BELLWAY HOMES LTD (MANCHESTER)

PROPOSED RESIDENTIAL DEVELOPMENT

PITSFORD ROAD, MANCHESTER

ENVIRONMENTAL NOISE STUDY

R2224-REP02A-JW

6 JUNE 2024

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REPORT DETAILS

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SUMMARY

Red Acoustics Ltd has been commissioned by Bellway Homes Ltd (Manchester) to provide an assessment of the impact of environmental noise on the proposed development site at land off Pitsford Road, Manchester.

This report has been prepared for the purpose of providing Bellway Homes (Manchester) Ltd with information in relation to noise impact and advice on boundary and facade noise mitigation to reduce noise impact as far as is reasonably practicable. The site has been identified in Manchester City Council's Strategic Housing Land Availability Assessment (SHLAA) 2023 and it is proposed that a residential housing development be brought forward having implemented reasonable levels of acoustic protection.

Environmental noise surveys have been carried out to determine the existing noise climate affecting the site. Measured and predicted noise levels were then used to provide recommendations in relation to noise mitigation across the site based on the current proposed layout plans provided by Bellway Homes Ltd.

It should be noted that there are two sets of acoustic requirements for the site for an assessment in accordance with the National Planning Policy Framework and the supplementary planning guidance published by Manchester City Council. The first set of requirements is that of general noise (i.e. road, rail and and distant aircraft) and these relate to the guidance in BS8233:2014 which provide the below set of target requirements. The second set of requirements relate to commercial and industrial noise impact and a requirement to assess this in line with the guidance in BS4142:2014+A1:2019 which provides guidance to assess specific impacts from individual commercial and industrial noise sources.

Noise break-in calculations have been undertaken based on typical house types for the site layout provided, having regard to the guidance in BS8233:2014. The break-in calculations have been used to determine the indicative acoustic strategy in relation to facade noise mitigation. The aim of the strategy is to achieve the following internal and external noise levels:

- Living Rooms, Dining Rooms and Kitchens 35dB $L_{Aeq,t}$
- Bedrooms 30dB $L_{Aeq,t}$ and 45dB L_{Amax}
- Garden and Patios - up to 55dB $L_{Aeq,t}$

The proposed development site experiences noise impact in terms of the adjacent railway lines and traffic noise impact, though rail noise impact is the driving factor in noise recommendations having regard to BS8233 guidance. While undertaking noise surveys to determine this impact, significant additional commercial noise impact from the aggregates

processing and waste sorting business located approximately 35m from the proposed site boundary was also noted. Environmental noise survey data was obtained to provide an assessment of planning stage risk associated with the impact from this site. The noise mitigation recommended in this report is intended to address road and rail impact as well as additional commercial impact, so as to reduce noise as far as is practicable.

Assessment of road and rail traffic noise impact and commercial noise impact to the same proposed residences require a balance to be struck between the differing recommendations contained within the separate, relevant guidance documents in each case (BS8233, BS4142 and MCC guidance). To achieve this balance, internal noise impact reductions are estimated to be achieved by uprating relevant glazing by 5-10dB R_w above the BS8233 'baseline' recommendations to account for BS4142 guidance on the commercial noise impact. While external impact to gardens may be reduced as far as is practicable, reducing impact from this use to a level that strictly meets the requirements of MCC is unlikely to be practicable based on the information gathered from environmental noise surveys. The mitigation is however, robust in terms of the baseline noise mitigation and the relevant areas of uprated mitigation to account for inevitable adverse impact due to commercial noise.

This report presents the noise mitigation recommendations and a commentary on noise impact from road, rail and commercial activity. It is recommended that MCC be consulted on their opinions relating to noise impact to the site at an early stage and noise impact targets be agreed in advance of detailed design work being undertaken.

The results of the environmental noise survey/noise propagation modelling and subsequent noise break-in calculations conclude that the BS8233:2014 acoustic targets can be achieved using a mixture of acoustic glazing configurations and MVHR systems not relying on passive ventilators in the facade. Mechanical ventilation capable of addressing overheating without the need for opening windows is anticipated as the preferred strategy for Building Regulations 2010 compliance. A 4m acoustic barrier will be required as a minimum along the South-Eastern boundary with the railway and into the site at the Western extreme. The baseline 4m acoustic barrier recommendation is not sufficient to completely address garden noise adverse impact having regard to BS4142 however BS8233 targets will be met in the majority of garden spaces.

Garden noise levels are expected to achieve the BS8233:2014 target noise levels for all except 4 plots with the recommended 4m acoustic barrier in place as indicated. This relates to absolute levels for transportation sources and the adjacent waste and aggregates processing site. Commercial noise impact is however expected to be potentially adverse with regard to BS4142:2014+A1:2019 guidance however, in context of the area and proximity to the rail line, this is not expected to be prohibitive to the development given a significant acoustic barrier is proposed.

Indicative recommendations are mapped onto the proposed site layout in Appendix B. Appendix B also presents an overview of BS4142 rated commercial noise impact.

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1.0 INTRODUCTION

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This report presents the noise mitigation recommendations and a commentary on noise impact from road, rail and commercial activity.

2.0 SITE DESCRIPTION & PROPOSED DEVELOPMENT

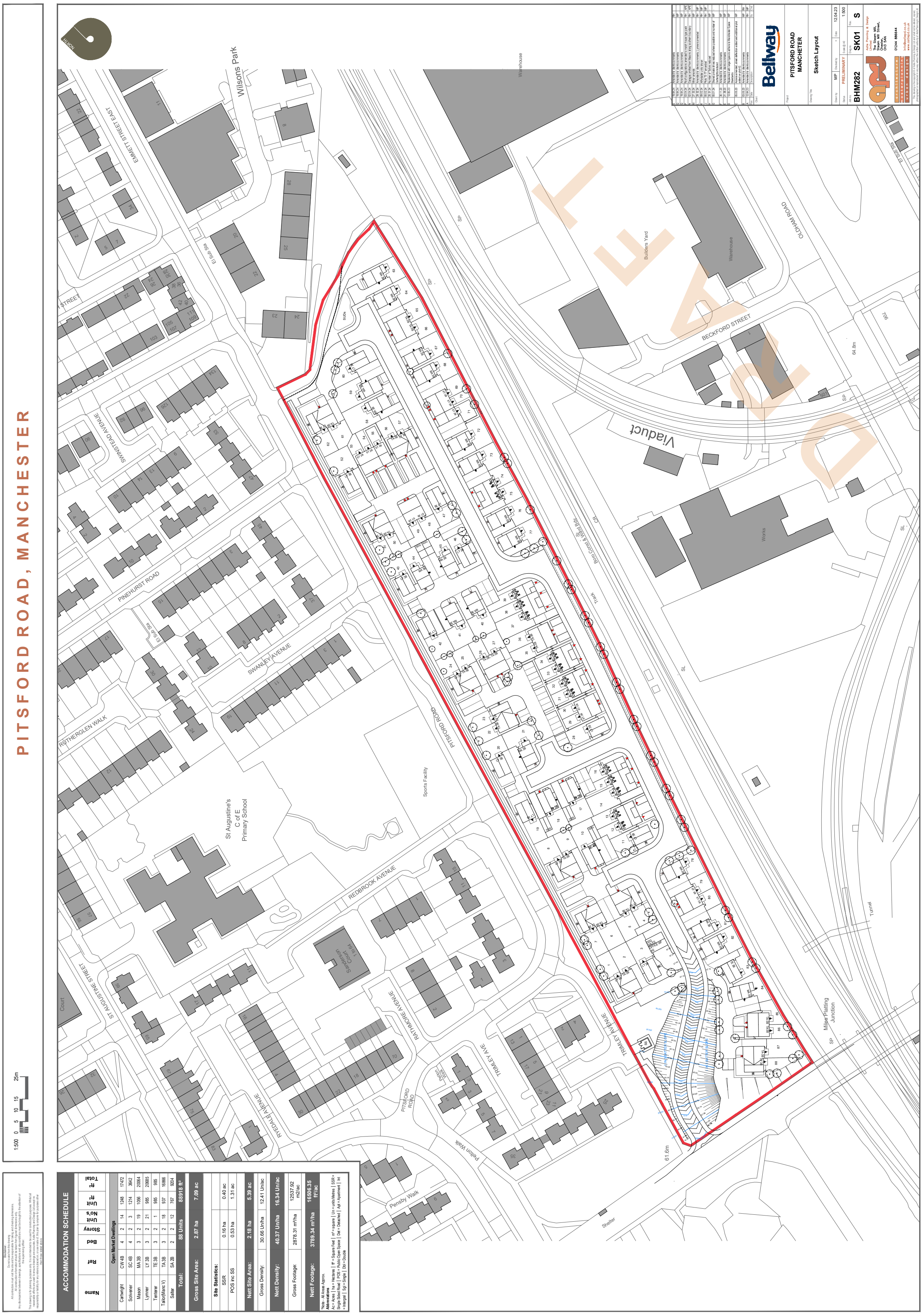
The development site is located adjacent to Pitsford Road, Manchester. The site is bordered to the South-West by the A6010 (Queens Road). To the South-East are several converging railway branches serving Manchester Victoria made up by the Miles Platting, Oldham Road and Brewery Junctions of the Manchester Rail Network. To the North and East is Pitsford road with existing residential development, a school and commercial uses as well as the Network Rail road access to the rail sidings. Figure 2.1 below shows the location of the site. Figure 2.2 shows the proposed site layout.

Figure 2.1: Proposed Site Location



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Figure 2.2: Proposed Site Layout



3.0 ENVIRONMENTAL NOISE SURVEYS

Environmental noise surveys have been carried out at Measurement Positions 1 - 3 (MP1 - MP3) between 15th and 16th November 2023 to determine the existing noise climate at the proposed development site. Further measurements were undertaken at positions MP1, MP4 & MP5 between 5th and 6th March 2024 to provide additional data in relation to commercial and rail noise. Figure 3.1 below shows the location of the monitoring positions.

