1 DETAILS OF INVESTIGATION

1.1 Noise Survey Methodology

An environmental noise survey was conducted at two measurement positions on site from c.14:00 hours on Tuesday 25 October 2022 to c.13:00 hours on Monday 31 October 2022.

This consisted of two measurement positions at the development site as shown on Figure 1 and described in Table 1:

Measurement Position	Description
MP1	The boom-mounted microphone was positioned on the boundary of the bin store associated with RAR Blocks B. The microphone was c.3m above ground level and c.28m from the near edge of Plumstead Road. The soundscape at this position was dominated by road traffic noise from Plumstead Road and overheard aircraft associated with London City Airport with light construction noise coming from nearby BHET developments.
MP2	The boom-mounted microphone was positioned on the boundary of the BHET site entrance along Plumstead Road. The microphone was c.3m above ground level and c.5m from the near edge of Plumstead Road. The soundscape at this position was dominated by road traffic noise from Plumstead Road and overheard aircraft associated with London City Airport, with light construction noise coming from nearby BHET developments.

Table 1: Noise monitoring measurement positions summary

The prevailing weather conditions were suitable for the purposes of environmental noise measurements throughout the noise survey. Average wind speeds were below 5m/s for the entirety of the survey period.

Notwithstanding the weather conditions recorded, the microphone systems were entirely weatherproofed and fitted with all-weather environmental windshields, each with a bird spike.

Type 1 Precision Grade sound measuring instrumentation was exclusively used for all surveys and microphone windshields were in use at all times. Full details of all the instrumentation used, and corresponding traceable calibration records, are retained on file by Sol and available for inspection if required.

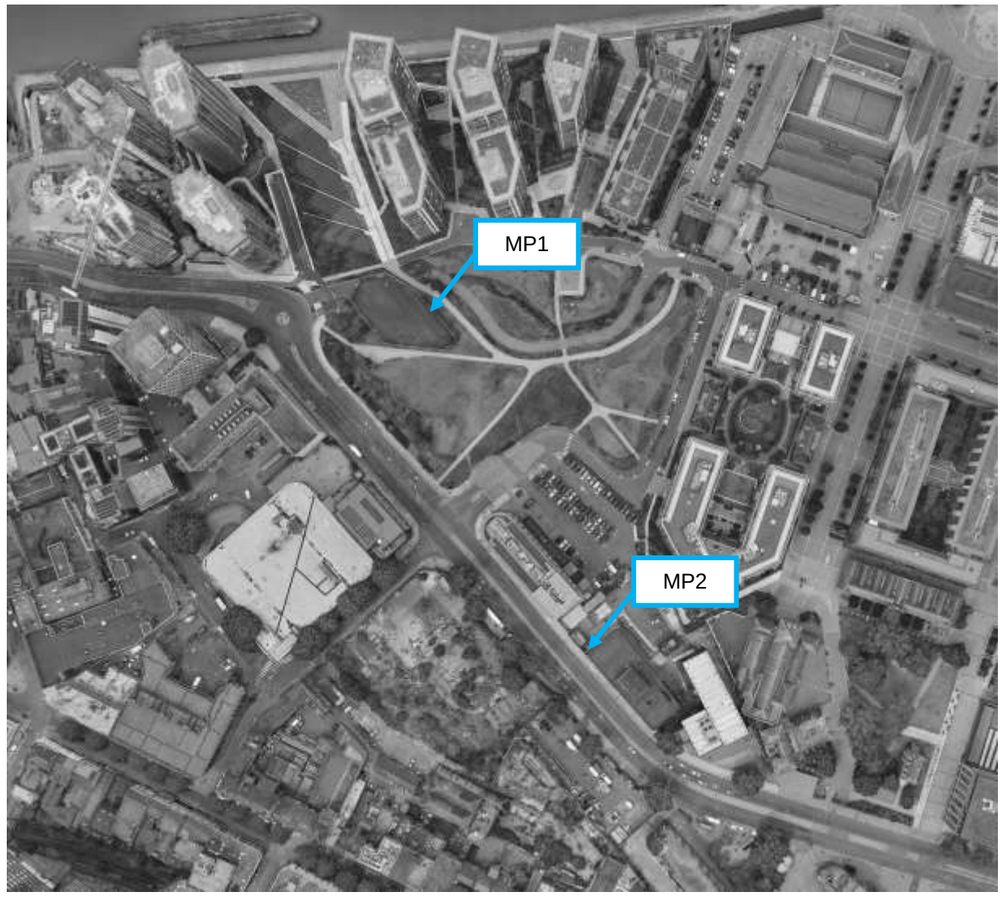


Figure 1: Image showing noise survey measurement positions (Google 2022)

1.2 Environmental Noise Survey Results

Graphs 1, and 2 summarise the results obtained from the noise surveys at Measurement Position MP1, and Measurement Position MP2 respectively.

Table 2 provides a basic summary of the average, free field environmental noise levels measured at Positions MP1 and MP2.

