

Gopuff
Unit 26
Midland Street
Manchester
M12 6LB

Plant Noise Impact Assessment

On behalf of

gopuff

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Executive Summary

Noise Solutions Limited has been appointed to provide a noise impact assessment for a retrospective planning application dealing with plant serving the existing Gopuff warehouse in Manchester.

Three new air conditioning (AC) units have been installed within a service area at the rear of the unit.

An environmental noise survey has been undertaken to establish the existing prevailing noise levels at a location representative of the noise climate outside the nearest noise sensitive receptors to the proposed plant area. A plant noise survey was also undertaken to determine compliance with the local authority's usual requirements.

The assessment shows that the noise from the proposed plant will meet the local authority's usual requirements and should therefore be acceptable to them.

1.0 Introduction

- 1.1. Noise Solutions Ltd (NSL) has been commissioned to provide a noise impact assessment for existing plant serving the Gopuff warehouse in Manchester.
- 1.2. An environmental sound survey has been undertaken to establish the prevailing background sound pressure levels at a location representative of the sound levels outside the nearest noise sensitive receptors to the site.
- 1.3. Noise levels from the plant have been measured in situ and assessed against the local authority's usual requirements and recognised standards.
- 1.4. A glossary of acoustic terminology is given in [Appendix A](#).

2.0 Details of development proposals

- 2.1. The existing warehouse unit occupies a unit on Midland Street in Manchester. Plant is currently located within a service area at the rear (north) of the premises.
- 2.2. The proposed plant layout is shown in [Appendix D](#). Plant noise data is given in [Appendix E](#).
- 2.3. A site plan showing the site and surrounding area, the nearest noise sensitive properties and the noise monitoring location used in this assessment is presented in [Appendix B](#).

3.0 Nearest noise sensitive receptors

- 3.1. The area surrounding the site comprises a combination of industrial and residential buildings. The nearest residential properties to the plant are on Viaduct Street, to the northeast of the site (Receptor R1). The closest windows are approximately 183m from the nearest plant. This receptor is completely screened by the proposed unit due to building geometry.

4.0 Existing noise climate

- 4.1. An environmental noise survey was undertaken to establish the typical background sound levels at a location representative of the noise climate outside the façades of the nearest noise sensitive receptors to the proposed plant area during the quietest times at which the plant will operate.
- 4.2. Noise measurements were undertaken during a representative hour during the daytime period and a representative hour during the night-time period.

- 4.3. The results of the environmental sound survey are summarised in Table 1 below. The full set of measurement results and details of the survey methodology are presented in [Appendix C](#).

Table 1 Summary of survey results

Measurement period	Range of recorded sound pressure levels (dB)			
	L _{Aeq} (15mins)	L _{Amax} (15mins)	L _{A10} (15mins)	L _{A90} (15mins)
Daytime (22.00 – 23.00 hours)	55-56	68-73	58-59	43-46
Night-time (02.00 – 03.00 hours)	50-53	67-68	54-57	33-37

- 4.4. To ensure a robust assessment, the lowest measured values for the daytime and night-time periods have been selected for the plant noise assessment.

5.0 Plant noise design criteria

Manchester City Council

- 5.1. Correspondence with Manchester City Council's Planning Officer has confirmed the following conditions associated with this application:

For external equipment, the following condition is normally recommended:

a) Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location. Prior to commencement of the use hereby approved the scheme shall be submitted to and approved in writing by the City Council as local planning authority in order to secure a reduction in the level of noise emanating from the site. The scheme shall be implemented in full before the use commences or as otherwise agreed in writing by the City Council as local planning authority.

b) Prior to the operation of the scheme a verification report shall be submitted to and approved in writing by the City Council as local planning authority to validate that the work undertaken throughout the development conforms to the recommendations and requirements in the approved acoustic report. The report shall also undertake post completion testing to confirm that the noise criteria have been met. Any instances of non-conformity with the recommendations in the report shall be detailed along with any measures required to ensure compliance with the agreed noise criteria.

However, as this an application for retrospective planning permission, and the units are already in place, this information is required prior to determination of the application.

