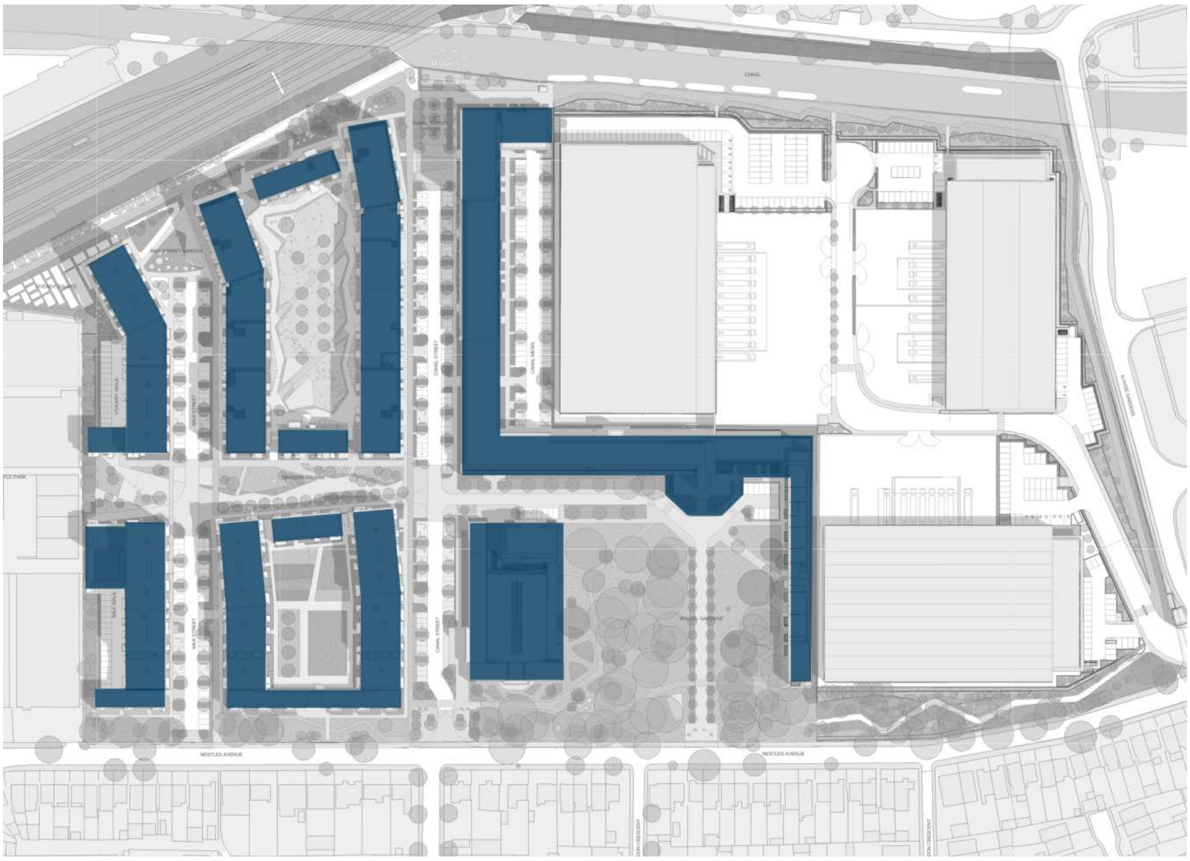
2.3.3 Given the size of the site, there are sources local to various parts of the site that contribute to the respective area. Most notably, the substation to the east, the railway lines to the north, and plant serving industrial units to the west.

2.3.4 It is worth noting that the operation of the Nestle factory would previously have been a source of a reasonable amount of industrial noise within the area, which is no longer present at the time of baseline noise surveying.

2.4 Proposals

2.4.1 The following figure illustrates the residential aspect of the proposed development.

Figure 2.2: Proposed Residential Layout



2.4.2 As the above figure illustrates, the residential element of the site comprises a number of blocks on the western portion of the site.

3 Design Standards & Assessment Criteria

3.1 General

3.1.1 This section sets out the design standards and assessment criteria that would need to be adopted during the design and construction of the development.

3.2 Liaison with Local Authority

3.2.1 Each local authority has the potential to dictate their own local policies on procedure and criteria to be used when carrying acoustic assessments. In this case, the local authority is Hillingdon Council, and the relevant Environmental Health Officer is Muhammad Islam.

3.2.2 Various correspondence has taken place between Muhammad Islam and PBA by telephone and email to establish the assessment methodology and criteria to be adopted when carrying out assessments needed to support the proposed application. The sections below summarise the outcome of the correspondence.

3.3 Internal Noise Levels

Continuous Levels

3.3.1 Residential dwellings should be designed to achieve an appropriate level of insulation against external noise. In order to determine the appropriate level of sound insulation, suitable internal noise levels are presented in BS 8233[1]. These are given below.

Table 3.1: Values presented in Table 4 of BS 8233 – 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 $L_{Aeq,\ 8hour}$

Note 7 to the above table states:

"Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved."

As such, the aim would be for internal noise levels to meet the levels presented in the table. However, if incident noise levels exceed a level of 55 dB $L_{Aeq,\ 16hour}$ during the daytime, a 5 dB relaxation of the internal noise levels presented in Table 4 will be considered acceptable.

3.3.2 It should be noted that the design standards presented in BS 8233 and set out above relate to anonymous noise sources, such as transportation. Where the source is not anonymous, such as from an adjacent site, or contains a distinct character, there is the potential for the source to give rise to a greater disturbance at the same level.

[1] BS 8233:2014 - Guidance on sound insulation and noise reduction for buildings

3.3.3 To address this concern, a further design target of NR20 within bedrooms during the night-time from industrial noise incident on future residences is recommended. The rationale behind the use of a Noise Rating curve as the basis for the criteria is that where there is a concern of a disproportionate amount of energy at one part of the frequency spectrum – e.g. tonal components from industrial sources, the use of an NR criterion is seen as a good solution. This is because the NR calculation process penalises a greater proportion of energy at any part of the spectrum as it is the closest point at any frequency to the curve that determines the entire NR value. This is different from the L_{Aeq} calculation procedure, which could allow higher energy at one part of the spectrum to be compensated by little energy at other parts.

Individual Events

3.3.4 Note 4 to the above tables states:

"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."

3.3.5 In the previous version of BS 8233, criteria took the form of 45dB $L_{Amax,F}$ not being regularly exceeded. It has been agreed with the local authority that to assess the measures necessary to achieved this, the 10th highest $L_{AMax,F,15min}$ measured at the site during the noise survey would be used as a basis.

Ventilation

3.3.6 Alternative means of ventilation (to opening windows) will only be provided in order to ensure suitable background ventilation rates are achieved. Purge ventilation rates will be achieved via means of opening windows.

3.4 External Amenity Area Noise Levels

3.4.1 With regards to acceptable noise levels in amenity areas (i.e. private gardens), BS8233:2014 states that:

"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."

3.4.2 Therefore, based on the above guidance, if a level of 55 dB $L_{Aeq\ (16\ hours)}$ in outdoor amenity areas is exceeded this should not automatically trigger the necessity for mitigation measures.

3.4.3 However, when residential development is proposed near a source of noise (i.e. a road or railtracks) where incident noise levels are likely to exceed 55 dB $L_{Aeq\ (16\ hours)}$, then the private amenity gardens should be located behind the buildings which will therefore provide partial noise screening.

3.5 Change in Road Traffic due to Development

3.5.1 Guidance on the assessment of the effects of road traffic noise and vibration is given in the Design Manual for Roads and Bridges (DMRB)[2]. DMRB assessment procedures are based on a substantial amount of research on the effects of road traffic noise on people. It acknowledges that people react in a different manner to sudden changes in noise level than to gradual changes.

3.5.2 The classification of magnitude of noise impacts in the long germ are given in the following table, and equated to the Planning Practice Guidance effect levels.

Table 3.2: Impact of changes in road traffic

Noise change, $L_{A10,18h}$	Magnitude of Impact	Perception From Increase	Increasing Effect Level
0	No Change	Not Noticeable	No Observed Effect
0.1-2.9	Negligible	Noticeable and not intrusive	No Observed Adverse Effect
3-4.9	Minor	Noticeable and intrusive	Observed Adverse Effect
5-9.9	Moderate	Noticeable and disruptive	Significant Observed Adverse Effect
10+	Major	Noticeable and very disruptive	Unacceptable Adverse Effect

3.6 Vibration

3.6.1 The following table shows, BS 6472 gives ranges for the various subjective responses.

Table 3.3: BS 6472 VDV Ranges which Might Result in Various Probabilities of Adverse Comment within Residential Buildings

	Low Probability of Adverse Comment (ms-1.75)	Adverse Comment Possible (ms-1.75)	Adverse Comment Probable (ms-1.75)
Residential buildings 16 h day	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential buildings 8 h night	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8

[2] The Highways Agency, November 2011, Design Manual for Roads and Bridges, Volume 11, Section 3 Part 7 'Traffic Noise and Vibration'.

4 Baseline Noise Levels

4.1 General

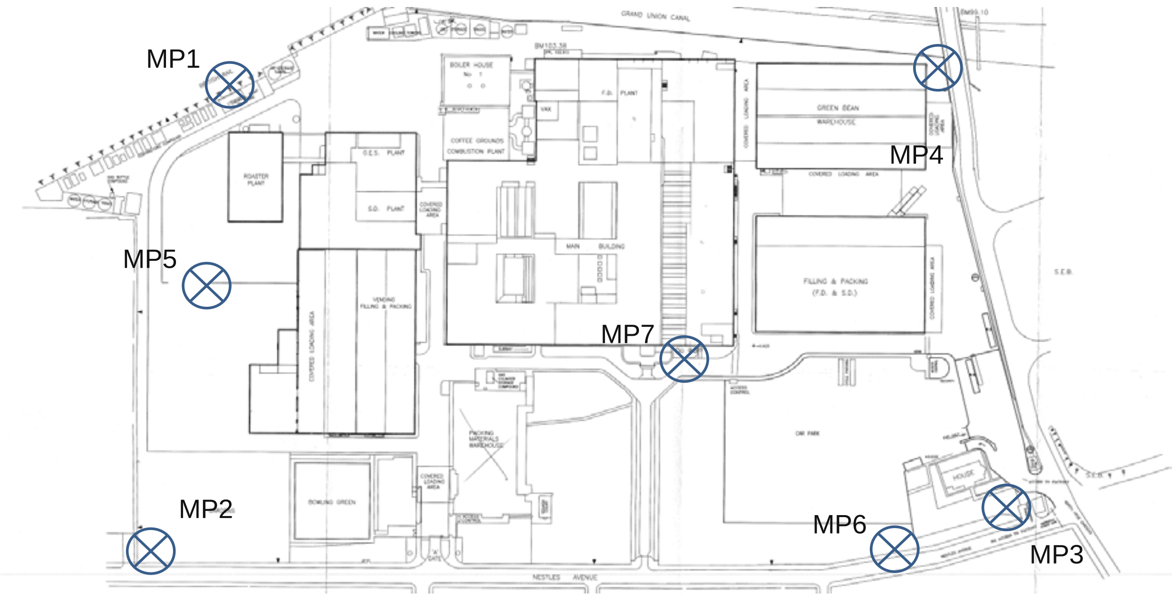
4.1.1 In order to quantify baseline noise levels around the site, noise surveys were undertaken in October 2014 by PBA, and in March and April 2016 by both PBA and Sharps Gayler.

4.1.2 The attached **Appendix B** sets out general methodology employed when undertaking the noise measurements, and full survey specific methodology and further details can be provided on request.

4.2 Measurement Positions

4.2.1 The following figure illustrates the measurement locations.

Figure 4.1: Baseline Noise Measurement Positions



4.2.2 The following table gives a description of each of the measurement positions in the above figure.

Table 4.1: Description of noise survey measurement positions

Name	Description
MP1	The sound level meter was placed on top of the bank along the northern site boundary beside the metal fence separating the site from the railway lines. This position was intended primarily to record noise levels from incident on the site from the railway lines, along with general ambient levels, and background levels representative of residences on the opposite side of the railway lines
MP2	The sound level meter was located 5m from the south-western site boundary, and 1m from the north-western site boundary. This position was intended primarily to record noise levels from incident on the site from Nestles Avenue, along with general ambient levels, and background levels representative of residences on the opposite side of the Nestles Avenue.
MP3	The sound level meter was located 2.4m from the south-western site boundary, and 3m from the kerb of North Hyde Gardens. This position was intended primarily to record noise levels incident on the site from the Nestles Avenue and other roads within the vicinity, along with general ambient levels, and background levels representative of residences on the opposite side of the Nestles Avenue.
MP4	The sound level meter was located close to the fence along the northern site boundary separating it from the canal, and approximately 3m from the eastern site boundary. This position was intended to record general ambient at this part of the site.
MP5	The sound level meter was located approximately 35m east of the western site boundary. This position was primarily intended to record noise levels for the existing industrial activity to the west of the site.
MP6	The sound level meter microphone was fixed to the top of a pole approximately 8m from the kerb of Nestle Avenue. Measurements were made under free-field conditions. The purpose of this position was to quantify background noise levels at adjacent sensitivities, as well as noise incident on the site from environmental sources.
MP7	The sound level meter microphone was fixed to the top of a pole approximately 113m from the kerb of Nestle Avenue at the location of the yellow barriers separating the access road lanes. Measurements were made under free-field conditions. The purpose of this position was to quantify noise levels further into the site from environmental sources.

4.3 Ambient Noise Levels

4.3.1 The following table presents a summary of the ambient noise levels measured at the above positions.

Table 4.2: Summary of Baseline Ambient Noise Levels

Acoustic Index	MP1	MP1	MP2	MP3	MP4	MP5	MP6	MP7
	Oct 2014	Apr 2016	Oct 2014	Oct 2014	Oct 2014	Apr 2016	Apr 2016	Apr 2016
Daytime $L_{Aeq,\ 16h}$	70	68	61	58	63	60	52	51
Night-time $L_{Aeq,\ 8h}$	64	63	53	56	58	56	54	50
Night $L_{Amax,10th\ Highest}$	85	88	73	75	76	71	68	64
Night $L_{Amax,\ Average}$	78	81	70	73	75	67	63	60

4.4 Background Noise Levels

4.4.1 The following table presents a summary of the background noise levels measured at the above positions.

Table 4.3: Summary of Baseline Background Noise Levels

Acoustic Index	MP1	MP1	MP2	MP3	MP4	MP5	MP6	MP7
	Oct 2014	Apr 2016	Oct 2014	Oct 2014	Oct 2014	Apr 2016	Apr 2016	Apr 2016
Daytime L_{A90}	52 - 59	48 - 59	49 – 56	50 – 56	55 – 64	49 – 62	43 – 54	41 – 57
Evening L_{A90}	51 – 57	47 - 55	49 – 53	51 – 52	54 – 55	49 – 59	44 – 52	43 – 52
Night L_{A90}	54 – 58	44 - 55	45 - 52	47 - 55	51 - 57	41 – 59	41 - 52	40 - 57

4.4.2 The time-history figures attached as **Appendix C** present the noise levels measured at the assessment positions in terms of L_{Aeq}, L_{AMax} and L_{A90}.

5 Vibration Measurements

5.1 Methodology

5.1.1 In order to quantify the level of vibration at the site, a baseline vibration survey was carried out over a 48-hour period commencing October 21st 2014.

5.1.2 As the railway lines to the north are the only appreciable source of vibration at the site, vibration measurements were made at a single position on the bank along the northern site boundary beside the metal fence separating the site from the railway lines. The measurement position is identified as MP1 on **Figure 4.1**.

5.1.3 The vibration measurements were made using a tri-axial accelerometer fixed to a spiked plate and embedded into the earth to be in good contact with the ground.