Position	Typical Measured Noise Level (Range L_{Aeq}, Highest L_{Amax}, Range L_{A90})				
	Daytime (07:00 – 23:00 hrs)		Night time (23:00 – 07:00 hrs)		
	dB $L_{Aeq,16hour}$	dB $L_{A90,15min}$	dB $L_{Aeq,8hour}$	dB L_{Amax}	dB $L_{A90,15min}$
MP1	63 - 64	50 - 60	60 - 63	85	41 - 58
MP2	72 - 73	54 - 64	69 - 71	93	43 - 63

Table 2: Summary of typical, measured environmental noise levels, broadband terms

Table 3 summarises the corresponding unweighted, time-averaged ($L_{Aeq,T}$) daytime and night time period ambient noise levels used for the assessment, in linear octave band frequency terms (as measured - no façade correction has been applied to the presented levels for Position MP1):

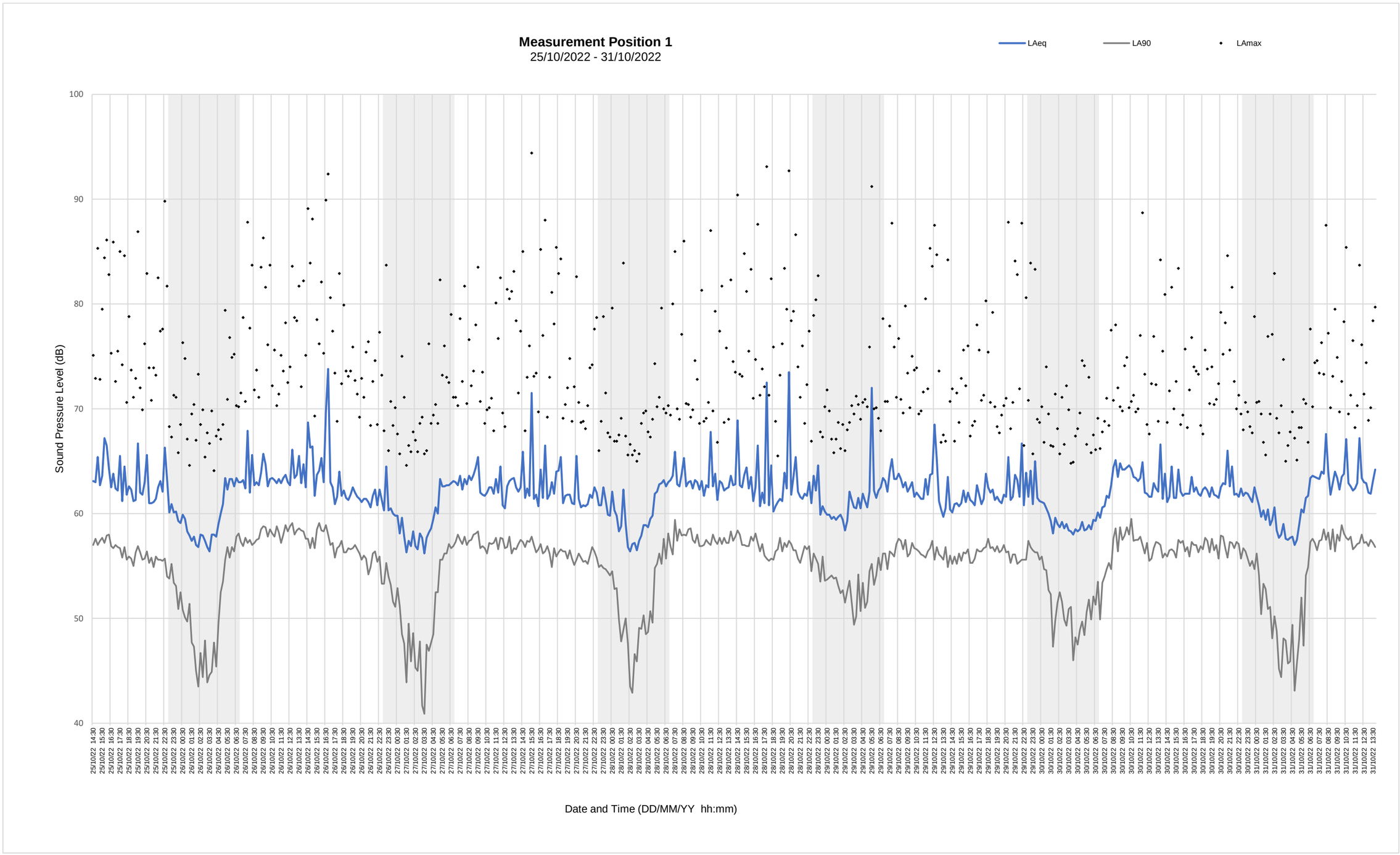
Measurement Location	Broadband Noise Level, dB $L_{Aeq,T}$	Sound Pressure Level (dB) @ Octave Band Centre Frequency (Hz)						
		63	125	250	500	1k	2k	4k
Position MP1								
Daytime	63	69	64	50	57	59	55	50
Night time	62	65	59	56	55	59	55	44
Position MP2								
Daytime	72	72	68	66	65	69	65	58
Night time	71	71	64	64	64	68	64	55

Table 3: Summary of time-averaged environmental noise levels, in octave band terms

