REF: L1597.3 V2

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Mr [redacted]
STP Propco Ltd
79-81 Euston Road
LONDON
NW1 2QE

20th February 2025

RE: KABANNAS, 79-81 EUSTON ROAD, LONDON
NOISE IMPACT ASSESSMENT OF REPLACEMENT MECHANICAL PLANT

Dear Mr Little,

Following our recent correspondence, we are writing to you with respect to the above project, to provide a summary of the noise impact assessment of the proposed new mechanical plant.

We understand the scheme involves the refurbishment of an existing building in central London and we have been appointed to review the noise impact associated with the replacement mechanical plant.

The scheme includes a backup generator and smoke extract fan for life safety. These items are not normally operating and subject to separate targets.

For our assessment of noise impact, we have followed the methodology set out in British Standard 4142:2014 *Method for Rating and Assessing Industrial and Commercial Sound*. This is considered to be the most relevant piece of guidance for the situation and our assessment is described in the following sections.

1.0 BS4142 CRITERIA…

BS4142 presents a method for determining the likelihood of complaints arising from noise levels associated with fixed sources. The procedure set out in the standard involves the comparison of two noise levels at a noise sensitive location, these are:

Rating Level $L_{Ar,Tr}$	The level of noise produced by the source when it has been corrected for tonal and temporal components.
Background Sound Level $L_{A90,T}$	The background noise measured as an L_{A90} (the noise exceeded for 90% of the time) when the plant equipment is not operating.

The assessment periods defined by BS4142 are 1-hour periods during the daytime hours between 07:00 and 23:00, and 15-minute periods at night between 23:00 and 07:00.

If the plant noise has any distinguishing characteristics such as tonal (e.g. whine, hiss, hum etc) or impulsive components (e.g. bangs, clicks, thumps etc), or if the noise is irregular enough to attract attention, then a penalty is applied depending on the severity of the characteristic.

Acoustically Distinguishing Characteristic	Size of Penalty	Assessment Methodologies
Tonality	0 dB to +6 dB	Subjective Method 1/3 Octave Method Reference Method
Impulsivity	Up to +9 dB	Subjective Method Reference Method
Other sound characteristics	3 dB	Subjective Method
Intermittency	3 dB	Subjective Method

TABLE 1: SUMMARY OF BS4142 ACOUSTIC CHARACTERISTIC PENALTIES

To assess the likelihood of complaints, the difference between the *Rating Level* and the *Background Sound Level* is calculated. A simple comparison of these levels provides the outcome of the assessment as shown in Table 2.

Level Difference (Rating – Background) dB(A)	Assessment Conclusion
Around +10 or more	Likely to be an indication of a significant adverse impact, depending on the context
Around +5	Likely to be an indication of an adverse impact, depending on the context
Zero or less	Indication of the specific sound source having a low impact, depending on the context

TABLE 2: SUMMARY OF BS4142:2014 ASSESSMENT METHOD

The assessment conclusions are all subject to taking into consideration the context of the ambient sound at the site, the character of the specific sound and the sensitivity of the receptors.

Where the assessment takes place prior to the specific source of noise being installed, it is permitted to predict the noise level at the noise sensitive location.

2.0 OTHER DESIGN CRITERIA…

Local Planning Policy
The site falls with Camden Council. Of relevance to development in this area is the Camden Local Plan 2017.

Within the local plan is a specific policy relating to noise and vibration, A4 which states,

> ***Policy A4 Noise and vibration***
> *The Council will seek to ensure that noise and vibration is controlled and managed. Development should have regard to Camden's Noise and Vibration Thresholds (Appendix 3). We will not grant planning permission for:*
> *a. development likely to generate unacceptable noise and vibration impacts; or*

b. *development sensitive to noise in locations which experience high levels of noise, unless appropriate attenuation measures can be provided and will not harm the continued operation of existing uses.*

We will only grant permission for noise generating development, including any plant and machinery, if it can be operated without causing harm to amenity. We will also seek to minimise the impact on local amenity from deliveries and from the demolition and construction phases of development.

In relation to this development, the relevant information from Appendix 3 of the Camden Local Plan is summarised Table 3.

The references to LOAEL and SOAEL refer to the terminology in the National Planning Policy Framework (NPPF) and Planning Practice Guidance with the following meanings:

NOEL – No observed Effect Level
LOAEL – Lowest Observed Adverse Effect Level
SOAEL – Significant Observed Adverse Effect Level

The reference to a colour code is described in the plan to have the following meanings,

Green – Where noise is considered to be at an acceptable level.
Amber – Where noise is observed to have an adverse effect level, but which may be considered acceptable when assessed in the context of other merits of the development.
Red – Where noise is observed to have a significant adverse effect.

For development which generates noise, the following limits are provided based on BS4142:2014.

Existing Noise Sensitive Receptor	Assessment Location	Design Period	LOAEL (Green)	LOAEL to SOAEL (Amber)	SOAEL (Red)
Dwellings	Gardens used for main amenity (free-field) and outside living or dining or bedroom window (façade)	Day	**Rating Level 10 dB below background**	Rating Level between 9 dB below and 5 dB above background	Rating Level greater than 5 dB above background
	Outside bedroom window (façade)	Night	**Rating Level 10 dB below background, and no events exceeding 57 dB L_{Amax}**	Rating Level between 9 dB below and 5 dB above background or noise events between 57 dB and 88 dB L_{Amax}	Rating Level greater than 5 dB above background and/or events exceeding 88 dB L_{Amax}

TABLE 3: TABLE C NOISE LEVELS APPLICABLE TO PROPOSED INDUSTRIAL AND COMMERCIAL DEVELOPMENTS (INCLUDING PLANT AND MACHINERY)

The desirable target criteria have been highlighted with **bold text**.

The Camden Council website[1] provides guidance for what needs to be included in the assessment stating the following,

> *A noise, vibration and ventilation assessment should include the following information:*
> - *existing background noise levels measured over a 24-hour period. This includes the cumulative noise levels of all existing units.*
> - *proposed background noise levels. This includes the cumulative noise levels of all existing units.*
> - *any proposed measures to reduce noise, fume emissions and vibration*
> - *the system manufacturers specification of the proposed equipment to be installed, altered or replaced*
> - *details of the method used to compile the report and examples of the calculations and assumptions made*

In addition, we have also considered BS8233:2014 and the World Health Organisation guidance for noise levels which offer good external amenity. A good standard of external amenity is considered to be 50 dB(A) L_{Aeq} and below.

Furthermore, we would expect neighbouring dwellings to maintain reasonable internal noise levels with windows open for ventilation. The BS8233 guidance for reasonable internal noise during the day within a dwelling is 35 dB(A) L_{Aeq}. We would normally expect 10-15 dB(A) reduction through an open window and hence we would not expect the noise level from new plant equipment to exceed 45 dB(A) L_{Aeq} measured 1 m from the external building façade where there is an opening window.

The most onerous of the available criteria are expected to apply.

3.0 EXISTING BACKGROUND SOUND LEVELS…

There are no restrictions on the minimum duration of measurement of the *Background Sound Level* in BS4142, albeit to say they should represent the "*Typical*" background level when the new equipment will be in operation.

A survey of the pre-development noise environment was undertaken in a location which is considered representative of the pre-development *Background Sound Levels* at the nearest noise sensitive receptors, in free-field conditions.

The measurement has been carried out in full accordance with the following standards and guidance:

- BS 7445-1:2003: Description and measurement of environmental noise – Part 1: Guide to quantities and procedures.
- BS 7445-2:1991: Description and measurement of environmental noise – Part 2: Guide to the acquisition of data pertinent to land use.
- BS 4142:2014: Methods for rating and assessing industrial and commercial sound.
- ANC Green Book Guidelines.

Full details of the survey and results are provided in Appendix A.

We have measured a *Background Sound Level* of 65 dB $L_{A90,1hr}$ during the day and 61 dB(A) $L_{A90,15min}$ at night on the Euston Road elevation, and 54 dB $L_{A90,1hr}$ during the day and 52 dB(A) $L_{A90,15min}$ at night on the rear elevation, and for our assessment at the nearest sensitive neighbour.

[1] https://www.camden.gov.uk/noise-vibration-ventilation-assessments accessed 13th February 2025

The daytime period is defined as 07:00 to 23:00 and the night-time period 23:00 to 07:00.

The measurement of Background Sound Level was taken close to the façade. A correction of -3 dB can be used to convert the façade level measurement to a free-field level for comparison with other free-field sound levels in accordance with BS4142 Clause 6.2.

The noise exposure is predominantly due to existing plant and local road traffic.

4.0 PROPOSED PLANT EQUIPMENT…

4.1 Equipment Schedule

The proposed location of the new equipment is indicated on a marked-up plan included in Appendix B to this letter. The sound output data for the proposed equipment is summarised in Table 4.

Ref	Make/Model	No Off	Sound Power Level (dB re 1 pW) 1/1 Octave Band Centre Frequencies (Hz)								A
			63	125	250	500	1k	2k	4k	8k	
CON	Mitsubishi PURY EP350YLM-A1 Low Noise Mode	5	85	81	73	71	67	64	58	59	74
AHU	Intake	1	67	71	66	59	43	50	51	60	64
	Exhaust	1	67	71	66	59	43	50	51	60	64
	Case	1	71	73	61	56	54	54	54	44	--
GEN	FG Wilson P175-2	1	94	92	91	87	84	87	87	84	93
FAN	Case	1	96	88	80	76	71	67	73	65	80
	Exhaust/Outlet	1	104	104	99	89	83	86	83	81	95

TABLE 4: MANUFACTURERS' SOUND POWER DATA OF PROPOSED EQUIPMENT

The CON and GEN data has been provided as a sound pressure level in a free field (anechoic conditions for CON). We have converted the sound pressure level to a sound power level in accordance with the principles of ISO3544. For GEN, the data has been provided as a single value A-weighted pressure level. We have used spectral data for a similar unit, adjusted the same in all bands to match the overall A-weighted level.

The AHU and CON units are located outside on the Level 8 roof. We understand that the equipment can operate in response to demand at any time of day or night.

We have assessed the noise levels from the emergency units consisting of an extract fan and a generator. These units are to be used sporadically in the event of an emergency or during testing and as such are not expected to form a regular or consistent component of the sound scape. The emergency generator is located inside the level 8 plant room which is ventilated through louvres to outside, and the extract fan is on the level 9 roof.

No specific noise limits apply to the emergency equipment however a commonly accepted noise limit for testing of emergency plant is no greater than 10 dB above background sound levels during the daytime period (combined level when operating simultaneously) when measured at the receiver. We recommend that testing only takes place between the periods of 09:00 and 17:00 Monday to Friday and 09:00 – 12:00 on Saturdays.

4.2 Noise Control

Our modelling has included mitigation of the AHU noise emission which we understand is to take the form of passive splitter silencers installed to the inlet and exhaust ductwork.

At this stage, the specification of the attenuation to the AHU is unknown. We have, however been advised that the attenuated noise levels are as provided in Table 4. Should details of the proposed attenuation become available, we can review further.

We have included a 2 m high solid balustrade to the south side of the roof running from the corner of the level 8 plant room to the south-east corner of the building. The extent of the balustrade is shown in FIGURE 12. This structure has been modelled as solid, free from holes, with a minimum density of 10 kg/m^2.

The back up generator is installed inside the level 8 plant room. We have used the sound power level of the unit with the room dimensions and finishes to calculate a reverberant sound pressure level inside during operation. We have used this level to estimate the sound escaping from the plant room via the louvres which are modelled as having no acoustic properties.

The smoke extract fan is provided with the manufacturer's attenuator. The data has been provided with the attenuator included (as shown in Table 4), however we have extracted the insertion loss information from the available data which is shown in Table 5. We understand that further attenuation will be installed to the fan to further reduce the noise emission, and so our assessment is a worst case.

Unit	Insertion Loss (dB) at 1/1 Octave Band Centre Frequencies (Hz)								A
	63	125	250	500	1k	2k	4k	8k	
FAN Outlet Attenuator	2	5	7	12	13	8	9	8	8

TABLE 5: SMOKE EXTRACT FAN ATTENUATOR LOSSES

4.3 On-Time Correction

We are not aware of any routine cyclical usage of the equipment. As a worst-case, we have assumed all plant to be running continuously for an entire reference period during the day and/or night.

4.4 Assessment of Penalties

Following the procedures set out in clause 9.2, Annex D and Annex E of BS4142 we have undertaken an assessment of the penalties to be applied to the measured *Specific Sound Levels* to adjust for tonality, impulsivity, and other sound characteristics to obtain the *Rating Level*.

Whilst we cannot confirm the presence of tonal or temporal characteristics from the manufacturer's data, we do not expect the sound of the normal equipment to be noticeable in context of other mechanical services and the dominance of road traffic noise. This is considered a reasonable approach on the basis that all the equipment is new and will be installed correctly in accordance with the manufacturer's instructions.