Figure 3.1: Environmental Noise Survey Positions



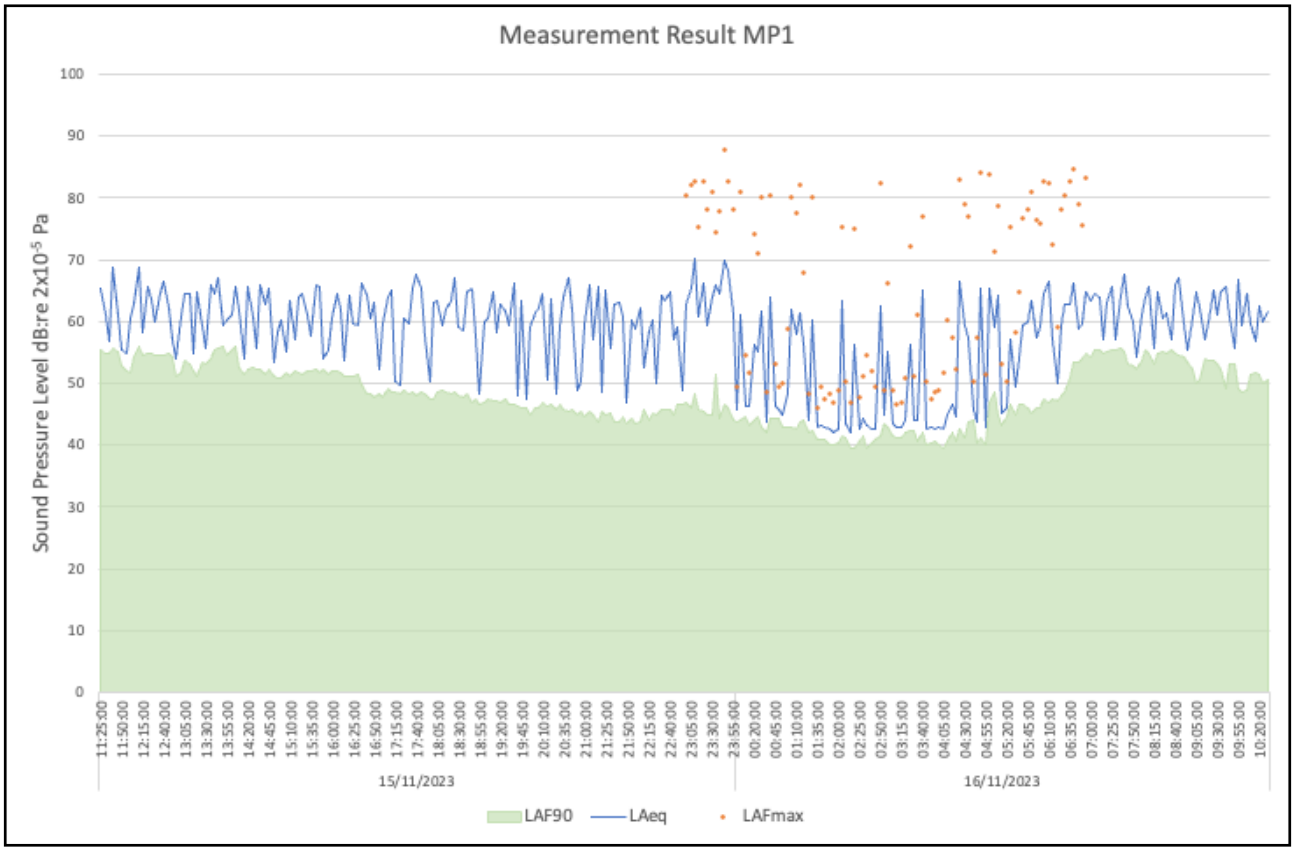
Position MP1 was chosen to measure noise impact from trains passing by the site as well as to provide an indicative assessment of commercial noise impact. Position MP2 was selected to measure noise impact from the rail network in the vicinity of the Oldham Road Junction and the road network. Position MP3 was selected to measure noise impact from Queens Road and provide a noise model validation position. Data was gathered in relation to commercial noise impact at MP1 during the 2023 surveys and further measurements were undertaken at MP1 & MP4 following analysis of the earlier data. MP5 was chosen to provide additional validation data following the area becoming accessible.

The purpose of the environmental noise surveys has been to provide measured data to assess noise impact on the proposed development site. The data has been used to calibrate and validate a CadnaA 3D noise propagation model to assess noise impact across the facades of the development from the dominant noise sources identified.

Traffic flow data from the Department of Transport has been used to input road sources within the model which calculates road noise impact using the methodology in Calculation of Road Traffic Noise (CRTN). Road noise (in addition to other calibrated noise sources) is then predicted to the measurement positions within the model to validate the model is predicting accurately against measured data. This is discussed further in Section 7.0 below.

Survey details and instrumentation used are presented in Appendix A. The results of the environmental noise surveys are presented below.

Figure 3.2: Survey Results MP1



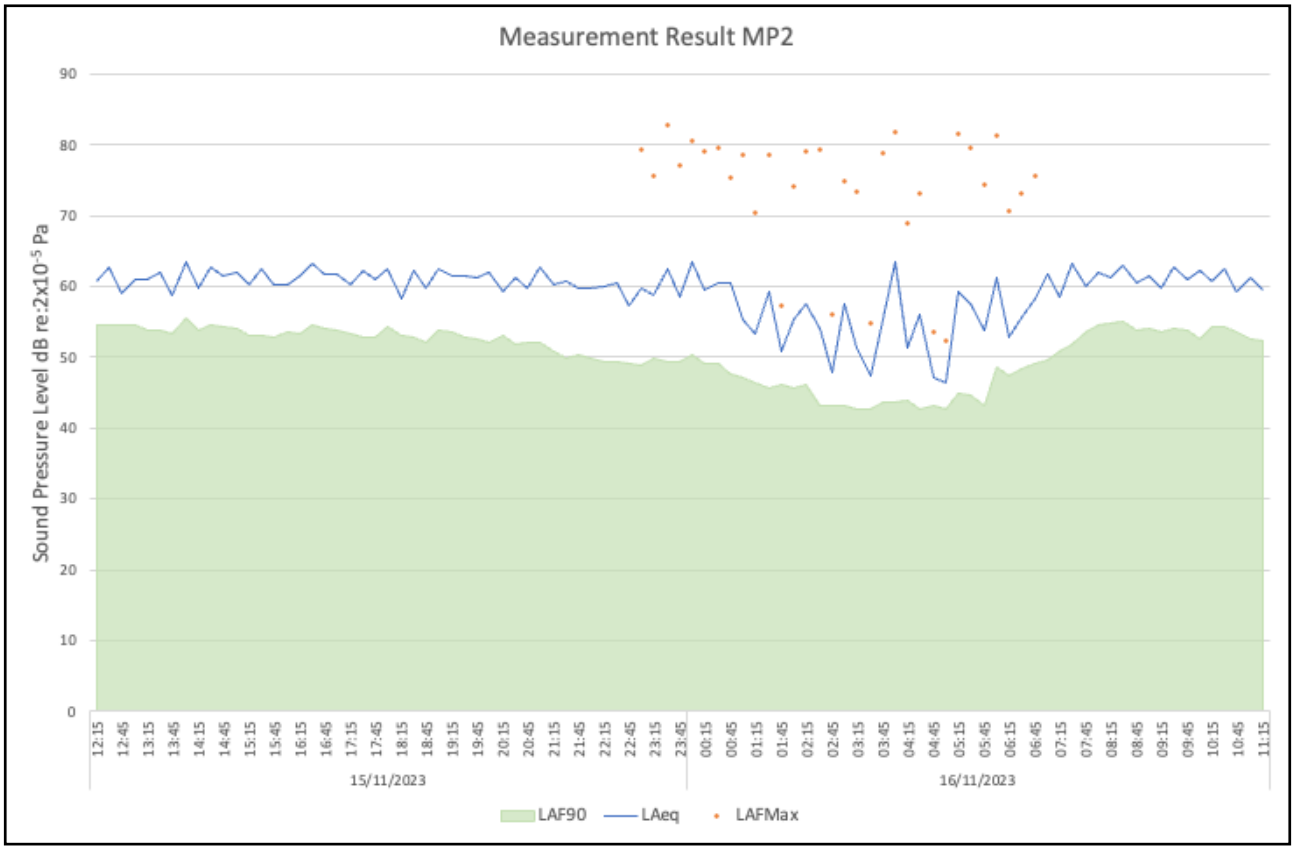
Measurements at position MP1 were taken in November 2023 adjacent to the closest rail line to enable a CadnaA noise propagation model to be calibrated for the rail source. This enables an accurate assessment of noise impact from this noise source across the development in addition to the other noise sources assessed. Individual pass by events were used for the daytime and night-time periods to calculate a Sound Exposure Level to determine the $L_{Aeq,t}$ sound level due to the railway for each relevant period. This was then used to calibrate the rail source within the CadnaA noise propagation model to then predict noise impact to all facades of the development in addition to other noise sources. Table 3.1 below summarises the measurement at position MP1. Further relevant measurements taken at MP1 are shown and discussed below.

Table 3.1: Summary of Measured Noise Levels (MP1)

Position	Date	Period	Measurement Period	Octave Band Centre Frequency Hz / dB					Measured Broadband (dBA)
				125	250	500	1000	2000	
MP1	15-16/11/2023	Daytime	$L_{eq,16hr}$	60.5	58.5	58	58	56.1	62.5
		Night-time	$L_{eq,8hr}$	61	58.2	56.2	55.8	54.3	60.7
			*L_{Fmax}	87.8	85.9	79.5	76.7	75.7	83.1

* L_{AFmax} values represent the 5th highest measured maximum of the night time period for roads.

