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Noise Assessment

Former Greggs Bakery, Twickenham

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Noise Assessment

Project: FORMER GREGGS BAKERY, TWICKENHAM

Report reference: RP01-20351-R0

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1. EXECUTIVE SUMMARY

1.1 Cass Allen has been instructed by London Square Developments Ltd to assess the noise impact associated with a proposed new development at the site known as the Former Greggs Bakery, Twickenham.

1.2 The assessment was carried out in accordance with relevant local and national planning guidance.

1.3 Noise surveys were carried out at the site by Paragon Acoustic Consultants Ltd and Cass Allen. Noise levels at the site are dictated by road, rail, aircraft, and occasionally adjacent commercial/industrial uses.

1.4 The proposed development has been assessed according to the guidance in ProPG and Richmond Council's Supplementary Planning Document (SPD) – *Development Control for Noise Generating and Noise Sensitive Development.*

1.5 The proposed development is considered to represent good acoustic design in-line with ProPG and the Richmond SPD.

1.6 Preliminary recommendations have been provided for the development to comply with ProPG and the Richmond SPD and to assist compliance with Part O of the Building Regulations.

1.7 Appropriate limits for noise from mechanical plant have been calculated based on measured noise levels at the site, BS4142 and the Richmond SPD.

1.8 It is our view that the site is suitable for the development in terms of noise levels and there is no noise-related reason why planning permission should not be granted.

1.9 Compliance with the recommendations of this report could be secured via the imposition of suitable planning conditions if deemed necessary by the Local Planning Authority.

2. INTRODUCTION

2.1 The assessment has been carried out in accordance with relevant local and national planning guidance.

2.2 The aims of the assessment were:

- To establish the suitability of existing noise levels at the site for the proposed development;
- Where required, identify appropriate measures to optimise the acoustic design of the development and achieve acceptable noise levels in habitable areas;
- To assess the potential impact of noise emissions from mechanical plant associated with the development at the positions of existing sensitive receptors in the area.

2.3 It is noted that there has been a previous application for a similar scheme at this site, where noise was not raised as grounds for refusal.

2.4 This report contains technical terminology; a glossary of terms can be found at www.cassallen.co.uk/glossary.

3. PROJECT DESCRIPTION

3.1 The site currently contains industrial units previously used as a bakery. It is located in a predominantly residential area, bounded to the east and west by residential properties, to the south by Edwin Road and to the north by a railway and buildings within the Mereway Nature Park. Further to the north is a recycling depot and to the south are commercial car garages.

3.2 The site location is shown in Figure 1 below.

Figure 1 Site Location and Surrounding Area (red line approximate)

3.3 The proposed development comprises *"demolition of existing buildings (with retention of a single dwelling) and redevelopment of the site to provide up to 116 residential units and 175 sqm commercial floorspace (Use Class E) with associated hard and soft landscaping, car parking and highways works and other associated works*". A current drawing of the proposed development layout is shown in Appendix 1.

4. PLANNING POLICY

National Policy

4.1 Outline guidance for the assessment of noise affecting new developments is given in the National Planning Policy Framework (NPPF). Relevant sections in this case are highlighted below:

> *174. 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.*
>
> *185. Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:*
>
> *a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*
>
> *b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.*
>
> *186. Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.*

Local Policy

4.2 Richmond Council's Supplementary Planning Document (SPD) – *Development Control for Noise Generating and Noise Sensitive Development* (September 2018) provides further guidance and criteria for the assessment of noise relating to new development in the borough, in-line with ProPG: *Planning and Noise for New Residential Development*, May 2017 (ProPG). The ProPG guidance is standard practice for noise assessment of new residential development in England and has been adopted for this assessment.

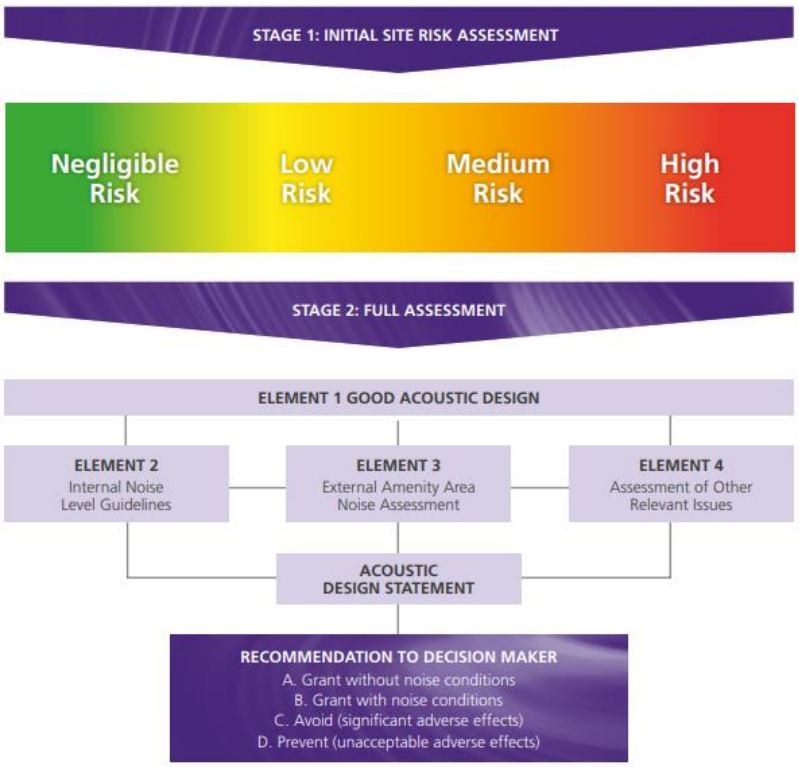
5. NOISE AFFECTING THE DEVELOPMENT

5.1 The ProPG assessment process can be summarised as follows:

- Stage 1 – measure noise levels at the site and carry out an initial noise risk assessment of the proposed development site based on the measured levels.
- Stage 2 – where a higher noise risk is identified, carry out a detailed assessment including the following four considerations:
  - Element 1 – the overall acoustic design and layout of the site
  - Element 2 – internal noise levels in habitable areas
  - Element 3 – noise levels in external amenity areas
  - Element 4 – consideration of other relevant issues
- Based on the results of the Stage 2 assessment, provide a recommendation to the decision maker on whether planning permission can and should be granted.