Should it transpire that the equipment has more undesirable acoustic characteristics, further penalties to that already included would be applied as described in BS4142 dependent on the prominence of the features.

The emergency equipment is likely to be noticeable when in use. As the use is infrequent for maintenance and testing, or under emergency conditions we have not penalised the noise levels.

5.0 RATING LEVEL…

5.1 Calculation Method

We have modelled the propagation of sound from the plant equipment using the method described in ISO 9613-2 and Appendix D.

5.2 Assessment Location

We have used architectural drawings and on-line mapping tools to estimate the distance between the assessment location and the closest of the proposed new noise sources.

We have used 1 No assessment location as follows:

1. Receiver No 1. UCL Halls, John Dodgson House, 24-36 Bidborough Street, LONDON, WC1H 9BL. The nearest receiver to the proposed roof level plant is on the top floor of this building which is 1 floor below the level of the roof plant. The closest window has been used for the assessment, which we understand to be operable for ventilation and approximately 8.5 m to the south of the AHU.

During our scoping assessment we have also identified a second receptor in the same building which is affected more by the emergency equipment. This second received is in a similar location but further west from location No 1, and called No 2 herein.

The assessment locations are at 1 m from the façade of the receiver buildings and indicated on a mark-up in the appendix.

5.3 Assessment Outcomes – Standard Plant

The calculated *Rating Level* of the proposed equipment at the assessment location, and comparison of these sound levels against the target values, and the resulting conclusions are summarised in Table 6.

Receiver Location	Period	Background Sound Level dB(A) $L_{A90,T}$	Predicted Rating Level dB(A) $L_{Ar,Tr}$	Difference Rating - BG dB(A)	BS4142 Conclusion
1	Day 07:00 to 23:00	54	39	-15	Low Impact (Green)
	Night 23:00 to 07:00	52	39	-13	Low Impact (Green)

TABLE 6: SUMMARY OF PREDICTED RATING LEVELS AND NOISE IMPACT

When comparing the assessment results against BS4142, with the inclusion of the 2 m high solid balustrade, an outcome of low impact is concluded during the day and night.

Following the council criteria the impact is classified as Green during the daytime and night-time periods.

We note that the assessment is based on all equipment operating at full duty at all times. It is likely that the system will be designed to have some diversity and not all condensers operate together. This will make the emission quieter and have a benefit to the noise impact.

5.4 Assessment Outcomes – Emergency Plant

The calculated *Rating Level* of the proposed emergency equipment at the assessment location, and comparison of these sound levels against the target values, and the resulting conclusions are summarised in Table 7.

Receiver Location	Period	Background Sound Level dB(A) $L_{A90,T}$	Predicted Rating Level dB(A) $L_{Ar,Tr}$	Difference Rating - BG dB(A)	BS4142 Conclusion
1	Day 07:00 to 23:00	54	54	0	Low Impact (Amber)
	Night 23:00 to 07:00	52	54	+2	Low Impact (Amber)
2	Day 07:00 to 23:00	54	60	+6	Adverse Impact (Red)
	Night 23:00 to 07:00	52	60	+8	Significant Adverse Impact (Red)

TABLE 7: SUMMARY OF PREDICTED RATING LEVELS AND NOISE IMPACT OF EMERGENCY EQUIPMENT

The predicted levels achieve the target criteria for emergency plant (i.e. no more than 10 dB above background sound levels). On this basis no further mitigation is required.

We have compared the outcome against the BS4142 criteria and the noise level of the emergency plant is expected to have a low impact during the day and night and to be classified as the Amber following the local authority method at receiver 1.

Applying the BS4142 methodology at receiver 2 the noise level of the emergency plant is expected to have an adverse impact during the day and night, and is classified as Red following the local authority method.

The balustrade has little effect on the noise from the emergency equipment which is dominated by the extract fan on the level 9 roof.

We would recommend further attenuation is considered to this item provided it does not imped the operation in an emergency. We note that our assessment is based on the manufacturer's noise control hardware. We understand that additional mitigation is to be installed to further reduce the noise emissions and the above conclusions represent a worst case.

6.0 CONCLUSIONS IN CONTEXT…

The context of the site is in a location where noise levels are dominated by local traffic, and the existing plant equipment.

The proposed mechanical plant is continuous in nature, which is similar to road traffic noise and in keeping with the context of the site during daytime and night-time hours.

In our opinion, in context, targeting a *Rating Leve*l that is less than *Background Sound Level* in this environment is considered acceptable and not likely to cause adverse impact to nearby noise sensitive receivers.

7.0 EFFECTS OF UNCERTAINTY…

Where available we have considered uncertainty. We have assessed the uncertainty associated with the measurement of the background sound level based on the measurement tolerance of a Class 1 sound level meter which conforms with IEC61672-1:2002. The typical uncertainty based on the frequency spectrum of road traffic noise on the measured background level is ±1 dB(A).

There are other sources of uncertainty in our assessment, such as, tolerances to be applied to manufacturers data, the variation in *Background Sound Level* on a different day, and the calculation tolerances for the propagation model.

The survey of the *Background Sound Level* has been undertaken in full accordance with BS7445 and ANC Green Book Guidance using laboratory calibrated measurement equipment. These precautions will minimise sources of uncertainty in the survey data. The current site conditions exhibit a low variability in the ambient and background sound levels and our data is considered to be a good representation of the site.

We do not expect the effects of uncertainty to have a significant effect on the outcome of our assessment and would not be of a magnitude to alter the conclusions of noise impact.

8.0 ASSESSMENT CONCLUSION…

We have undertaken an assessment of the proposed new fixed building plant against the methodology set out in BS4142:2014 during day and night-time operational hours.

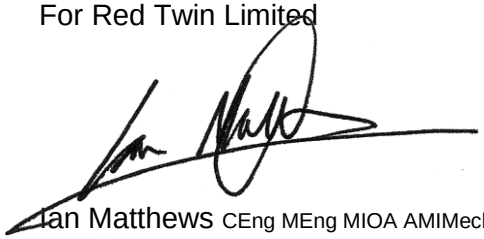
We have estimated the likely noise levels at the nearest residential building based on information provided to us and using standard noise propagation and mapping tools.

We have concluded that the condensing plant dominates the noise emanating from the building due to the normal equipment. The conclusion is that the noise from the equipment will be of a “low impact depending on the context”, and achieves the Amber criterion set by the local authority.

We have assessed the noise impact from the emergency life-safety equipment. Our assessment has identified the noise from the emergency equipment affects a different location, and is dominated by the smoke extract fan. The estimated noise levels achieve our derived target of no greater than 10 dB above the background sound level however in our opinion it will be noticeable and we recommend further mitigation is considered provided it does not impede the operation of the equipment.

I trust you find this assessment provides suitable information for consideration by the local authority. Please don't hesitate to contact me if you require anything further.

Yours sincerely,
For Red Twin Limited



Ian Matthews CEng MEng MIOA AMIMechE
Director
Chartered Engineer

APPENDIX A – SURVEY DETAILS…

Address: Kabannas, 79-81 Euston Road, LONDON, NW1 2QE

Date: 21st September 2023 to 27th September 2023

Measurement Locations

Location No 1	The microphone was mounted on the railing outside the first floor Juliet balcony, approximately 1.5 m above finished floor level, and c. 0.5 m from the window on the northern elevation facing Euston Road. The levels are considered a façade level. (Orange equipment).
Location No 2	The microphone was pole mounted extending from the third floor store room window on the southern elevation into the courtyard. The pole extended 1 m from the façade approximately 1.5 m above finished floor level. The levels are a façade level. (Black equipment).

The measurement locations are indicated in FIGURE 10 and FIGURE 11 with a photograph in FIGURE 1.

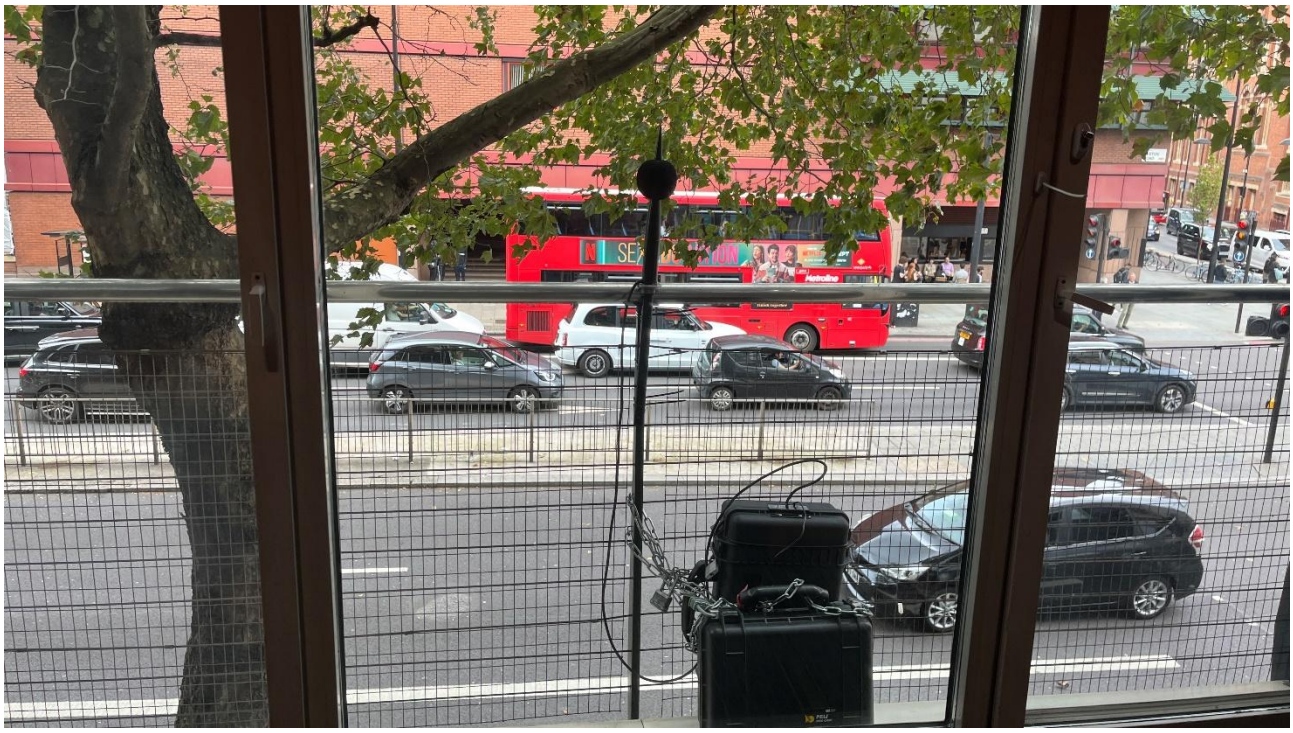


FIGURE 1: PHOTOGRAPH OF SURVEY MEASUREMENT LOCATION NO 1 (UN-MANNED)

No photograph was taken of Location No 2.

Equipment – Location No 1 {Orange Kit}

NTi XL2 TA hand held analyser, serial No A2A-18241-E0, with a NTi MC230A Microphone, serial No A19347. The microphone was fitted with a MA220 weather protection kit. The hand held analyser and microphone were laboratory calibrated on 30th May 2023 (Certificate No. U44354). The sensitivity of the equipment was checked before and after the survey using a Brüel & Kjær Type 4231 Acoustic Calibrator, serial No 2656621 which was laboratory calibrated on 20th October 2022 (Certificate No U42188) and no reportable drift was observed during the survey and no adjustments to the measurements have been made to the data. The equipment was operated on battery power.

Equipment – Location No 2 {Black Kit}
NTi XL2 TA hand held analyser, serial No A2A-18210-E0, with a NTi MC230A Microphone, serial No A20279. The microphone was fitted with a MA220 weather protection kit. The hand held analyser and microphone were laboratory calibrated on 31st May 2023 (Certificate No. U44367). The sensitivity of the equipment was checked before and after the survey using a Brüel & Kjær Type 4231 Acoustic Calibrator, serial No 2656621 which was laboratory calibrated on 20th October 2022 (Certificate No U42188) and no reportable drift was observed during the survey and no adjustments to the measurements have been made to the data. The equipment was operated on battery power.

Personnel
The survey was set up, collected and part attended by Ian Matthews of Red Twin Limited.

Weather
The weather was suitable for noise measurement for the majority of the survey period with light winds. There was some precipitation during the set up of the survey and a little the following afternoon, but the period was otherwise dry.

Weather observations for the survey period have been obtained from the Met Office station at Hammersmith, which are reproduced in Figure 2.