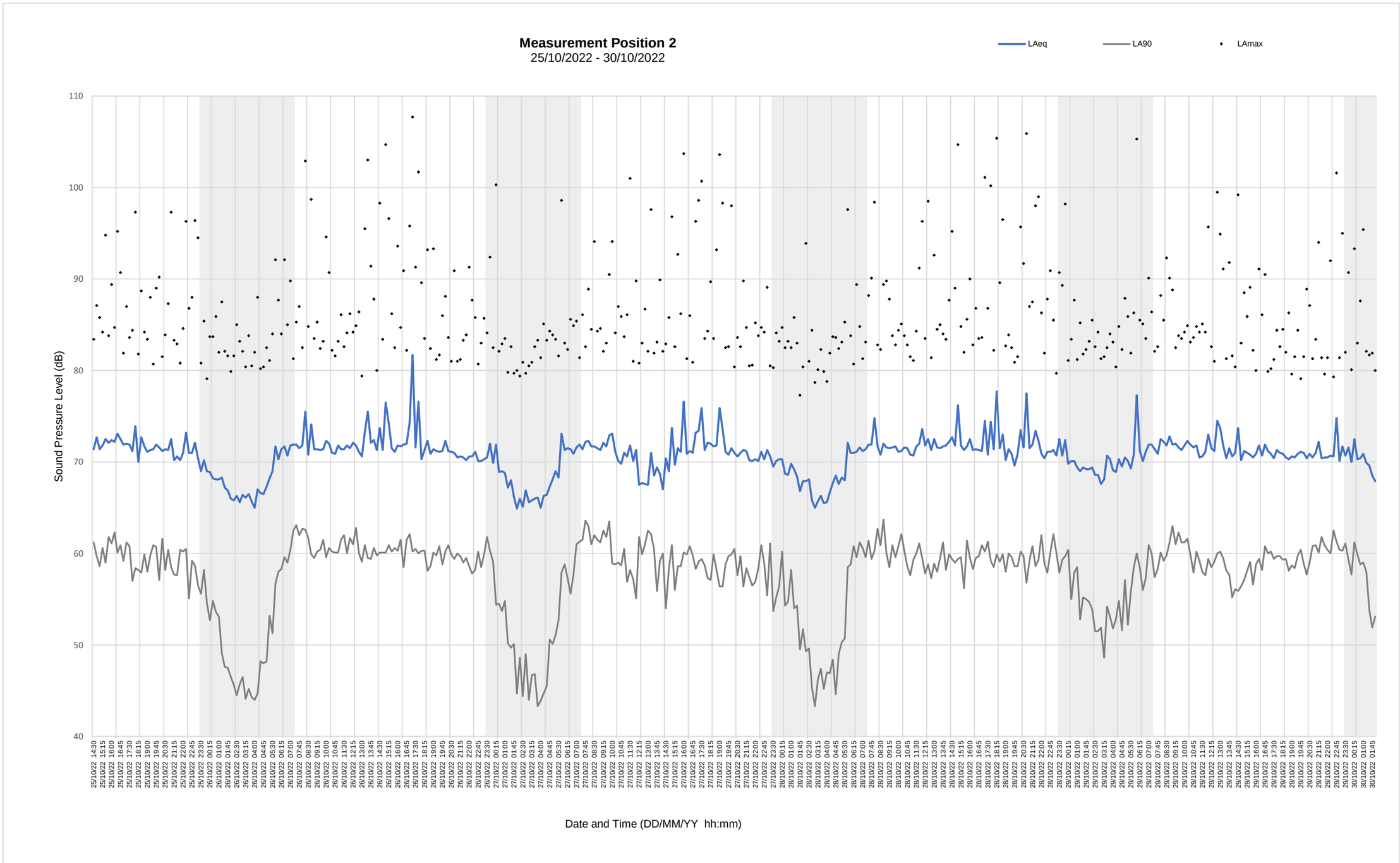
Table 4 provides a summary of the metrological conditions during the baseline noise survey:

Date	Daytime (07:00 - 23:00)				Night Time (23:00 – 07:00)			
	Average Temp, °C	Rain, mm	Wind Direction	Average Wind Speed, m/s	Average Temp, °C	Rain, mm	Wind Direction	Average Wind Speed, m/s
25/10/2022	15	0	S	3	11	0	ESE	2
26/10/2022	16	0	S	4	14	0	ESE	3
27/10/2022	19	0	SSW	5	15	0	SSE	2
28/10/2022	16	0	WSW	5	11	0	E	3
29/10/2022	20	0	S	3	14	0	S	1
30/10/2022	15	0	SSW	5	11	0	S	3
31/10/2022	15	0	SE	5	N/A			

Table 4: Summary of time-averaged environmental noise levels, in octave band terms



Graph 1: Graph showing measured environmental noise levels, Measurement Position MP1, 25th October 2022 – 31st October 2022.



Graph 2: Graph showing measured environmental noise levels, Measurement Position MP2, 25th October 2022 – 31st October 2022

2 RESIDENTIAL INTRUSIVE NOISE ASSESSMENT

By taking account of the levels of ambient and maximum noise levels as measured and predicted at the site façade locations, the proposed areas of façade elements and their intended constructions (i.e. glazing and walls), as well as the likely acoustic characteristics of the noise sensitive receiving space (i.e. living rooms, bedrooms), the required sound reduction performance specification of glazing has been determined through acoustic calculation.

The window areas, room dimensions and elevations used in all calculations are all as shown by the PRP Architects drawings as downloaded by Sol from the BHET Asite workspace during November 2023. Additional floor and site layouts have been provided by PRP in February 2024. If there are any subsequent changes to any of the proposed glazing areas and/or room layouts and floor plans, for any habitable room(s), these must be evaluated acoustically.