5.2 The process is shown visually in Figure 2 below.

Figure 2 ProPG Assessment Process



5.3 It should be noted that the ProPG assessment methodology applies to noise from anonymous (e.g. transport) sources affecting residential development only, therefore the following matters outside this scope also require consideration:

- Noise affecting the proposed development from nearby commercial/industrial sources such as the recycling depot or garages have the potential for greater noise impact than anonymous sources. Guidance from BS4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound* has been incorporated into the ProPG assessment below where relevant to account for this potential additional impact.
- The industrial area at the south of the site is proposed for Class E use. Class E industrial (i.e. E(g)(iii) use is classified as industrial processes *"which can be carried out in a residential area without detriment to its amenity"* and is also not expected to be more sensitive to noise than the proposed residential. On this basis it is not considered further in this assessment, with the exception that mechanical plant (e.g. ventilation or cooling) associated with the building may need to be considered during detailed design in-line with the guidance provided in Section 6.

Stage 1 – Noise survey and initial assessment

5.4 Site noise surveys were carried out at the site by Paragon Acoustic Consultants from 8 November to 12 November 2018 and by Cass Allen from 28 July to 2 August 2022. The survey methodologies and results are provided in Appendix 2 and Appendix 3. Generally, noise data from the Paragon survey was used, particularly regarding aircraft as this was pre-pandemic and therefore is representative of a worst-case average noise level that is likely to occur again in future. Cass Allen survey data supports the above findings. The newer Cass Allen data has been used for commercial/industrial noise to enable more detailed analysis.

5.5 When Heathrow airport is in easterly operation, aircraft pass directly over the site. Noise levels in this scenario are generally dictated by rail and air traffic. Noise from road traffic is occasionally audible at the south of the site and noise from the adjacent industrial/commercial uses is also audible in the most northern and southern areas of the site however does not generally dictate the average, maximum or background levels.

5.6 When Heathrow airport is in westerly operation, aircraft do not take off over the site and much lower levels are produced by landing aircraft, which also do not pass directly over the site. In this scenario, background levels across the site are dictated by distant road traffic. Average and maximum noise levels are dictated by:

- Rail traffic at the north of the site.
- Sporadic road traffic and the nearby commercial uses at the south of the site.

5.7 The levels during easterly operation have been used to inform the assessment as they represent the worst-case levels at the site. For this reason, anonymous noise levels during westerly operation are not considered further in this report. Commercial/industrial noise is considered separately in Paragraphs 5.14-5.18.

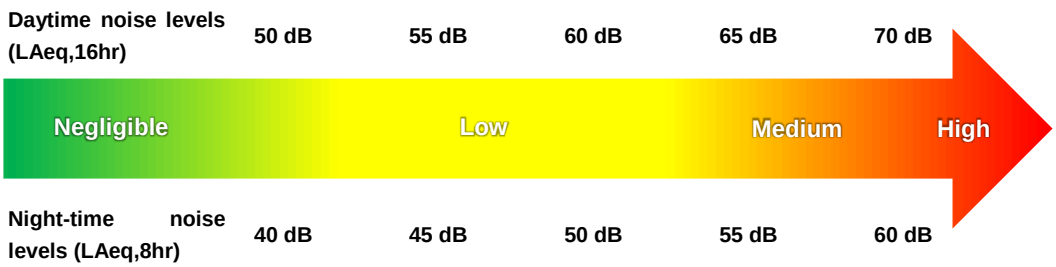
5.8 Noise from a transformer was measured at the north east of the site. However, it is understood that this will be removed, therefore it is not considered further in this report.

5.9 Areas of the development at the northern and southern edges of the site will be subject to the highest noise levels. The noise survey results show that noise levels at these positions are as follows:

- Northern edge of the site facing railway (free-field):
  - Average noise levels during the daytime – 64 dB LAeq,0700-2300hrs;
  - Average noise levels during the night-time – 58 dB LAeq,2300-0700hrs;
  - Typical maximum noise levels during the night-time - 80 dB LAmax.
- Southern edge of the site facing road (facade level) during easterly Heathrow operation:
  - Average noise levels during the daytime - 61 dB LAeq,0700-2300hrs;
  - Average noise levels during the night-time - 53 dB LAeq,2300-0700hrs;
  - Typical maximum noise levels during the night-time - 71 dB LAmax.

5.10 The measured noise levels can be compared with Figure 3 below to assess the 'noise risk' of the site. Where the noise risk is high, significant acoustic design measures may be required to achieve appropriate noise levels in the development. Where the noise risk is low, appropriate noise levels may be achievable with no specific acoustic design measures.

Figure 3 Noise Risk Assessment (Adaption of Figure 1 from ProPG)



5.11 It can be seen from a comparison of the measured noise levels in Paragraph 5.9 above with Figure 3 that the site is 'Medium' risk. Therefore, ProPG requires that a more detailed 'Stage 2' assessment is carried out. This is presented below.

Stage 2 – Element 1 – Overall acoustic design of the site

5.12 In our view the development represents good acoustic design for the following reasons:

1. The proposal is to place residential properties in a predominantly residential area with no conflicting directly adjacent land uses (e.g. no direct boundaries between residential and industrial use). All nearby industrial uses are separated from the site by roads, railways etc.
2. The proposal represents a planning gain in noise terms by removing potential industrial noise impact of the bakery site from nearby existing residential properties.

3. Buildings at the north of the site are laid out such that private gardens are at the rear and screened from road and railway noise.
4. The residential building (terraced house) nearest the existing garages is oriented such that the gable end of the building is facade the garages with minimal window area.
5. Buildings on the rest of the site are laid out such that gardens are screened from the new access road.

Stage 2 – Element 2 - Internal noise levels

5.13 ProPG criteria for acceptable noise levels in acoustically sensitive areas of new developments are given in Table 1 below.

Table 1 ProPG Internal Noise Criteria

Location	07:00 to 23:00	23:00 to 07:00
Living room	35 dB LAeq,16hour	-
Dining room/area	40 dB LAeq,16hour	-
Bedroom	35 dB LAeq,16hour	30 dB LAeq,8hour 45 dB LAFmax[1]

Note 1: Not typically exceeded more than 10 times a night.