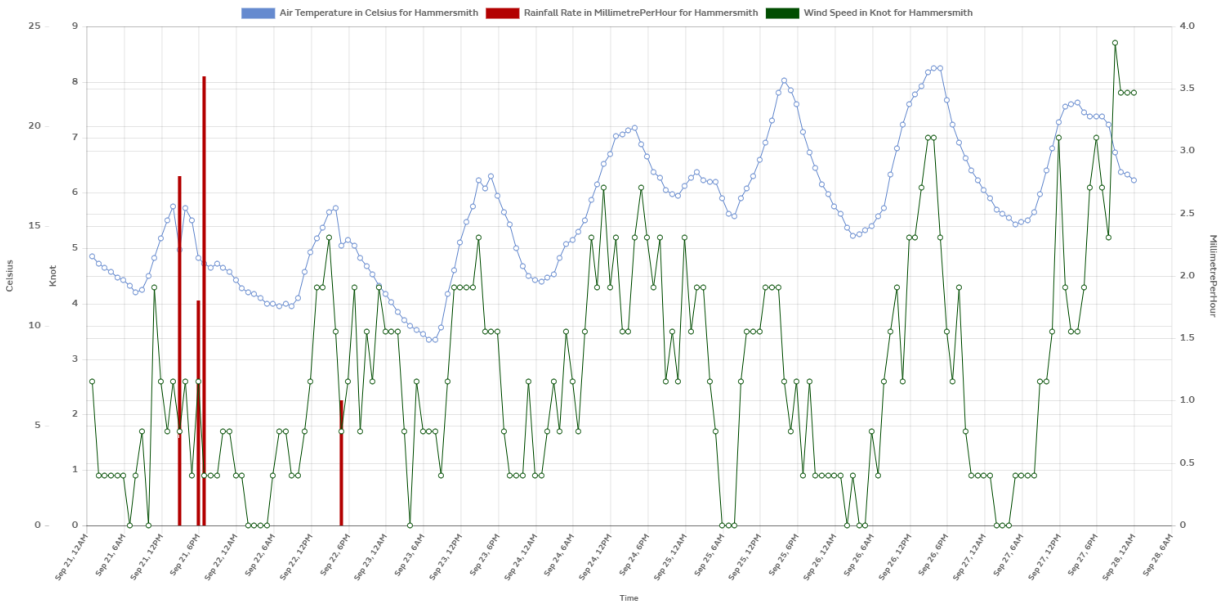


FIGURE 2: MET OFFICE WEATHER OBSERVATIONS (HAMMERSMITH) DURING SURVEY

Conditions were generally acceptable for noise measurement work and in full accordance with BS7445.

Survey Comments
The orange equipment on the Euston Road elevation had issues with power and did not operate for the planned duration. The levels observed are very consistent on Euston Road and it is felt suitable information has been collected to inform the design of this elevation of the building.

Results
Data from the unmanned measurements are presented in graphical form. The full data is available upon request.

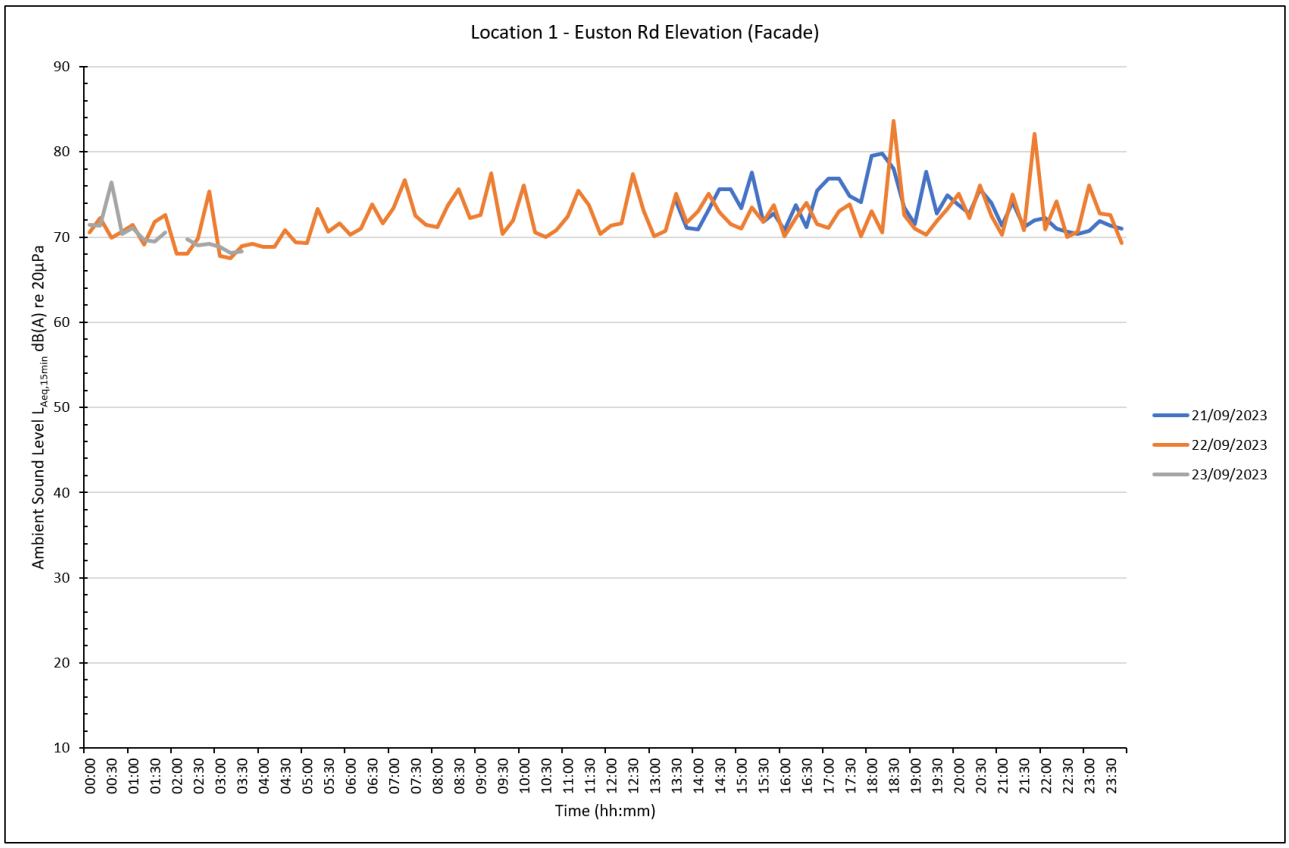


FIGURE 3: LOCATION NO 1 UNMANNED SURVEY DATA (LAEQ,15MIN)

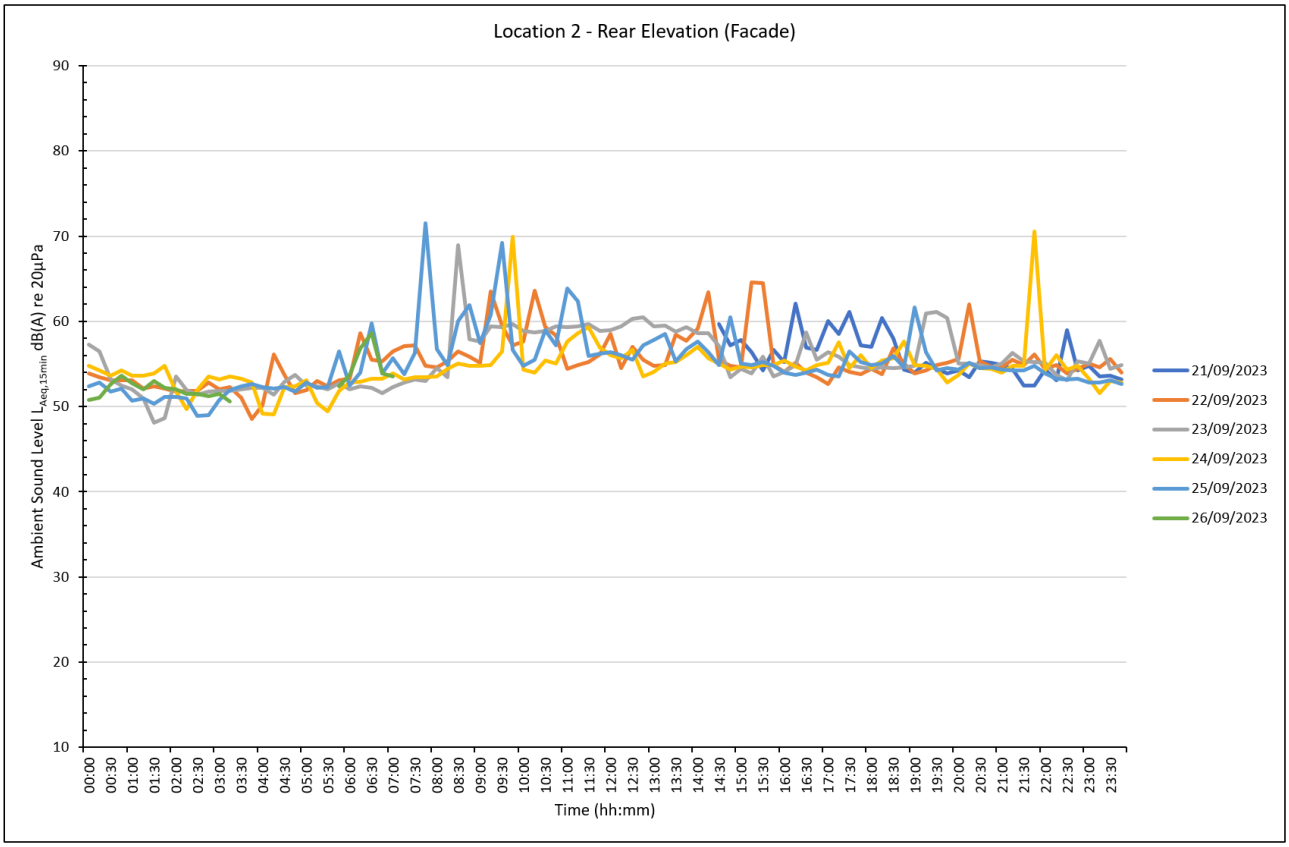


FIGURE 4: LOCATION NO 2 UNMANNED SURVEY DATA (LAEQ,15MIN)

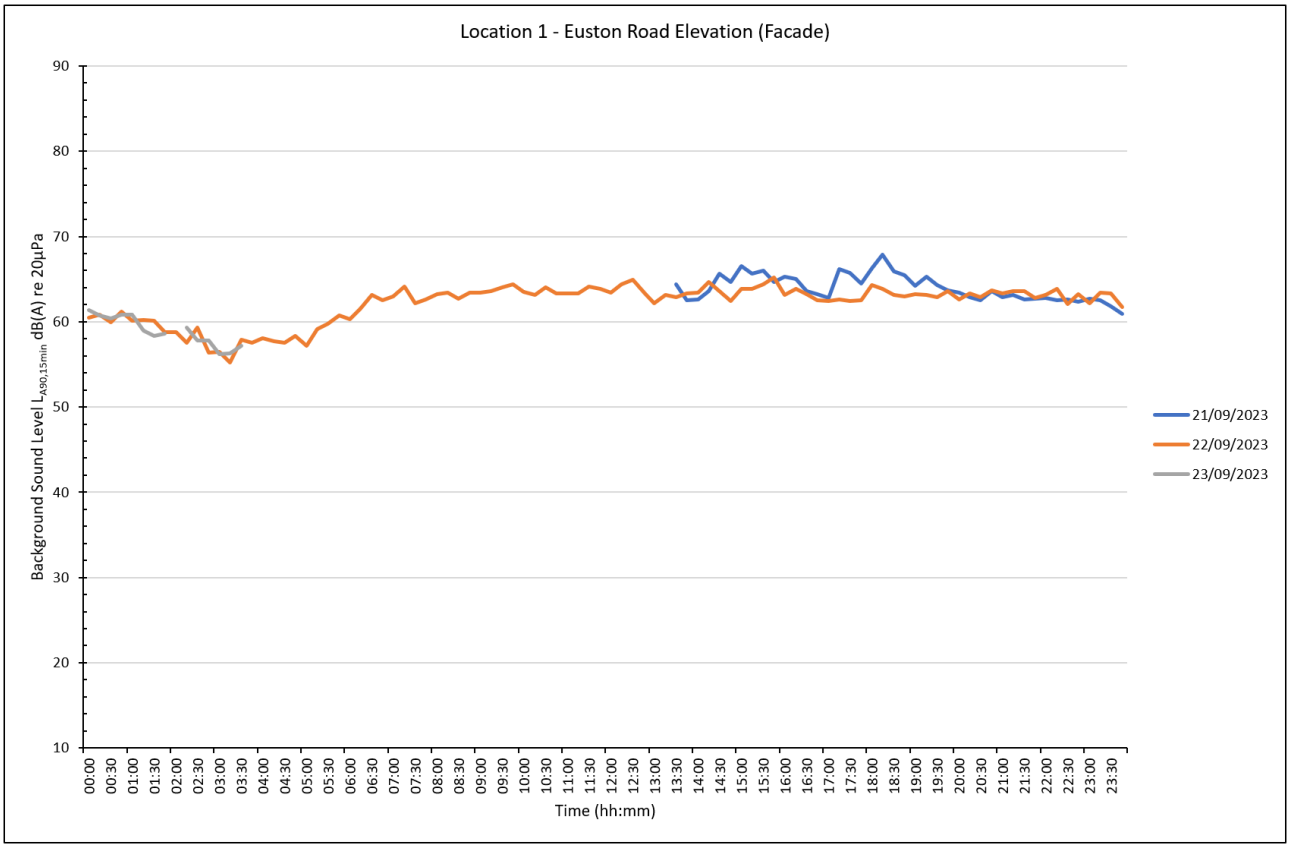


FIGURE 5: LOCATION NO 1 UNMANNED SURVEY DATA (LA90,15MIN)