It is understood that the Part F ventilation strategy for the development is based on Mechanical Ventilation Heat Recovery (“MVHR”) units and that no openings in the façade (e.g. trickle vents) are required for background ventilation.

2.1 Predicted Development Environmental Noise Levels

In order to predict the likely resultant environmental noise levels impinging noise sensitive receptors, 3D computer based environmental noise models have been created using the DataKustik ‘CadnaA’ Noise Mapping software. The following assumptions have been made in the generation of the noise model:

- The noise model was set up to apply the noise prediction methodology set out in ISO 9613-2: *‘Acoustics – Attenuation of Sound propagation outdoors – Part 2: General Method of Calculation’*;
- The model was set to include up to second order reflected noise from solid structures;
- Ground absorption has been set to G=0 (hard ground) with the exception of large, grassed areas (G=1).
- Acoustic screening and reflections afforded by nearby buildings and solid structures.

Based upon the above, the daytime and night time free field noise levels have been predicted across all proposed external facades of the development as shown in Figure 2 and Figure 3.

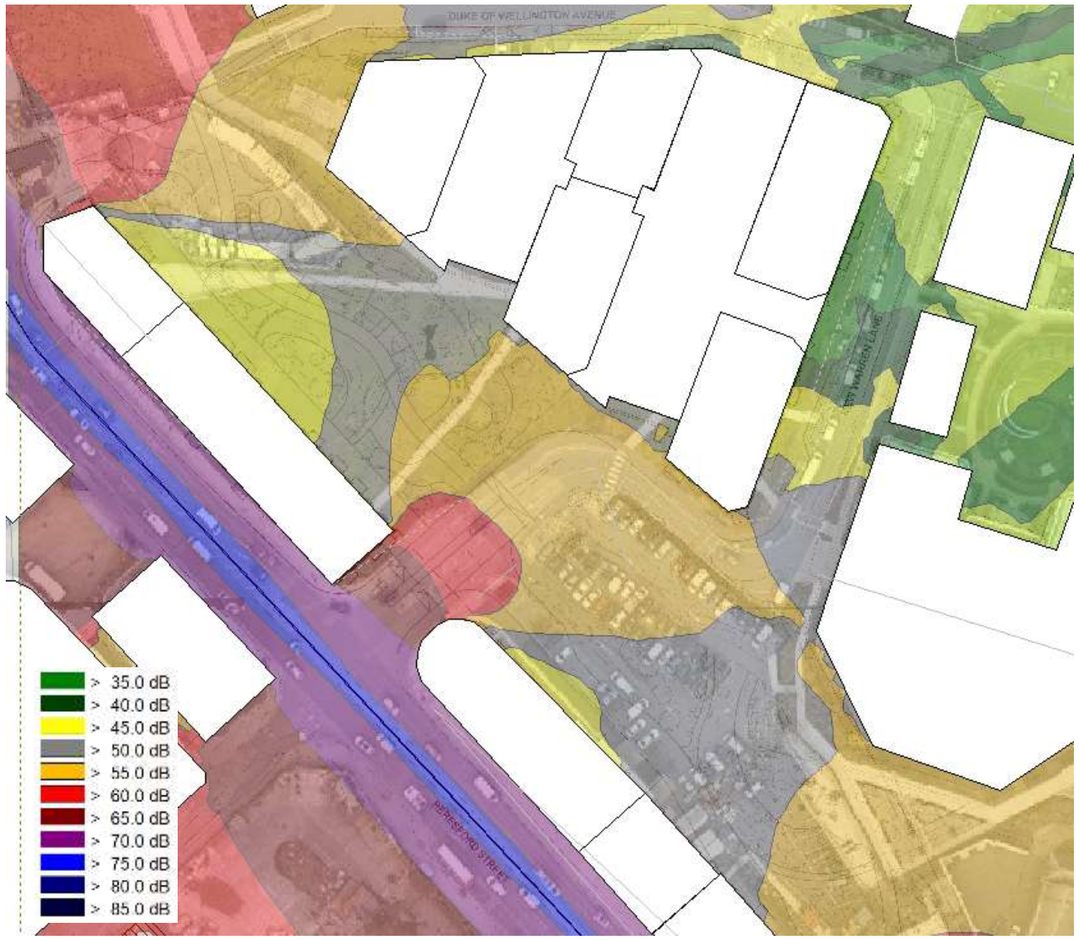


Figure 2: Predicted daytime environmental noise levels ($L_{Aeq,16\ hour}$)

Figure 3: Predicted night time environmental noise levels ($L_{Aeq,8\ hour}$)

2.2 Building Envelope

2.2.1 External wall

Table 5 provides the recommended minimum acoustic performance requirements for the external building envelope, in terms of sound reduction indices:

Zone	Minimum Weighted Sound Reduction Index dB ($R'_w + C_{tr}$)
Façade Zone 1	55
Façade Zone 2	40

Table 5: Minimum building fabric acoustic airborne sound insulation performance requirements

At present, the exact façade construction is unknown. However, it is understood to comprise of a traditional brick (i.e. masonry) façade, which is likely to be suitable.

2.2.2 Acoustic Specification for Glazing to Habitable Rooms

It is understood that an MVHR Part F background ventilation strategy is proposed for all apartments; therefore, all of the following recommendations have been given in terms of the minimum sound reduction for glazing forming part of the building envelope.