Figure 3.3: Survey Results MP2

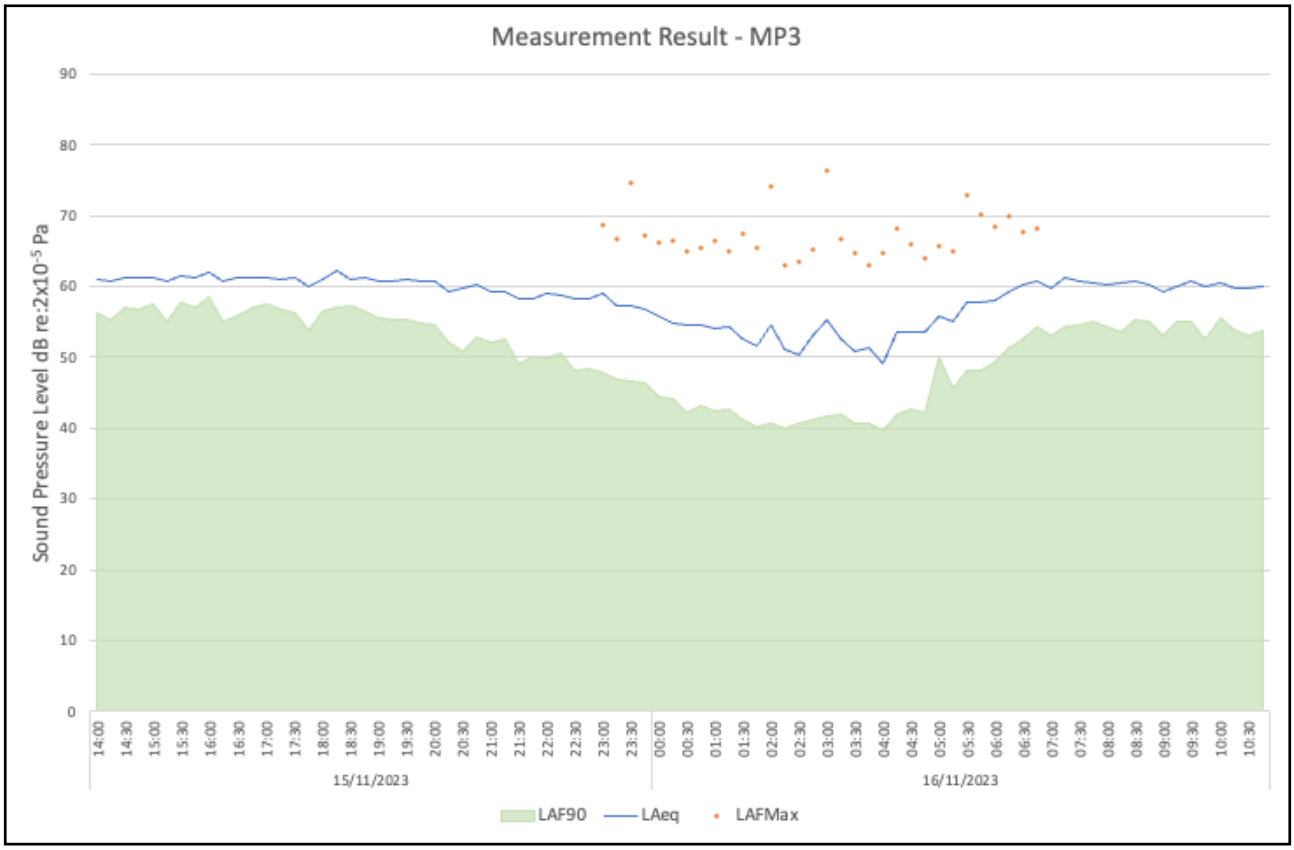


The measurement at position MP2 was taken to measure pass-by events due to trains in the vicinity of the road network to enable the noise propagation model to be validated. Table 3.2 below summarises the measurement at position MP2.

Table 3.2: Summary of Measured Noise Levels (MP2)

Position	Date	Period	Measurement Period	Octave Band Centre Frequency Hz / dB					Measured Broadband (dBA)
				125	250	500	1000	2000	
MP2	15-16/11/2023	Daytime	$L_{eq,16hr}$	58.5	55.2	54.7	58.3	54.6	61.3
		Night-time	$L_{eq,8hr}$	57.2	52.2	51.4	54.9	51.6	58.1
			*L_{Fmax}	78.2	74.6	72.4	76.7	75.4	80.5

Figure 3.4: Survey Results MP3



Measurements undertaken at MP3 were used to further validate the noise propagation model and to account for noise impact from Queens Road. The typical maximum events level taken at MP3 has been used as the baseline level for maximum event mitigation across the development. Table 3.3 below summarises the measurement at MP3.

Table 3.3: Survey Results MP3

Position	Date	Period	Measurement Period	Octave Band Centre Frequency Hz / dB					Measured Broadband (dBA)
				125	250	500	1000	2000	
MP3	15-16/11/2023	Daytime	$L_{eq,16hr}$	55.8	52.9	53.1	58.2	53.6	60.5
		Night-time	$L_{eq,8hr}$	52.6	48	48.6	53.7	48.7	55.9
			*L_{Fmax}	62.2	60.6	58.5	67.3	65.5	70.1

Figure 3.5: Survey Results MP5

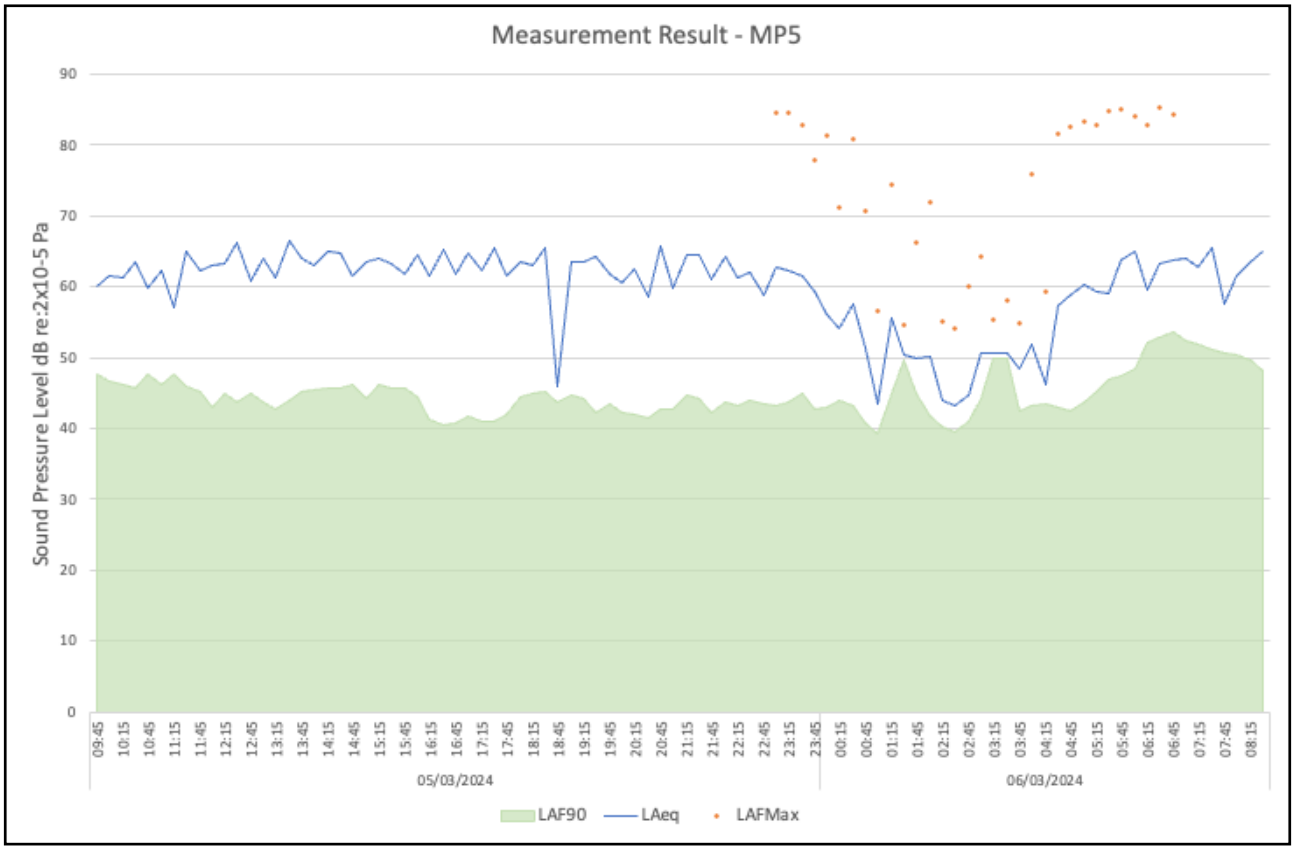


Table 3.4: Survey Results MP5

Position	Date	Period	Measurement Period	Octave Band Centre Frequency Hz / dB					Measured Broadband (dBA)
				125	250	500	1000	2000	
MP5	05-06/03/2024	Daytime	$L_{eq,16hr}$	61.2	58.2	58	60.3	55.3	63.2
		Night-time	$L_{eq,8hr}$	59.4	54.4	53.9	55.6	50.7	58.7
			*L_{Fmax}	80.1	78	77.7	79.5	72.6	84.5

Measurements at MP5 were taken in March 2024 when access to this area was made available. This data has been presented for completeness though the levels measured are broadly in line with MP1 and MP2. This data has also been used for the noise propagation model to be validated to this area of the site.

Figures 3.6 - 3.9 below present the measured data taken to form the basis of the assessment of commercial noise in line with the guidance in BS4142:2014+A1:2019. There relevant measurements were taken at positions MP1 (November 2023) and then MP1 & MP4 (March 2024) to provide additional detail on the nature of the noise sources for assessment and noise propagation modelling.

Figure 3.6 below shows a 1 hour period of noise generating activity measured at MP1 during the November 2023 survey. Activity was observed and recorded (including audio) to take place within the Western part of the adjacent aggregates processing site. It is unclear from observation if the main activity is crushing or screening of aggregates but it is assumed to be both, operating in addition to earth movers feeding the machinery and sorting raw and finished product. This represents the Ambient Sound Level in terms of the assessment of commercial noise in terms of BS4142:2014+A1:2019.