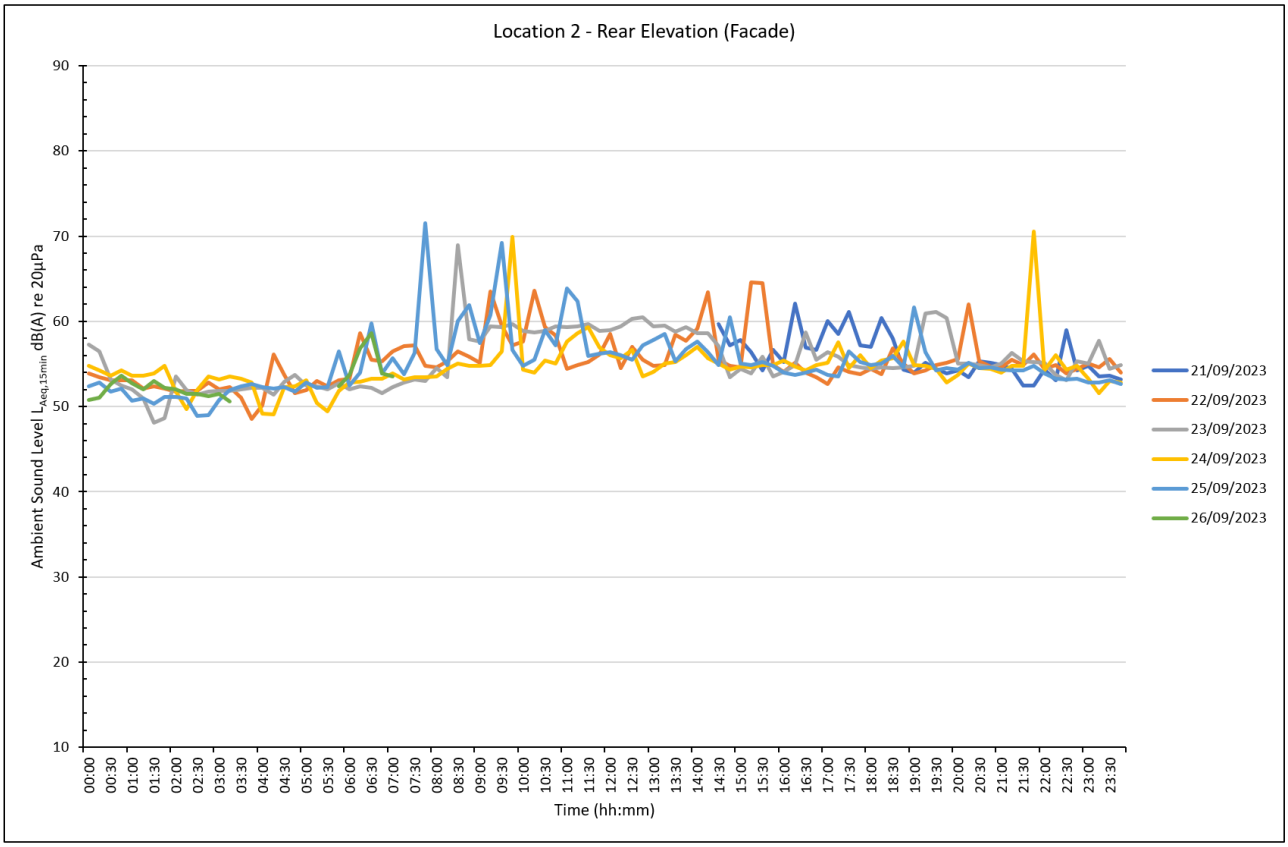
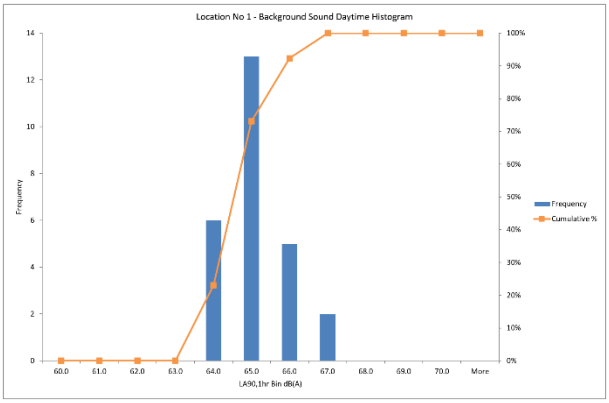


FIGURE 6: LOCATION NO 2 UNMANNED SURVEY DATA (LA90,15MIN)



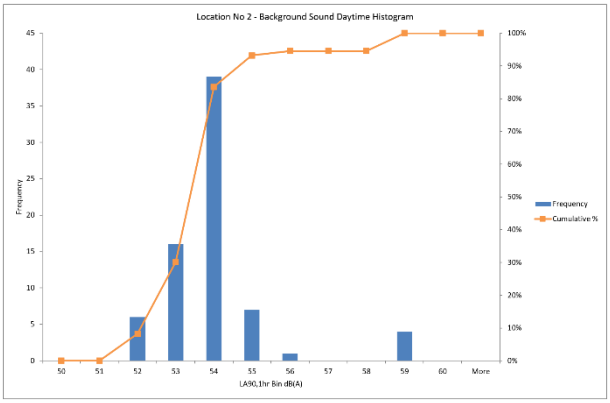
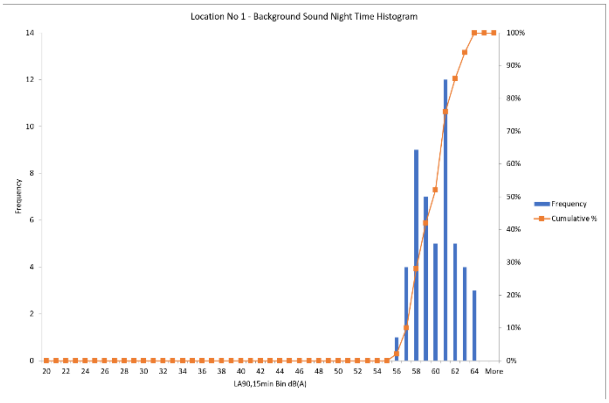


FIGURE 7: BACKGROUND SOUND HISTOGRAMS DURING DAYTIME (LA90,1HR)



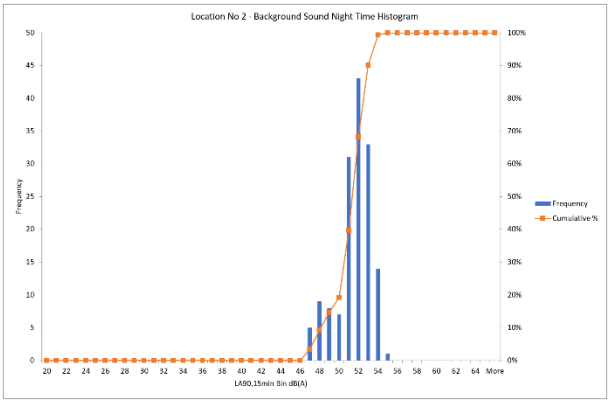
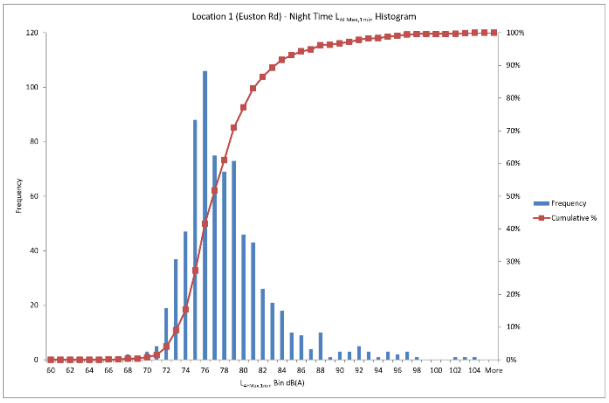


FIGURE 8: BACKGROUND SOUND HISTOGRAMS AT NIGHT (LA90,15MIN)



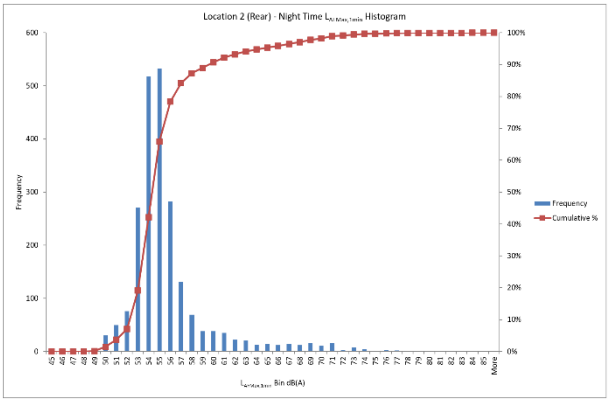


FIGURE 9: MAXIMUM NOISE LEVEL HISTOGRAMS AT NIGHT (LAFMAX,1MIN)

The derived design levels at each measurement location, which are subsequently used in our analysis/modelling are summarised in Table 8.

Situation	Unit	Value
Daytime external noise (Euston Road 1st Floor)	$L_{Aeq,16hr}$	74
Night time external noise (Euston Road 1st Floor)	$L_{Aeq,8hr}$	71
Night time external noise (Euston Road 1st Floor)	$L_{AfMax,10x}$	93
Daytime external noise (Rear 3rd Floor)	$L_{Aeq,16hr}$	58
Night time external noise (Rear 3rd Floor)	$L_{Aeq,8hr}$	53
Night time external noise (Rear 3rd Floor)	$L_{AfMax,10x}$	70
Daytime background sound level (Euston Road)	Mode $L_{A90,1hr}$	65
Night time background sound level (Euston Road)	Mode $L_{A90,15min}$	61
Daytime background sound level (Rear)	Mode $L_{A90,1hr}$	54
Night time background sound level (Rear)	Mode $L_{A90,15min}$	52

TABLE 8: SUMMARY OF PROCESSED SURVEY DATA

APPENDIX B – SITE PLANS…

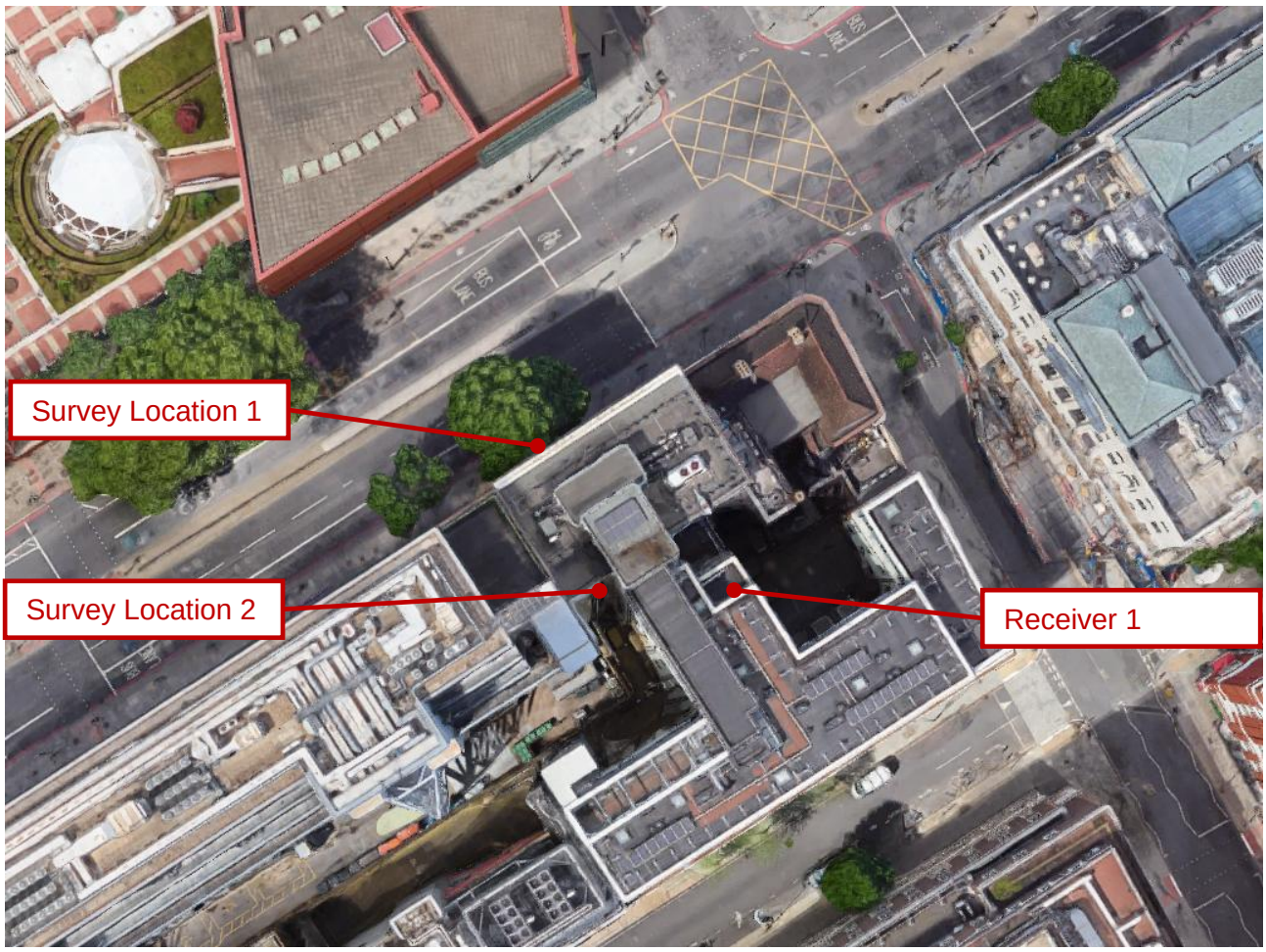


FIGURE 10: SITE AERIAL VIEW INDICATING MEASUREMENT LOCATIONS (NOT TO SCALE)