The acoustic performance specifications presented in Table 6 should be read in conjunction with Figure 4, which identifies the location of each “façade zone”.

Façade Zone	Room Type	Example Double Glazing Configuration	Minimum Weighted Sound Reduction Index ($R'_w + C_{tr}$)
Zone 1	Living Rooms	8mm / 10mm / 8mm Laminated Double Glazing	36dB
	Bedrooms	12mm / 20mm / 12mm Laminated Double Glazing	42dB
Zone 2	All	4mm / 16mm / 4mm Double Glazing	27dB

Table 6: Recommended minimum glazing system acoustic specification, per zone

2.2.3 Glazing Configurations and Specification Compliance

In all cases, example glazing configurations are provided for guidance only.

All glazing, including any glazed doors, inclusive of framing systems, seals, and hardware must achieve the minimum acoustic performance specifications as indicated.

The sound reduction performance must be confirmed and corroborated by independent acoustic laboratory test data in accordance with BS EN ISO 10140-2:2010 of identical constructions (i.e. including window frames).

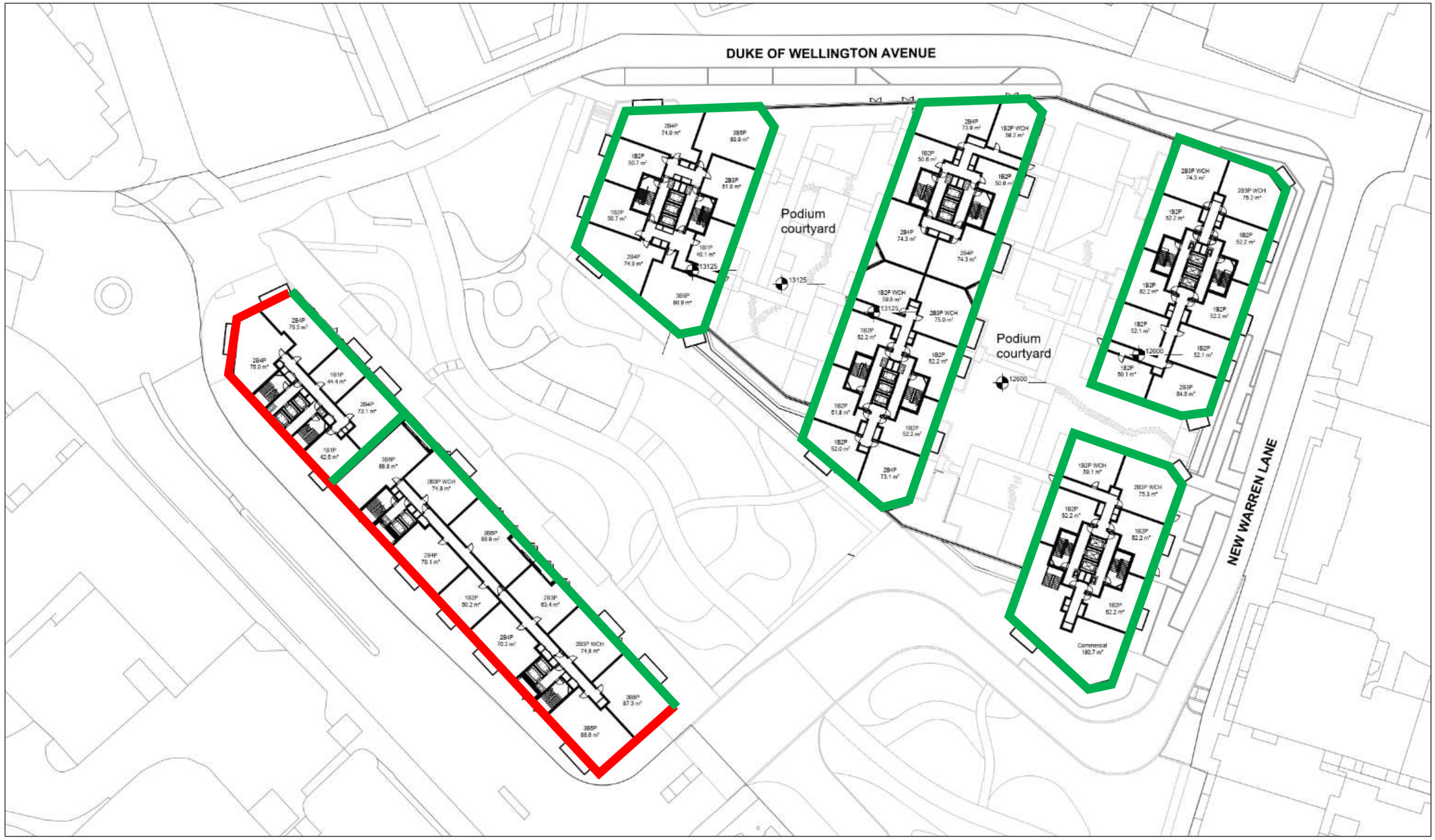


Figure 4: Acoustic glazing “Façade Zones” – **All Levels**

3 ACOUSTICS, VENTILATION & OVERHEATING FOR RESIDENTIAL DWELLINGS

3.1 Approved Document O - Night Time Assessment

3.1.1 Fully Open Window

An initial assessment has been undertaken to determine the extent of facades which are able to use 'fully open' (unrestricted) windows to mitigate summertime overheating during night time periods to achieve Approved Document O mandatory internal noise criteria.