5.1.4 Vibration measurements were carried out using the equipment as detailed in the following table.

Table 5.1: Equipment used during vibration measurements

Item	Manufacturer	Type
Vibration Monitor	Rion	VM-54
Tri-axial Accelerometer	Rion	PV-83CW

5.1.5 The vibration meter was self-calibrating, and had been laboratory calibrated within the 12 months prior to the survey.

5.1.6 The vibration monitor continuously logged VDV_{5min} vibration dose values with the appropriate *b* or *d* weighting applied as detailed in BS 6472[3]. These were then used to calculate the VDV_{day} and VDV_{night} values using equation 3 of BS 6472.

5.1.7 As the vibration measurements were undertaken at the same time as the baseline noise survey, a description of meteorological conditions can be found with the noise measurement methodology.

5.2 Results

5.2.1 The following table presents the calculated VDV_{day} and VDV_{night} values.

Table 5.2: Calculated vibration dose values

Period	$VDV_{b/d}$,$ms^{-1.75}$ calculated for the relevant period in axis		
	X	Y	Z
Day	0.012	0.018	0.090
Night	0.009	0.011	0.044

[3] BS 6472-1:2008: Guide to evaluation of human exposure to vibration in buildings - Part 1: Vibration sources other than blasting

5.2.2 It’s worth noting that VDVs are predominantly controlled by the vibration levels caused by the trains, rather than the number of trains. For example, if the number of trains were to double, the VDVs would increase by just 19%. Therefore, it should be noted that small variations in the number of trains on the lines, due for example to variations between summer and winter timetables will not have any significant effect on the measured VDVs.

6 External Noise Levels

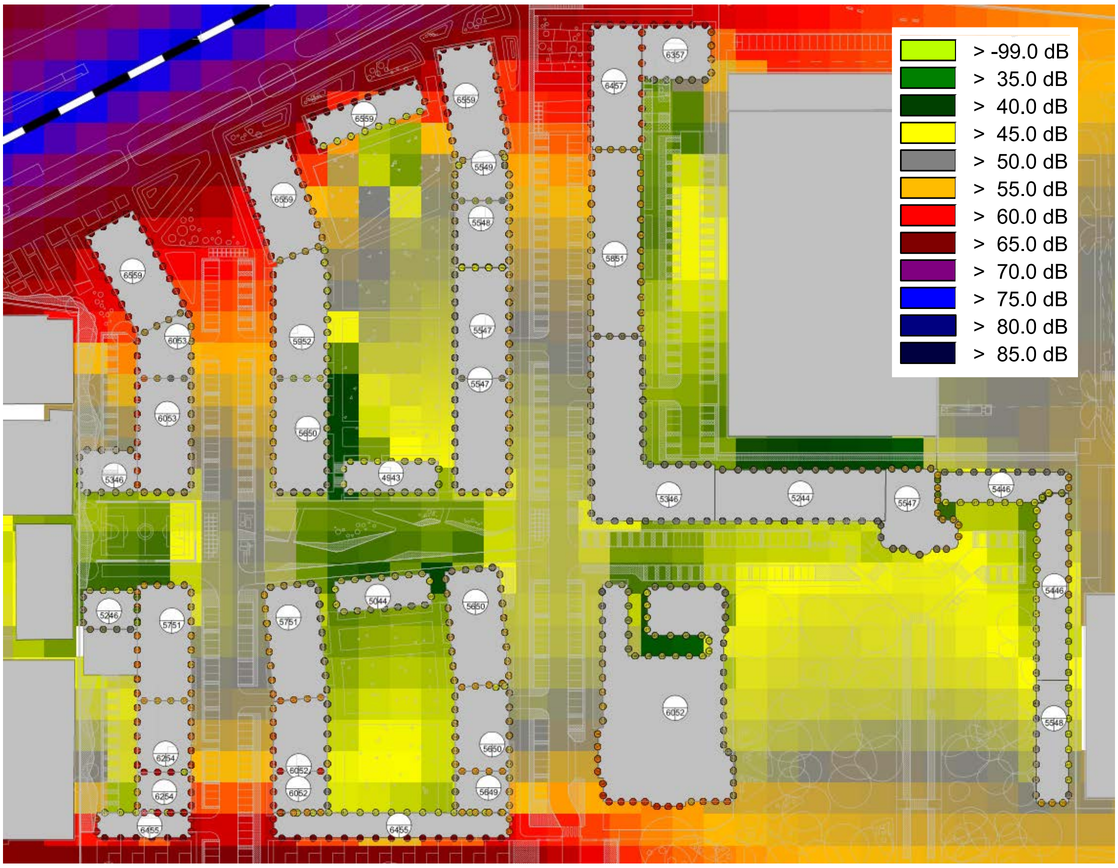
6.1.1 As set out in section 3.4, the aim is to provide external amenity areas where noise levels do not exceed 50 dB – 55 dB L_{Aeq}.

6.1.2 Looking at figure 4.1, and the values in table 4.1, the noise levels drop to around 51 L_{Aeq} during the daytime once there is a reasonable distance or screening from environmental sources.

6.1.3 In order to calculate the noise levels with the proposed buildings in place, a noise model has been built using the CADNA noise mapping software. The noise map determines the propagation of sources according to the appropriate national standard, such as CRN for rail sources, CRTN for road sources, and ISO 9613 for point sources. Where possible, the noise model is calibrated / verified using noise levels as measured during the baseline survey.

6.1.4 Using the noise model, the following noise map has been generated, which presents the propagation of environmental sources across the site.

Figure 6.1: Daytime Noise Levels from Environmental Sources



6.1.5 As the above illustrates, the screening provided by the proposed buildings reduces noise levels to within the target range of noise levels from the railway noise source.

6.1.6 Taking this into account, coupled with the levels measured during the baseline survey, it is expected that noise levels within the amenity areas will fall within the range set out in BS 8233. As such, no specific acoustic mitigation measures to control noise to external amenity areas beyond those already proposed are expected to be necessary.

7 Internal Levels

7.1 General

7.1.1 In order to determine the acoustic requirements for elements forming the building façade, preliminary noise break-in calculations have been undertaken. In principle, these start with the measured external noise levels at the site, take an allowance for the various elements forming the façade, and compare the resultant levels with the internal noise criteria set out in section 3.3.

7.1.2 The procedure used to carry out the break-in calculations is presented in Paragraph 2.1 of Annex G of BS 8233.

7.1.3 For the purposes of this assessment it is assumed that the glazing, along with any penetrations required for ventilation will form the weakest elements of the façade. These will therefore dictate the achievable sound reduction from the building envelope. This is a reasonable assumption if the external walls were to incorporate masonry elements for example, or use cladding, curtain walling etc. and appropriate internal linings with a high sound reduction index.

7.1.4 It should be noted that the solutions put forward in this section are not expected to be the final design specifications. These are given to illustrate the feasibility of meeting internal noise criteria using the various glazing types and ventilation strategies in order to inform on-going design considerations. Detailed calculations would need to be undertaken at the appropriate stage of development to determine final specifications.

7.2 Façade Incident Levels

7.2.1 In order to determine noise levels incident on the proposed facades, a noise model has been built using the CADNA noise mapping software. The noise map determines the propagation of sources according to the appropriate national standard, such as CRN for rail sources, and ISO 9613 for point sources. Where possible, the noise model is calibrated / verified using noise levels as measured during the baseline survey.

7.2.2 By using the noise model as described, façade incident noise levels on the proposed buildings from both existing environmental sources and proposed industrial sources have been calculated. The attached **Appendix D** illustrates the calculated levels.

7.2.3 These levels, coupled with the wider baseline survey data have allowed the acoustic requirements for elements forming the building envelopes to be determined.

7.3 Internal Noise Criteria

7.3.1 As set out in **Section 3.3**, the intention is for proposed habitable rooms exposed to anonymous sources to meet the internal noise level criteria set out in BS 8233, with further consideration given to transient noise sources and their resultant L_{AMax} noise levels.

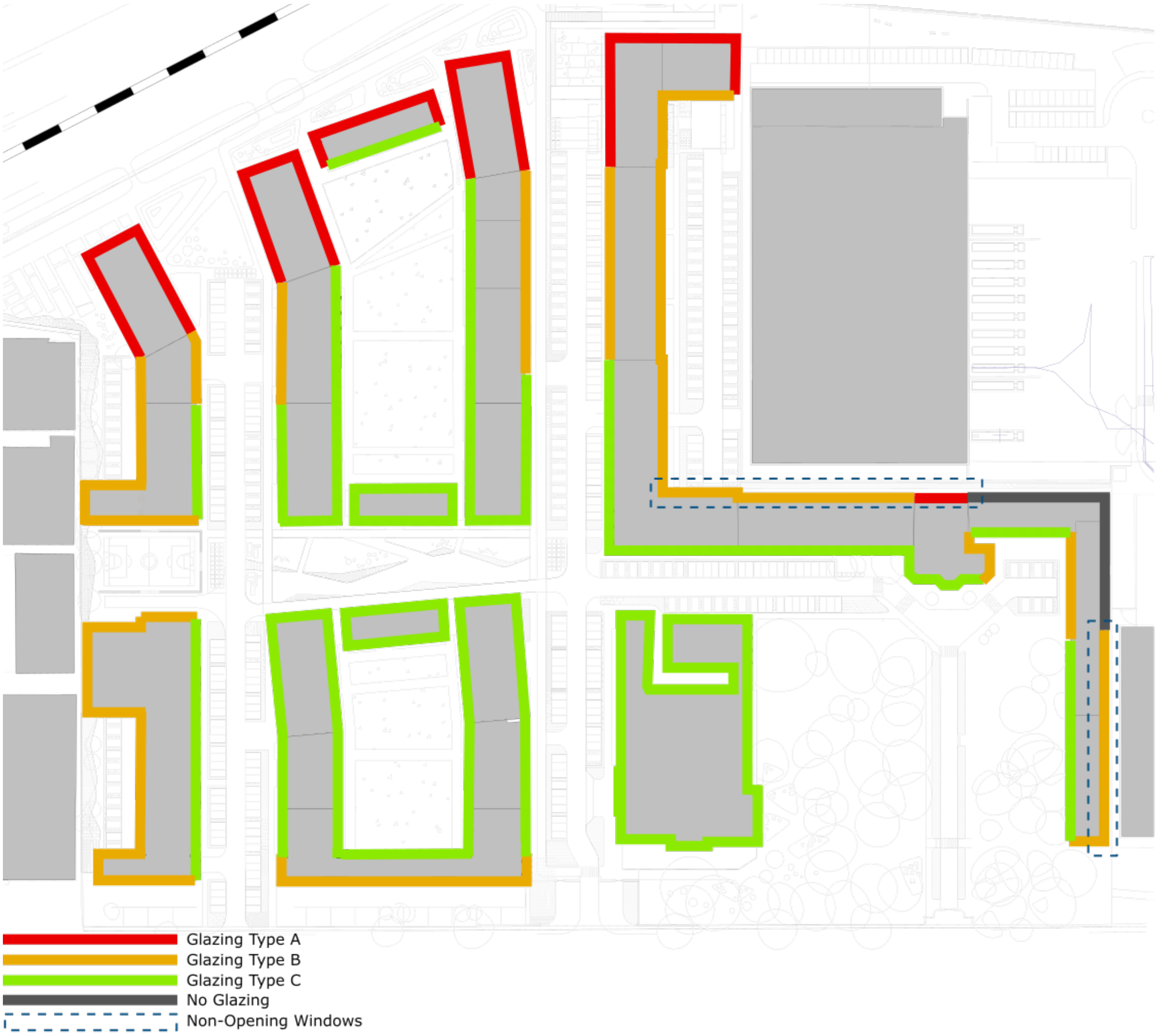
7.3.2 As also set out in **Section 3.3**, for proposed residences exposed to noise from proposed industrial sources to the east of the site, such as service yard activities, the internal noise level criteria put forward is NR20 within bedrooms during the night. To this end, noise levels from service yard activities have been predicted as part of the industrial noise assessments set out in Industrial Planning Noise Report (ref 37205/3002/FINAL002), and these have been used to inform the break-in calculations undertaken as part of this assessment.

7.4 Building Envelope

7.4.1 In order to determine the acoustic specification for the glazed and ventilation elements, various configurations have been assessed. An example of the calculations undertaken as part of this is presented in **Appendix E**, and full calculations can be provided on request.

7.4.2 Based on the attached calculations, sound insulation requirements for three types of glazing specifications have been established. The locations where the various specifications are required are illustrated on the following figure.

Figure 7.1: Acoustic Requirements of Glazing



7.4.3 The acoustic requirements of the three glazing specifications are set out in the following table.

Table 7.1: Sound reduction performance required for glazing

Glazing Type	Sound Reduction Index (dB) at Octave band with Centre Frequency (Hz)						
	125	250	500	1k	2k	4k	R'_w
Glazing Type A	24	21	32	37	42	43	34
Glazing Type B	22	21	28	38	40	47	33
Glazing Type C	20	18	28	38	34	38	31

7.4.4 The sound reduction performance figures quoted above are valid for the building glazing elements taken as a whole and in their installed condition. The specification therefore applies to the glass, the frames or mullions, all seals on any openable part of the system and any openings in the frames required for ventilation purposes. This list is not exhaustive: no part of the glazed element shall cause the above figures not to be achieved.

7.4.5 Based on general data provided in Table 4 of Section 7 of BS EN 12758:2011[4] the following glazing and airspace configuration is expected to be capable of providing the required sound reduction indices:

- Glazing Type A - 10/6-16/4 double glazing: 10mm pane, 6mm-16mm air space, 4mm pane.
- Glazing Type B - 8/6-16/4 double glazing: 8mm pane, 6mm-16mm air space, 4mm pane.
- Glazing Type C - 6/6-16/6 double glazing: 6mm pane, 6mm-16mm air space, 6 mm pane.

7.4.6 With regards to ventilation, rooms requiring Glazing Type A will need to provide a means of ventilation that does not require a penetration through the façade (i.e. a vent) or opening windows. As such, areas requiring Glazing Type A will need to be mechanically ventilated. It should be noted that windows overlooking the South of Unit 4 and the west of Unit 1 will be non-opening. Ventilation to rooms glazed in this manner will be achieved by mechanical means.

7.4.7 For areas with a lower glazing requirement, it is feasible to use a natural ventilation strategy. We calculate that with areas identified for Glazing Type B or Type C, internal noise criteria will be met with ventilation provided by a single vent with the following element normalised level differences.

Table 7.2: Acoustic performance of vents where Glazing Type B or Type C is indicated

Vent Type	Element Normalised Level Difference (D_{ne}, dB) at Octave band with Centre Frequency (Hz)						
	125	250	500	1k	2k	4k	$D_{n,e,w}$
Vent Type A	36	36	36	34	35	35	36

[4] BS EN 12758:2011 - Glass in building — Glazing and airborne sound insulation — Product descriptions and determination of properties

7.4.8 Based on data presented in a draft version of Approved Document E, a trickle vent with an indirect air path would be capable of providing the D_{ne} values required for Vent Type A.

8 Vibration

8.1.1 The VDVs given in **Table 5.2** above were measured on the ground, and as such corrections need to be made to determine internal levels of vibration for comparison with the criteria. In order to do this, two effects need to be considered: the reduction in vibration as it passes into the foundations of the building, and the amplification as the vibration propagates up the building to the upper storeys and across potentially suspended floors.

8.1.2 Different types of foundations will affect resultant reduction in vibration. The foundations of the proposed residences are not known, although it is anticipated that they will be piled foundations.

8.1.3 Appropriate corrections can be found in the Handbook of Urban Rail Noise and Vibration Control (HURNVC)[5], which gives a multiplication factor for piled foundations of approximately 0.4 based on the 31.5 Hz frequency band.