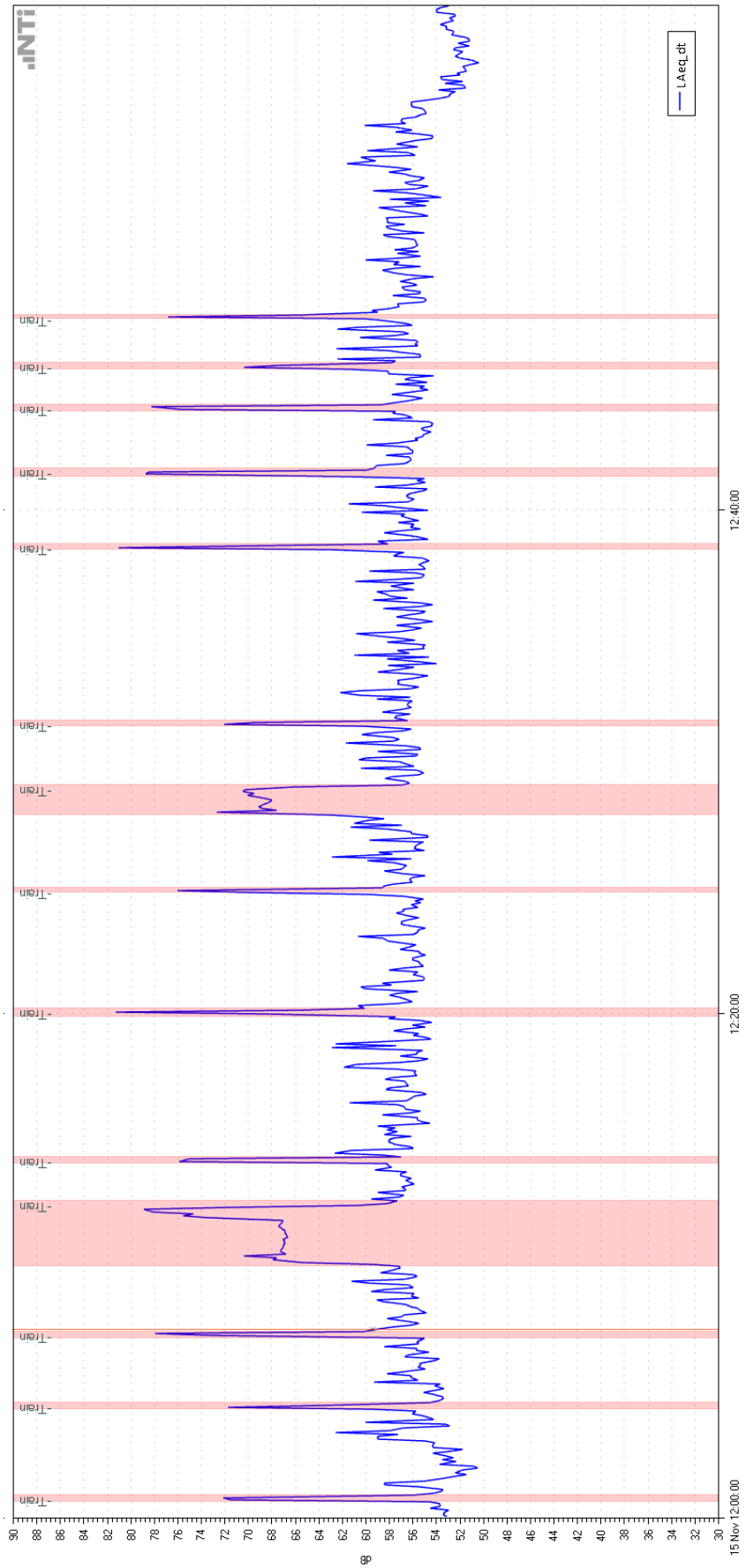
Figure 3.7 below shows a 1 hour period following cessation of noise generating activity measured at MP1 during the November 2023 survey. This represents the Residual Sound Level in terms of the assessment of commercial noise in terms of BS4142:2014+A1:2019.

Following the initial measurement at MP1 during the November 2023 survey it is clear from the audio recording that the main noise generating activity of concern affecting the site is the processing of aggregates at the adjacent commercial site. Further measurement was recommended to the client (and subsequently agreed) to take place during a second survey with manned observation of the activity on site. The purpose of the second measurement was to establish the sound levels due to site operations in the Eastern part of the site, where raw waste product is delivered by HGV and then sorted into different areas of this part of the site. This activity was less evident at MP1 due to domination by activity on the Western part of the adjacent site and could not be modelled due to a specific sound level not being determined. This is relevant as the proposed development site runs parallel to the site and impact for the adjacent site could not be assessed fully for areas where the main crushing/screening activity is not dominant. This has now been undertaken to provide more accurate modelling results. Although, evident from manned observation, that the two areas seemed to operate alternately, we have measured each area separately and assumed both operate simultaneously for a robust assessment of potential impact. It is assumed that the two areas are operated as a single business, however the separate assessment undertaken, allows for the two parts to be included in the assessment as separate entities if required.

Figure 3.8 below shows the measurement at MP4 during the second survey in March 2024. The purpose of the measurement was to establish an Ambient Sound Level for operations with the Eastern sorting area of the adjacent commercial site in the absence of the crushing/screening activity that had been previously observed and measured at position MP1. The 1 hour period shown was undertaken as a manned measurement when activity was ongoing in the sorting area but little/no activity was taking place at the crushing screening area.

Figure 3.9 below shows a 45 minute period following cessation of noise generating activity measured at MP4 during the March 2024 survey. This represents the Residual Sound Level in terms of the assessment of commercial noise in terms of BS4142:2014+A1:2019.

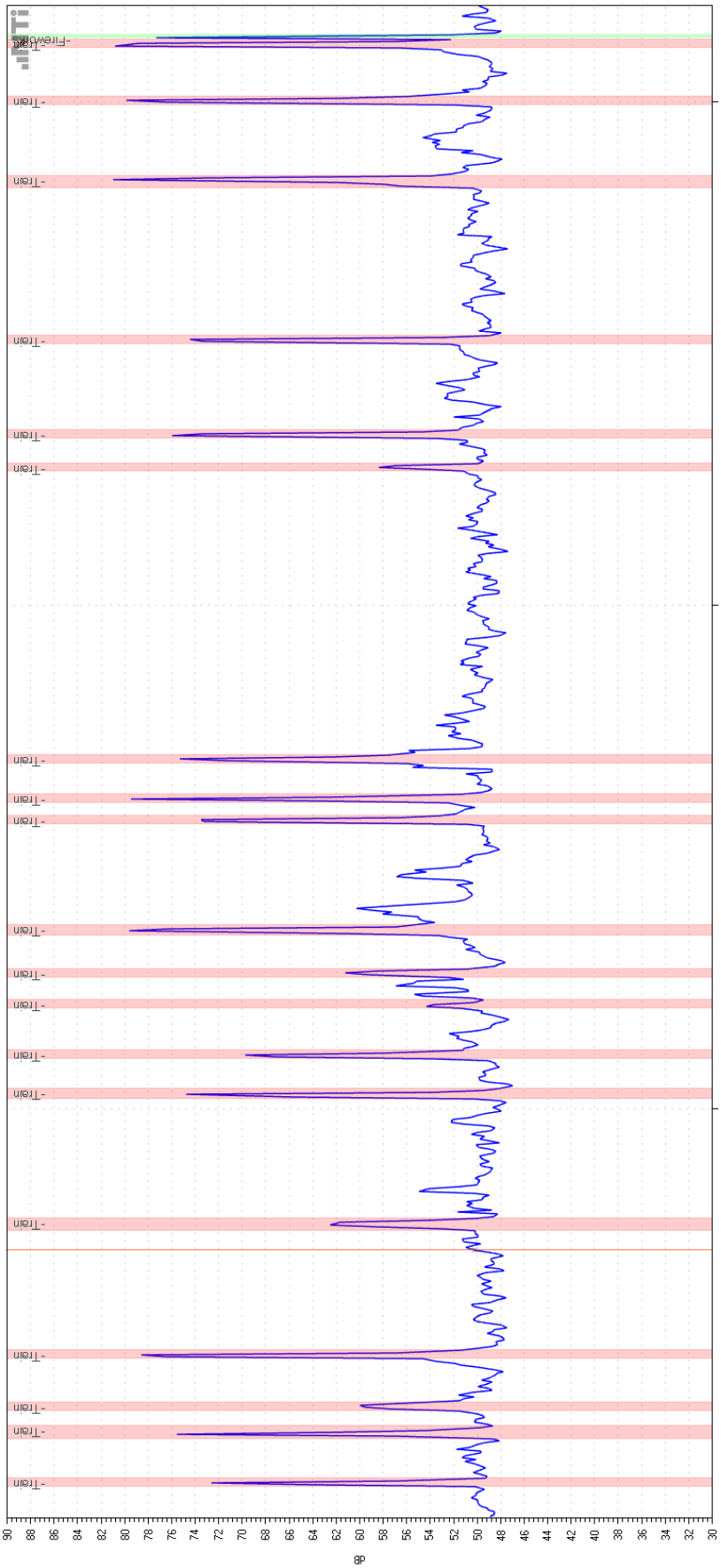
Figure 3.6: Survey Results MP1 - Crushing/Screening Operation Ongoing



The data shown represents a 1 hour period of activity with the crusher/screener operating and being loaded with product. This is the dominant source of noise at MP1 with train pass-by events excluded from the measurement.

The Ambient Sound Level at MP1 is 56.9dBA. The location of the source of the under measurement was noted and is assumed to be in this location for the purpose of the assessment though this can vary slightly within the processing area and is assumed for the assessment to be a point source located 3m from the ground height in the processing area to allow for being located on a small aggregate mound. The measurement was undertaken at a position minimally screened by the aggregate mounds/storage. This screening varies and may reduce the levels at times. This has not been accounted for to provide a more robust assessment.