The assessment has been undertaken based on the as-measured environmental noise levels, the predicted façade noise levels and the corresponding predicted daytime and night time internal ambient noise levels, as based on a typical open window providing a minimum of 5dB attenuation, seen to be representative of a 90 degree 'fully open window'.

Results of the assessment show that predicted internal noise levels (particularly L_{Afmax}) are predicted to exceed the ADO noise criteria on ALL facades of the proposed development when assessed against a fully open window due to noise from London City Airport (06:00 to 07:00). Therefore, fully open windows will not be permissible for overheating mitigation within Buildings D & K.

3.1.2 Partially Open Window Assessment

An additional assessment has been undertaken to determine the extent of facades which are able to use 'partially open' windows (e.g.: open on restrictors) to mitigate summertime overheating during night time periods to achieve the Approved Document O mandatory internal noise criteria.

The additional assessment has been undertaken based on the as-measured environmental noise levels, the predicted façade noise levels, typical "low speed" car passby noise levels, and the corresponding predicted daytime and night time internal ambient noise levels, as based on the window opening providing a minimum of 9dB attenuation, representative of a 'partially open window'.

Figure 6.5 presents a markup visualising the results of the 'partially open window' assessment.

Façade areas shown in **orange** may be permitted to use partially open bedroom windows to mitigate overheating during night time periods. Where ventilation rates need to be increased a natural ventilation acoustic louvre could be used.

Façade areas shown in **red** are not suitable for natural ventilation to mitigate overheating during night time periods. A wholly mechanical ventilation strategy will likely be required for these dwellings.

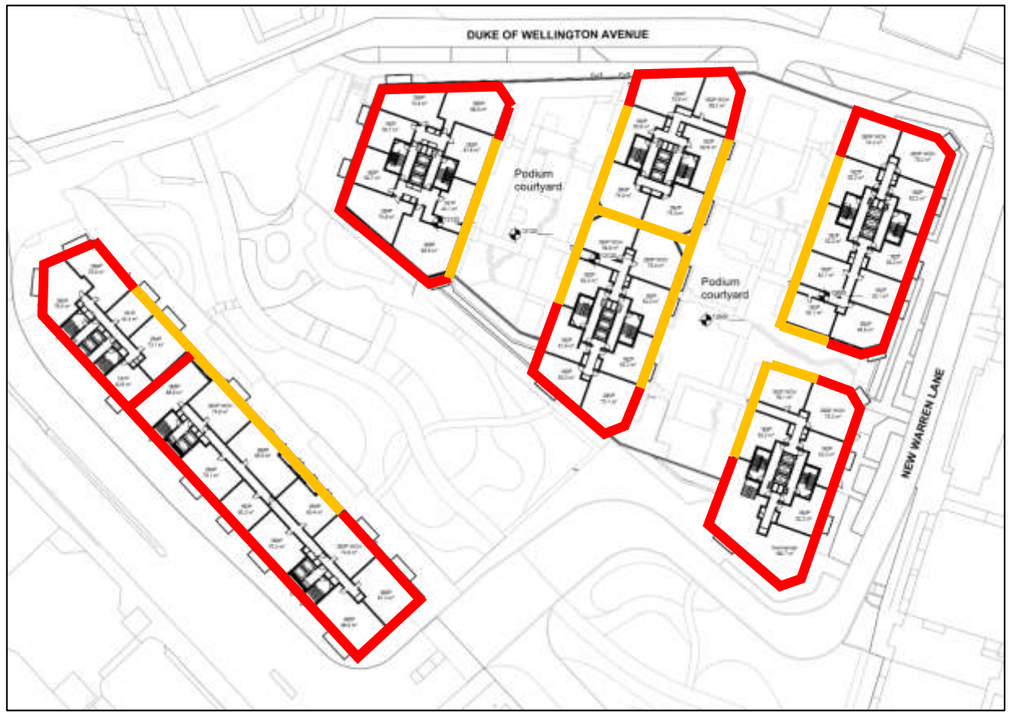


Figure 5: ADO Façade Markup – Red Areas indicate exceedance of night time overheating noise criteria

3.1.2.1. Additional Commentary - Access Roads

The restrictions on open windows presented in Figure 12 include consideration of car passbys on access roads within the development site (i.e. Duke of Wellington Avenue and New Warren Lane).

Whilst traffic is data is not available for these future roads, following discussions with the traffic consultants and based on the number of parking spaces within the development, it is deemed likely that the number of cars passbys on these roads during the night time (23:00 – 07:00hrs) will exceed ten.

Based on typical L_{Amax} noise levels for cars travelling up to 30mph, bedrooms overlooking these roads can therefore not rely on open windows for overheating mitigation whilst complying with the onerous L_{Amax} criteria in Approved Document O.

Sol Acoustics have investigated whether traffic calming measures such as limiting speeds of cars to 20mph or the use of speed bumps is likely to sufficiently reduce noise from passing cars to allow for open windows. The findings concluded that even with such measures, noise from passing cars would not be sufficiently reduced to allow for a permissible open window overheating mitigation strategy for affected apartments.