8.1.4 As mentioned above, the vibration is likely to be amplified as it propagates up the structure. To calculate vibration levels up the building, an amplification factor of 1.26 per floor has been used, based on figures presented the HURNVC. With buildings closest to the railway line comprising 11 storeys, a total amplification factor of 10.1 is obtained (i.e. 1.26^{10}). With the reduction into the foundations taken into account, this gives a total amplification of 4.0 (i.e. 10.1 x 0.4).

8.1.5 As vibration measurements were carried out close to the railway-line (around 6m closer than the proposed residences), no correction for distance needs to be applied.

8.1.6 On the basis described above, the following table gives the vibration dose values estimated for the top storey of buildings close to the railway lines.

Table 8.1: Estimated vibration dose values on top storey of proposed residences close to railway

Period	Estimated Vibration Dose Values ($eVDV_{b/d}$ / $ms^{-1.75}$) for the relevant period in axis		
	X	Y	Z
Day	0.05	0.07	0.36
Night	0.04	0.04	0.18

.

8.1.7 As the above table shows, levels of vibration on the top storey of the proposed buildings are estimated to be within the 'Low Probability of Adverse Comment' range outlined in **Table 3.3**. As such, no specific measures to the building foundations are expected to be necessary to control vibration.

[5] H J Saurenam, J T Nelson and G P Wilson, 'Handbook of Urban Rail Noise and Vibration Control (HURNVC) , The Federal Transit Administration, USA

9 Impact of Development on Surroundings

9.1 Traffic

9.1.1 The noise impact arising from changes in traffic flows as a result of the development needs to be assessed. The following table presents the baseline traffic flows excluding and including development traffic, along with the percentage change for the year of opening – i.e. the first year of operation of the site.

Table 9.1: Traffic flow figures and percentage changes

Location	Baseline			Baseline + Dev			Change		
	Cars / LGV	HGV	Total	Cars / LGV	HGV	Total	Cars / LGV	HGV	Total
North Hyde Road (East of North Hyde Gardens)	26985	2824	29808	34146	2937	37082	27%	4%	24%
North Hyde Gardens	1365	619	1984	7099	742	7841	420%	20%	295%
Nestles Ave East of Harold Ave	811	36	847	811	36	847	0%	0%	0%
Harold Ave	2641	269	2909	4608	269	4876	74%	0%	68%
Nestles Ave East of Station Road	2849	284	3133	3763	284	4047	32%	0%	29%
North Hyde Road East of Station Road	17842	2073	19915	18865	2094	20959	6%	1%	5%
Station Road North of Crowland Avenue	13036	1846	14882	14026	1856	15882	8%	1%	7%

9.1.2 As the above shows, with the exception of North Hyde Gardens, the highest percentage change would be experienced by residences facing Harold Avenue, with a 74% increase in Cars / LGVs.

9.1.3 According to Design Manual of Roads and Bridges[2]:

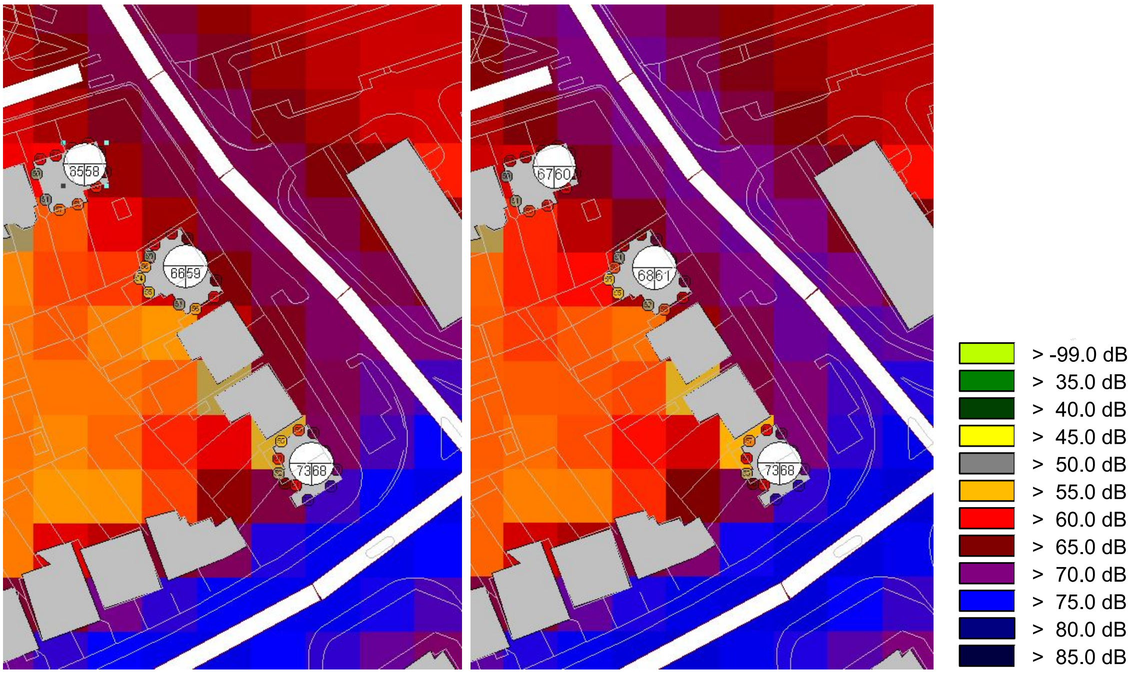
"A change in noise level of 1 dB $L_{A10,18h}$ *is equivalent to a 25% increase or a 20% decrease in traffic flow, assuming other factors remain unchanged and a change in noise level of 3 dB* $L_{A10,18h}$ *is equivalent to a 100% increase or a 50% decrease in traffic flow; "*

9.1.4 On the basis set-out above, with the exception of North Hyde Gardens, the highest percentage increase would equate to an increase in noise level of 2.4dB. This is within the 'No Observed Adverse Effect' range as set out in **Table 3.2**, which, according to relevant Planning Practice Guidance the action for which is 'no specific measures required'.

9.1.5 With regards to North Hyde Gardens, there are two factors that need to be considered when determining the impact. The first is that the percentage change approach outlined above assumes each road is the dominant source for residences fronting on to it. This is not the case however for residences facing North Hyde Gardens, as the dominant contribution comes from

North Hyde Road and other surrounding roads. To this end, the following figures present the calculated noise levels at residences fronting onto North Hyde Gardens with and without the development traffic.

Figure 9.1: Comparison of Noise Levels on North Hyde Gardens with (right) and without (left) Development Traffic



9.1.6 Using this approach, as the above figures illustrate the highest increase in noise levels would be for the residence on the corner of Nestles Avenue and North Hyde Gardens. The highest calculated increase at this location equates to 2.1dB. This is within the 'No Observed Adverse Effect' range as set out in **Table 3.2**, which, according to relevant Planning Practice Guidance the action for which is 'no specific measures required'.

9.1.7 It is also worth considering that the baseline figures assume no contribution from the development site (i.e. there are currently no vehicle movements associated with it, and the baseline figures assume this remains the case). This would not have been the case when the site was previously operational, and in reality if the development were not to proceed, the use of the site would inevitably resume in some capacity under its existing permission, which would give rise to a significant number of vehicle movements. As such, the above can be considered very much a worst case with regards to the impact on existing residences.

9.2 Mechanical Services Noise

9.2.1 As set out in **Section 3.5**, it will be important to ensure noise from mechanical services plant installed as part of the development is suitably controlled such that it does not give rise to a significant adverse impact on existing sensitivities in the vicinity of the site.

9.2.2 To this end, existing background noise levels at the site have been quantified, which would be used to form the basis of a BS 4142 assessment (detailed in **Table 4.2**).

9.2.3 Given the current stage of development, outline details only are available regarding the mechanical services strategy, with locations plant types that could give to atmospheric noise emissions not yet known.

9.2.4 It is therefore expected to be appropriate to attach a condition to planning permission to require a plant noise assessment to be carried out at the appropriate stage of development, once more details regarding the mechanical services scheme are available. An example of the type of condition is given below:

"Noise arising from mechanical services plant installed as part of the development shall not give rise to a rating level higher than the existing background sound levels (given in terms of $L_{A90,15min}$*) at the nearest noise-sensitive premises. The measurements, assessment and reporting shall be carried out according to BS 4142:2014. To demonstrate that this will be achieved, a noise assessment prepared by a suitably qualified acoustician must be submitted to and approved by the local planning authority prior to operation of the mechanical services plant".*

10 Conclusions

10.1.1 Several baseline noise and vibration surveys have been undertaken at the development site since October 2014. Using these, ambient and transient acoustic indices have been determined, such as $L_{Aeq,16h}$ for the daytime, $L_{Aeq,8h}$ for the night, and average and 10th highest L_{AFMax} levels.

10.1.2 Noise levels around the site were measured to be 52 dB – 70 dB $L_{Aeq,16h}$ during the day, and 50 dB – 64 dB $L_{Aeq,8h}$ during the night, with noise levels varying primarily with proximity to environmental sources, such as roads to the south of the site, and railway lines to the north.

10.1.3 Using the baseline noise data, and a noise model of the proposed site layout, external noise levels were determined. It is expected that the distance and screening provided by the proposed buildings from the dominant environmental sources will produce amenity spaces with noise levels within the BS 8233 target range of 50dB - 55dB $L_{Aeq,16hour}$. As such, no specific acoustic mitigation measures to control noise to external amenity areas beyond those already inherent in the scheme are expected to be necessary.

10.1.4 In order to address the issue of providing an appropriate internal noise climate within future residences, an assessment of the acoustic requirements of the building envelope was undertaken. The assessment used the noise survey data and noise model developed for the site as a basis, along with relevant guidance from BS 8233.

10.1.5 Based in the assessment, the acoustic requirements of the glazing were grouped into three types. The example configurations for these types ranged from 6/6-16/6 double glazing to 10/6-16/4 double glazing.

10.1.6 With regards to ventilation, areas requiring the highest specification of glazing will need to provide a means of ventilation that does not require a penetration through the façade (i.e. a vent) or opening windows, and as such need to be mechanically ventilated. For areas with a lower glazing requirement, it is feasible to use a natural ventilation strategy in the form of a trickle vent capable of providing the acoustic performance set out in the report.

10.1.7 Using vibration data measured as part of the site survey as the basis for an assessment of internal vibration levels, along with guidance contained within BS 6472, it was concluded that the expected internal vibration would fall into the range corresponding to 'Low probability of adverse comment'. As such, no specific measures to the building foundations are expected to be necessary to control vibration.

10.1.8 In order to determine the impact of any change in noise levels arising from additional vehicles on the road as a result of the development, a traffic noise assessment was undertaken. Based on a percentage change approach, with the exception of North Hyde Gardens, the highest percentage increase would equate to an increase in noise level of 2.4 dB. When looking at noise levels predicted when considering the impact of all surrounding roads, the highest increase in noise levels for residents on North Hyde Gardens was calculated to be 2.1 dB. This is within the ‘No Observed Adverse Effect’ range for which the action, according to relevant Planning Practice Guidance, is ‘no specific measures required’.

10.1.9 With regards to the traffic noise impact assessment, it should be noted that the baseline figures assume no contribution from the development site (i.e. there are currently no vehicle movements associated with it, and the baseline figures assume this remains the case). This would not have been the case when the site was previously operational, and in reality if the development were not to proceed, the use of the site would inevitably resume in some capacity under its existing permission, which would give rise to a significant number of vehicle movements. As such, the traffic noise impact assessment can be considered very much a worst case with regards to the impact on existing residences.

10.1.10 Finally, the issue of mechanical services plant installed as part of the development was considered. Given the current stage of development, outline details only are available regarding the mechanical services strategy. Specific plant selections and locations are not yet known. It is therefore expected to be appropriate to attach a condition to planning permission to require a plant noise assessment to be carried out at the appropriate stage of development. To this end, an example of the type of condition has been given.

10.1.11 In this regard, the range of L_{A90} background noise levels was presented which were derived based on the noise survey data. Using these, noise limits for plant installed as part of the development can be established. These levels are intended to facilitate future BS 4142 assessments of mechanical services plant installed as part of the development.

10.1.12 It should be noted that the solutions put-forward in this report are intended to demonstrate the feasibility of achieving suitable conditions for future residents whilst minimising the impact of the development on existing residences. They are not expected to necessarily be the ultimate solutions, and detailed assessments would need to be carried out to determine actual solutions at a more appropriate stage of development.

Appendix A Acoustic Terminology

Parameter	Description
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near ($L_{Aeq,T}$).
Daytime	The period 07:00-23:00 hours.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s_1 and s_2 is given by 20 $\log_{10}$ (s_1/s_2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa. The threshold of normal hearing is in the region of 0 dB and 140 dB is the threshold of pain. A change of 1 dB is only perceptible under controlled conditions.
dB(A), L_{Ax}	Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).
Fast Time Weighting	Setting on sound level meter, denoted by a subscript F that determines the speed at which the instrument responds to changes in the amplitude of any measured signal. The fast time weighting can lead to higher values than the slow time weighting when rapidly changing signals are measured. The average time constant for the fast response setting is 0.125 (1/8) seconds.
Free-field	Sound pressure level measured outside, far away from reflecting surfaces (except the ground), usually taken to mean at least 3.5 metres
Façade	Sound pressure level measured at a distance of 1 metre in front of a large sound reflecting object such as a building façade.
Insertion Loss	Insertion loss is the difference in sound pressure level at a single fixed position before and after a noise control element (e.g. enclosure, barrier etc.) is installed.
L_{AE} or SEL	A noise level which, if maintained for a period of 1 second, would cause the same A-weighted sound energy to be received as is actually received from a given noise event.
$L_{Aeq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level recorded during a noise event with a period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment.

	Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise. $L_{A10,18h}$ is the A – weighted arithmetic average of the 18 hourly $L_{A10,1h}$ values from 06:00-24:00.
$L_{90,T}$ or Background Noise Level	A noise level index. The noise level exceeded for 90% of the time over the period T. L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise.
LOAEL	Lowest Observed Adverse Effect Level. This is the noise level above which adverse effects on health and quality of life can be detected.
Night-time	The period 23:00-07:00 hours.
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.
Noise Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
SOAEL	Significant Observed Adverse Effect Level. This is the level above which significant adverse effects on health and quality of life occur.
Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level, L_p	The sound pressure level, L_p is the sound pressure relative to a standard reference pressure of 20μPa ($20x10^{-6}$ Pascals) on a decibel scale.
Specific Noise Level	The noise source under investigation for assessing the likelihood of complaints, measured as and $L_{Aeq,T}$
Rating Noise Level	The specific noise source plus any adjustment for the characteristic features of the noise, denoted by $L_{Ar,T}$.

Appendix B Baseline Noise Survey Methodology

Guidance and Standards

The survey instrumentation, methodology and reporting of results has been carried out following guidance contained within British Standard 7445-1:2003 - *'Description and measurement of environmental noise - Part 1: Guide to quantities and procedures'*.

Measurement Positions

Noise measurements were made at each position for a period of at least 48 hours using unattended noise monitors at each of the measurement positions indicated on the **Figure 4.1.**

At each location the sound level meter microphone was fixed to the top of a pole at height of 1.5m above relative ground level. Measurements were made under free-field conditions.

Noise Monitoring Equipment

The sound level analysers used to undertake the noise measurements conform to the Type 1 specification as given in BS EN 61672-1:2003 - *'Electroacoustics - Sound level meters - Part 1: Specifications'*. The calibrator presented in the above table conforms to the Class 1 specification as specified in IEC 60942:2003 – *'Electroacoustics - Sound calibrators'*.