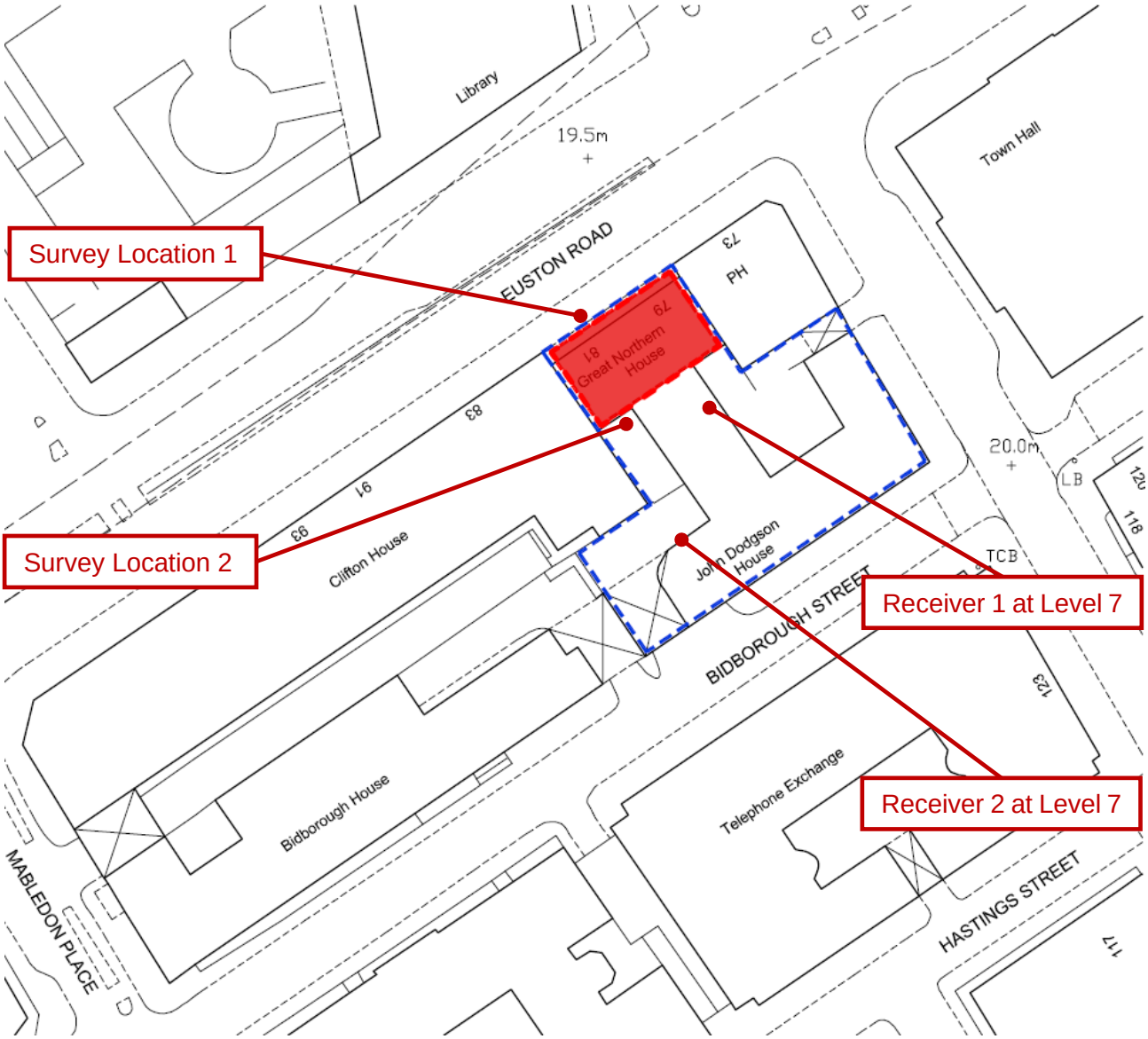


FIGURE 11: PROPOSED SITE LOCATION PLAN INDICATING KEY LOCATIONS (NOT TO SCALE)

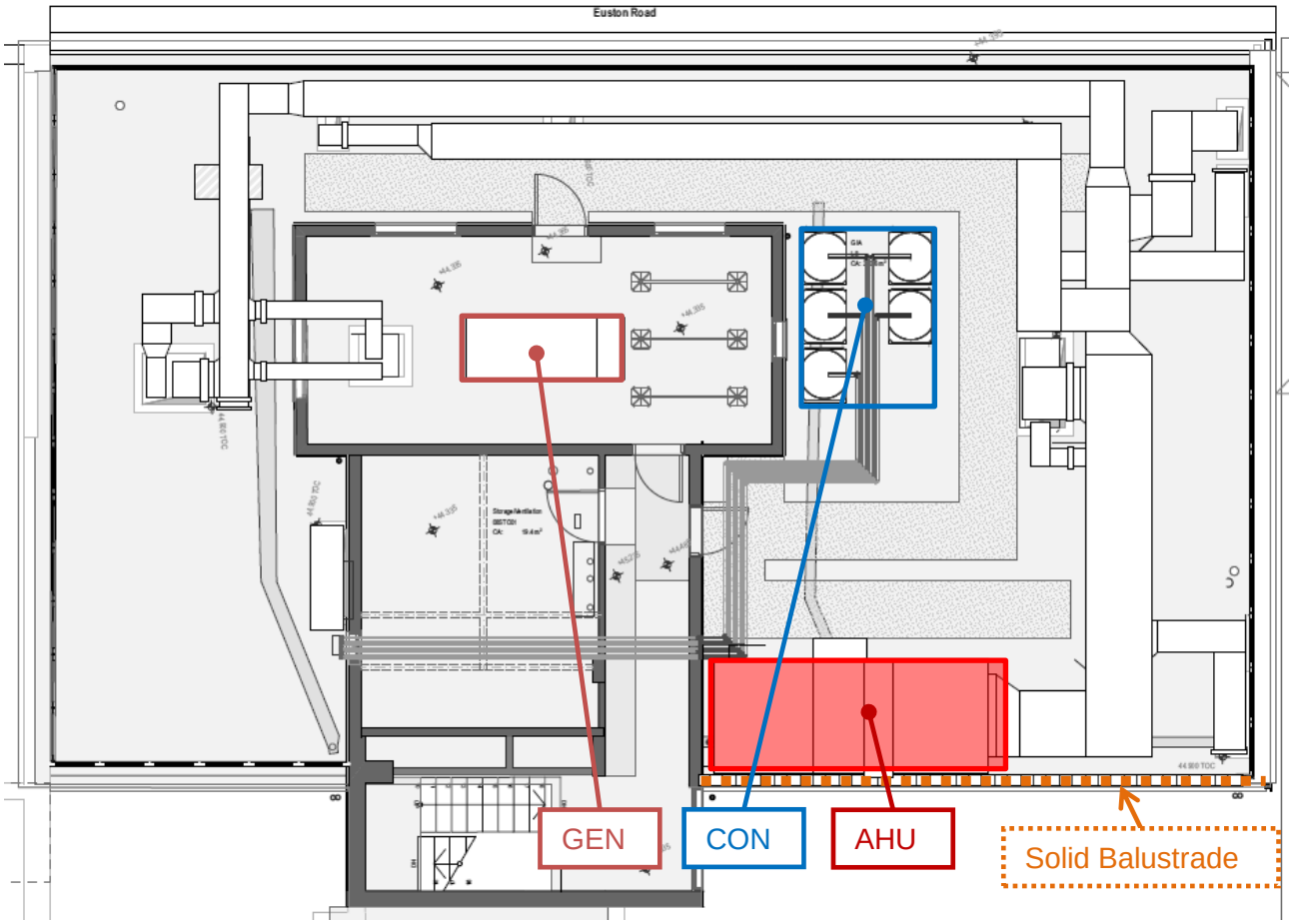


FIGURE 12: PROPOSED LEVEL 8 ROOF PLANT LAYOUT (NOT TO SCALE)

GEN is located indoors inside the L8 plant room. The exact location may vary however the sound output into the plant room is assumed to be diffuse and the same everywhere regardless of the unit position.

CON and AHU are located outside on the L8 roof.

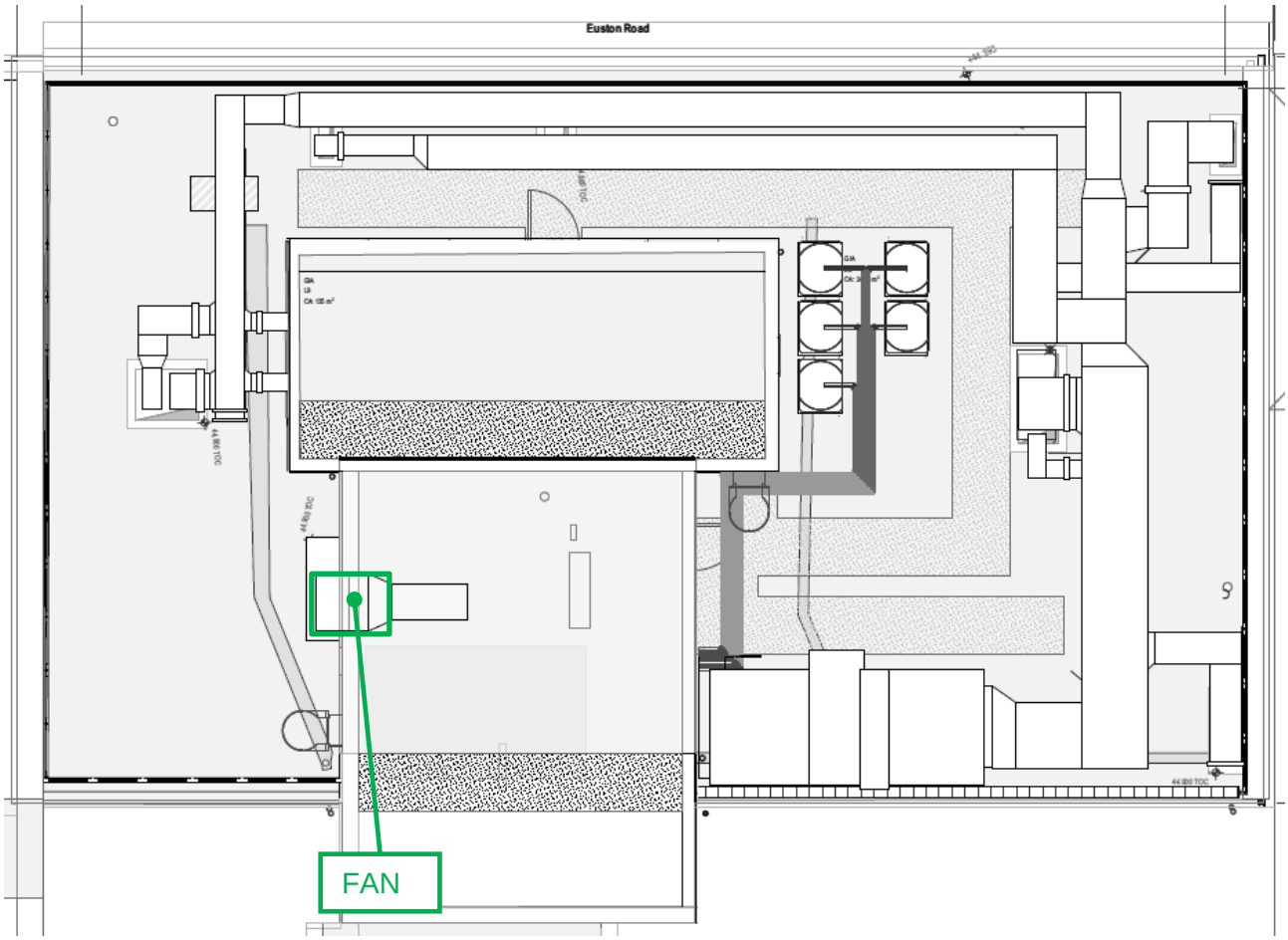


FIGURE 13: PROPOSED LEVEL 9 ROOF PLANT LAYOUT (NOT TO SCALE)