5.14 As discussed in Paragraph 5.3 above, there is potential for additional noise impact from the nearby recycling depot and commercial garages. Assessment Examples 6 and 8 in BS4142:2014+A1:2019 describe a method for assessing the potential impact of existing commercial noise on new residential, based on the BS8233 (and ProPG) internal noise level criteria set out in Table 1 above including additional BS4142 “rating corrections” to account for distinguishing character features of this noise.

5.15 The following BS4142 character corrections to the average noise levels are considered appropriate in this case:

- Recycling depot – +6 dB for “clearly perceptible” impulsive noise from moving materials around the site.
- Commercial garages – +6 dB for “clearly perceptible” impulsivity and +2 dB for occasional tonality from use of hand tools.

5.16 The average noise levels due to the existing recycling centre to the north of the site were measured to be 49 dB LAeq,T, resulting in 55 dB LAr,Tr after applying the character corrections discussed above.

5.17 The average noise levels due to the existing garages to the south of the site varied throughout the attended survey. To ensure a robust assessment, the highest measured level of 56 dB LAeq,5mins has been used. This results in a rating level of 64 dB LAr,Tr.

5.18 The above rating levels have been included in the sound insulation calculations below in order to consider both the anonymous and industrial/commercial noise.

5.19 Full construction details for the development have not been finalised as the project is at an early design stage. It has therefore been assumed that the external walls of the development will be constructed using a standard masonry construction (e.g. 102mm brick, 100mm insulated cavity, 100mm concrete block) or a light-weight construction designed to achieve a similar level of sound insulation (this is technically achievable subject to detailed design, including the roof construction where appropriate to address aircraft noise). Consequently, internal noise levels would be dictated by external noise ingress via glazing and ventilators.

5.20 The ventilation scheme for the project has not yet been decided and therefore, for the purpose of the assessment, it has been assumed that units will be ventilated via trickle ventilators in the external facades with openable windows for the provision of purge ventilation (as per System 1 or System 3 from Building Regulations Part F) as this represents a 'worst case' scenario in terms of noise ingress.

5.21 Calculations were carried out using facade modelling software in accordance with the methodology given in BS8233:2014 to calculate the approximate sound insulation performance required of the glazing and ventilation to achieve compliant internal noise levels in the 'worst-case' habitable rooms of the development (i.e. the habitable rooms that will be subject to the highest external noise levels). The calculations included a 3 dB design margin.

5.22 If acceptable internal noise levels can be achieved in 'worst case' habitable rooms then it follows that acceptable internal noise levels can be achieved in all other habitable rooms of the development using similar glazing and ventilator types.

5.23 The results of the calculations are summarised in Table 2 below.

Table 2 Indicative Acoustic Requirements for 'Worst Case' Habitable Rooms

'Worst Case' Rooms	Glazing Performance Requirements (inc. Frames)	Ventilator Performance Requirements (in Open Position)
Bedrooms overlooking railway	38 dB Rw+Ctr	44 dB Dne,w + Ctr
Living rooms overlooking railway	33 dB Rw+Ctr	37 dB Dne,w + Ctr
Bedrooms and living rooms overlooking Edwin Road	35 dB Rw+Ctr	39 dB Dne,w + Ctr

Note The requirements given are approximate only and should be confirmed at the detailed design stage when full design details are available.

5.24 The required sound insulation performance values in Table 2 could typically be achieved by the example glazing and ventilator types shown in Table 3.

Table 3 Example Glazing / Ventilator Acoustic Performances

Glazing (in Good Quality Sealed Frames)	**Typical Weighted Sound Reduction (Rw + Ctr)**
Typical "thermal" double glazing	27
8.8/12/4mm acoustically upgraded thermal double glazing	33
10.8/12/6mm acoustically upgraded thermal double glazing	35
12.8/16/8.8mm acoustically upgraded thermal double glazing	39
Ventilators	**Typical Acoustic Performance (Dnew + Ctr)**
Typical hit&miss trickle ventilator	31
Greenwood 5000EAW.AC1 in-frame trickle ventilator + external module	37
Passivent TVES4dB window vent + TVCG390 canopy	39
Greenwood AAB4000 Acoustic airbrick	44

5.25 It can be seen from the above that acceptable internal noise levels will be achievable in the development subject to the specification of suitable glazing and ventilation systems at the detailed design stage (which could be secured with a suitable planning condition). It is our view therefore that the proposed development is, in principle, acceptable with regard to the noise levels that will exist within the habitable rooms.

5.26 It should be noted that it will be possible to use lower acoustic performance façade elements for façades that are further from or acoustically screened from the surrounding noise sources. This could be investigated further at the detailed design stage.

5.27 The development is expected to be subject to the recently published Part O of the Building Regulations (Approved Document O), which came into effect on 15 June 2022 and states that:

> *In locations where external noise may be an issue (for example, where the local planning authority considered external noise to be an issue at the planning stage), the overheating mitigation strategy should take account of the likelihood that windows will be closed during sleeping hours (11pm to 7am).*
>
> *Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits.*
>
> *a. 40dB LAeq,T, averaged over 8 hours (between 11pm and 7am).*
>
> *b. 55dB LAFmax, more than 10 times a night (between 11pm and 7am).*

5.28 The results of the noise survey indicate that areas of the development may exceed the noise limits provided in Approved Document O when the windows are opened. The overheating assessment is therefore not likely to be able to rely solely on open windows as overheating mitigation. This will need to be confirmed as part of the overheating assessment during the detailed design stage.

Stage 2 – Element 3 – Noise levels in external amenity areas

5.29 BS8233 states that it is desirable that noise levels in external amenity areas of residential developments do not exceed 50 dB LAeq and that 55 dB LAeq,T should be regarded as an upper guideline value. However, BS8233 recognises that these guideline values will not always be achievable in city centres or urban areas adjoining main roads or other transport sources. In these cases, BS8233 states that the development should be designed to achieve the lowest practicable noise levels in the amenity spaces.

5.30 Noise levels in gardens may exceed the 55 dB LAeq,T upper guideline level due to noise from aircraft overhead. Whilst this is not ideal, it is not uncommon for noise levels in gardens in urban areas to be higher than the BS8233 recommended levels. This is particularly true for areas exposed to significant aircraft noise where the effect of screening is minimal, and would therefore be true for all existing gardens in the surrounding area.