The noise measurement equipment was calibrated before and after the survey to ensure a consistent and acceptable level of accuracy is maintained. No significant drift (greater than 0.2dB) was noted to have occurred.

Data Recorded

Noise data was recorded in all relevant indices, including L_{Aeq}, L_{A10}, L_{A90}, $L_{AMax,F}$ and $L_{AMax,S}$ [6]. See attached **Error! Reference source not found.** - Glossary for an explanation of noise units used.

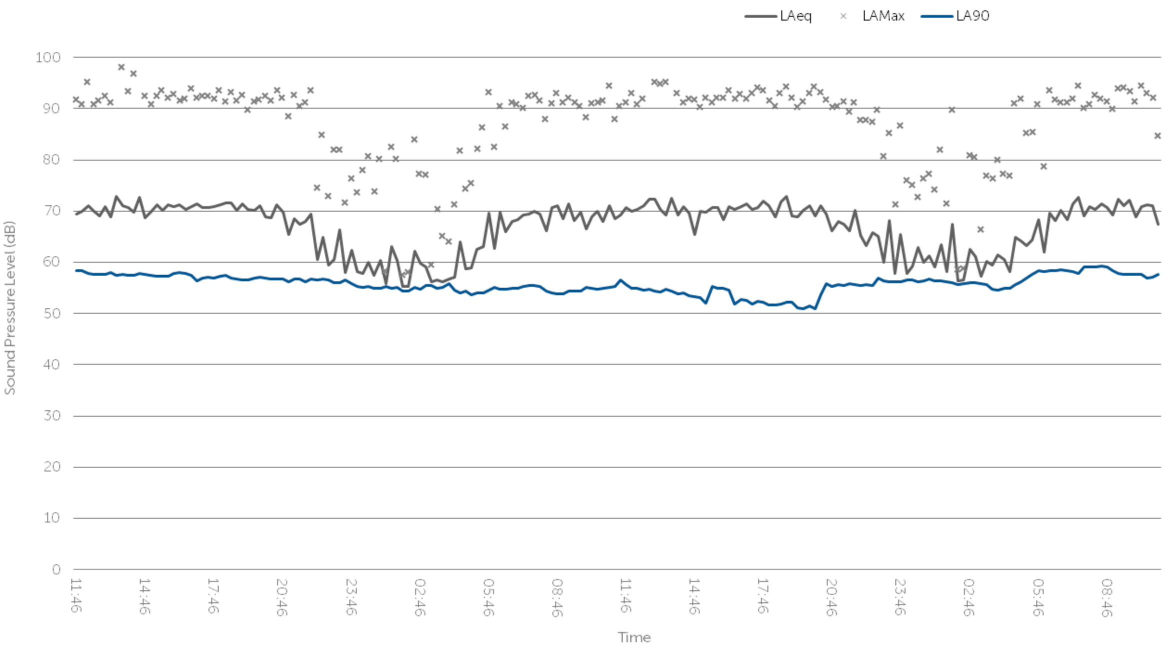
Octave band data for each of the above indices was also recorded, the filters for which met the requirements of BS EN 61260:1996, Class 1.

Noise data was recorded over consecutive 15-minute periods, in which all indices and octave band spectra were recorded.

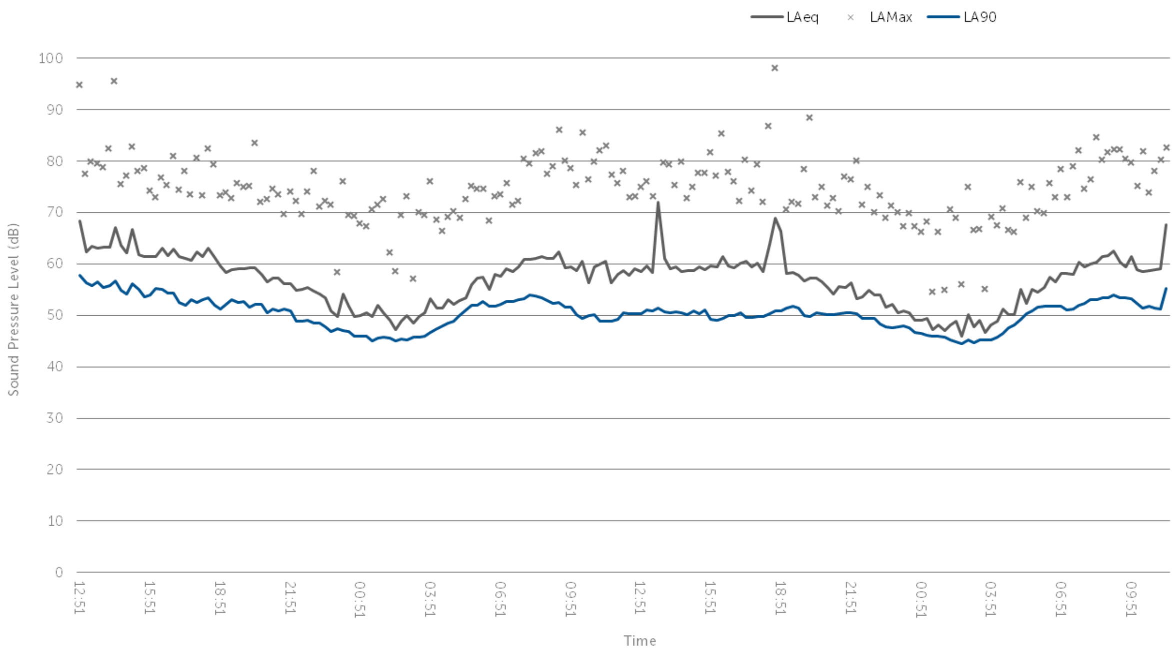
[6] Maximum A-weighted sound pressure level using time-weighting "F" and "S". As stated in BS EN 61672−1:2003 Design-goal time constants are 0,125 s for time-weighting F (Fast) and 1 s for time weighting S (Slow).

Appendix C Time History Figures

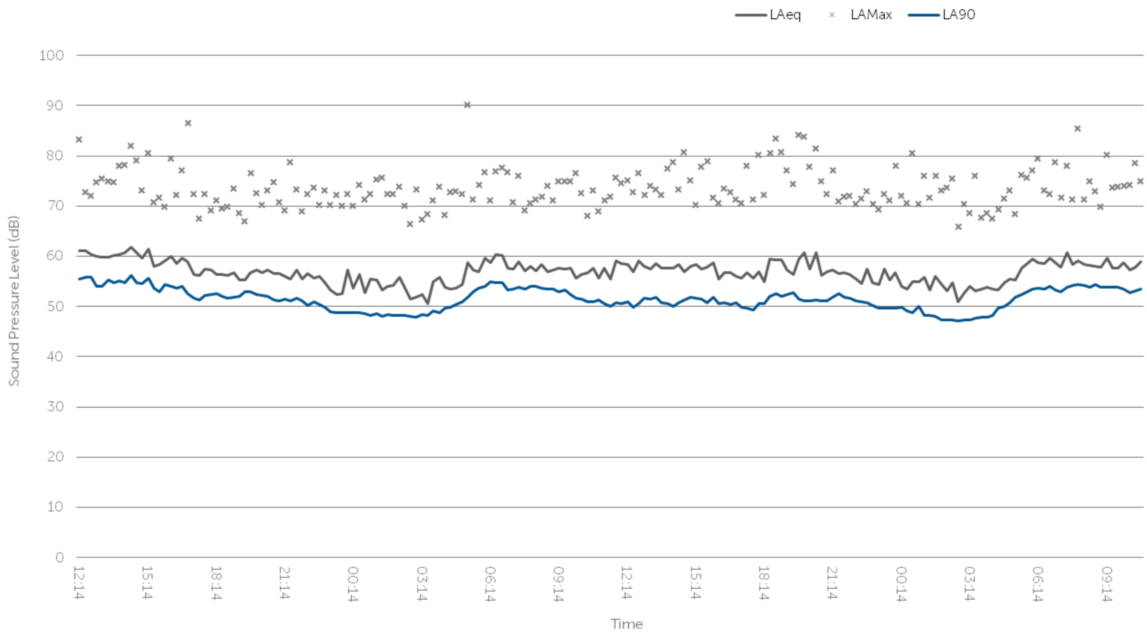
C.1 Noise Levels Recorded at Position MP1, 28th - 30th October 2014



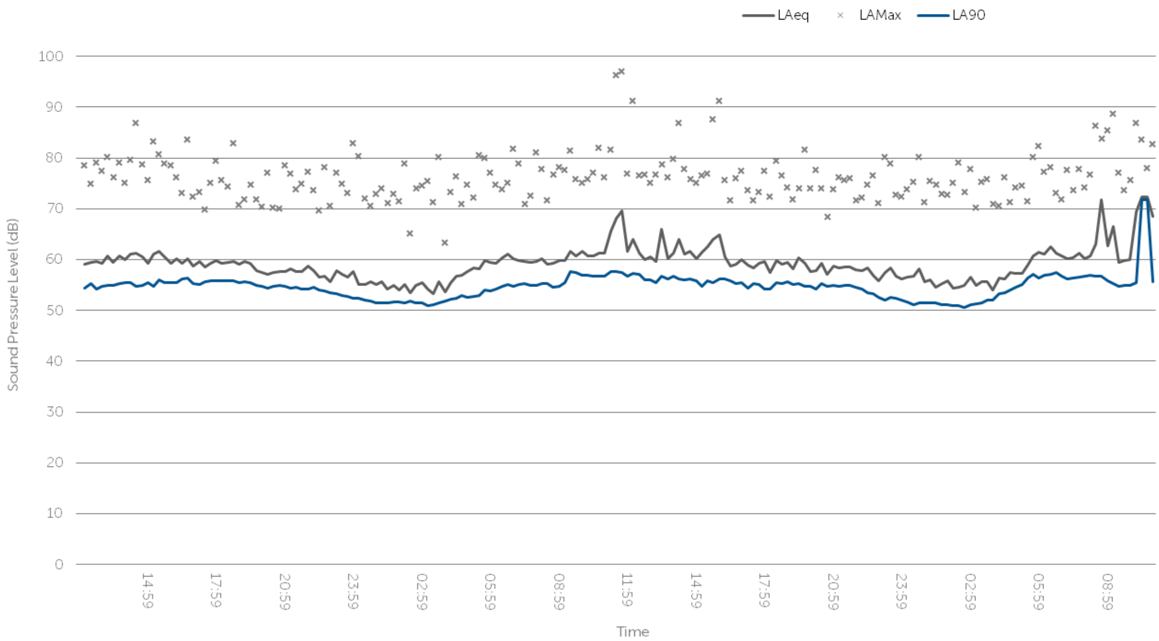
C.2 Noise Levels Recorded at Position MP2, 21st – 23rd October 2014



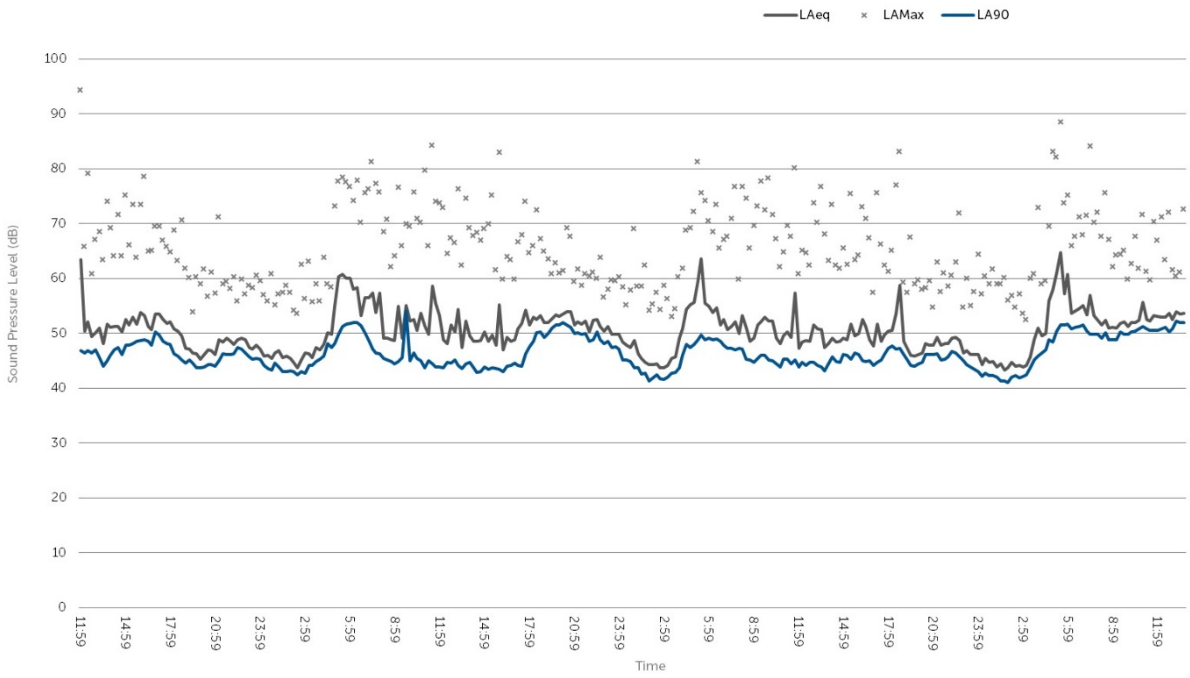
C.3 Noise Levels Recorded at Position MP3, 21st – 23rd October 2014



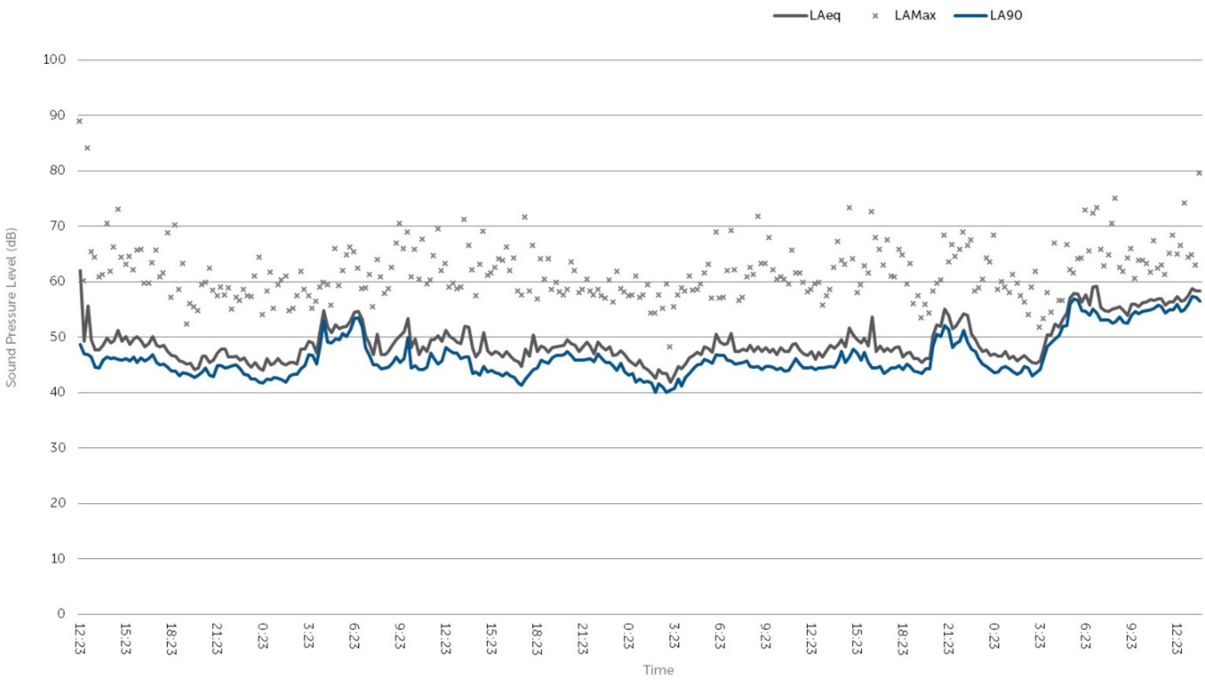
C.4 Noise Levels Recorded at Position MP4, 28th – 30th October 2014