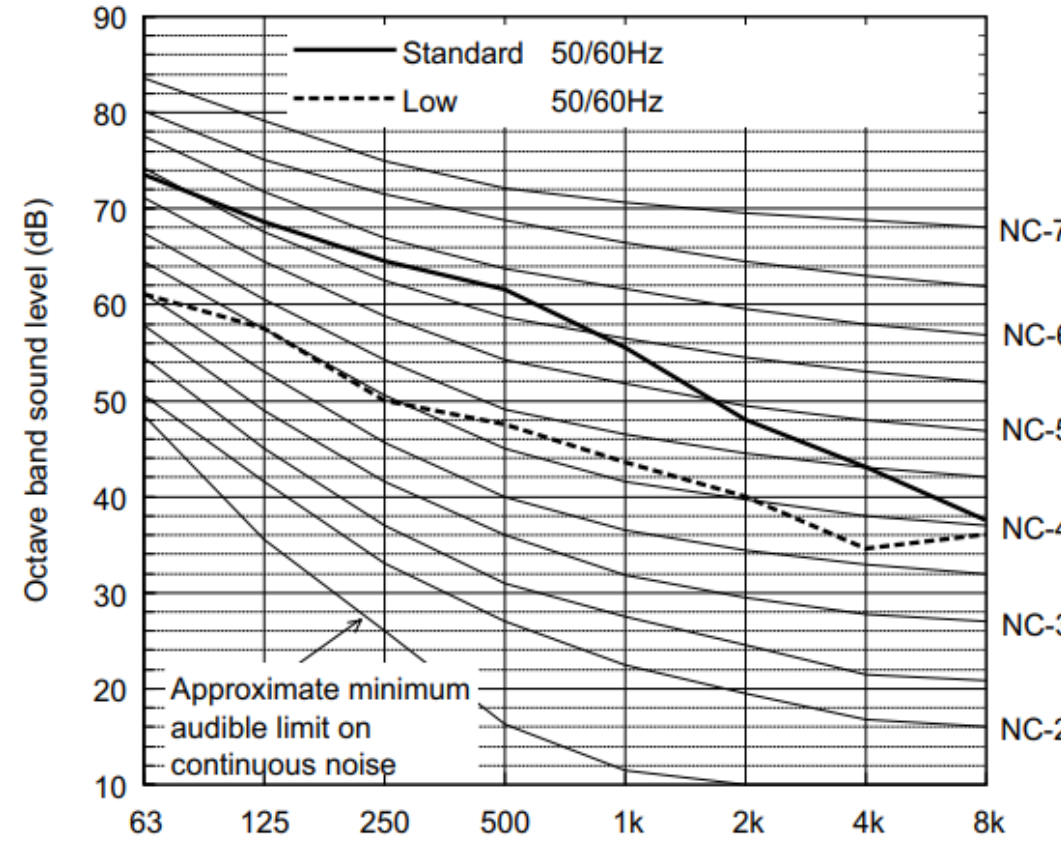
FAN is located outside on the L9 roof.

APPENDIX C – MANUFACTURER'S DATA…

Sound data (sound power EN13053)

Frequency band	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*		*Total*	
Supply air:											
To surroundings	67	69	57	53	49	49	47	37	dB	58	dB(A)
Outdoor air with Sound Att	54	60	53	42	27	27	23	22	dB	48	dB(A)
Supply air with Sound Att	67	71	66	59	43	50	51	60	dB	64	dB(A)
Extract air:											
To surroundings	68	70	58	53	53	53	53	43	dB	61	dB(A)
Extract air with Sound Att	55	62	55	43	34	35	34	34	dB	50	dB(A)
Exhaust air with Sound Att	67	71	66	59	43	50	51	60	dB	64	dB(A)
Total:											
To surroundings	71	73	61	56	54	54	54	44	dB	63	dB(A)

FIGURE 14: AHU DATA WITH ATTENUATION INCLUDED



		63	125	250	500	1k	2k	4k	8k	dB(A)
Standard	50/60Hz	73.5	68.5	64.5	61.5	55.5	48.0	43.0	37.5	62.5
Low noise mode	50/60Hz	61.0	57.5	50.0	47.5	43.5	40.0	34.5	36.0	50.0

When Low noise mode is set,the A/C system's capacity is limited. The system could return to normal operation from Low noise mode automatically in the case that the operation condition is severe.

FIGURE 15: CONDENSER SOUND POWER DATA

Modular Acoustic Enclosures

24 – 220 kVA Range

www.FGWilson.com

The intelligent and striking design of the 24 – 220 kVA enclosure range meets the demands of diverse applications. Extremely durable, the enclosures are designed to resist corrosion and handling damage.

Developed through continuing research and development by our specialist engineers, all FG Wilson enclosures are weather resistant and incorporate internally mounted exhaust silencers. These enclosures reduce sound levels to comply with the stage 2 levels of the European Community Directive 2000/14/EC which became effective 3 January 2006.

Excellent Access for Maintenance

- Side hinged doors on both sides of the enclosure incorporating lift-off hinges at 45 degrees
- Radiator fill via removable, flush mounted rain cap fitted with compression seal
- Lube oil drain valves / Coolant drain valves
- Removable end panels allow access to radiator, exhaust outlet and alternator rear
- Doors positioned for optimum access to frequently serviced items

Robust/Highly Corrosion Resistant Construction

- Manufactured from galvanised steel
- Advanced powder coating paint finish
- Single piece main roof
- Baseframe extends beyond enclosure protecting against handling damage
- Minimal external fixings exposed to environment
- Zinc plated fasteners
- Corner posts and air handling units manufactured from high grade composite material

Security and Safety

- Secure, lockable doors prevent unauthorised access to control panel, fuel fill and battery
- Emergency stop button mounted on exterior, convenient to control panel
- Cooling fan and battery charging alternator fully guarded

Transportability

- Optional tested and certified lifting arch
- Lifting and drag points on baseframe facilitating handling from both sides

Sound Pressure Levels (dBA) for CAE Enclosure

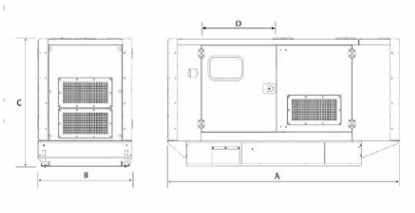
Generator Set Model			50 Hz						60 Hz					
			15 m (50 ft)		7 m (23 ft)		1 m (3 ft)		15 m (50 ft)		7 m (23 ft)		1 m (3 ft)	
			75% Load	100% Load	75% Load	100% Load	75% Load	100% Load	75% Load	100% Load	75% Load	100% Load	75% Load	100% Load
P33-3	Prime	93	61	62	67	68	76	77	61	63	67	69	77	79
	Standby	93	61	62	67	68	76	77	61	64	67	70	78	80
P33-6	Prime	94	59	61	65	67	75	77	–	–	–	–	–	–
	Standby	94	60	62	66	68	76	78	–	–	–	–	–	–
P50-3	Prime	93	57	58	63	64	74	74	60	61	66	67	76	77
	Standby	93	57	58	63	64	74	75	60	62	66	68	77	78
P50-4	Prime	90	56	56	62	62	74	75	–	–	–	–	–	–
	Standby	90	56	57	62	63	74	75	–	–	–	–	–	–
P55-3	Prime	93	57	58	63	64	74	75	60	62	66	68	77	78
	Standby	93	57	59	63	65	74	76	61	62	67	68	77	79
P55-4	Prime	91	56	57	62	63	74	74	–	–	–	–	–	–
	Standby	91	56	57	62	63	74	75	–	–	–	–	–	–
P65-5	Prime	93	58	60	64	66	74	76	61	63	67	69	77	79
	Standby	93	58	61	64	67	75	77	62	64	68	70	78	80
P65-6	Prime	91	58	59	64	65	75	76	–	–	–	–	–	–
	Standby	91	58	59	64	65	75	76	–	–	–	–	–	–
P88-3	Prime	92	58	59	64	65	76	76	61	61	67	67	78	79
	Standby	92	58	60	64	66	76	77	61	62	67	68	79	79
P88-6	Prime	96	61	61	67	67	79	79	–	–	–	–	–	–
	Standby	96	61	62	67	68	79	79	–	–	–	–	–	–
P110-3	Prime	96	62	63	68	69	80	81	65	65	71	71	84	84
	Standby	96	63	64	69	70	80	81	65	66	71	72	84	84
P110-6	Prime	94	61	62	67	68	79	79	–	–	–	–	–	–
	Standby	94	62	62	68	68	79	79	–	–	–	–	–	–
P150-5	Prime		60	61	66	67	76	76	61	61	67	67	77	77
	Standby		60	61	66	67	76	77	61	61	67	67	77	78
P165-5	Prime		59	59	65	65	74	74	61	62	67	68	77	77
	Standby		59	59	65	65	74	75	62	62	68	68	77	78
P165-6	Prime		58	59	64	65	73	74	–	–	–	–	–	–
	Standby		58	59	64	65	74	74	–	–	–	–	–	–
P175-2	Prime		58	59	64	65	74	74	–	–	–	–	–	–
	Standby		58	59	64	65	74	75	–	–	–	–	–	–
P200-3	Prime	97	62	62	68	68	78	78	65	65	71	71	81	81
	Standby	97	62	63	68	69	78	78	65	65	71	71	81	81
P200-6	Prime		59	60	65	66	74	75	–	–	–	–	–	–
	Standby		59	60	65	66	74	75	–	–	–	–	–	–
P220-3	Prime	97	62	64	68	70	78	79	–	–	–	–	–	–
	Standby	97	63	64	69	70	78	79	–	–	–	–	–	–

Levels in accordance with European Noise Directive (2000/14/EC).

Sound Pressure Levels (dBA) for CAE Enclosure

Generator Set Model			50 Hz						60 Hz					
			15 m (50 ft)		7 m (23 ft)		1 m (3 ft)		15 m (50 ft)		7 m (23 ft)		1 m (3 ft)	
			75% Load	100% Load	75% Load	100% Load	75% Load	100% Load	75% Load	100% Load	75% Load	100% Load	75% Load	100% Load
P26-3S	Prime	93	61	62	67	68	76	77	61	63	67	69	77	79
	Standby	93	61	62	67	68	76	77	61	64	67	70	78	80
P26-6S	Prime	94	59	61	65	67	75	77	–	–	–	–	–	–
	Standby	94	60	62	66	68	76	77	–	–	–	–	–	–
P40-3S	Prime	93	57	58	63	64	74	74	60	61	66	67	76	77
	Standby	93	57	58	63	64	74	75	60	62	66	68	77	78
P40-4S	Prime	90	56	56	62	62	74	75	–	–	–	–	–	–
	Standby	90	56	57	62	63	74	75	–	–	–	–	–	–
P50-5S	Prime	–	57	59	63	65	74	76	61	62	67	68	77	79
	Standby	–	58	60	64	66	75	77	61	63	67	69	77	79
P55-6S	Prime	–	58	59	64	65	75	76	–	–	–	–	–	–
	Standby	–	58	59	64	65	75	76	–	–	–	–	–	–
P90-3S	Prime	–	62	63	68	69	80	81	65	65	71	71	84	84
	Standby	–	63	64	69	70	80	81	65	66	71	72	84	84
P90-6S	Prime	–	61	62	67	68	79	79	–	–	–	–	–	–
	Standby	–	62	62	68	68	79	79	–	–	–	–	–	–

Levels in accordance with European Noise Directive (2000/14/EC).