5.31 Considering the screening effect of the building orientation on noise from the railway and surrounding roads, it is our view that noise levels in gardens are designed to be as low as practically achievable and therefore the development is in-line with the guidance in BS8233/ProPG.

Stage 2 – Element 4 – Other relevant issues

5.32 In our view the design and acoustic approach outlined above is in line with both local and national noise policy. It is common for residential properties to be situated near to railways, local roads and flight paths and this is an acceptable scenario provided that the properties are acoustically upgraded where necessary to achieve acceptable noise levels in habitable areas.

5.33 Noise from mechanical plant associated with the proposed development will require consideration during the detailed design stage and this is discussed in Section 6 below.

Recommendation to decision maker

5.34 It is our view that there is no noise-related reason why planning permission should not be granted. Suitable planning conditions could be used to control further assessment according to the recommendations in this report.

6. PLANT NOISE IMPACT ASSESSMENT

Design criteria – Mechanical plant noise

6.1 BS4142:2014 – *Methods for rating and assessing industrial and commercial sound* (BS4142) can be used to assess the impact of noise from external industrial and/or commercial noise sources on nearby sensitive receptors, including fixed mechanical plant noise associated with the proposed residential and commercial buildings.

6.2 The BS4142 assessment methodology for the introduction of new plant can be summarised as follows:

1. Measure the existing background noise levels (LA90,T dB) at the locations of nearby noise sensitive receptors during the quietest periods when the noise source(s) under investigation will operate;
2. Predict or measure the noise emissions (LAeq,T dB) from the noise source(s) under investigation at the location(s) of the nearby sensitive receptors, and add corrections for any distinguishable acoustic features (e.g. tones, whines, screeches, hisses etc);
3. Subtract the measured background noise levels (item 1 above) with the measured or predicted rating noise levels (item 2 above) at each sensitive receptor. BS4142 states that:

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

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

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

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

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

6.3 The Richmond SPD states that “Noise Generating Developments” (e.g. including mechanical plant) should be considered acceptable from a noise perspective where the rating level does not exceed a level 5 dB below the existing background noise (LA90).

6.4 Background noise levels at the site were measured as part of the noise surveys. The measured background noise levels have been used to develop guideline limits for plant noise emissions from the new development at the positions of the surrounding existing residential properties in

accordance with the BS4142 assessment methodology and based on the typical lowest levels during the day and night-time periods. The limits are shown in Table 4 below. It should be noted that where new mechanical plant only operates at certain times (or the level of noise emission varies significantly at different times) then it would be appropriate to assess plant noise in view of prevailing background noise levels at these times.

Table 4 BS4142 Noise Limits - Free-field Rating Levels

Location	Period	
	Day-time/Evening (0700-2300hrs)	Night-time (2300-0700hrs)
Existing residential near the north of the site	35 dB LAr,Tr	32 dB LAr,Tr
Existing residential near the south of the site	37 dB LAr,Tr	30 dB LAr,Tr[1]

Note 1 Although there are periods during the quietest part of the night where the background noise levels would suggest a limit below this level, BS4142 states that where background and/or specific sound levels are very low then absolute noise levels may be more important. The Richmond SPD also states that noise at this level (between 0 dB and 5 dB below background) may be acceptable depending on the effect on noise sensitive receptors. In this case 30 dB LAr is considered a very low level and in our view would lead to negligible noise impact.

Proposed mechanical plant design

6.5 Detailed design information is not yet available for external mechanical plant for the development, and therefore these noise emissions cannot yet be predicted.

6.6 The selection and design of external mechanical plant will be reviewed as project information becomes available to ensure that the project BS4142:2014 noise limits given in Table 4 are achieved. Compliance with the limits could be secured through the imposition of a suitable planning condition if deemed necessary by the Local Planning Authority.

6.7 The design of the mechanical plant should also be reviewed in context during the detailed design stage to ensure that there is not significant impact to new noise-sensitive areas (e.g. dwellings) on the proposed development itself.

7. CONCLUSIONS

7.1 The proposed development has been assessed in accordance with and deemed to be compliant with ProPG and relevant local planning guidance with regard to noise subject to the adoption of appropriate noise mitigation measures.

7.2 It is our view that the site is suitable for the development in terms of noise levels and there is no noise-related reason why planning permission should not be granted.

7.3 Compliance with the recommendations of this report could be secured via the imposition of suitable planning conditions if desired.

Appendix 1 Proposed site layout

Appendix 2 Paragon (2018) Survey

The following is an excerpt from the Paragon Acoustic Consultants Ltd. draft report reference: *20220621_4340_ Residential development on site of Greggs Factory_Scheme_1_Residential_B* dated 20 June 2022.

6.0 Environmental Noise Surveys

6.1 Environmental Noise

Detailed noise surveys have been carried out at site to determine the extant noise climate in the area. Measurements were made between 8th November 2018 and 12th November 2018, at the locations described below.

- MP1: North of the site at 5m in height adjacent to the River Crane. Measurements considered free field
- MP2: South of the site external to an existing industrial building. Considered to be façade measurements

It is considered reasonable to use the same noise data for this application. The noise data was taken prior to the impact on transportation noise sources caused by the Covid 19 outbreak. It is considered that aircraft noise level provides a major contribution to the site noise levels and recent comments by Heathrow Airport's chief executive suggests that a return to normal "could be years away". (Source : BBC News). As such it is considered that the 2018 measurements will provide a robust approach.