BS 4142:2014 Methods for rating and assessing industrial and commercial sound

- 5.2. BS 4142:2014 is intended to be used to assess the likely effects of sound on people residing in nearby dwellings. The scope of BS 4142:2014 includes *"sound from fixed plant installations which comprise mechanical and electrical plant and equipment"*.
- 5.3. The procedure contained in BS 4142:2014 is to quantify the *"specific sound level"*, which is the measured or predicted level of sound from the source in question over a one hour period for the daytime and a 15 minute period for the night-time. Daytime is defined in the standard as 07:00 to 23:00 hours, and night-time as 23:00 to 07:00 hours.
- 5.4. The specific sound level is converted to a rating level by adding penalties on a sliding scale to account for either potentially tonal or impulsive elements. The standard sets out objective methods for determining the presence of tones or impulsive elements, but notes that it is acceptable to subjectively determine these effects.
- 5.5. The penalty for tonal elements is between 0dB and 6dB, and the standard notes: *"Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible."*
- 5.6. The penalty for impulsive elements is between 0dB and 9dB, and the standard notes: *"Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible."*
- 5.7. The assessment outcome results from a comparison of the rating level with the background sound level. The standard states:
- *Typically, the greater this difference, the greater the magnitude of the impact.*
 - *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context;*
 - *A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context;*
 - *The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.*

- 5.8. The standard does state that *"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."*
- 5.9. The standard goes on to note that: *"Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night."*
- 5.10. In addition to the margin by which the Rating Level of the specific sound source exceeds the Background Sound Level, the 2014 edition places emphasis upon an appreciation of the context, as follows:
- "An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context."*
- 5.11. BS 4142:2014 requires uncertainties in the assessment to be considered, and where the uncertainty is likely to affect the outcome of the assessment, steps should be taken to reduce the uncertainty.

Low background sound levels

- 5.12. Due to the low prevailing environmental noise levels measured during the night-time period, it is proposed that the plant noise design criterion at the nearest residences should be capped at 30dBA at night. This proposed criterion is based on guidance found in Section 11 of BS 4142:2014 which states:

Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.

- 5.13. A plant noise level of 30dBA at the façade would result in an internal noise level of 15dBA, which is likely to be lower than self-generated noise internally (for example, from domestic refrigerators). This assumption is based on guidance found in BS 8233:2014, which states that approximately 15dB of insulation is provided by a partially open window.

Summary of criteria

- 5.14. As noted above, Manchester City Council requires that noise from new plant, at the nearest noise-sensitive premises, must be at least 5dB below the existing background sound level during the daytime and night-time periods.
- 5.15. Table 2 below presents the proposed plant noise rating level at the nearest residences.

Table 2 Proposed plant noise rating level at noise sensitive residential receptors

Period	Cumulative plant noise rating level, dB(A)
Daytime (07.00 – 23.00 hours)	38
Night-time (23.00 – 07.00 hours)	30

- 5.16. It should be noted that the above criteria are below the level which would have a “low impact, depending on the context” using BS 4142:2014.

6.0 Plant noise survey and assessment

Plant noise survey methodology

- 6.1. Noise Solutions Ltd attended site between 1915 and 21.00 hours on Thursday 18th June 2022 to measure noise emissions from the plant.
- 6.2. Measurements of sound pressure levels were undertaken with the microphone positioned on a tripod at various distances from the existing plant. Details of the measurement location can be found in [Appendix B](#).
- 6.3. Measurements were taken with the air conditioning units operating on and off simultaneously and in isolation.
- 6.4. Measurements were taken with the condensers operating continuously and at maximum duty (where all fans are running at maximum output, used primarily when ambient temperatures are high). Noise measurements were also taken with the condensers switched off.
- 6.5. Measurements of plant noise emissions were undertaken over short durations (30 seconds) to minimise the influence of extraneous sources (e.g., car pass-bys, passing aircraft, etc.).

- 6.6. Both broadband and one-third octave band frequency data was measured. The measured L_{A90} noise measurements have been used in this assessment since noise from the plant was constant during operation and, again, this minimised influence from extraneous sources.
- 6.7. Details of the noise monitoring equipment used during the survey are detailed in the following table.