Dimensions and Weights for CAE Enclosure

Generator Set Model	A: mm	B: mm	C: mm	D*: mm	Weight: kg FGL	Weight: kg Marelli	Weight: kg LS	Fuel Capacity: l
Three Phase Models								
P33-3	2120	970	1525	718	963	1002	991	161
P33-6	2120	970	1525	718	963	1002	991	161
P50-3	2300	1120	1525	795	1191	1237	1191	219
P50-4	2300	1120	1525	795	1188	1229	1183	219
P55-3	2300	1120	1525	795	1196	1237	1196	219
P55-4	2300	1120	1525	795	1236	1277	1236	219
P65-5	2300	1120	1525	795	1205	1279	1207	219
P65-6	2300	1120	1525	795	1245	1319	1247	219
P88-3	2300	1120	1525	795	1358	1416	1391	219
P88-6	2770	1120	1525	896	1496	1554	1529	250
P110-3	2770	1120	1525	896	1511	1615	1547	250
P110-6	2770	1120	1525	896	1640	1744	1637	250
P150-5	3520	1120	1815	1145	1888	1975	1918	349
P165-5	3520	1120	1815	1145	1981	2113	2016	349
P165-6	3520	1120	1815	1145	2411	2543	2446	349
P175-2	3520	1120	1815	1145	2446	2543	2584	349
P200-3	3520	1320	1815	1080	2172	2203	2198	418
P200-6	3520	1320	1815	1080	2217	2248	2227	418
P220-3	3520	1320	1815	1080	2157	2273	2238	418
Single Phase Models								
P26-3S	2120	970	1525	718	1000	-	991	161
P26-6S	2120	970	1525	718	1000	-	991	161
P40-3S	2300	1120	1525	795	1247	-	1247	219
P40-4S	2300	1120	1525	795	1199	-	1199	219
P50-5S	2300	1120	1525	795	1315	-	1315	219
P55-6S	2300	1120	1525	795	1355	-	1355	219
P90-3S	2770	1120	1525	899	1643	-	1613	250
P90-6S	2770	1120	1525	899	1643	-	1653	250

*Clearance required both sides; Weight with lube oil, no coolant, no fuel.

5

FG Wilson manufactures product in the following locations:
Northern Ireland • Brazil • China • India • USA
With headquarters in Northern Ireland, FG Wilson operates through a Global Dealer Network.
To contact your local Sales Office please visit the FG Wilson website at www.FGWilson.com.
FG Wilson is a trading name of Caterpillar (NI) Limited.

In line with our policy of continuous product development, we reserve the right to change specification without notice.

24-220 WA/Inclosure/0816/GB

FIGURE 16: LIFE SAFETY PLANT DATA (GENERATOR)

vent engineering
natural and smoke ventilation systems

ventec SERIES 1000-G | AXF630

SHAFT FAN

UK SMOKE BS EN12101-3 CERTIFIED STANDARD

NEXT DAY DESPATCH

Fläkt Woods DESIGN & TECHNOLOGY

SMOKE VENTILATION

ENVIRO VENTILATION

380-420V POWER INPUT

1000-G COMPATIBLE

2HR @ 300° ONE OFF USE

630mm FAN DIAMETER

About This Product

Manufactured by Fläkt Woods, Ventec AXF 630 high temperature axial extract fans with high efficiency rating are tested and certified to BS EN12101-3.

Fully compatible with the Ventec 1000-G smoke ventilation control system including the optional Enviro Assist mode. Enviro Assist is designed to exhaust heat and used air from your building, introducing fresher, cooler air and reducing the need for air conditioning system use. The speed of the fans can be reduced to 20% of full speed via the Ventec Fan Control Panel invertor.

Two fans, mounted in series (Duty / Standby) come complete with an externally mounted pre-wired electrical terminal box.

This data sheet includes information based on installation with unpodded cylindrical attenuation. Silencers to be mounted directly to fans.

Product Highlights

- Fan Duty – 6.0m³/s @ 350 Pa
- IP55 motor protection rating
- Fans tested to ISO5801 and BS 848
- Low installed noise levels
- Temperature Range: -40°C to 50°C as standard
- 2 hours at 300°C one off emergency use

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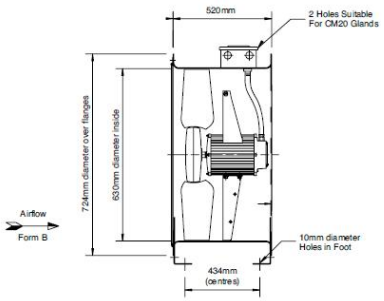
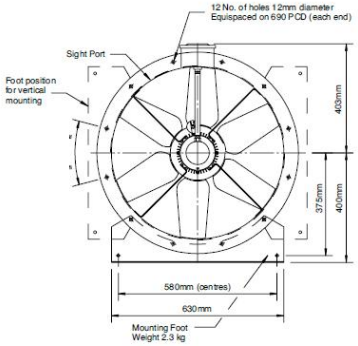
ventec SERIES 1000-G | AXF630

SHAFT FAN

Dimensions (630mm fan – 112M motor frame)





DETAILED TECHNICAL DRAWING ON FINAL PAGE

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SHAFT FAN

Technical Data (630mm fan diameter)

Fläkt Woods Fan Code	HT63JM/3I/2/3/28
Fan Internal Diameter	630mm
Blades	3
Fan Speed	2910 rpm
Velocity	20.0 m/s
Blade Angle	28°
Installation Type / Form of Running	B / B
Fan Casing	Long
Requested Duty	6.0m³/s @ 350 Pa (static)
Actual Emergency Duty	6.23m³/s @ 504 Pa (static)
Outlet Dynamic Pressure	240 Pa
Standby Fan Idling Loss	167 Pa
Duty Shaft Power	7.77 kW
Maximun Shaft Power	7.98 kW
Total Efficiency	59.7%
Motor Frame	112M
Motor Rating	8.25 kW [IE2]
Full Load Current	15.5 A

Starting Current	99.42 A
Motor Mounting	Pad
Electrical Supply	415 Volts / 50 Hz / 3 Phase
Start Type	DOL (direct on line)
Motor Winding	Standard
Enclosure	Standard All
ErP [FMEG] Rating	N 58 (ErP Compliant 2015)
ErP [FMEG] Target	N 55
FMEG Blade Angle	20°
Measurement Category	B (Total)
VSD	No
Fan + Motor Efficiency	56.6% (4.89 m³/s @ 601 Pa)
Motor Input Power (ErP)	5.19 kW
SFP value	1.43 W/(l/s) @ Actual Duty
Power from mains	8.9 kW
Energy Consumption	26713 kWh (3000 h/year)
Running Cost / Year	approx. £3206
Air Density	1.2 kg/m³ / 20°C / 0 m / 50% RH
Smoke Venting	300°C / 2 Hours (F300+)

Vent Engineering advises that the design, supply, and installation of all electrical wiring be carried out in accordance with current standards.

Sound Data

	Sound Spectrum (Hz)								Overall	
	63	125	250	500	1k	2k	4k	8k	Lw*	LpA @ 3m**
Inlet*	104	107	105	101	96	93	90	87	111	83
Outlet*	106	109	106	101	96	94	92	89	113	83
Breakout*	96	88	80	76	71	67	73	65	97	60

* Lw dB re 10-12W ** dBA re 2x 10-5 Pa – Sound data at actual duty.
Selection includes run / standby in series losses. Sound levels could differ to those stated, dependent on fan spacing.

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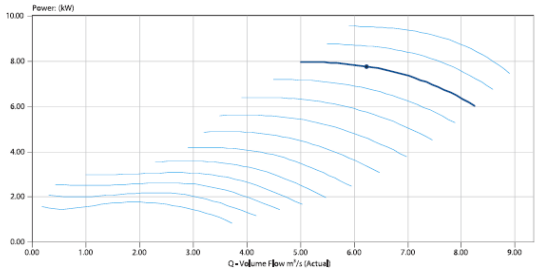
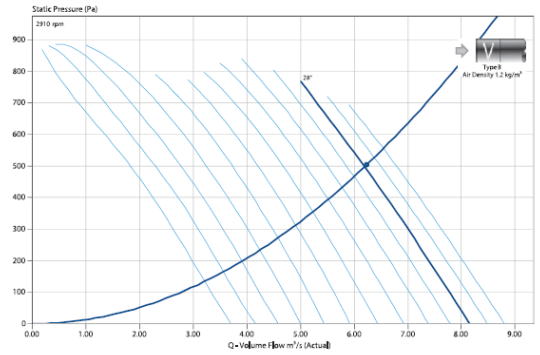
SHAFT FAN

Performance Data (continued)





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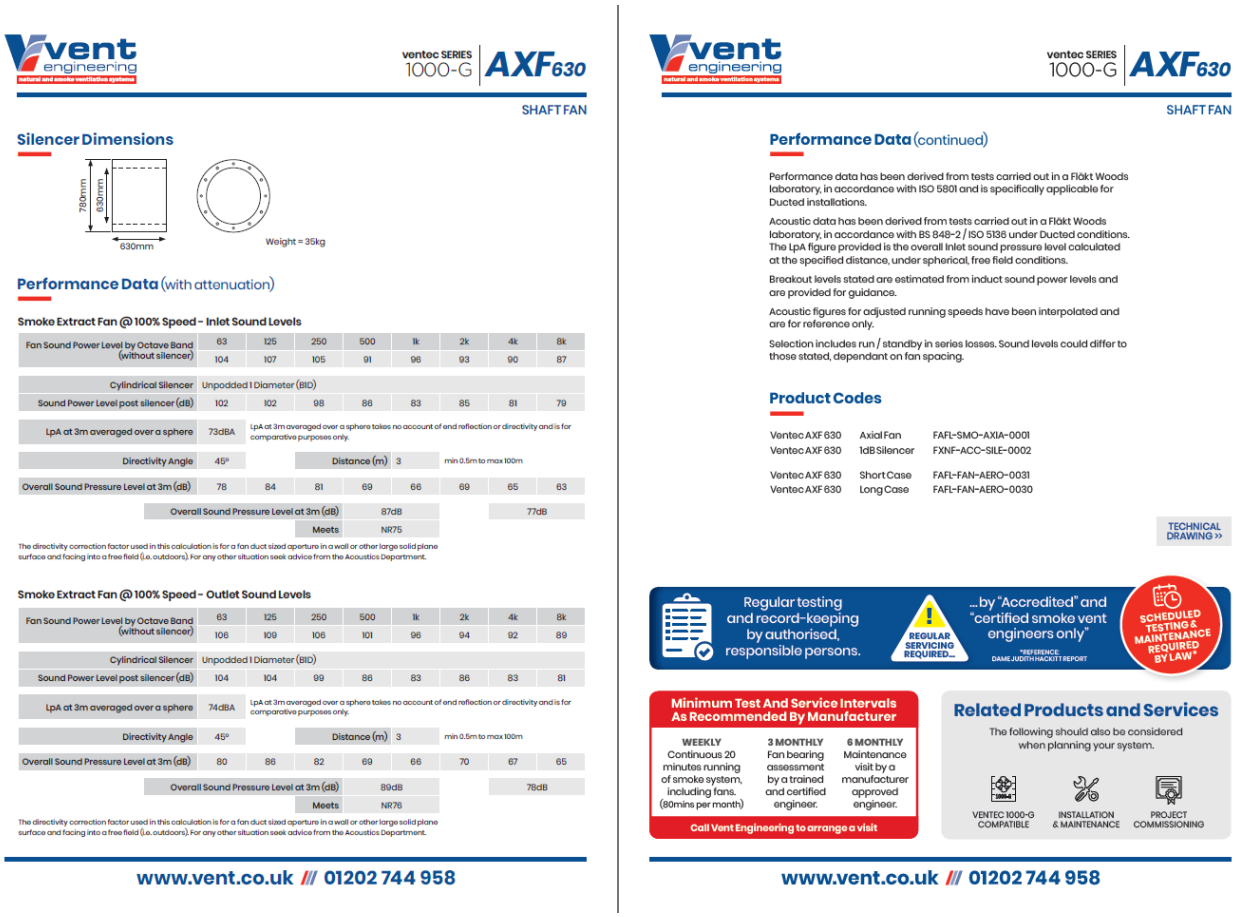

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SHAFT FAN

Silencer Dimensions

Weight = 35kg

Performance Data (with attenuation)

Smoke Extract Fan @ 100% Speed - Inlet Sound Levels

Fan Sound Power Level by Octave Band (without silencer)	63	125	250	500	1k	2k	4k	8k
	104	107	105	91	96	93	90	87
Cylindrical Silencer	Unpodded I Diameter (BID)							
Sound Power Level post silencer (dB)	102	102	98	86	83	85	81	79
LpA at 3m averaged over a sphere	73dBA	LpA at 3m averaged over a sphere takes no account of end reflection or directivity and is for comparative purposes only.						
Directivity Angle	45°		Distance (m)	3	min 0.5m to max 100m			
Overall Sound Pressure Level at 3m (dB)	78	84	81	69	66	69	65	63
Overall Sound Pressure Level at 3m (dB)				87dB			77dB	
Meets				NR75				

The directivity correction factor used in this calculation is for a fan duct sized aperture in a wall or other large solid plane surface and facing into a free field (i.e. outdoors). For any other situation seek advice from the Acoustics Department.