Figure 3.7: Survey Results MP1 - Crushing/Screening Operation Ceased

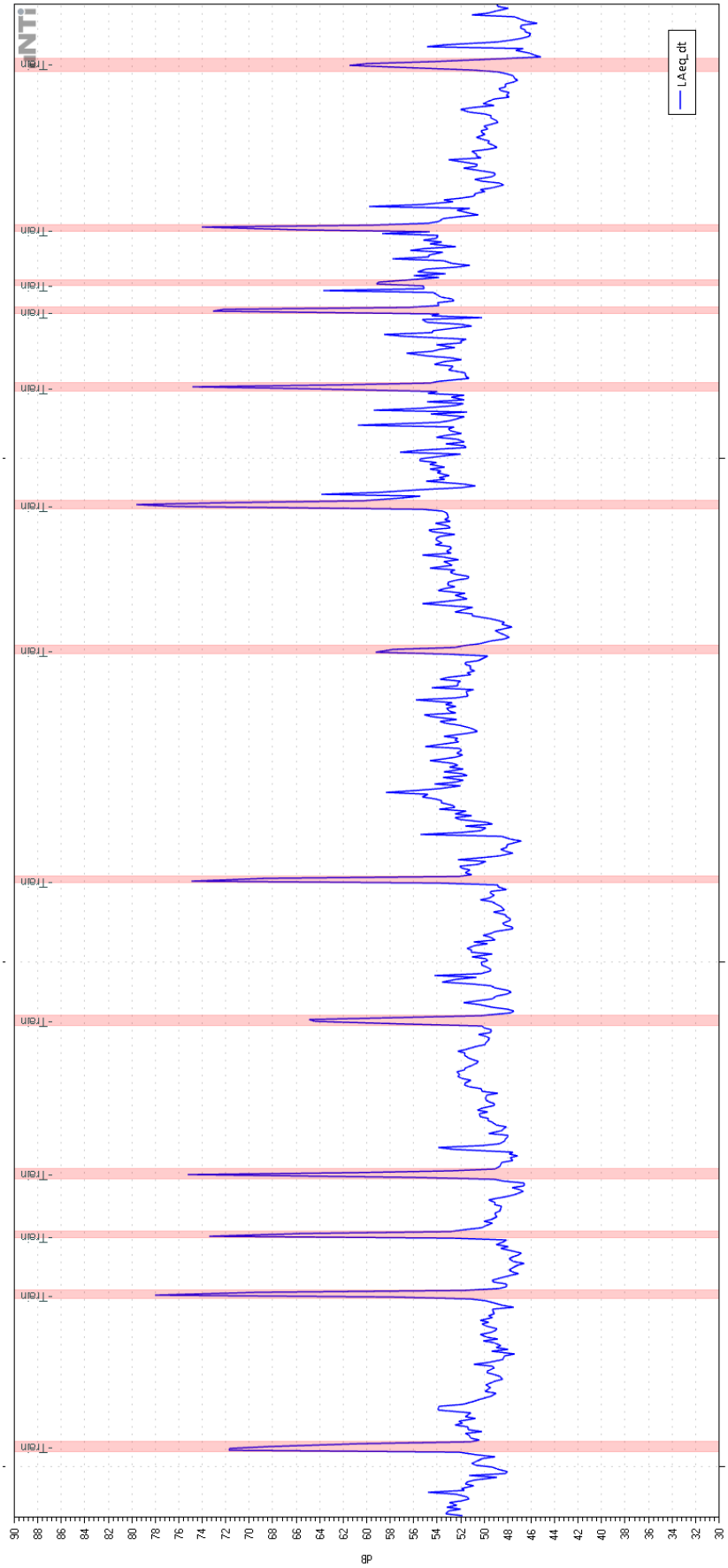


The measurement shown represents a period of inactivity following cessation of works measured at MP1. Train pass-by events have been excluded as with the measurement of the Ambient Sound Level.

The Residual Sound Level measured at MP1 is 50.6dBA.

The Specific Sound Level has therefore been calculated to be 55.7dBA at MP1 in relation to the crushing/screening area.

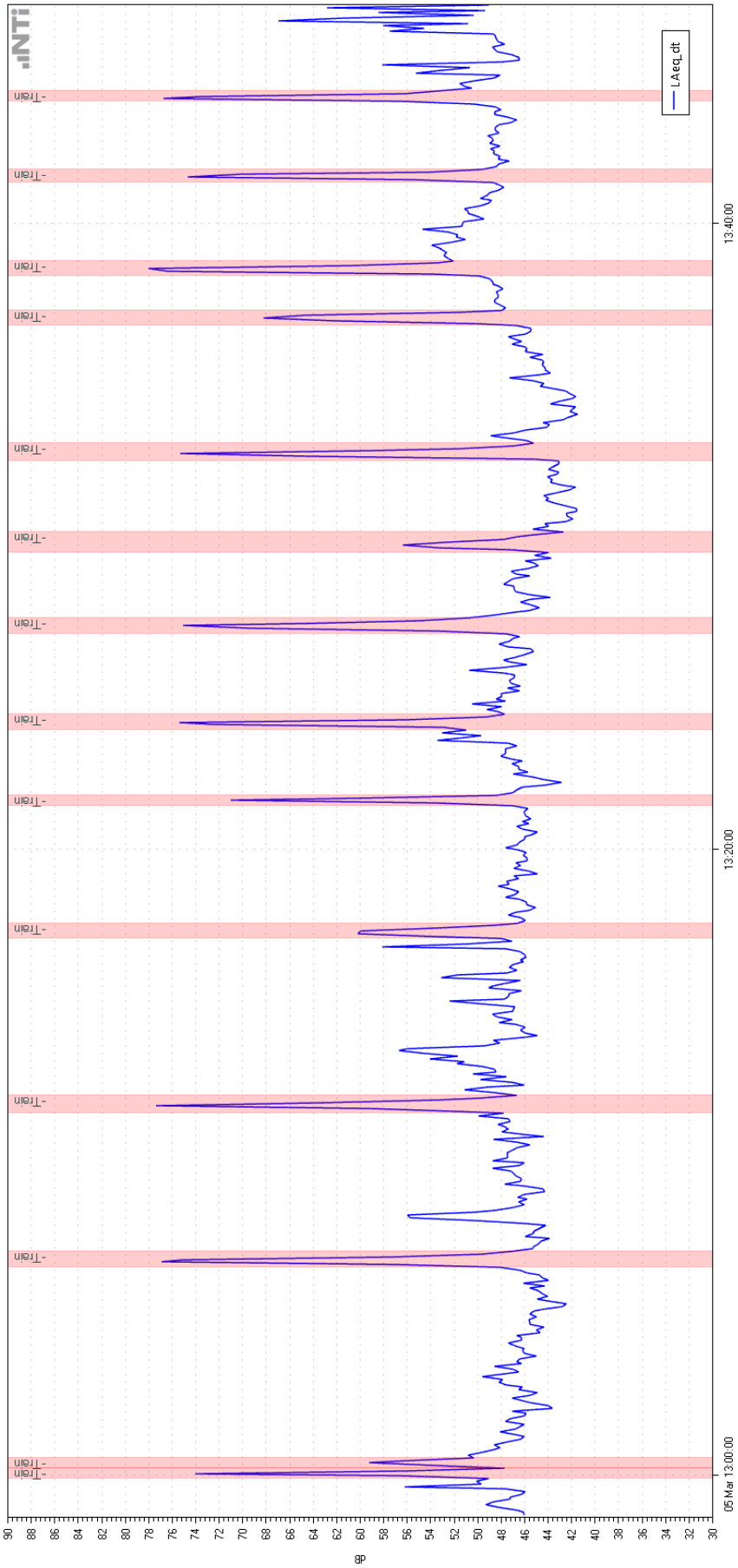
Figure 3.8: Survey Results MP4 - Sorting Operations Ongoing



The data shown represents a 1 hour period of activity with the sorting area operating. This is the dominant source of noise at MP4 with train pass-by events excluded from the measurement. The crushing/screening operation measured at MP1 was not operating at the time of this measurement.

The Ambient Sound Level at MP4 is 52.0dBA. The location of the source of the sorting measurement was noted and is assumed to be in this location for the purpose of the assessment though this can vary slightly within the processing area and is assumed for the assessment to be a point source located 3m from the ground height in the processing area to allow for waste being collected from piles and dropped into large skips. The measurement position was located to provide line of site through a small gap in the sorting site boundary fence for a worst case measurement.

Figure 3.9: Survey Results MP4 - Sorting Operations Ceased



The measurement shown represents a period of inactivity following cessation of works measured at MP4. Train pass-by events have been excluded as with the measurement of the Ambient Sound Level.

The Residual Sound Level measured at MP1 is 49.3dBA.

The Specific Sound Level has therefore been calculated to be 48.7dBA at MP4 in relation to the sorting area.

With regard to the typical Background Sound Level, the data taken at MP3 during the daytime period when the aggregates business was not operating has been used to provide the level to be used for the purpose of the assessment in line with BS4142:2014+A1:2019. Levels were measured in 15 minute periods and for the purpose of a robust assessment, the lowest Background Sound Level has been used and is assumed to be typical for the site. Table 3.5 below summarises the measured Background Sound Levels taken at MP3.

Position	Dates	Period	Measurement	Measured Broadband Range (dBA)	Lowest Measured Daytime Background Sound Level Used for BS4142 Assessment
MP3	15/11/2023 (16:30-23:00hrs) & 16/11/2024 (07:00-09:00)	Daytime (When Aggregates Process Not Taking Place)	LAF90 15min	48 - 58dBA	48dBA

4.0 PLANNING POLICY & DESIGN TARGETS

Planning Policy

National Planning Policy Framework

The National Planning Policy Framework (NPPF[1]) was updated in 2021 and sets out the Government's planning policies for England and how these should be applied. Where issues of noise impact are relevant the NPPF provides guidance. In paragraph 174 it states that planning policies and decisions should contribute to and enhance the natural and local environment by:

'preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of noise pollution'.

Paragraph 185 also advises:

'Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should: mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development - and avoid noise giving rise to significant adverse impacts on health and quality of life'.

The NPPF also refers to the 2010 DEFRA publication, the Noise Policy Statement for England (NSPE) which reinforces and supplements the NPPF guidance.