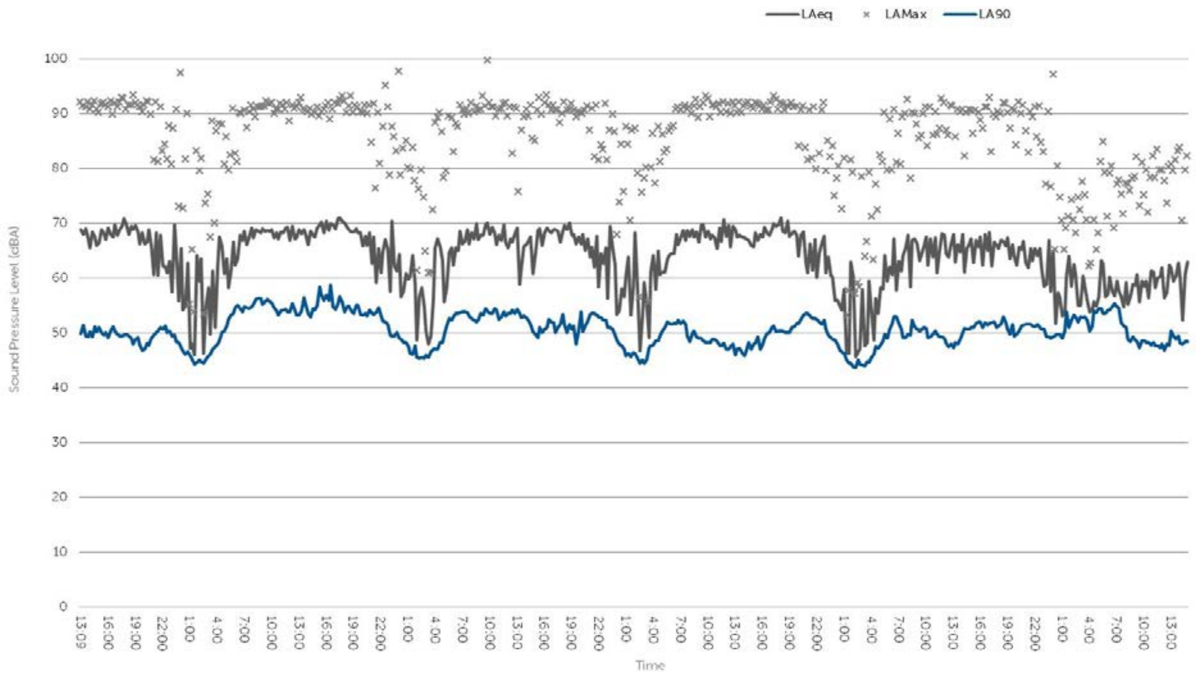
C.5 Noise Levels Recorded at Position MP6, 21st – 24th March 2016



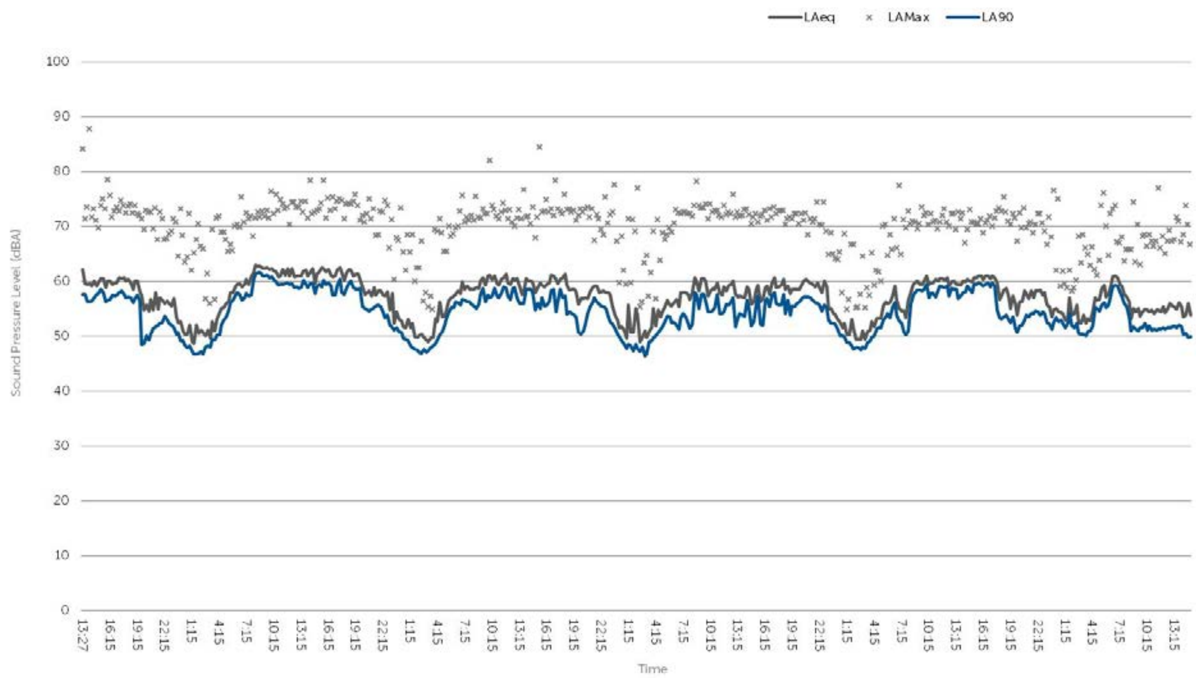
C.6 Noise Levels Recorded at Position MP7, 21st – 24th March 2016



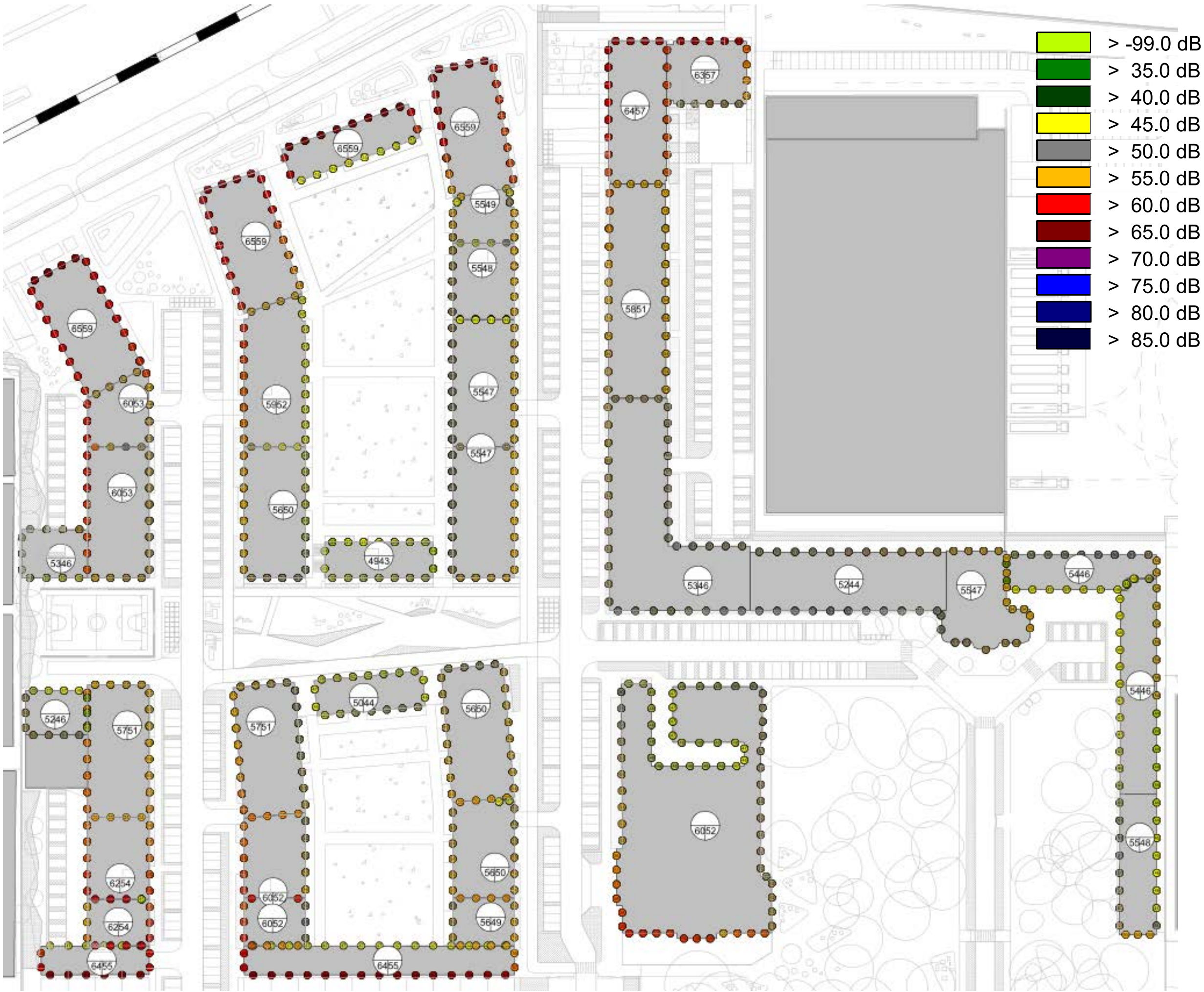
C.7 Noise Levels Recorded at Position MP1, 5th – 10th April 2016



C.8 Noise Levels Recorded at Position MP5, 5th – 10th April 2016



Appendix D Façade Incident Levels



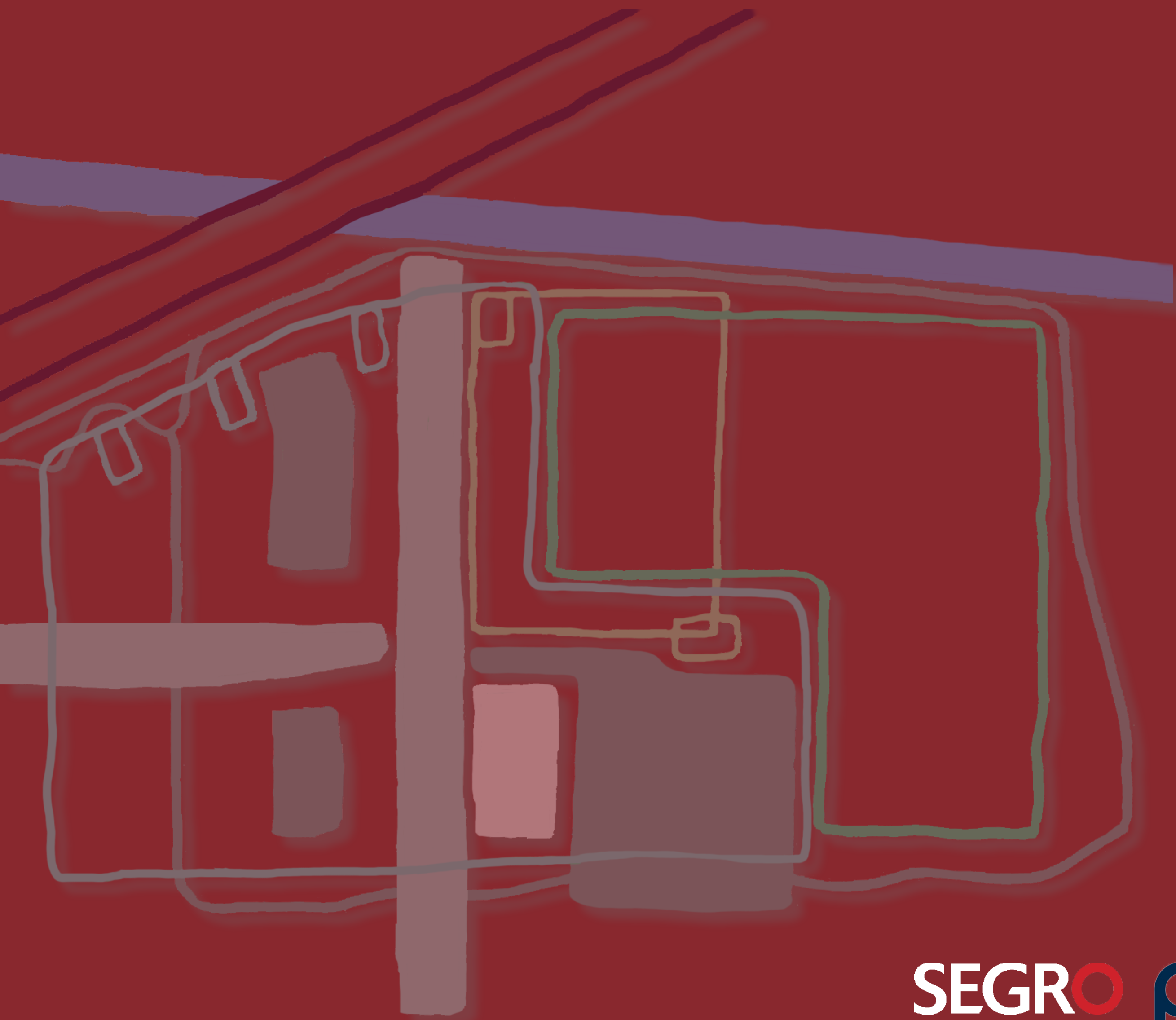
Appendix E Example Break-In Calculation

E.1 Example Break-In Calculation to Living Room during the Day From Rail Source

		Octave Band Centre Frequency (Hz)								
		63	125	250	500	1k	2k	4k	8k	
Noise Source										
Noise Source - Day Leq from Rail										
Noise Levels		72.1	68.8	64.8	64.2	66.4	64.3	55.7	52.0	70.2dBA
Line Source Distance Loss										
		-11.4	*-11.4*	*-11.4*	*-11.4*	*-11.4*	*-11.4*	*-11.4*	*-11.4*	
Composite SRI										
Facade Width (m)	4.0									
Facade Height (m)	2.5									
Main Element - EW-01										
SRI		-	37.0	42.0	52.0	60.0	63.0	68.0	-	
Window Width (m)	1.5									
Window Height (m)	1.5									
No. of Windows (no)	2.0									
Glazed Element - GL-02										
SRI		-	22.0	21.0	28.0	38.0	40.0	47.0	-	
No. of Vents (no)	1.0									
Vent - VE-01										
Dne		-	35.0	35.0	34.0	36.0	34.0	34.0	-	
		-	*-24.9*	*-24.1*	*-29.5*	*-34.9*	*-33.5*	*-33.9*	-	
10 log (S/A)										
Internal Receiver - Day Living Leq										
		-	*-2.1*	*-2.1*	*-2.1*	*-2.1*	*-2.1*	*-2.1*	-	
+3										
		-	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	-	
Levels Out										
Input		-	33.5	30.3	24.2	21.0	20.3	11.3	-	27.9dBA

FORMER NESTLE FACTORY, HAYES

PLANNING NOISE REPORT
(Industrial Scheme)
MAY 2017

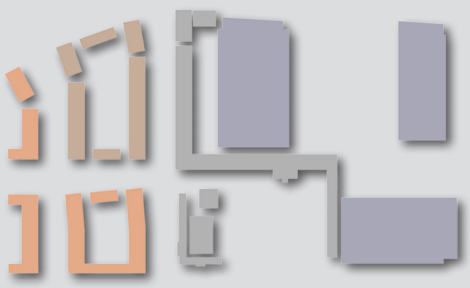


SEGRO

pba peterbrett

This report relates to the potential noise impacts associated with the industrial elements of the scheme.