Table 3 Details of noise monitoring equipment

Description	Model / serial no.	Calibration date	Calibration certificate no.
Class 1 Sound level meter	Svantek 977 / 36190	25/05/2021	1500077-1
Condenser microphone	ACO Pacific 7052E / 74975		
Preamplifier	Svantek SV12L / 10325		
Calibrator	Svantek SV33A / 73430	28/06/2022	1502822-1

- 6.8. Weather conditions during the survey were still with a temperature of 17°C with clear skies. Road surfaces in the surrounding area were dry. Weather conditions were unlikely to have affected the results of the plant noise survey.

Results

- 6.9. The results of the various plant noise measurements are summarised in Table 4 below. The measured levels have been corrected to take residual sound levels into account to determine the specific plant noise level for each item.

Table 4 Summary of external plant noise measurements at measurement locations

Plant	Distance from plant (m)	Ambient noise level, L_{A90} (dB)	Residual noise level, L_{A90} (dB)	Specific noise level @ 5m, L_{A90} (dB)
All	1	56	49	-
	5	54	49	52
GM1401ATP-E	1	57	49	-
	5	54	49	52
GM2801AT8-E1	1	52	49	-
	5	51	49	47
GM2801AT8-E1	1	54	49	-
	5	53	49	50

- 6.10. It must also be noted that the ambient noise levels for some of the measurements are comparable to the residual levels. There will be an element of inaccuracy when determining the specific noise level when the difference between the ambient and residual levels is small.
- 6.11. There is observed to be a smaller than expected difference between the measured noise levels at 1 and 5m. This strongly suggests that the residual sound level has been underestimated, and therefore that noise levels from the plant have been overestimated, which will lead to a robust assessment.

External noise assessment

- 6.12. The plant noise levels at the nearest noise sensitive receptors have been predicted based on the measurements obtained for the existing plant. The assessment has considered distance losses and surface acoustic reflections from the store building.
- 6.13. It should be noted that the proposed plant is not anticipated to exhibit any tonal or impulsive characteristics provided it is well maintained. All proposed plant will be inverter driven and, therefore, will gently ramp up and down depending on the demands on the various systems. The plant is also not expected to contain any significant low frequency tones, as stated in BS 4142:2014. At worst, a penalty of 3dB as described in BS 4142:2014 may be applied for the possible presence of *"...characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment..."*.

Table 5 Calculation of cumulative plant noise levels at the nearest receptor (R1)

Plant	Specific noise level, L_{A90} (dB)	Distance to R1 from plant (m)	Distance correction (dB)	Screening (dB)*	BS 4142:2014 Feature Correction (dB)	Plant rating level at R1 (dB)
All	52	181	-31	-15	3	9
GM1401ATP-E	52	181	-31	-15	3	9
GM2801AT8-E1	47	181	-31	-15	3	4
GM2801AT8-E1	50	181	-31	-15	3	7

**Screening due to surrounding buildings blocking line of sight from condensers to R1*

- 6.14. Table 6 provides a comparison of the noise levels calculated at the sensitive receptors with the daytime and night-time emissions criteria for each sensitive receptor.

Table 6 Summary of results (R1)

Plant	Plant rating level at receptor(dB)	Daytime / Night-time Criterion	Difference
All	9	38 / 30	-29 / -21
GM1401ATP-E	9	38 / 30	-29 / -21
GM2801AT8-E1	4	38 / 30	-34 / -26
GM2801AT8-E1	7	38 / 30	-31 / -23

- 6.15. As seen above, noise levels have been determined to show compliance with the local authority's criteria in accordance with BS 4142:2014 at the assessed noise-sensitive receptor.
- 6.16. The assessment shows that noise from the plant is comfortably below the proposed criteria and would therefore be below the level at which a "low impact" would be expected, when assessed using the methodology in BS 4142:2014. The assessment demonstrates compliance with Manchester City Council's requirements and, therefore, the proposals should be acceptable to them in terms of noise.