Noise Policy Statement for England

The Noise Policy Statement for England[2] (NPSE) sets out the long term vision of promoting good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development. This vision is supported by the following aims:

- Avoid Significant adverse impacts on health and quality of life.
- Mitigate and minimise adverse impacts on health and quality of life.
- Where possible, contribute to the improvement of health and quality of life.

[1] National Planning Policy Framework. Ministry of Housing, Communities & Local Government (2021)

[2] Noise Policy Statement for England - Department for Environment, Food & Rural Affairs (2010)

The NPSE describes the following levels at which noise impacts may be identified:

- NOEL - No Observed Effect Level. This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.
- LOAEL - Lowest Observed Adverse Effect Level : This is the level above which adverse effects on health and quality of life can be detected.
- SOAEL - Significant Observed Adverse Effect Level : This is the level above which significant adverse effects on health and quality of life occur.

According to the explanatory notes in the statement, where a noise level falls between LOAEL and a level which represents SOAEL then:

'all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life whilst also taking into consideration the guiding principles of sustainable development. This does not mean that such effects cannot occur'.

Planning Practice Guidance on Noise

Planning Practice Guidance (PPG) - Noise[3] is an online www.gov.uk resource (last updated 2019) to provide additional guidance on the NPPF. It discusses:

- *whether or not a significant adverse effect is occurring or likely to occur;*
- *whether or not an adverse effect is occurring or likely to occur and;*
- *whether or not a good standard of amenity can be achieved.*

In line with the Explanatory Note of the NPSE, the PPG references the LOAEL and SOAEL in relation to noise impact. It also provides examples of outcomes that could be expected for a given perception level of noise, plus actions that may be required to bring about a desired outcome. However, inline with the NPSE, no objective noise levels are provided although the PPG states that:

'the subjective nature of noise means that there is not a simple relationship between noise levels and impact on those effected. This will depend on how various factors combine in any particular situation'

Table 4.1 below summarises the PGG noise expose hierarchy.

[3] Planning Practice Guidance on Noise (https://www.gov.uk/guidance/noise--2). Ministry of Housing, Communities & Local Government

Table 4.1: Explanation of Noise Exposure Hierarchy - PPG

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

British Standard 4142

BS 4142:2014+A1:2019[4] presents methods for rating and assessing the potential impact of commercial and industrial sound upon noise sensitive receptors. In order to assess impact using BS 4142, the 'rating level' of the new sound source is compared with the existing contextual 'background sound level'.

- 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.
- 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.

The 'rating level' is determined by assessing the 'ambient sound level', distinguishing the 'specific sound level' from the 'residual sound level' and applying any sound specific penalties for acoustic features that would subjectively cause the sound to be perceived differently.

The 'specific sound level' of the commercial / industrial sound source is determined by either; measurement or calculation with regard to the appropriate reference time interval (for daytime or night-time periods). The standard requires separate analysis for daytime and night-time periods, evaluating the 'rating level' over an appropriate reference time interval (T_r) of: 1hr for daytime (07:00 - 23:00 hrs) and 15min for night time (23:00 - 07:00 hrs). The 'specific sound level' is defined as equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, *T* (determined either by calculation or deducting the measured 'residual sound level' from the measured 'ambient sound level').

'Ambient sound' is defined as the totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far (The ambient sound comprises the residual sound and the specific sound when present).

'Residual sound' is defined as the 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.

[4] BS4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound

Where appropriate, a rating penalty can be applied to the specific sound level to account for the character of the sound, namely: tonality, impulsivity and intermittency. Such acoustic feature corrections can be added together linearly.

Tonality can be determined objectively (using adjacent third octave band analysis or the Joint Nordic method) or subjectively as described below:

- +2dB penalty: Just perceptible
- +4dB penalty: Clearly perceptible
- +6dB penalty: Highly perceptible

Impulsivity can be determined objectively (using Fast Fourier Transform analysis) or subjectively as described below:

- +3dB penalty: Just perceptible
- +6dB penalty: Clearly perceptible
- +9dB penalty: Highly perceptible

Where intermittency is present, a +3dB penalty can be applied. Where the acoustic feature characteristics are neither tonal nor impulsive, but are clearly distinguishable against the residual sound, a +3dB penalty can be applied.

BS4142:2014+A1:2019 provides limitations in its scope and states that it is not intended to be applied to assessment of sound from, people, recreational activities, shooting, music/entertainment, construction, demolition, PA systems, domestic animals and determination of noise amounting to a nuisance.

World Health Organisation, Environmental Noise Guidelines for the European Region 2018 (WHO)

The WHO (World Health Organisation) guidelines provide guidelines in relation to noise in the community and these are in line with the guidance in BS8233:2014. The WHO guidelines relate to the potential for health impacts relating to environmental noise and the impact of noise on uninterrupted speech and sleep. The suggested guideline values for the daytime in noise levels in external areas are reflected in the guidance in BS8233:2014 and typical Local Authority noise target levels.

Design Targets

The noise design targets for internal habitable spaces and gardens are detailed in Table 4.2. The targets are based on the advice provided in BS8233:2014.

Table 4.2: BS8223:2014 Design Targets

Space	$L_{Aeq,16hr}$ (07:00 - 23:00)	$L_{Aeq,8hr}$ (23:00 - 07:00)	L_{Amax} (23:00 - 07:00)
Living Room & Kitchen	35dB	-	-
Dining Room & Study	40dB	-	-
Bedroom	35dB	30dB	≤45dB

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 50dB $L_{Aeq,T}$, with an upper guideline value of 55dB $L_{Aeq,T}$ which would be acceptable in noisier environments.

However, it is also recognised 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.

In this case, the majority of garden spaces will comply with the 50-55dBA target with the recommended 4m high performing acoustic barrier for the general environmental noise sources including the absolute levels relating to the aggregates processing activity, this is shown in Appendix B. This also assumes both areas of the aggregates processing site are operating simultaneously based on the Specific Sound Levels calculated for the BS4142 assessment.

Manchester City Council SPD

Manchester City Council has published comprehensive guidance in relation to noise impact to new development from existing noise sources. The MCC Planning and Noise Technical Guidance document was updated in October 2022 and discusses the assessment of environmental noise for new development in the vicinity of nearby noise sources. The published guidance forms the basis for the decision making process when assessing planning applications within the Council's boundaries and provides design targets.

5.0 NOISE BREAK-IN CALCULATIONS

The methodology described in BS8233:2014[5] for break-in calculations has been used to determine a suitable glazing strategy for compliance with BS8233:2014 criteria.

Bellway Homes Ltd (Manchester) have provided information in relation to the preferred strategy for ventilation of dwellings to comply with Building Regulations 2010. It is understood that where the acoustic requirements of Approved Document O are unlikely to be met during periods of overheating with bedroom windows open at night to remove excess heat, alternative methods have been proposed by Bellway Homes Manchester Ltd to remove excess heat. These options include:

1. A full mechanical supply and extract system sufficient to manage overheating which supplies fresh air and remove extracted air via ducts within the whole dwelling (MVHR) (no window trickle ventilators);
2. Mechanical extract systems utilising a purge ventilation unit to remove air from bedrooms via acoustically lined loft ducting and acoustic wall vent, with fresh supply via passive window trickle ventilation in the dwelling in conjunction with a standard decentralised continuous extract ventilation system (DMEV);
3. Dwellings that can rely on open windows to remove excess heat and make use of passive window trickle ventilators in conjunction with a standard decentralised continuous extract ventilation system (DMEV).

Red Acoustics can comment on the implications of noise break-in to dwellings with proposed ventilation and facade/boundary noise mitigation in place though specific ventilation requirements and compliance with the relevant Approved Documents of the Building Regulations 2010 must be confirmed by the client. It is understood that the details for the second category system are in development and noise break-in calculations do not include for noise break-in through the mechanical extraction unit pathway. This can be checked if necessary once details of the system are available.

The modelling outputs presented in Appendix B separate out the plots into the categories above based on external noise levels. In this case however, all plots will fail to comply with the acoustic requirements of Approved Document O with open windows to remove excess heat at night in bedrooms. Therefore no plots fall into the third category.

[5] British Standards Institute 8233:2014 *Guidance on sound insulation and noise reduction for buildings*

The variables required to determine suitable glazing and ventilation acoustic requirements are as follows:

- Room volume in m^3
- Facade element surface areas m^2
- Facade element sound reduction indexes in each octave band (125Hz - 2kHz).
- Room reverberation time in seconds to determine affective absorption area in m^2 in the receiving room.

The room volume and facade element surface areas have been taken from typical Bellway Homes house types. The sound reduction index levels for glazing elements are held on file and taken from manufacturers' published data. The room reverberation time is assumed to be 0.4s, 0.6s and 0.8s in each octave band for bedrooms, living rooms and kitchens respectively.

For the purpose of noise break-in calculations in-line with BS8233:2014 guidance, windows are assumed to be closed with ventilation to be provided capable of complying with the Building Regulations 2010. Ventilation is assumed to be provided to ensure compliance with the Building Regulations 2010, though compliance in this regard and compliance with thermal comfort criteria is outside the scope of this assessment and should be checked and confirmed by others. It is recommended that an assessment of overheating be undertaken at an early design stage to ensure that overheating mitigation works in conjunction with facade noise mitigation and is suitable in areas where windows cannot be relied upon for removal of excess heat. Copies of break-in calculations are available if requested.

6.0 BS4142+A1:2019 COMMERCIAL NOISE ASSESSMENT

An assessment of noise impact in accordance with BS4142:2014+A1:2019 is discussed below with regard to operational noise measured at the adjacent aggregates processing business located 35m to the South-East of the proposed development site.

Table 6.1 below presents the measured data taken at MP1 & MP4 relating to commercial noise impact from the aggregates processing business. The sound level meters recorded continuous audio and is paired with software able to separate and process data for individual events after completion of the measurement. Using the audio recordings and specialist software, an assessment of noise impact can be undertaken for impact to plots and gardens across the proposed development site from both areas operating simultaneously.