The report summarises baseline noise surveys carried out at the site, the subsequent assessment under-taken using the data collected and proposals for the development as a basis, and conclusions drawn from the assessment.



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Former Nestlé Factory, Hayes

Industrial Planning Noise Report

On behalf of **SEGRO**

Project Ref: 37205/3002 | Rev: AA | Date: February 2017

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Document Control Sheet

Project Name: **Former Nestlé Factory, Hayes**

Project Ref: **37205/3002**

Report Title: **Industrial Planning Noise Report**

Doc Ref: **FINAL/002**

Date: **May 2017**

	Name	Position	Signature	Date
Prepared by:	Derek Nash	Associate		May 2017
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Approved by:	David Walker	Environment Director		May 2017
For and on behalf of Peter Brett Associates LLP				

Revision	Date	Description	Prepared	Reviewed	Approved

Contents

Figures

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Appendices

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1 Introduction

1.1.1 It is proposed to redevelop the former Nestle site in Hayes for part residential, part industrial use. The proposed development will comprise a number of residential blocks on the western half of the application site, and 4 industrial units on the eastern portion.

1.1.2 As part of obtaining planning permission, it is required to demonstrate to the satisfaction of the local planning authority that both the impact of the existing noise and vibration climate on the development, and impact of the development on surrounding sensitivities has been properly considered.

1.1.3 To this end, Peter Brett Associates LLP (PBA) has been commissioned by SEGRO Plc to undertake acoustic assessments of the industrial element of the development in order to identify any measures necessary and practicable to minimize the impact on existing sensitivities, as well as those proposed as part of the wider scheme.

1.1.4 Two detailed planning noise and vibration reports have been prepared, one relating to the residential element (Residential Planning Noise Report ref 37205/3002/FINAL003), and this report relating to the industrial element. In addition, a summary report has been prepared that summarises the conclusions of both residential and industrial reports (Noise and Vibration Planning Strategy Report ref 37205/3002/FINAL001).

1.1.5 This report summarises baseline noise surveys carried out at the site, the subsequent assessment undertaken using the data collected and proposals for the development as a basis, and conclusions drawn from the assessment.

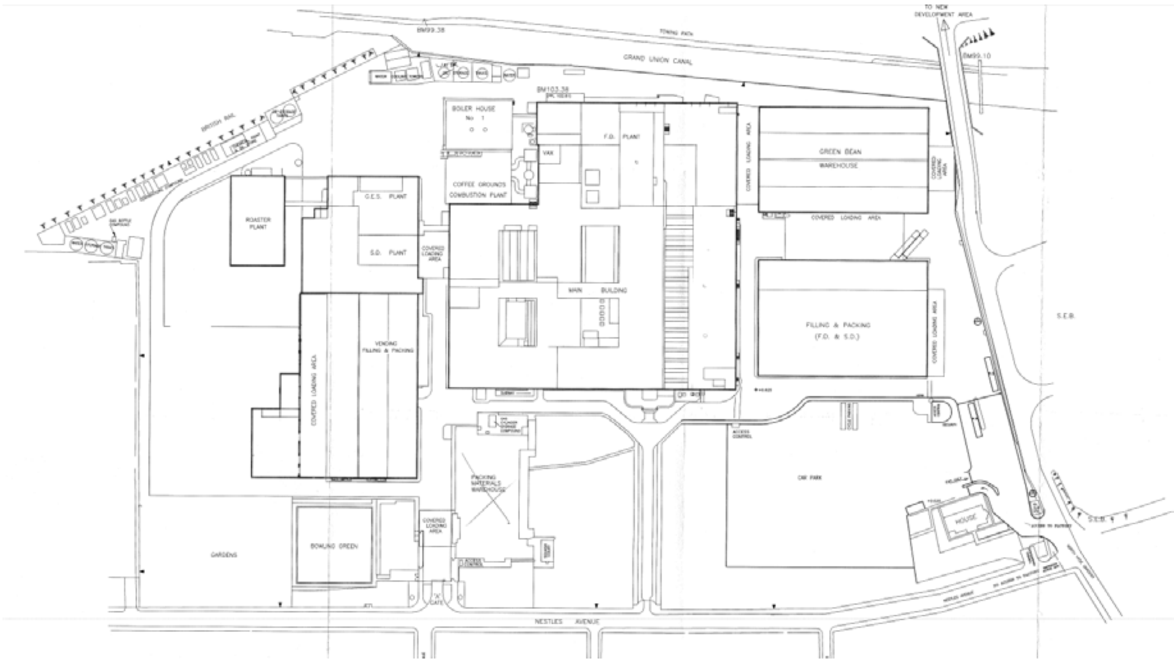
1.1.6 Whilst every effort has been made to ensure that this report is easy to understand, it is technical in nature. To assist the reader, an explanation of the terminology used in this report is contained in **Appendix A**.

2 Site Layout

2.1 General

2.1.1 The site is located on Nestles Avenue in Hayes, as illustrated in the following Figure.

Figure 2.1: Existing Site Layout



2.2 Site Context

2.2.1 The site is bound to the north by railway lines entering Hayes & Harlington Station. Beyond the railway lines is High Point Village, a large residential development comprising numerous 5-7 storey buildings. The Grand Union Canal forms the north eastern site boundary, beyond which is an industrial area.

2.2.2 To the east, the site is bound by North Hyde Gardens, an access road for the North Hyde Electricity Substation east of the site, and the industrial area north east of the site. Beyond the substation is the A312 - The Parkway, a busy dual carriageway.

2.2.3 To the south, the site is bound by Nestles Avenue, a single carriageway road used to access the residences on the opposite side of Nestles Avenue from the site.

2.2.4 Industrial units and a trading estate accessed from Viveash Close run along the western site boundary

2.3 Noise Climate

2.3.1 Generally speaking the ambient noise climate across the site is dominated by road traffic from local roads close to the site, and main roads within the vicinity such as the A312 around 230m to the east, and the M4, around 700m to the south.

2.3.2 Heathrow airport lies around 2.4km south of the site. Being due south, the contribution from air traffic is minimal owing to the east - west orientation of the runways. Easterly departures

heading northeast after take-off remain around 3km from the site. As no other departure or arrival passes closer to the site than this, aircraft are closest while at the airport.

2.3.3 Given the size of the site, there are sources local to various parts of the site that contribute to the respective area. Most notably, the substation to the east, the railway lines to the north, and plant serving industrial units to the west.

2.3.4 It is worth noting that the operation of the Nestle factory would previously have been a source of a reasonable amount of industrial noise within the area, which is no longer present at the time of baseline noise surveying.

2.4 Proposals

2.4.1 The following figure illustrates the industrial aspect of the proposed development.

Figure 2.2: Proposed Industrial Layout

2.4.2 As the above figure illustrates, the industrial element of the site comprises four units on the eastern portion of the site.

3 Design Standards & Assessment Criteria

3.1 General

3.1.1 This section sets out the design standards and assessment criteria that would need to be adopted during the design and construction of the development.

3.2 Liaison with Local Authority

3.2.1 Each local authority has the potential to dictate their own local policies on procedure and criteria to be used when carrying acoustic assessments. In this case, the local authority is Hillingdon Council, and the relevant Environmental Health Officer is Muhammad Islam.

3.2.2 Various correspondence has taken place between Muhammad Islam and PBA by telephone and email to establish the assessment methodology and criteria to be adopted when carrying out assessments needed to support the proposed application. The sections below summarise the outcome of the correspondence.

3.3 Change in Road Traffic due to Development

3.3.1 Guidance on the assessment of the effects of road traffic noise and vibration is given in the Design Manual for Roads and Bridges (DMRB)[1]. DMRB assessment procedures are based on a substantial amount of research on the effects of road traffic noise on people. It acknowledges that people react in a different manner to sudden changes in noise level than to gradual changes.

3.3.2 The classification of magnitude of noise impacts in the long germ are given in the following table, and equated to the Planning Practice Guidance effect levels.

Table 3.2: Impact of changes in road traffic

Noise change, $L_{A10,18h}$	Magnitude of Impact	Perception From Increase	Increasing Effect Level
0	No Change	Not Noticeable	No Observed Effect
0.1-2.9	Negligible	Noticeable and not intrusive	No Observed Adverse Effect
3-4.9	Minor	Noticeable and intrusive	Observed Adverse Effect
5-9.9	Moderate	Noticeable and disruptive	Significant Observed Adverse Effect
10+	Major	Noticeable and very disruptive	Unacceptable Adverse Effect

[1] The Highways Agency, November 2011, Design Manual for Roads and Bridges, Volume 11, Section 3 Part 7 'Traffic Noise and Vibration'.

3.4 Operational Noise

3.4.1 When assessing the significance of noise from fixed mechanical services plant items and operational activities on noise sensitive residential premises, British Standard 4142 contains relevant guidance.

3.4.2 BS 4142:2014 – “Methods for rating and assessing industrial and commercial sound” describes a method for assessing whether noise from factories, industrial premises, fixed installations, sources of industrial nature and commercial premises is likely to give rise to complaints.

3.4.3 Under the BS 4142 procedure, a noise rating level is calculated for the source at a receiver location (normally an existing residence or other sensitive premises). This rating level takes the predicted noise level at that location and adds various penalties for acoustic features expected to increase the significance of the source, such as tonality, impulsivity and intermittency.

3.4.4 The significance of the sound is then calculated by comparing the measured background sound level with the rating level, and observing the following principles:

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

3.4.5 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.

3.5 Terminology

3.5.1 BS 4142 contains specific terminology which it's helpful to summarise here.

- Specific sound: sound from the source being assessed - in this case the extract plant. The specific sound level is measured and reported using the L_{Aeq} index.
- Residual sound: ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound. The residual sound level is also measured and reported using the L_{Aeq} index.
- Ambient sound: totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far. This includes the specific sound. The ambient sound level is also measured and reported using the L_{Aeq} index.
- Background sound: this is the sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval. It's used to indicate the underlying noise levels in the absence of more transient sources, and is measured and reported using the L_{A90} index.

3.5.2 Rating level: The rating level is the specific sound once any adjustments for the characteristic features of the sound that result in an increased likelihood of disturbance (such as tonality, impulsivity, intermittency etc.) have been taken into account. It should be noted that these adjustments are as heard at the receiver, and not simply a consequence of the plant operating sound levels and conditions. As the adjustments increase the rating level, these can be thought of as penalties. As such, the rating level is the specific sound level with penalties applied.

4 Baseline Noise Levels

4.1 General

4.1.1 In order to quantify the existing sound climate at the site and at the sensitivities within the vicinity of the site, a sound survey was undertaken.

4.1.2 The survey commenced at 12:00 on Monday 21st March and completed at 14:00 on Thursday 24th March 2016.

4.1.3 Measurements were undertaken at two positions as described in the following section. The purpose of these positions was primarily to quantify the background noise climate at the nearest sensitivities to the site. As such the measurement positions were chosen as these are expected to be best representative of these, as well as providing broader contextual noise data.

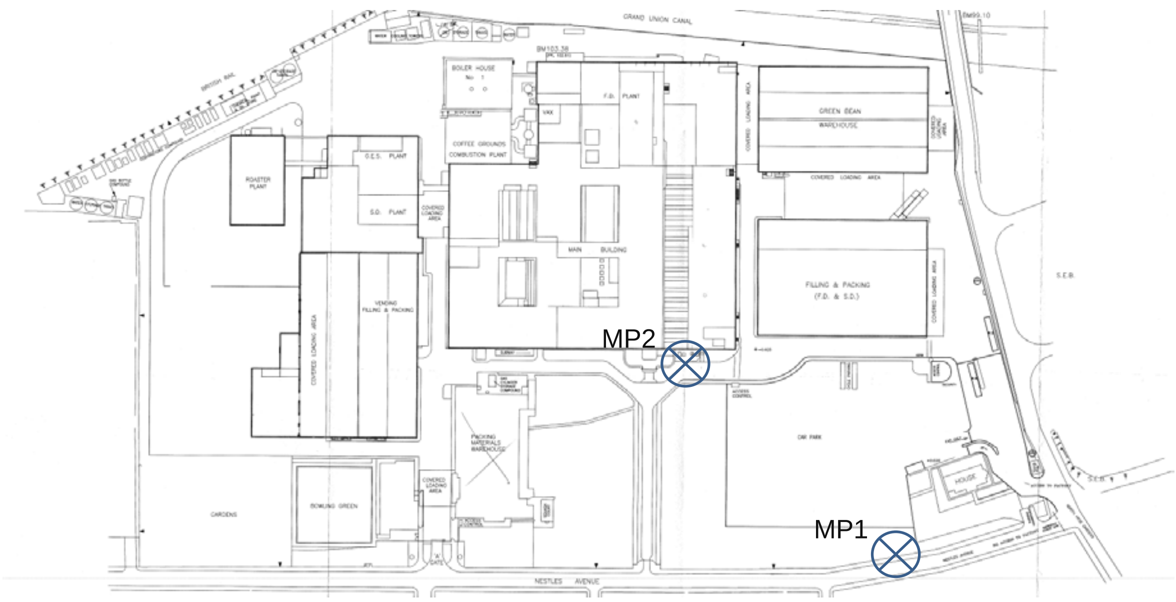
4.2 Guidance and Standards

4.2.1 The survey instrumentation, methodology and reporting of results was carried out following guidance contained within British Standard 7445-1:2003 - '*Description and measurement of environmental noise - Part 1: Guide to quantities and procedures*'.

4.3 Measurement Positions

4.3.1 The following figure illustrates the measurement locations.

Figure 4.1: Baseline Noise Measurement Positions



4.3.2 Measurements were made using two unattended noise monitors located facing Nestles Avenue (MP1) and further into the site on the boundary of proposed industrial / residential uses (MP2). A description of the position is given below.

- MP1 The sound level meter microphone was fixed to the top of a pole approximately 8 m from the kerb of Nestle Avenue. Measurements were made under free-field conditions. The purpose of this position was to quantify background noise levels at adjacent sensitivities, as well as noise incident on the site from environmental sources.

- MP2 The sound level meter microphone was fixed to the top of a pole approximately 113 m from the kerb of Nestle Avenue at the location of the yellow barriers separating the access road lanes. Measurements were made under free-field conditions. The purpose of this position was to quantify noise levels from existing environmental sources at a position location further into the site.

4.4 Noise Monitoring Equipment

4.4.1 Vibration measurements were carried out using the equipment as detailed in the following table.

Table 4.1: Equipment used during noise measurements

Item	Manufacturer	Type
Sound Level Analyser	Rion	NL-52
Acoustic Calibrator	Rion	NC-74

4.4.2 The sound level analyser presented in the above table conforms to the Type 1 specification as given in BS EN 61672-1:2003 - '*Electroacoustics - Sound level meters - Part 1: Specifications*'. The calibrator presented in the above table conforms to the Class 1 specification as specified in IEC 60942:2003 – '*Electroacoustics - Sound calibrators'*.

4.4.3 The measurement instrumentation, including sound level analyser, preamplifier and microphones has undergone traceable calibration by either the equipment manufacture or a competent laboratory within the last two years.

4.4.4 The associated acoustic calibrator has undergone traceable calibration by either the equipment manufacturer or a competent laboratory within the last year. The calibration certificates for the above equipment can be provided on request.

4.4.5 The noise measurement equipment was calibrated before and after the survey to ensure a consistent and acceptable level of accuracy is maintained. No significant drift (greater than 0.2dB) was noted to have occurred.

4.5 Data Recorded

4.5.1 Noise data was recorded in all relevant indices, including L_{Aeq}, L_{A90}, $L_{AMax,F}$ and $L_{AMax,S}$. Octave band data for each of the above indices was also recorded, the filters for which met the requirements of BS EN 61260:1996, Class 1.