Smoke Extract Fan @ 100% Speed - Outlet Sound Levels

Fan Sound Power Level by Octave Band (without silencer)	63	125	250	500	1k	2k	4k	8k
	106	109	106	101	96	94	92	89
Cylindrical Silencer	Unpodded I Diameter (BID)							
Sound Power Level post silencer (dB)	104	104	99	86	83	86	83	81
LpA at 3m averaged over a sphere	74dBA	LpA at 3m averaged over a sphere takes no account of end reflection or directivity and is for comparative purposes only.						
Directivity Angle	45°		Distance (m)	3	min 0.5m to max 100m			
Overall Sound Pressure Level at 3m (dB)	80	86	82	69	66	70	67	65
Overall Sound Pressure Level at 3m (dB)				89dB			78dB	
Meets				NR76				

The directivity correction factor used in this calculation is for a fan duct sized aperture in a wall or other large solid plane surface and facing into a free field (i.e. outdoors). For any other situation seek advice from the Acoustics Department.

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SHAFT FAN

Performance Data (continued)

Performance data has been derived from tests carried out in a Flakt Woods laboratory, in accordance with ISO 5801 and is specifically applicable for Ducted installations.

Acoustic data has been derived from tests carried out in a Flakt Woods laboratory, in accordance with BS 848-2 / ISO 5136 under Ducted conditions. The LpA figure provided is the overall inlet sound pressure level calculated at the specified distance, under spherical, free field conditions.

Breakout levels stated are estimated from induct sound power levels and are provided for guidance.

Acoustic figures for adjusted running speeds have been interpolated and are for reference only.

Selection includes run / standby in series losses. Sound levels could differ to those stated, dependant on fan spacing.

Product Codes

Ventec AXF 630	Axial Fan	FAFL-SMO-AXIA-0001
Ventec AXF 630	1dB Silencer	FXNF-ACC-SILE-0002
Ventec AXF 630	Short Case	FAFL-FAN-AERO-0031
Ventec AXF 630	Long Case	FAFL-FAN-AERO-0030

TECHNICAL DRAWING >>

Regular testing and record-keeping by authorised, responsible persons.

REGULAR SERVICING REQUIRED...

...by "Accredited" and "certified smoke vent engineers only"

*REFERENCE: DAME JUDITH HACKITT REPORT

SCHEDULED TESTING & MAINTENANCE REQUIRED BY LAW*

Minimum Test And Service Intervals As Recommended By Manufacturer

WEEKLY
Continuous 20 minutes running of smoke system, including fans. (80mins per month)

3 MONTHLY
Fan bearing assessment by a trained and certified engineer.

6 MONTHLY
Maintenance visit by a manufacturer approved engineer.

Call Vent Engineering to arrange a visit

Related Products and Services

The following should also be considered when planning your system.

VENTEC 1000-G COMPATIBLE

INSTALLATION & MAINTENANCE

PROJECT COMMISSIONING

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FIGURE 17: LIFE SAFETY PLANT DATA (SMOKE EXTRACT)

APPENDIX D – NOISE MODELLING…

The large scale and complexity of the site, with numerous areas where sound will be generated and screened by buildings and features, lends itself to using an environmental noise model. We have used a software package to generate a noise map of the site and the immediate surroundings.

The software used implements the methodology set out in ISO 9613-2 *Acoustics – Attenuation of Sound During Propagation Outdoors – Part 2: General Method of Calculation*.

The ISO propagation model calculates the sound pressure level from a source sound power level in each 1/1 octave band and subtracts various attenuation factors as follows,

$$L_{ft}(DW) = L_w + D_c - \left(A_{div} + A_{atm} + A_{gr} + A_{bar} + A_{misc}\right)$$

Where

$L_{ft}(DW)$ is the equivalent continuous downwind octave-band sound pressure level (dB)

L_w is the octave band sound power level (dB)

D_c is a directivity correction that describes the extent by which the $L_{ft}(DW)$ deviates in a specified direction from the level of an omni-directional sound source (dB)

A_{div} is the attenuation due to geometrical divergence (dB)

A_{atm} is the attenuation due to atmospheric absorption (dB)

A_{gr} is the attenuation due to the ground effects (dB)

A_{bar} is the attenuation due to a barrier (dB)

A_{misc} is the attenuation due to miscellaneous other effects such as foliage, industrial sites and housing (dB).

The A-weighted total level is obtained by combining the octave band levels with the appropriate weighting and summing the contributions from each source.

Our calculations are performed using a proprietary software package, Predictor V2024 available through Softnoise in the UK, and it should be noted that the model is an approximation of the real situation. The calculated values are based on geometry information included in the model, some of which is approximate.

The noise model has assumed all areas to be a ‘hard’ ground surface. This is considered to represent a worst case. It has also included the effects of air absorption at 273 K at 101 kPa and 60% humidity.

The predicted noise levels are based on information made available from the design team and end-users. A flat topography has been used for the model.

The countours shown are calculated at 24 m above ground level, i.e. at the height of the receiver.

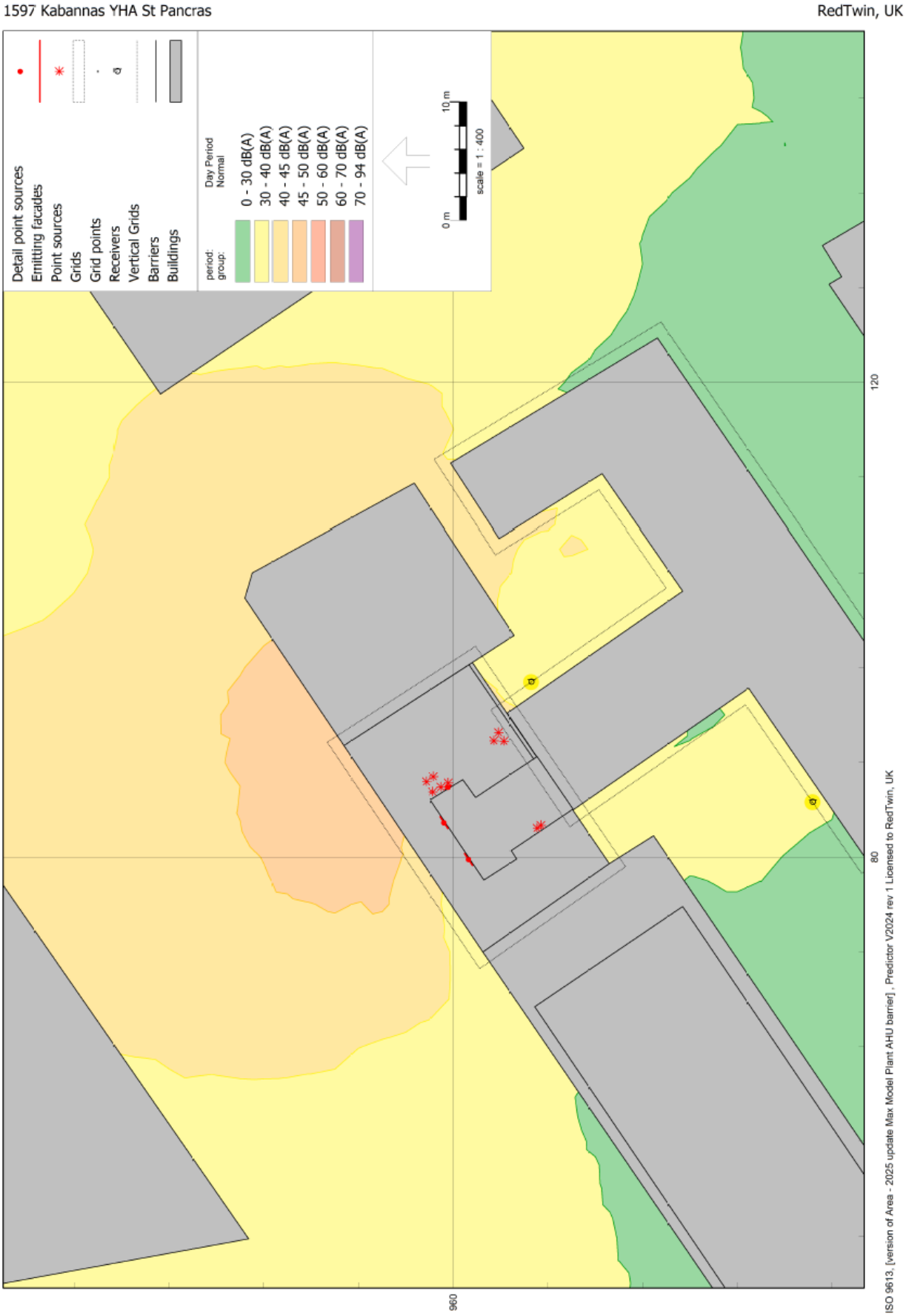

FIGURE 18: CALCULATED NOISE CONTOURS (NORMAL EQUIPMENT AT NORMAL DUTY)

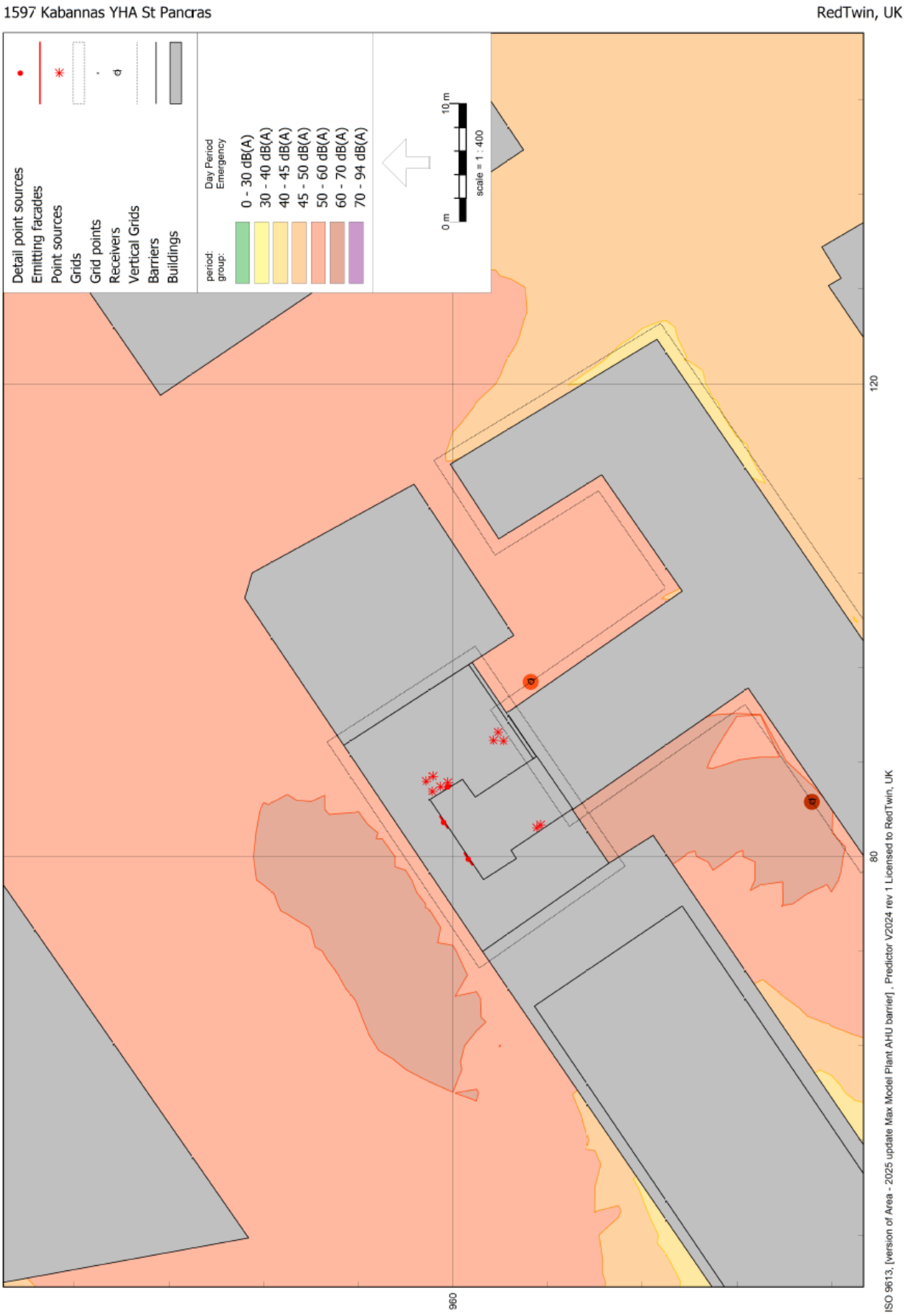

FIGURE 19: CALCULATED NOISE CONTOURS (EMERGENCY EQUIPMENT ONLY)