4 BASELINE VIBRATION AND OUTLINE GROUNDBORNE NOISE ASSESSMENT

4.1 Basis of Assessment

In order to inform the potential impact of tactile vibration and re-radiated groundborne noise on the residential elements of the Development, as occurring from the operation of nearby transport routes, a baseline vibration survey and outline assessment has been undertaken.

4.2 Survey Methodology

An unattended vibration survey was conducted by Sol Acoustics between 25 October 2022 and 27 October 2022.

Simultaneous tri-axial vibration measurements were taken at 1m from the southern façade of the existing building on the proposed development site. The measurement position is shown in Figure 6 and described in Table 7 below:

Measurement Position	Description
VMP1	Located at ground level approximately on the boundary of the existing RAR Phase 10 bin store. The 01dB Orion accelerometer and DIN 45669-2 compliant mounting plate was mounted directly onto the floor surface.

Table 7: Vibration monitoring measurement positions summary

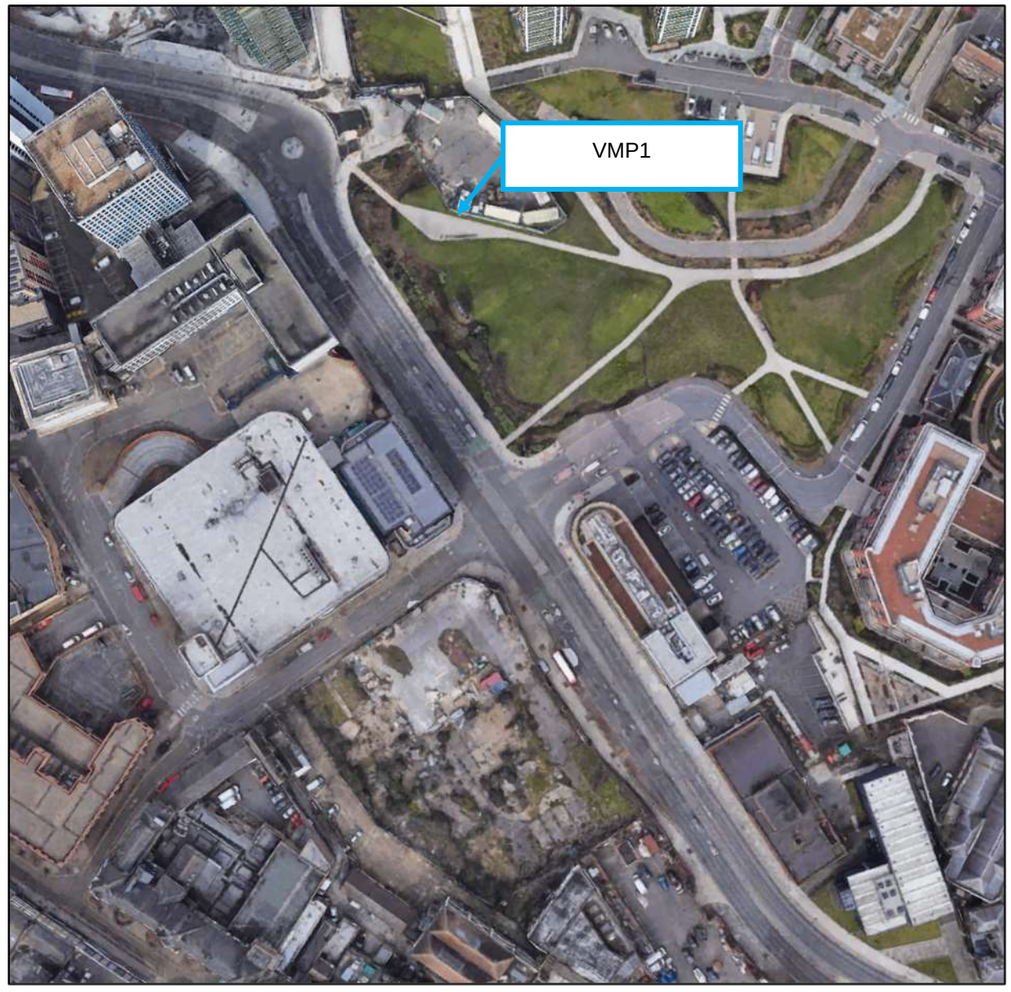


Figure 6: Location of vibration monitoring equipment (Google Earth, 2022)

4.3 Baseline VDV Assessment

Table 8 summarises the measured z-axis VDV for each day, from both measurement positions, the presented data represents the highest measured levels across the three axes:

Date	VMP1	
	VDV_{d}, **16h day** ***m·s$^{-1.75}$***	**VDV_{b},** **8h night** ***m·s$^{-1.75}$***
25/10/22	0.019	0.017
26/10/22	0.022	0.017
27/10/22	0.016	-

Table 8: Measured Vibration Dosage Value $_{b/d,day/night}$ in the z-axis

As shown in Table 6.8, the measured levels are well below the recommended limits of 0.4 m·s$^{-1.75}$ and 0.2 m·s$^{-1.75}$ for day and night values, respectively. It is therefore considered that groundborne vibration is very unlikely to have an adverse impact on the future residents of the Development.

4.4 Reradiated Groundborne Noise Assessment

The vibration velocity measurement data was assessed using 01dB's "dBTrait" software, Version 6.2. Graph 3 overleaf presents the measured re-radiated groundborne noise time history used for the assessment.