4.5.2 Noise data was recorded over consecutive 15-minute periods during the unattended measurements. All indices and octave band spectra were recorded.

4.6 Meteorological Conditions

4.6.1 During the survey, temperatures were mild to cold, ranging between 10 °C – 14 °C during the day to 1 °C – 6 °C during the night. Wind speeds were low on average, being less than 5 m/s. No precipitation was recorded throughout the duration of the survey.

4.7 Results

4.7.1 The time-history figures presented in **Appendix B** set out the noise levels measured at MP1 and MP2. The results are summarised in Table 4.2 below.

Table 4.2: Summary of Baseline Noise Levels

Position	Index	Day (07:00-19:00)	Evening (19:00 – 23:00)	Night (23:00 – 07:00)
MP1	Ambient, L_{Aeq}	53 dB	50 dB	54 dB
MP1	Background, L_{A90}	43 – 54 dB	45 – 52 dB	41 – 52 dB
MP2	Ambient, L_{Aeq}	51 dB	49 dB	50 dB
MP2	Background, L_{A90}	41 – 57 dB	43 – 52 dB	40 dB – 57 dB

4.8 Background Noise Levels

4.8.1 BS 4142 sets out a method for establishing the background sound level through statistical analysis of the measured levels. As such, the following graphs show the distribution of background sound levels measured at MP1 and MP2 respectively during the evening and night-time periods.

Figure 4.2: Distribution of $L_{A90,15min}$ measurements during the evening (19:00 – 23:00) at MP1

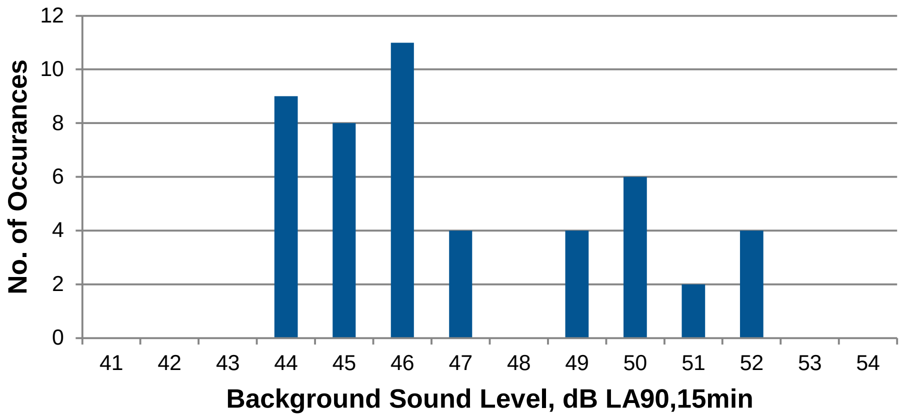


Figure 4.3: Distribution of $L_{A90,15min}$ measurements during the night-time (23:00 – 07:00) at MP1

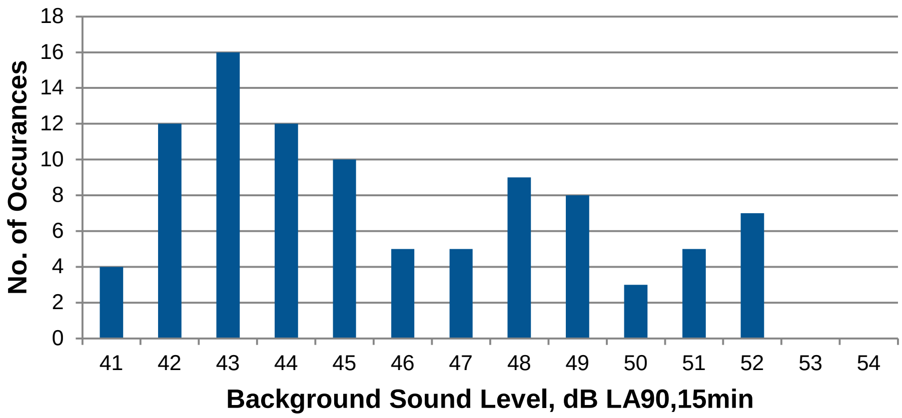


Figure 4.4: Distribution of $L_{A90,15min}$ measurements during the evening (19:00 – 23:00) at MP2

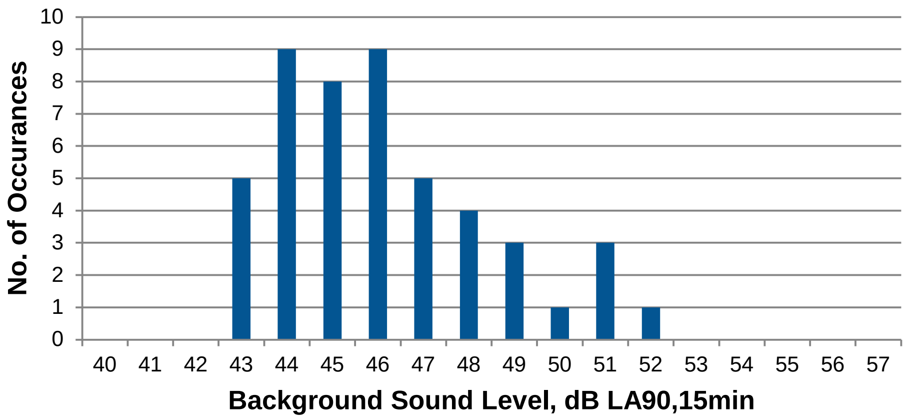
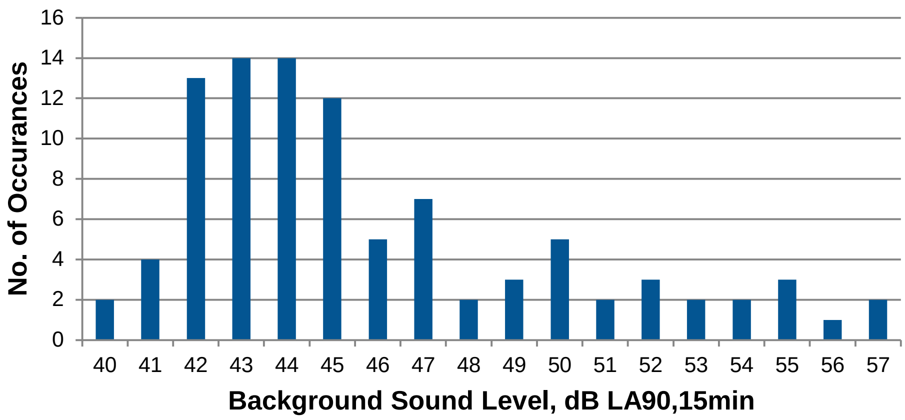


Figure 4.5: Distribution of $L_{A90,15min}$ measurements during the night-time (23:00 – 07:00) at MP2



4.9 Industrial Noise Limits

4.9.1 As detailed previously, the current version of BS 4142 addresses the issue of the likelihood of creating an adverse impact. The guidance states that 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.

4.9.2 On this basis, the limits for the rating level calculated as per the methodology set out in BS 4142 to apply at 1m from noise sensitive premises within the vicinity of the plant locations are as shown in the following **Table 4.3**.

Table 4.3: Industrial Noise Limits

Location	BS4142 Rating Level Targets, dB
Noise sensitivities within vicinity of site	42 - 45

4.9.3 It should be noted that if the nose source is tonal, impulsive, intermittent, or has other features that distinguish it from the general sound climate as heard at the receiver locations, it will need to be adequately penalised weighted when determining the rating level in accordance within methodology set out in BS 4124.

5 Service Yard Assessment

5.1 General

5.1.1 In order to address the issue of the impact of noise generated within service yards on existing and proposed residential, a service yard noise assessment has been carried out.

5.1.2 In essence, this starts with expected noise levels from various activities, such as a lorry pulling into the yard, reversing into a bay, and pulling away, calculates the resultant levels at sensitivities, and compares this with the previously established industrial noise criteria.

5.2 Source Data

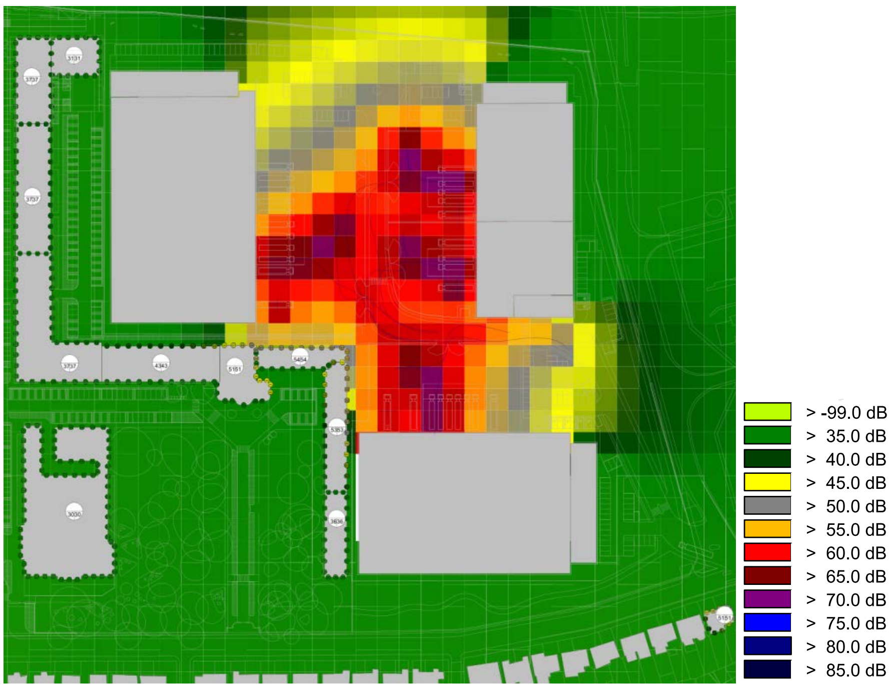
5.2.1 The calculations start with Sound Event Levels (SELs) for each activity, and uses these to build a picture of the $L_{Aeq,T}$ noise levels at the residences. The events and noise levels associated with activity in the service yards due to the arrival and departure of HGVs are presented in **Appendix C**.

5.2.2 Vehicle movements during the night-time have the highest likelihood of causing a disturbance, and as such a night-time scenario has been assessed. Specific numbers of vehicle movements are not known at this stage, and as such what we understand to be a worst case assumption of 1 HGV arrival, idle, and departure along with associated activities (e.g. unloading) at each industrial unit in a 15-minute period during the night has been used to facilitate the assessment.

5.3 Noise Model

5.3.1 In order to facilitate the assessment, a noise model of the industrial unit service yards has been built using the CADNA noise mapping software. The noise levels set out in in **Appendix C** have then been used in conjunction with the noise model to determine resultant levels at the nearest sensitivities. The following figure illustrates the model of activities in the service yard.

Figure 5.1: Noise Map of Service Yard Activity



5.4 Existing Residences

5.4.1 Using this information as a basis, the following table presents the calculated noise levels from service yard activity to the worst affected existing residences on Nestles Avenue. The rating level has also been presented, where a 5dB penalty has been applied given the nature of the noise (BS 4142 presents a range of corrections for various acoustic features, and 5dB is seen as a reasonable general correction). The existing background levels, along with the difference are presented for comparison.

Table 5.1: Calculated noise levels from service yard activity at worst affected existing residences on Nestles Avenue

Location	Calculated Noise Levels (dB $L_{Aeq,15mins}$)	Rating Level	Rating Limit (dB $L_{A90,15min}$)	Difference
Residences on Nestles Avenue	27	32	42 - 45	-13 to -10

5.4.2 As the above shows, based on the preliminary assessment data, the rating levels are predicted to be at least 10dB below the existing background. In terms of assessing the impact, the current version of BS 4142 states the following:

"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."

5.4.3 In this case, given the previous industrial use of the site, and industrial nature of the area, it is expected that further consideration of the noise levels to reflect the context is not necessary, and the assessment as reported is expected to stand.

5.4.4 As such, activities from the service yards of the industrial units are not expected to give rise to a significant impact at existing residences.

5.5 Proposed Residences

5.5.1 The protection of future occupants of proposed residences in close proximity to the service yards has been a principle consideration of the residential building envelope design and residential layout.

In order to allow for the appropriate design of the proposed building envelopes, façade incident levels generated as part of this exercise have been fed into the proposed residential building envelope design. The details of this are set out in Residential Planning Noise Report (ref 37205/3002/FINAL003).

6 Mechanical Services Noise

6.1.1 As set out in **Section 3.5**, it will be important to ensure noise from mechanical services plant installed as part of the development is suitably controlled such that it does not give rise to a significant adverse impact on existing sensitivities in the vicinity of the site.

6.1.2 To this end, existing background noise levels at the site have been quantified, and plant noise limits established, which would be used to form the basis of a BS 4142 assessment (detailed in **Table 4.3**).

6.1.3 Given the current stage of development, outline details only are available regarding the mechanical services strategy, with locations plant types that could give to atmospheric noise emissions not yet known.

6.1.4 It is therefore expected to be appropriate to attach a condition to planning permission to require a plant noise assessment to be carried out at the appropriate stage of development, once more details regarding the mechanical services scheme are available. An example of the type of condition is given below:

"Noise arising from mechanical services plant installed as part of the development shall not give rise to a rating level higher than the existing background sound levels (given in terms of $L_{A90,15min}$*) at the nearest noise-sensitive premises. The measurements, assessment and reporting shall be carried out according to BS 4142:2014. To demonstrate that this will be achieved, a noise assessment prepared by a suitably qualified acoustician must be submitted to and approved by the local planning authority prior to operation of the mechanical services plant".*

7 Traffic Noise Assessment

7.1 General

7.1.1 The noise impact arising from changes in traffic flows as a result of the development needs to be assessed. The following table presents the baseline traffic flows excluding and including development traffic, along with the percentage change for the year of opening.

Table 9.1 Traffic flow figures and percentage changes

Location	Baseline			Baseline + Dev			Change		
	Cars / LGV	HGV	Total	Cars / LGV	HGV	Total	Cars / LGV	HGV	Total
North Hyde Road (East of North Hyde Gardens)	26985	2824	29808	34146	2937	37082	27%	4%	24%
North Hyde Gardens	1365	619	1984	7099	742	7841	420%	20%	295%
Nestles Ave East of Harold Ave	811	36	847	811	36	847	0%	0%	0%
Harold Ave	2641	269	2909	4608	269	4876	74%	0%	68%
Nestles Ave East of Station Road	2849	284	3133	3763	284	4047	32%	0%	29%
North Hyde Road East of Station Road	17842	2073	19915	18865	2094	20959	6%	1%	5%
Station Road North of Crowland Avenue	13036	1846	14882	14026	1856	15882	8%	1%	7%

7.1.2 As the above shows, with the exception of North Hyde Gardens, the highest percentage change would be experienced by residences facing Harold Avenue, with a 74% increase in Cars / LGVs.