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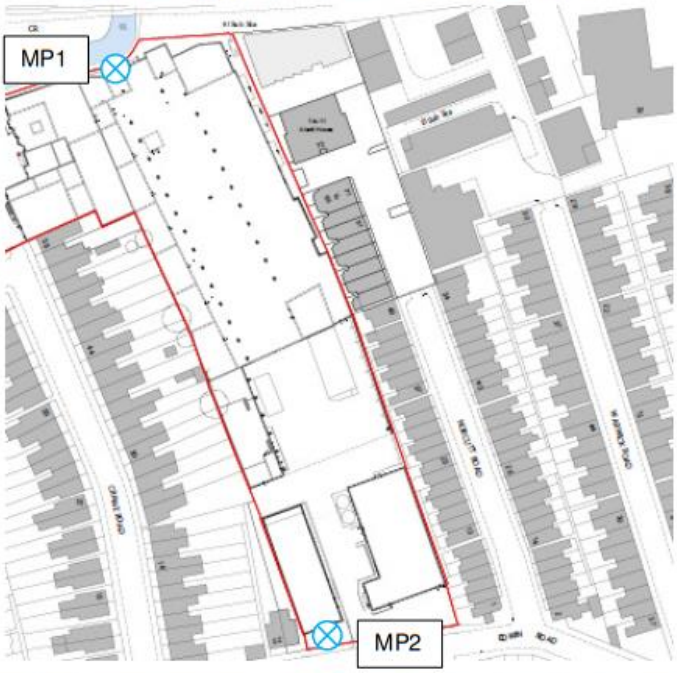
[2] Proposals for amending Part E (resistance to the passage of sound): consultation, Clause C1.5

Figure 2: Approximate Measurement Positions



Sound pressure level measurements were obtained using the following instrumentation, complying with the Type 1 specification of BS EN 60804, BS EN 60651, BS EN 60942, BS EN 61260, and BS EN 61672-1, as follows:

- **Position MP1:** Norsonic Type 118 Sound level analyser, serial number 31663, Norsonic Type 1225 ½" microphone
- **Position MP2**: SVAN 971 Sound level meter serial number 56214, pre-amplifier type SV18 serial number 57317, and type 7052E ½" microphone serial number 65484.

Calibration checks were made prior to and after completion of measurements using a Norsonic Type 1251 acoustical calibrator complying with Class 1 of BS EN 60942, calibration level 114.0 dB ± 0.3 dB, @ 1.0 kHz. All instrumentation carries a current manufacturer's certificate of conformance a copy of which is available upon request.

Various statistical broad-band and spectral sound pressure level measurements were obtained during the survey, including:

- $L_{Aeq,T}$: the equivalent continuous noise level over a measurement period, T
- L_{AFmax}: the maximum sound pressure level over a measurement period, T
- $L_{AF90\%,T}$: the noise level exceeded for 90% of the measurement period, T

Weather conditions at the start of the survey were mild and dry with a slight breeze. At the end of the survey the weather conditions were similar. Web site data suggests that the survey duration daytime temperatures were in the order 14 degrees at their highest and during the night-time the temperature dropped as low as 5 degrees. Web site data suggests wind direction generally south-west / south / south-east depending on the day. As the survey was generally unmanned, full weather conditions during the survey cannot be reported accurately, however, the survey duration was considered of appropriate time to allow a reasonable representation of the noise climate to be established.

Direct measurement of the noise during daytime and night-time was taken.

Runway departure direction was checked on the Heathrow XPlane website to ensure noise levels were taken during both Easterly and Westerly operations. On 8th November 2018, aircraft

departed in a westerly direction and on 9th November the aircraft departed in an easterly direction. Inspection of the noise data shows that the noise levels were marginally higher on easterly departures, and these have been used in the assessment.

Measurements were chosen at both ends of the proposed site. The railway noise is dominant at the north of the site, as is aircraft noise due to the flight path locations. As such a measurement was undertaken at the north end of the site. The southern elevation of the site is furthest away from railway noise and aircraft, although local traffic is potentially greater than at the north of the site. As such, a measurement position at the south of the site was also considered reasonable.

7.0 Results and Data Analysis

7.1 Environmental Noise Survey Results

Measurement results have been processed to determine day and night L_{Aeq} values, together with the 10th highest night maximum noise levels. The highest daytime and night-time period noise levels measured have been used in the assessment, these being confirmed as follows:

Table 4: Summary of Environmental Noise Levels

Measurement Position	Day $L_{Aeq,16h}$ *	Night $L_{Aeq,8h}$	L_{AFmax} 10th Highest
MP1 (North of site)	64 dB	58 dB	80 dB
MP2 (South of site)	61 dB	53 dB	71 dB

The details of each survey day / night-time period are confirmed as follows:

Position	Day of survey	Period	Hours	LAeq	10th Highest LAMax	Partial / full period data
Rear of site	Thursday	Period 1 Daytime	(07.00- 23.00)	64		PARTIAL DATA ONLY
Rear of site	Thursday Night	Period 1 Night-time	(23.00-07.00)	58	80	FULL PERIOD DATA
Rear of site	Friday	Period 2 Daytime	(07.00- 23.00)	64		FULL PERIOD DATA
Rear of site	Friday Night	Period 2 Night-time	(23.00-07.00)	58	80	FULL PERIOD DATA
Rear of site	Saturday	Period 3 Daytime	(07.00- 23.00)	63		FULL PERIOD DATA
Rear of site	Saturday Night	Period 3 Night-time	(23.00-07.00)	54	75	FULL PERIOD DATA
Rear of site	Sunday	Period 4 Daytime	(07.00- 23.00)	61		FULL PERIOD DATA
Rear of site	Sunday Night	Period 4 Night-time	(23.00-07.00)	57	80	FULL PERIOD DATA
Rear of site	Monday	Period 5 Daytime	(07.00- 23.00)	63		PARTIAL DATA ONLY

Position	Day of survey	Period	Hours	LAeq	10th Highest LAMax	Partial / full period data
Front of site	Thursday	Period 1 Daytime	(07.00- 23.00)	60		PARTIAL DATA ONLY
Front of site	Thursday Night	Period 1 Night-time	(23.00-07.00)	53	71	FULL PERIOD DATA
Front of site	Friday	Period 2 Daytime	(07.00- 23.00)	61		FULL PERIOD DATA
Front of site	Friday Night	Period 2 Night-time	(23.00-07.00)	50	67	FULL PERIOD DATA
Front of site	Saturday	Period 3 Daytime	(07.00- 23.00)	53		FULL PERIOD DATA
Front of site	Saturday Night	Period 3 Night-time	(23.00-07.00)	47	63	FULL PERIOD DATA
Front of site	Sunday	Period 4 Daytime	(07.00- 23.00)	50		FULL PERIOD DATA
Front of site	Sunday Night	Period 4 Night-time	(23.00-07.00)	42	64	FULL PERIOD DATA
Front of site	Monday	Period 5 Daytime	(07.00- 23.00)	54		PARTIAL DATA ONLY

The results are provided graphically as follows:

Figure 3: MP1 - Environmental Noise Time Series

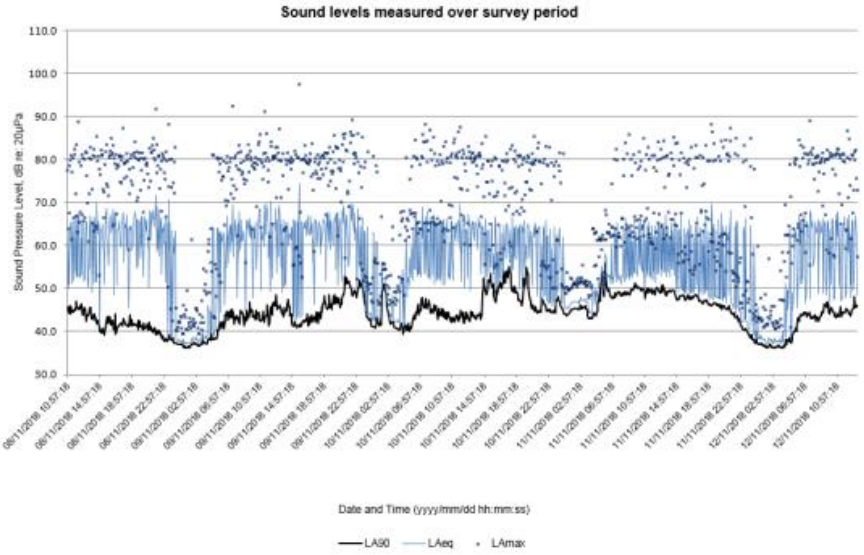
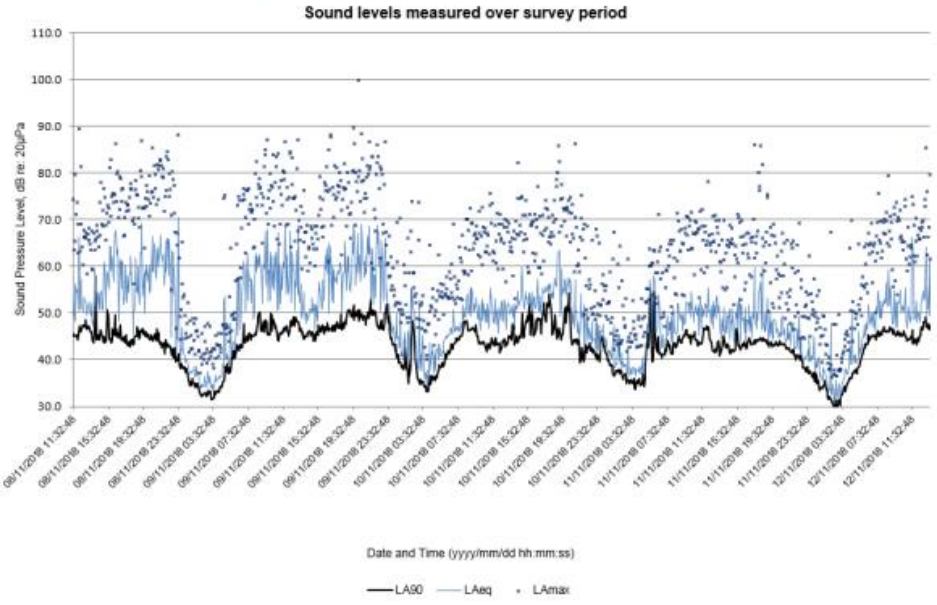


Figure 4: MP2 - Environmental Noise Time Series



Appendix 3 Cass Allen (2022) Noise Survey

Survey Summary:

The survey comprised short-term operator attended noise measurements and longer-term unattended noise monitoring at the site.

Average noise levels at the south of the site were generally dictated by:

- Aircraft overflights when Heathrow airport is in easterly operation.
- A combination of sporadic vehicle passes on Edwin Road and commercial noise from nearby car repair garages when Heathrow airport is in westerly operation.

Average noise levels at the north of the site were generally dictated by the adjacent railway. Aircraft overflights also contribute when Heathrow airport is in its easterly operation, due to aircraft passing over the site. Noise from mobile plant associated with the recycling centre is audible in between trains and plane passes during the day but does not dictate the average noise level.

Noise from a transformer (it is understood this will be removed) was measured at the north east of the site.

Vibration levels at the site were very low.

Survey Period:

28/07/2022 to 02/08/2022

Survey Objectives:

- To identify noise and vibration sources that contribute to ambient noise levels at the site;
- To measure noise and vibration levels around the site over a typical day and night-time period.

Equipment Used:

Type	Manufacturer	Model	Serial Number
Sound level meter[1]	NTi Audio	XL2	A2A-15506-E0
Calibrator	NTi Audio	600 000 388	15011
Sound level meter[1] (noise logger)	Rion	NL-32	00530374
Sound level meter[1] (noise logger)	Rion	NL-32	00903342
Calibrator	Rion	NC-74	34551703
Sound level meter[1]	Rion	NL-52	00965090
Tri-Axial Vibration Meter	Rion	XV-2P	00380055
Tri-axial accelerometer	Rion	PV-83C	73649

Note 1: All sound level meters were calibrated before and after measurement periods and no significant drift in calibration was found to have occurred. The results of the measurements are therefore considered to be representative.