The measured data has been used to calibrate a source within the noise propagation model. This is discussed in Section 7.0 below. The model calculates the impact from both areas of the commercial site to all plots and gardens and applies a +9dBA penalty for impulsivity in line with the guidance in BS4142. The model enables the assessment to be undertaken with the recommended acoustic barrier in place.

The business operates in the daytime period and it is assumed that the business does not operate at night. Noise that was observed in the night-time period cannot be attributed to a specific location and appears to be related to the railway and has been assessed as such. Operational noise was noted to include trucks tipping waste & aggregates, loading of trucks, reversing alarms, a large mobile processing machine, tracked excavators, and loading shovels.

Table 6.1: Indicative BS4142 Measurement Data - MP1 & MP4 Daytime

Position	Date	Measurement Type	Measured L_{Aeq} (dBA)	Comment
MP1	15-16/11/2023	Background	48	Underlying noise climate to which the impact is compared. Determined at MP3 by lowest measured LAF90 15min
	15/11/2023 12:00hrs to 13:00hrs	Ambient	57	Aggregates processing operations
	15/11/2023 16:43hrs to 17:43hrs	Residual	51	Business activity stopped
	15/11/2023 1hr Period of Activity	Specific	56	Ambient-Residual = Specific
MP4	15-16/11/2023	Background	48	Underlying noise climate to which the impact is compared. Determined at MP3 by lowest measured LAF90 15min
	05/03/2024 10:58hrs to 11:58hrs	Ambient	52	Aggregates processing operations
	05/03/2024 12:58hrs to 13:47hrs	Residual	49	Business activity stopped
	05/03/2024 1hr Period of Activity	Specific	49	Ambient-Residual = Specific

7.0 CADNAA NOISE PROPAGATION MODELLING

To predict noise levels from road traffic and rail traffic across the site, CadnaA 3D noise propagation modelling software has been used, which implements the calculation procedure specified within ISO9613-2.

The model has been calibrated and validated using the measured levels presented in Section 3.0. The calibration was undertaken by modelling the existing buildings and the surroundings using Google Earth imagery, terrain height data and drawn details including current proposed site levels based on the preliminary drainage and ground levels drawings provided by the client. If proposed site levels are developed further, this should be re-checked. The noise monitoring positions were assigned as receiver positions in the model and the sources of interest have been adjusted until the receiver position matched the measured data. In the case of roads, traffic flow data from the Department of Transport has been used to input road sources within the model which calculates road noise impact using the methodology in Calculation of Road Traffic Noise (CRTN). Road noise (in addition to other calibrated noise sources) is then predicted to the measurement positions within the model to validate that model is predicting accurately. Ground absorption is set within the model to 50% reflective to reflect mixed ground. Buildings and barriers are set to be fully reflective as is likely to be the case. Two orders of reflection are set within the model. The calibrated sources are used to predict noise propagation to and across the proposed development site with all sources operating simultaneously.

With regard to model accuracy, all measurement positions, set as receivers in the model correlate well between the measured data and the prediction to each position. All positions are well within an expected tolerance of +/- 3dBA and in most cases result in a 1-2dBA over prediction. This allows for a robust assessment of noise impact within the noise model across the facades and garden areas of the proposed development with all road, rail and aggregate processing activity operating simultaneously within the model.

The assessment in accordance with the guidance in BS4142:2014+A1:2019 has been included within the noise propagation model to predict the impact from the adjacent waste sorting and aggregates processing business to the gardens and facades of the proposed development with the recommended boundary treatment in place. The results are presented in Figure B7 in Appendix B and include the rating level penalties which total +9dB and are presented relative to the typical background sound level of 48dBA in the daytime period. For each of the waste sorting and aggregates processing areas, the measured commercial activity has been attributed to a point source in each of the relevant areas where the majority of activity was observed to take place. This is a simplification, however the observed dominant noise generating activities generally occurred in a single location at any one time and given the distance to the proposed development site this would approximate to a point source.

As the site operates two main areas, sometimes independently, these have been calibrated separately and are, for the purpose of the assessment operating simultaneously. As there are two main sources and multiple proposed dwellings and garden spaces, the BS4142:2014+A1:2019 assessment result has been provided graphically in Appendix B.

Appendix B presents the results of the noise propagation modelling and the recommended baseline facade and boundary noise mitigation across the development. The assessment includes for maximum events as well as daytime and night-time L_{Aeq} levels.

Figures B1 - B2 show the garden noise level prediction including all noise sources assessed relative to BS8233 targets with a 2m and 4m barrier along the railway boundary in the location indicated. This has been provided to show that a 4m barrier is required as a minimum.

Figures B3 - B6 show the recommended facade noise mitigation for ground floor living spaces and first floor bedroom spaces. Plots have been separated into those where MVHR is recommended to avoid the need for passive ventilation in the facade and those which can make use of passive ventilators as part of a ventilation strategy. The ventilation strategy is to be confirmed by others.

Figure B7 presents the result of the BS4142:2014+A1:2019 assessment of commercial noise from the adjacent waste and aggregates processing business.

8.0 DISCUSSION & RECOMMENDATIONS

Noise impact to the proposed development has been assessed in relation to road and rail noise as well as commercial noise from the adjacent waste and aggregates processing business. The rail network is relatively busy along the section adjacent to the site and includes freight train activity as well as trains idling for long periods at night. Impact to the site is relatively high in terms of train noise and a high level of acoustic mitigation is proposed. An acoustic barrier has been explored to determine the minimum recommended height to achieve internal noise break-in and garden noise levels that comply with BS8233:2014 guidance. It is recommended that a high performing acoustic barrier be installed along the entire South-Eastern boundary to a height of 4m as a minimum. Appendix B shows the location and heights for barrier recommendations.

The acoustic barrier also provides protection to the proposed dwellings in terms of commercial noise impact and the proposed residential layout assessed within this report has also incorporated re-orientation and re-location of plots to protect external amenity and facade noise levels as far as is practicable. As shown in Figure B7, the proposed layout and acoustic barrier is predicted to prevent significant adverse impacts to the dwellings. The impact with the recommended minimum 4m barrier will be reduced to 33 plots experiencing low impact to facades and 29 low impact garden spaces. 37 plots will experience the potential for adverse impact to facades with 50 gardens potentially adversely impacted. 19 plots and 10 gardens will experience potential significant adverse impact. These impacts can be reduced further by increasing the barrier height and it is recommended that this be increased as far as it practicable above 4m if possible.

Glazing recommendations for the site with the recommended minimum 4m barrier in place have been made for plots that are closest to the rail line and commercial sources. These are recommended to be mechanically ventilated to avoid the use of passive ventilation as these will compromise the acoustic performance of the facade. Glazing and passive window trickle ventilation acoustic performances have been made where these vents can be used, further from the dominant noise sources. The ventilation strategy should be confirmed by others in relation to the requirements of the Building Regulations 2010 and thermal comfort requirements. Where adverse impacts are predicted to facades, the recommended glaring performance mapped out in Appendix B includes for a +5 to +10 dBA R_w uplift over the performances required to achieve BS8233 target noise levels due to the absolute predicted facade levels. This accounts for additional BS4142 rating level impacts.

Based on the measured data and the noise break in calculations discussed in Section 5.0, the baseline BS8233:2014 target noise levels within the relevant spaces can be achieved across the development with a mixture of glazing specifications with the minimum performance values outlined below. These are mapped onto Figure B3 - B6 in Appendix B.

Table 8.1 presents the octave band Sound Reduction Index (SRI) values for the various facade elements used in the noise break in calculations. These should be used as a minimum for specification of glazing proposals and contractor glazing proposals should be checked by Red Acoustics to ensure acoustic performance requirements will be met. Alternative

proposals may be used provided that the relevant acoustic performances are met and the glazing configurations provided below are given as examples.

At present the window trickle vents used relates to the ongoing discussion with Bellway Homes Ltd (Manchester) regarding compliance with the updated requirements of the Building Regulations 2010. Alternative vents may ultimately be used provided that the below minimum octave band performances are met.

Table 8.1: Minimum Facade Element Performance Requirements (Options Mapped in Appendix B)

Facade Element	Octave Band Sound Reduction Index (SRI) and Element Normalised Level Difference ($D_{n,e}$) dB for glazing and ventilation elements					R_w
	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	
4/16/4 Glazing (SRI) including frame	21	17	25	35	37	29
8/16/6 Glazing (SRI) including frame	20	21	33	40	36	35
6/16/6.8 Glazing (SRI) including frame	21	28	37	48	48	40
SV1 Window Trickle Vent (e.g. Greenwood 4000EAV)	39	37	33	33	35	34 (+Ctr)
AV1 Window Trickle Vent (e.g. Greenwood 5000EAW.AC2)	39	38	31	44	43	37 (+Ctr)

In this case, all except 4 garden spaces will comply with the 50-55dBA target with the recommended 4m high performing acoustic barrier. This is shown by prediction in Appendix B along with a prediction with only a 2m barrier for comparison. Of the 4 exceedances these are not considered significant as the garden spaces exceed 55dBA by only 1dBA.

9.0 CONCLUSIONS

An assessment of noise levels impacting on the residential facades and garden spaces of the proposed development has been carried out in order to determine the recommended noise mitigation strategy to achieve indoor and garden target noise levels in line with relevant guidance.

The assessment has also included for commercial noise impact due to the adjacent waste and aggregates processing business and an assessment in line with the guidance in BS4142:2014+A1:2019 has been undertaken. Facade noise mitigation recommendations have been uplifted to account for adverse impact due to the commercial noise and a site boundary barrier has been recommended to reduce impact as far as is practicable.

APPENDIX A: NOISE SURVEY DETAILS

Location

Pitsford Road, Manchester

Survey Dates

15th - 16th November 2023

5th - 6th March 2024

Weather

Dry with cloud and wind speeds <5m/s.