7.1.3 According to Design Manual of Roads and Bridges[1]:

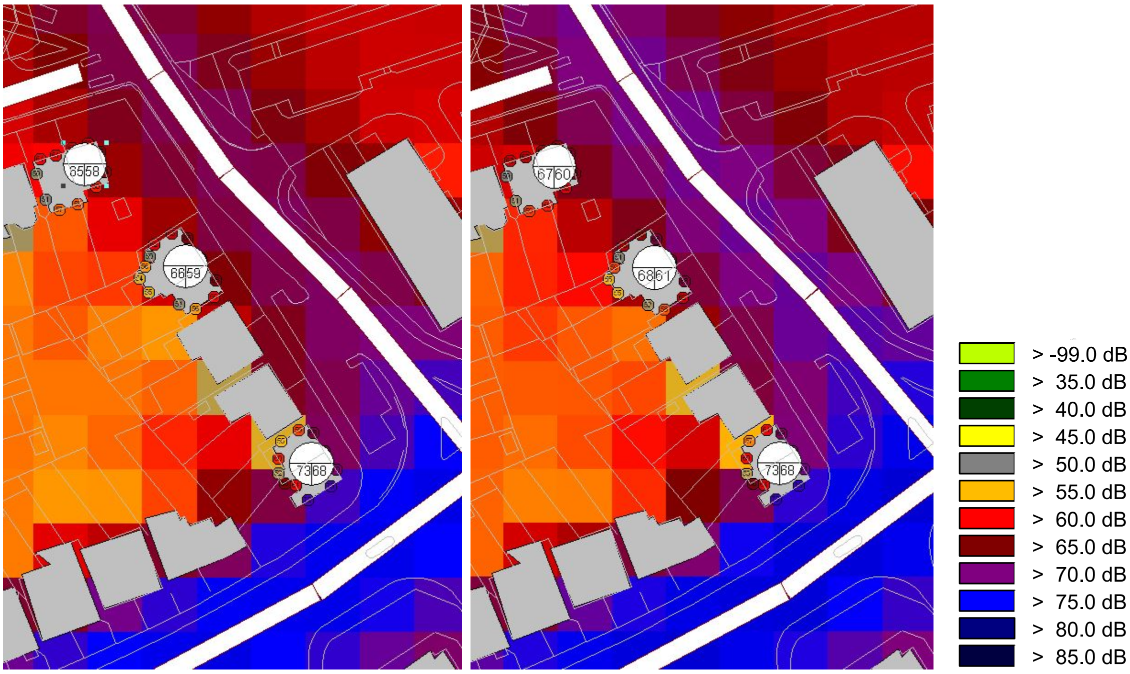
"A change in noise level of 1 dB $L_{A10,18h}$ *is equivalent to a 25% increase or a 20% decrease in traffic flow, assuming other factors remain unchanged and a change in noise level of 3 dB* $L_{A10,18h}$ *is equivalent to a 100% increase or a 50% decrease in traffic flow; "*

7.1.4 On the basis set-out above, with the exception of North Hyde Gardens, the highest percentage increase would equate to an increase in noise level of 2.4dB. This is within the 'No Observed Adverse Effect' range as set out in **Table 3.2**, which, according to relevant Planning Practice Guidance the action for which is 'no specific measures required'.

7.1.5 With regards to North Hyde Gardens, there are two factors that need to be considered when determining the impact. The first is that the percentage change approach outlined above assumes each road is the dominant source for residences fronting on to it. This is not the case however for residences facing North Hyde Gardens, as the dominant contribution comes from

North Hyde Road and other surrounding roads. To this end, the following figures present the calculated noise levels at residences fronting onto North Hyde Gardens with and without the development traffic.

Figure 9.1: Comparison of Noise Levels on North Hyde Gardens with (right) and without (left) Development Traffic



7.1.6 Using this approach, as the above figures illustrate the highest increase in noise levels would be for the residence on the corner of Nestles Avenue and North Hyde Gardens. The highest calculated increase at this location equates to 2.1dB. This is within the ‘No Observed Adverse Effect’ range as set out in **Table 3.2**, which, according to relevant Planning Practice Guidance the action for which is ‘no specific measures required’.

7.1.7 It is also worth considering that the baseline figures assume no contribution from the development site (i.e. there are currently no vehicle movements associated with it, and the baseline figures assume this remains the case). This would not have been the case when the site was previously operational, and in reality if the development were not to proceed, the use of the site would inevitably resume in some capacity under its existing permission, which would give rise to a significant number of vehicle movements. As such, the above can be considered very much a worst case with regards to the impact on existing residences.

8 Conclusions

8.1.1 Baseline noise data collected as part of an environmental noise survey carried out at the development site was used to establish background sound levels to which existing sensitivities are currently exposed.

8.1.2 The background sound data was used to establish rating limits at existing sensitivities for operational noise generated as part of the proposed development.

8.1.3 Using the established limits as a basis, a service yard noise assessment was undertaken in order to determine the impact on existing residences of activities taking place within the service yards of the proposed industrial units.

8.1.4 Specific numbers of vehicle movements are not known at this stage. As such, in order to ensure a worst-case assessment, a reasonable worst case assumption of 1 HGV arrival, idle, and departure along with associated activities (e.g. unloading) at each industrial unit in a 15-minute period during the night was used to facilitate the assessment.

8.1.5 Based on this, the rating levels are predicted to be at least 10dB below the existing background. Under the current version of BS 4142, the context of the development needs to be considered to determine whether this has any bearing on the quantitative assessment. In this case, given the previous industrial use of the site, and industrial nature of the area, it is expected that further consideration of the noise levels to reflect the context is not necessary, and the assessment as reported is expected to stand. As such, activities from the service yards of the industrial units are not expected to give rise to a significant impact at existing residences.

8.1.6 With regards to residences proposed as part of the wider development, the protection of future occupants of proposed residences in close proximity to the service yards has been a principle consideration of the residential building envelope design and residential layout.

8.1.7 In order to allow for the appropriate design of the proposed building envelopes, façade incident levels generated as part of this exercise have been fed into the proposed residential building envelope design.

8.1.8 Given the current stage of development, outline details only are available regarding the mechanical services strategy. Specific plant selections and locations are not yet known. It is therefore expected to be appropriate to attach a condition to planning permission to require a plant noise assessment to be carried out at the appropriate stage of development. To this end, an example of the type of condition has been given.

8.1.9 In this regard, the range of L_{A90} background noise levels was presented which were derived based on the noise survey data. Using these, noise limits for plant installed as part of the development can be established. These levels are intended to facilitate future BS 4142 assessments of mechanical services plant installed as part of the development.

8.1.10 Finally, in order to determine the impact of any change in noise levels arising from additional vehicles on the road as a result of the development, a traffic noise assessment was undertaken. Based on a percentage change approach, with the exception of North Hyde Gardens, the highest percentage increase would equate to an increase in noise level of 2.4 dB.

8.1.11 Looking at noise levels predicted when considering the impact of all surrounding roads, the highest increase in noise levels for residents on North Hyde Gardens was calculated to be 2.1 dB. This is within the 'No Observed Adverse Effect' range for which the action, according to relevant Planning Practice Guidance, is 'no specific measures required'.

8.1.12 With regards to the traffic noise impact assessment, it should be noted that the baseline figures assume no contribution from the development site (i.e. there are currently no vehicle movements associated with it, and the baseline figures assume this remains the case). This would not have been the case when the site was previously operational, and in reality if the development were not to proceed, the use of the site would inevitably resume in some capacity under its existing permission, which would give rise to a significant number of vehicle movements. As such, the traffic noise impact assessment can be considered very much a worst case with regards to the impact on existing residences.

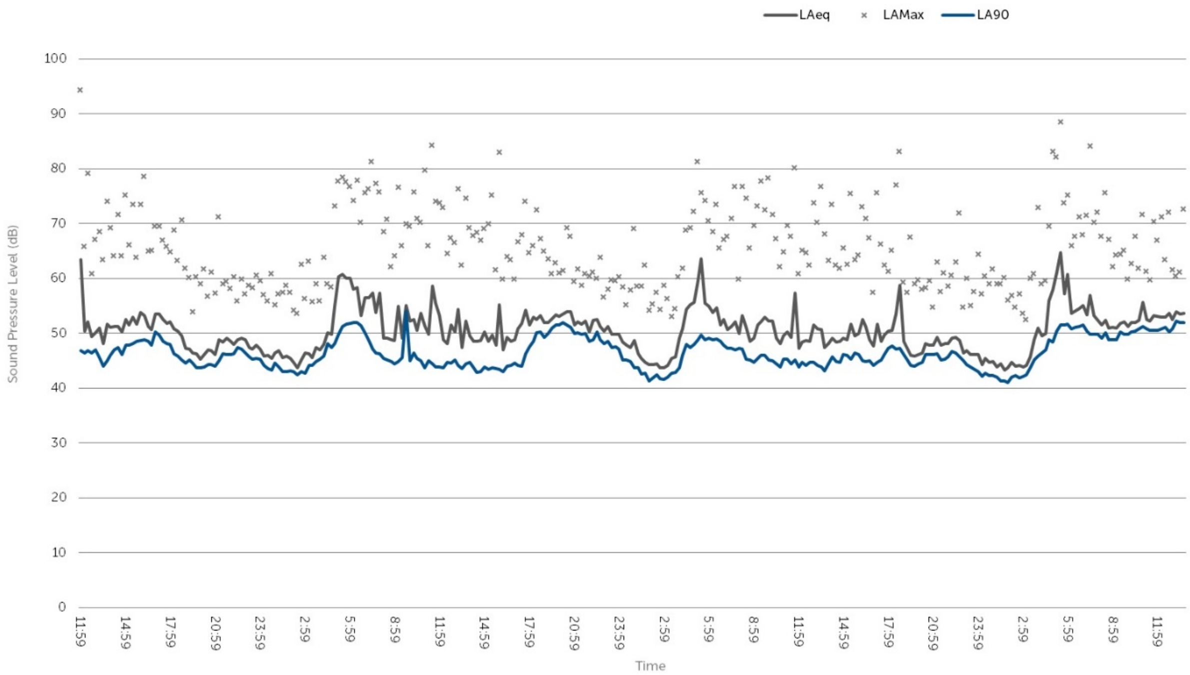
Appendix A Acoustic Terminology

Parameter	Description
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near ($L_{Aeq,T}$).
Daytime	The period 07:00-23:00 hours.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s_1 and s_2 is given by 20 $\log_{10}$ (s_1/s_2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa. The threshold of normal hearing is in the region of 0 dB and 140 dB is the threshold of pain. A change of 1 dB is only perceptible under controlled conditions.
dB(A), L_{Ax}	Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).
Fast Time Weighting	Setting on sound level meter, denoted by a subscript F that determines the speed at which the instrument responds to changes in the amplitude of any measured signal. The fast time weighting can lead to higher values than the slow time weighting when rapidly changing signals are measured. The average time constant for the fast response setting is 0.125 (1/8) seconds.
Free-field	Sound pressure level measured outside, far away from reflecting surfaces (except the ground), usually taken to mean at least 3.5 metres
Façade	Sound pressure level measured at a distance of 1 metre in front of a large sound reflecting object such as a building façade.
Insertion Loss	Insertion loss is the difference in sound pressure level at a single fixed position before and after a noise control element (e.g. enclosure, barrier etc.) is installed.
L_{AE} or SEL	A noise level which, if maintained for a period of 1 second, would cause the same A-weighted sound energy to be received as is actually received from a given noise event.
$L_{Aeq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level recorded during a noise event with a period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described

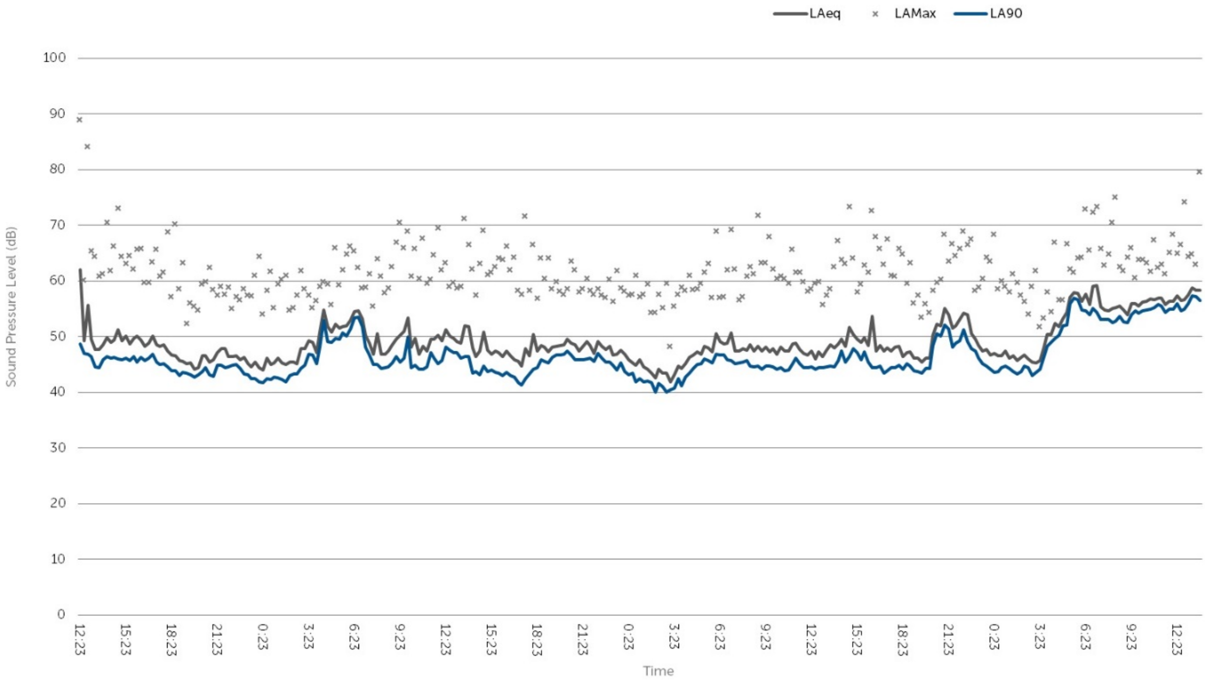
	otherwise, it is measured using the 'fast' sound level meter response.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise. $L_{A10,18h}$ is the A –weighted arithmetic average of the 18 hourly $L_{A10,1h}$ values from 06:00-24:00.
$L_{90,T}$ or Background Noise Level	A noise level index. The noise level exceeded for 90% of the time over the period T. L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise.
LOAEL	Lowest Observed Adverse Effect Level. This is the noise level above which adverse effects on health and quality of life can be detected.
Night-time	The period 23:00-07:00 hours.
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.
Noise Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
SOAEL	Significant Observed Adverse Effect Level. This is the level above which significant adverse effects on health and quality of life occur.
Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level, L_p	The sound pressure level, L_p is the sound pressure relative to a standard reference pressure of 20μPa ($20x10^{-6}$ Pascals) on a decibel scale.
Specific Noise Level	The noise source under investigation for assessing the likelihood of complaints, measured as and $L_{Aeq,T}$
Rating Noise Level	The specific noise source plus any adjustment for the characteristic features of the noise, denoted by $L_{Ar,T}$.

Appendix B Time History Figures

B.1 Noise Levels Recorded at Position MP1, 21st – 24th March 2016



B.2 Noise Levels Recorded at Position MP2, 21st – 24th March 2016



Appendix C HGV Arrival and Departure Events

	SEL (dB) @ 3m	No. per Trip
HGV Arrival Event		
Lorry driving in and stopping	84.7	1
Lorry reversing into bay	98.5	1
Lorry door slam	65.7	1
lowering tail lift	65.3	1
Raising tail lift	72.7	1
lorry shutter opening and removing support bars	77.6	1
moving roll cages inside lorry	77.3	10
loading tail lift with two roll cages	74.4	5
lowering tail lift	64.2	5
lowering tail lift ramp and wheeling 2 roll cages off into store	89.3	5
HGV Departure Event		
loading empty roll cages onto tail lift	77.3	5
Raising tail lift	72.7	5
Moving empty roll cages from tail lift into the lorry and securing support bars	72.6	5
Closing lorry shutter	71.1	1
lowering tail lift	64.2	1
Raising tail lift	72.7	1
Door slam	75	1
Lorry driving away	82.2	1
Lorry driving away (onto main road)	82.2	1
HGV Idling Event		
Lorry with Refrigeration Idling	78.5	1