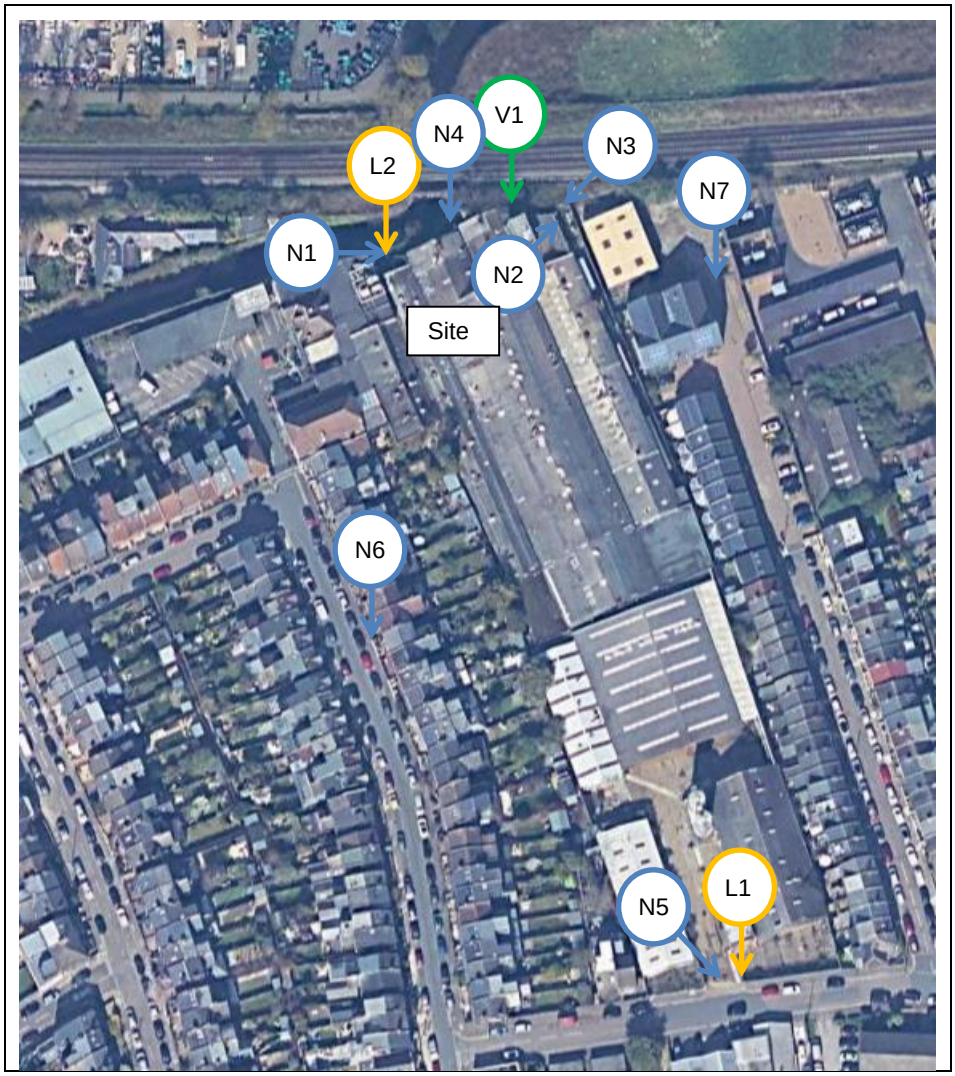
Weather Conditions:

The observed weather conditions were acceptable for acoustic measurement throughout the attended survey periods (low-medium wind speeds and no rain). Weather records for the area confirmed that weather conditions were also generally acceptable for acoustic measurement during the unattended monitoring.

Measurement Positions:

Position (refer plan below)	Description
N1	Attended noise monitoring position. 5m above ground. Free-field. Direct line of sight to recycling centre. Direct line of sight and 17m to rail.
N2	Attended noise monitoring position. 1.5m above ground. 1m from facade. Direct line of sight and 1m to transformer.
N3	Attended noise monitoring position. 1.5m above ground. Free-field. Direct line of sight and 1m to transformer.
N4	Attended noise monitoring position. 1.5m above ground. 1m from facade.
N5	Attended noise monitoring position. 1.5m above ground. Free-field. Direct line of sight and 3m to Edwin Road. Direct line of sight to commercial units.
N6	Attended noise monitoring position. 1.5m above ground. Free-field. Direct line of sight and 1m to Crane Road.
L1	Unattended noise logging position. 3m above ground level. Free-field. Direct line of sight to commercial units and Edwin Road (3m away).
L2	Unattended noise logging position. 7m above ground level. Free-field. Direct line of sight to recycling centre. Direct line of sight and 17m to rail.
V1	Attended ground-borne vibration monitoring position.

Site Plan showing Measurement Positions:



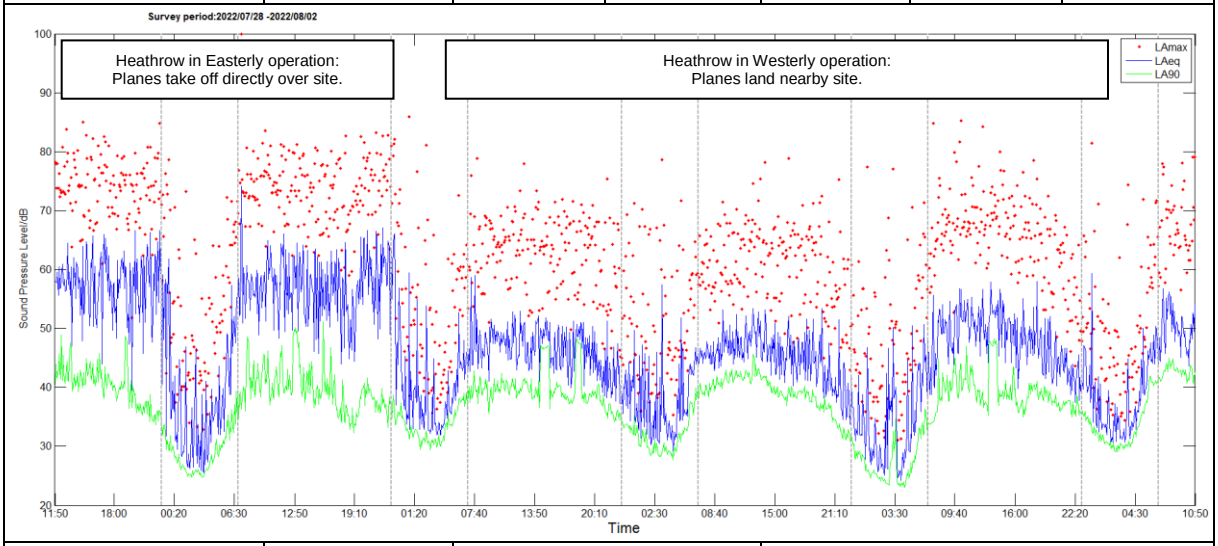
Attended Noise Monitoring Results:

Date	Position	Time	Duration	LAeq, dB	LAmax, dB	LA90, dB	Observations
28/07/2022	N1	13:29	1 min	64	71	49	Noise dictated by aircraft overflight.
		13:35	1 min	58	68	47	
		13:37	1 min	64	74	49	
		13:51	30 secs	72	81	53	
		13:31	30 secs	57	67	50	Noise generally dictated by aircraft overflight. LAmax dictated by impulsive noise from recycling centre.
		13:33	40 secs	52	61	47	
		13:47	30 secs	58	71	50	
		13:41	16 secs	74	80	51	Passenger train passing 17-20m away.
		13:51	10 secs	71	75	60	
		13:55	27 secs	73	79	48	
02/08/2022		11:08	20 secs	69	75	50	
		11:14	17 secs	74	80	56	
		11:08	5 mins	49	71	46	LAeq dictated by recycling centre (no overflights directly above due to westerly operations at Heathrow airport). LAmax dictated by impulsive noise from recycling centre. LA90 dictated by distant traffic.
		11:14	5 mins	49	73	45	
		11:21	5 mins	48	65	46	
		11:27	5 mins	49	73	46	
28/07/2022	N2	14:15	5 mins	57	71	49	LA90 dictated by transformer (to be removed) 1m away.
		14:22	5 mins	59	73	48	
	N3	14:28	5 mins	57	73	47	
	N4	14:35	10 mins	59	75	40	LA90 dictated by fixed plant (to be removed) on factory roof.
	N5	15:06	8 secs	43	50	39	LAmax dictated by train pass (180m away and screened by existing building).
		15:08	14 secs	43	48	40	
		14:52	30 secs	75	90	51	Noise dictated by aircraft overflight.
		15:05	30 secs	66	74	41	
		15:13	1 min	73	85	50	
		15:16	1 min	71	80	53	

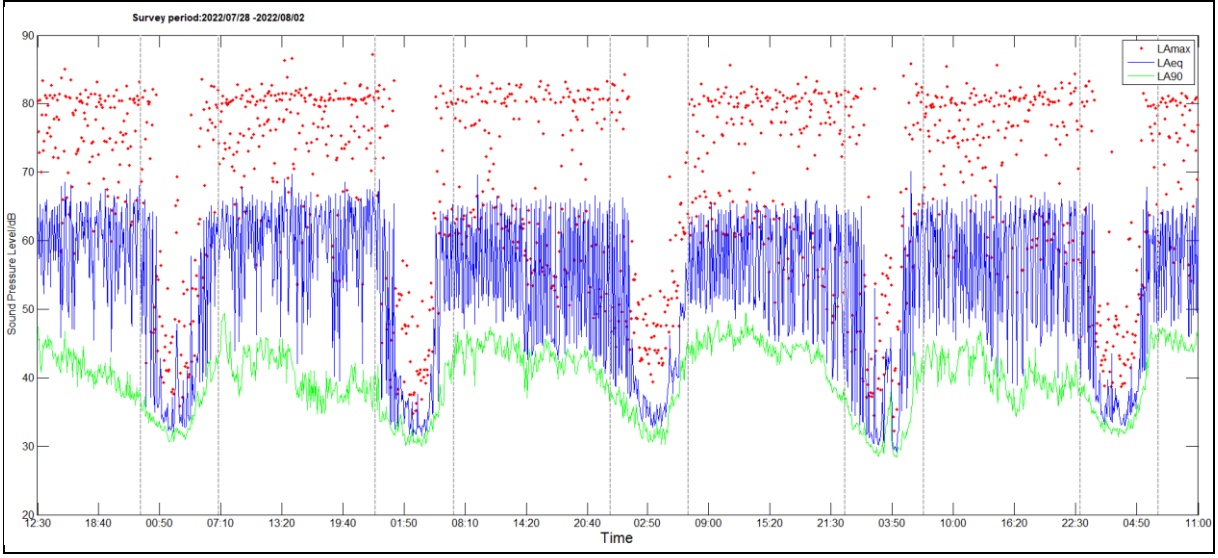
Date	Position	Time	Duration	LAeq, dB	LAmax, dB	LA90, dB	Observations
02/08/2022	N5	11:40	5 mins	54	72	40	LAeq dictated by commercial noise from nearby car repair garage (some drilling, regular 'clanging' of tools and materials). LAmax dictated by drilling from garage. LA90 dictated by distant traffic.
		11:48	5 mins	56	77	42	As above, but LAmax dictated by materials being moved into a bin next to the garage entrance. Hammering was also observed at a peak instantaneous LAF of 73 dB.
		11:54	5 mins	48	70	41	As above, but LAmax dictated by drilling from garage. Generally a quieter period than above.
		12:01	5mins	48	65	42	As above but LAmax dictated by car pass 5m away.
		11:48	12 secs	64	70	50	LAmax dictated by van passing 5m away.
		12:00	10 secs	65	72	50	LAmax dictated by car passing 5m away.
	N6	12:07	7 secs	58	64	49	Noise dictated by car passing 3m away.
28/07/2022	N7	15:38	10 mins	60	78	40	LA90 dictated by tonal noise from transformers to the east.

Unattended Noise Monitoring Results:

Meas. Period	Position	Daytime (0700-2300hrs)		Night-time (2300-0700hrs)		
		LAeq,16hr, dB	LA90,1hr dB[1]	LAeq,8hr, dB	LA90,5mins, dB[1]	LAmax, dB[2]
28/07/2022 to 02/08/2022	L1 – Easterly airport operations	60	40	51	32	70
	L1 – Westerly airport operations	49	40	43	32	65



Meas. Period	Position	Daytime (0700-2300hrs)		Night-time (2300-0700hrs)		
		LAeq,16hr, dB	LA90,1hr dB[1]	LAeq,8hr, dB	LA90,5mins, dB[1]	LAmax, dB[2]
28/07/2022 to 02/08/2022	L2	62	40	57	33	80



Note 1: Typical lowest measured during the period shown.

Note 2: Highest typical maximum noise level during the night-time (not exceeded more than 10-15 times per night).

cass allen

Architectural & Environmental Acousticians

Noise & Vibration Engineers

This report has been prepared by Cass Allen Associates Ltd in accordance with the CDM regulations with all reasonable skill, care and diligence, and taking account of the resources devoted to it by agreement with the client. Information reported herein is based on the interpretation of data collected and has been accepted in good faith as being accurate and valid at the time of collection. This report is for the exclusive use of the client named above; no warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from Cass Allen Associates Ltd. Cass Allen Associates Ltd disclaims any responsibility to the client and others in respect of any matters outside the agreed scope of work.

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