Personnel Present During Measurements

Johnathan Whittle AMIOA MCIEH

Paul Clark Pg. Dip. IOA MIOA

Instrumentation

Kit No	Equipment Description	Type Number	Manufacturer	Serial Number	Date of Last Calibration	Calibration Certificate Number
RED04	Sound Level Meter	CR:171B Type 1	Cirrus	G056973	10-Feb-23	187416
	Sound Calibrator	CR:515 Type 1	Cirrus	59150	27-Oct-23	45784
RED05	Sound Level Meter	CR:171B Type 1	Cirrus	G081108	30-Sep-22	1503025-12
	Sound Calibrator	CR:515 Type 1	Cirrus	88023	17-Jul-23	44876
RED12	Sound Level Meter	XL3	Nti Audio	A3A-00480-D1	20-Mar-23	UK-23-034
	Sound Calibrator	Type 1251 IEC 60942-2003 Class 1	Norsonic	33007	17-Jul-23	44878
RED14	Sound Level Meter	CR:171B Type 1	Cirrus	G300554	02-Dec-21	166932
	Sound Calibrator	CR:515 Type 1	Cirrus	59153	27-Oct-23	45782

Methodology & Calibration

Before and after the measurements, the sound level meters were check calibrated to an accuracy of ±0.3dB using their associated Class 1 Calibrators. No drift in the instruments' sensitivities were noted across any of the survey periods. Copies of all calibration certificates are kept on file by Red Acoustics Ltd and can be supplied if requested.

APPENDIX B: FACADE AND BOUNDARY NOISE MITIGATION RECOMMENDATIONS

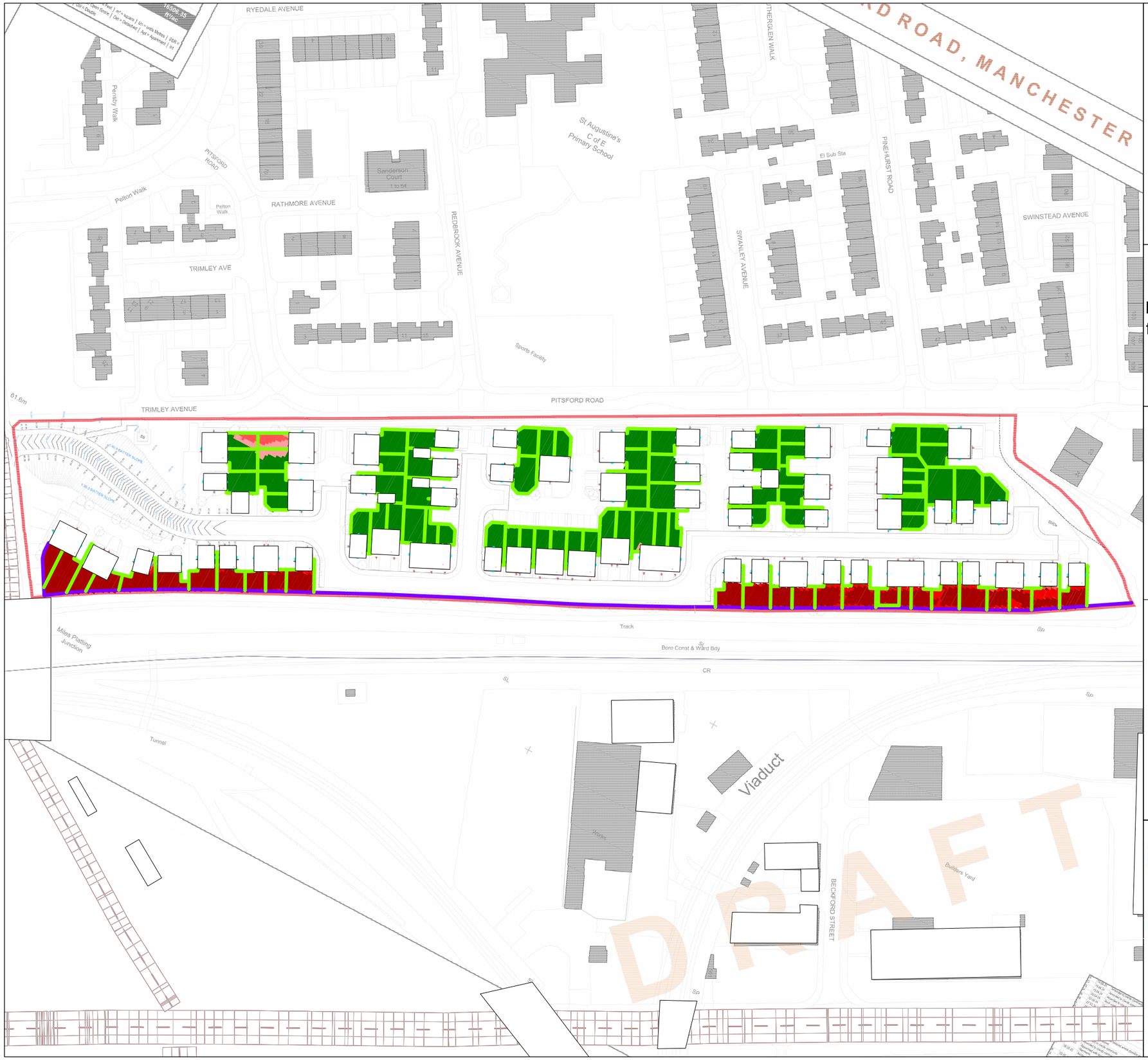


Figure B1: Garden Noise Level Prediction Daytime LAeq,16hr

2m Boundary Barrier

Drawing Notes

Daytime garden noise levels exceed 50-55dBA target for all Southern plots with 2m barrier along boundary as indicated.

Barrier Height Key:

- 1.8m Barrier
- 2.0m Barrier
- 3.0m Barrier
- 4.0m Barrier

Impact Map Key:

- <=55
- <=56
- <=57
- <=58
- >58

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Figure B2: Garden Noise Level Prediction Daytime LAeq,16hr

4m Recommedned Minimum Boundary Barrier

Drawing Notes

Daytime garden noise levels meet 50-55dBA target with 4m barrier along boundary as indicated.

Acoustic barrier details to be confirmed, however a high mass acoustic fence is recommended. Exact proposed ground heights to be confimed prior to insalling barrier to ensure expected level of acoustic protection.

Plot shows absolute levels including roads, trains and both areas of waste/aggregates procesing.

Barrier Height Key:

- 1.8m Barrier
- 2.0m Barrier
- 3.0m Barrier
- 4.0m Barrier

Impact Map Key dBA:

- <=55
- <=56
- <=57
- <=58
- >58

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Figure B3: Facade Mitigation Ground Floor Living & Kitchen Spaces dBA LAeq,16hr

Non-MVHR Plots

Drawing Notes

Recommendation relates to daytime road traffic and rail noise impact as as well as uprated performance recommendations to account for adverse BS4142 impacts as presented. Also See Figure B7.

All plots require alternative means of managing overheating to opening bedroom windows at night for Part O acoustic complaince.

Recommendation presented also relies on proposed 4m acoustic barrier.

See Table 8.1 for required glazing and trickle vent acoustic performance.

Impact Map Key:

- 4-16-4 Glazing & SV1 Vent
- 4-16-4 Glazing & AV1 Vent
- 8-16-6 Glazing & AV1 Vent
- 6-16-6.8 Opti Glazing + AV1 Vent

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Figure B4: Facade Mitigation First Floor Bedroom Spaces dBA LAeq,8hr & LAmax

Non-MVHR Plots

Drawing Notes

Recommendation relates to night-time road traffic and rail noise impact as as well as uprated performance recommendations to account for adverse BS4142 impacts as presented. Also See Figure B7.

All plots require alternative means of managing overheating to opening bedroom windows at night for Part O acoustic complaince.

Recommendation presented also relies on proposed 4m acoustic barrier.

See Table 8.1 for required glazing and trickle ventilator acoustic performance.

Impact Map Key:

- 4-16-4 Glazing & SV1 Vent
- 4-16-4 Glazing & AV1 Vent
- 6-16-6.8 Opti Glazing & AV1 Vent
- 8-16-6 Glazing & AV1 Vent

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Figure B5: Facade Mitigation Ground Floor Living & Kitchen Spaces dBA LAeq,16hr

MVHR Plots

Drawing Notes

Recommendation relates to daytime road traffic and rail noise impact as as well as uprated performance recommendations to account for adverse BS4142 impacts as presented. Also See Figure B7.

All plots require alternative means of managing overheating to opening bedroom windows at night for Part O acoustic complaince.

Recommendation presented also relies on proposed 4m acoustic barrier.

See Table 8.1 for required glazing acoustic performance.

Impact Map Key:

- 4-16-4 Glazing & MVHR (No Vent)
- 8-16-6 Glazing & MVHR (No Vent)
- 6-16-6.8 Opti Glazing & MVHR (No Vent)

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Figure B6: Facade Mitigation First Floor Bedroom Spaces dBA LAeq,8hr & LAmax

MVHR Plots

Drawing Notes

Recommendation relates to nighttime road traffic and rail noise impact as as well as uprated performance recommendations to account for adverse BS4142 impacts as presented. Also See Figure B7.

All plots require alternative means of managing overheating to opening bedroom windows at night for Part O acoustic complaince.

Recommendation presented also relies on proposed 4m acoustic barrier.

See Table 8.1 for required glazing acoustic performance.

Impact Map Key:

- 4-16-4 Glazing & MVHR (No Vent)
- 8-16-6 Glazing & MVHR (No Vent)
- 6-16-6.8 Opti Glazing & MVHR (No Vent)

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Figure B7: BS4142:2014+A1:2019 Results - Waste Sorting and Aggregates Processing

Drawing Notes

The results shown indicate the additional level of commercial noise impact in line with the guidance in BS4142. This includes a +9dBA penalty onto the absolute levels for highly perceptible impulsivity.

Where adverse impact is indicated in red colours, the glazing recommendation has been uprated to account for the amount of additional impact. +5dB Rw and +10dB Rw has been added to the glazing recommendation as needed on a facade by facade basis to account for impact above the baseline BS8233 glazing recommendation. This is incorporated into the outputs in Figures B3-B6.

Impact Map Key:

- <=43 up tp 48 (Low Impact)
- 48-53 (Potential for adverse impact indicated)
- 53-58 (Adverse impact indicated)
- 58-63 (Significant adverse impact)

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