As per Equation D.4 presented in the ANC book '*Measurement and Assessment of Groundborne Noise and Vibration'* the resultant sound pressure level (L_p) can be calculated from the measured RMS vibration velocity (L_v) using the following formula:

$$L_p = L_v - 32dB$$

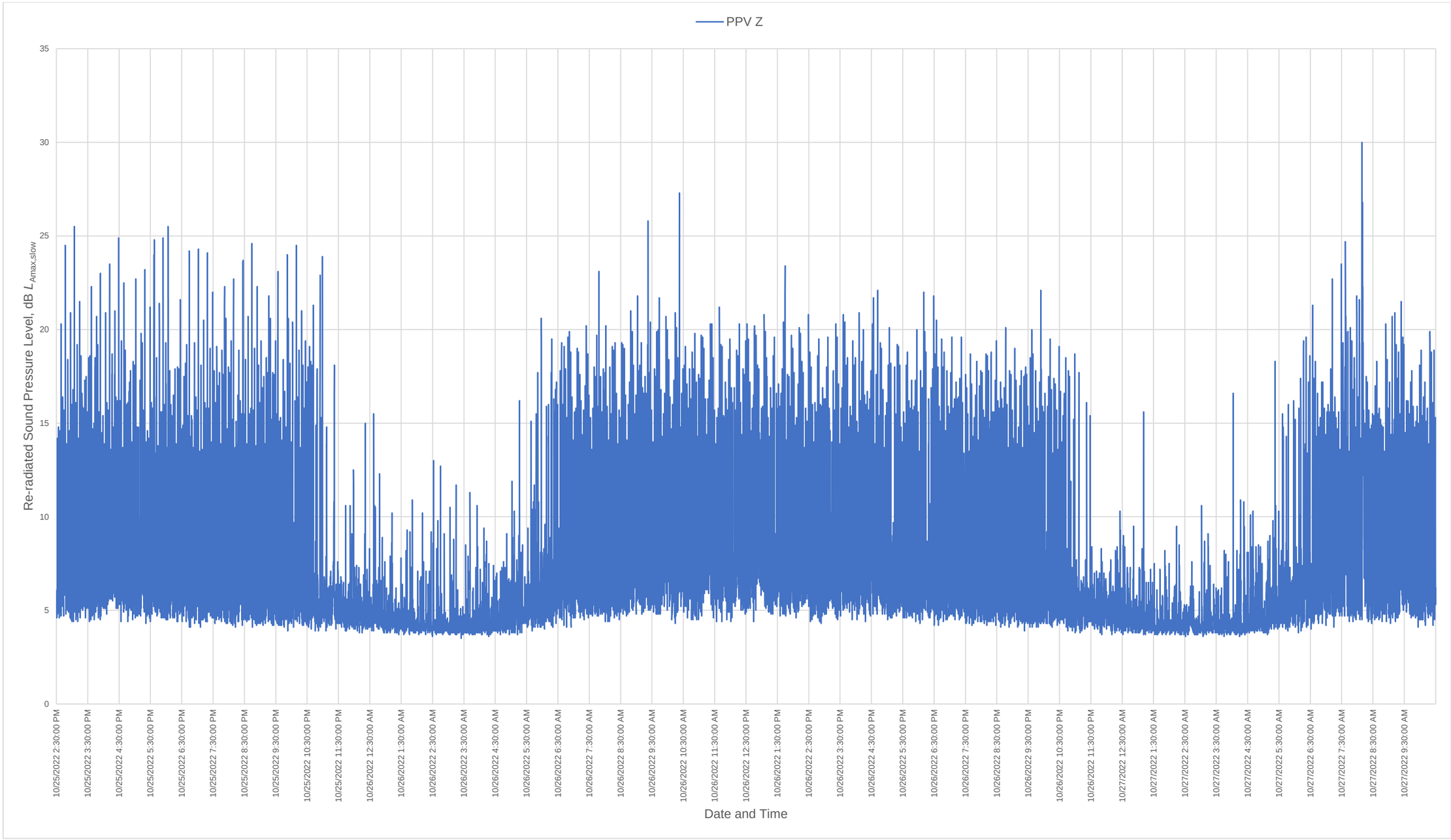
In accordance with the summary guidance presented in the ANC *'Measurement and Assessment of Groundborne Noise and Vibration'*, Table 9 presents the summary outline assessment guidance on the likely vibration transfer functions within the completed residential development:

Source Factor	Correction	Notes
Typical resultant sound pressure level	30dB	
Coupling to building foundations	-10dB	3 – 4 Storey masonry
Floor-to-floor attenuation	-2dB	Apartments on ground floor
Amplification due to resonances of floors, walls, ceilings	+6dB	Actual amplification will vary depending on final construction and dimensions
Predicted sound level in residential receptor	24dB $L_{Amax,slow}$	

Table 9: Predicted groundborne noise ($L_{Amax,slow}$) within residential apartments

Based on typical resultant sound pressure levels the calculated internal sound level due to re-radiated groundborne noise is significantly below the 35dB $L_{Amax,slow}$ design criterion.

Therefore, it is considered that with consideration to best practice construction techniques and the proposed pile foundations, groundborne noise will not have a significant impact of the occupants of the building, and additional vibration-specific mitigation is thus unlikely to be required.



Graph 3: Reradiated ground borne noise ($L_{Amax,slow}$) in the z-axis, from 25th October 2022 to 27th October 2022.