Context and uncertainties

- 6.17. As BS 4142:2014 advises, the impact must be considered within the context of the site and the surrounding acoustic environment. The following must, therefore, also be taken into consideration when determining the potential impact that may be experienced:
- The assessment is undertaken at the nearest residential window. The impact on all other nearby residential windows will be lower due to screening and distance attenuation.
 - The assessment has been made with all plant operating at maximum capacity, as this is not always the case, the assessment is an absolute worst-case scenario.
 - As noted in the results section, the noise levels due to the plant are likely to have been overestimated, leading to a more robust assessment.
- 6.18. Where possible uncertainty in the above assessments has been minimised by taking the following steps:
- The meter and calibrator used have a traceable laboratory calibration and the meter was field calibrated before and after the measurements.
 - Uncertainty in the calculated impacts has been reduced by the use of a well-established calculation method.

- Care was taken to ensure that the measurement positions were representative of the noise climate outside the nearby residential dwellings and not in positions where higher noise levels were present.

7.0 Summary

- 7.1. Noise Solutions Ltd (NSL) has been commissioned to provide a noise impact assessment on existing plant serving the Gopuff warehouse in Manchester.
- 7.2. An environmental noise survey has been undertaken to establish the existing prevailing noise levels at a location representative of the noise climate outside the nearest noise sensitive receptors to the proposed plant area. A plant noise survey was also undertaken to determine compliance with the local authority's usual requirements.
- 7.3. The assessments shows that noise from the proposed plant will comply with recognised Standards and guidance and should therefore be acceptable to the local authority.

Appendix A Acoustic terminology

Parameter	Description
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near ($L_{Aeq,T}$).
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s_1 and s_2 is given by $20 \log_{10} (s_1/s_2)$. The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is $20\mu\text{Pa}$. The threshold of normal hearing is in the region of 0 dB and 140 dB is the threshold of pain. A change of 1 dB is only perceptible under controlled conditions.
dB(A), L_{Ax}	Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).
Fast Time Weighting	Setting on sound level meter, denoted by a subscript F, that determines the speed at which the instrument responds to changes in the amplitude of any measured signal. The fast time weighting can lead to higher values than the slow time weighting when rapidly changing signals are measured. The average time constant for the fast response setting is 0.125 (1/8) seconds.
Free-field	Sound pressure level measured outside, far away from reflecting surfaces (except the ground), usually taken to mean at least 3.5 metres
Façade	Sound pressure level measured at a distance of 1 metre in front of a large sound reflecting object such as a building façade.
$L_{Aeq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level recorded during a noise event with a period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise. $L_{A10,18h}$ is the A-weighted arithmetic average of the 18 hourly $L_{A10,1h}$ values from 06:00-24:00.
$L_{90,T}$	A noise level index. The noise level that is exceeded for 90% of the measurement time interval, T. It gives an indication of the lower levels of fluctuating noise. It is often used to describe the background noise level and can be considered to be the "average minimum" noise level and is a term used to describe the level to which non-specific noise falls during quiet spells, when there is lull in passing traffic for example.

Appendix B Photograph of site showing areas of interest



Appendix C Environmental sound survey

Details of environmental sound survey

- C.1 Measurements of the existing background sound levels were undertaken between 22.00 hours and 23.00 on Wednesday 24th August and 02.00 hours and 03.00 hours on Thursday 25th August 2022.
- C.2 The sound level meter was programmed to record the A-weighted L_{eq} , L_{90} , L_{10} and L_{max} noise indices for consecutive fifteen-minute sample periods for the duration of the survey.

Measurement position

- C.3 The sound level meter was positioned on a tripod on Viaduct Street. The approximate location of the microphone is indicated on the aerial photograph in [Appendix B](#). In accordance with BS 7445-2:1991 '*Description and measurement of environmental noise – Part 2: Guide to the acquisition of data pertinent to land use*', the measurements were undertaken under free-field conditions.
- C.4 The survey location was chosen such that the lowest background noise levels were similar to those at the nearest residential receptors but exclude any potential effect of noise from existing plant serving the site.

Equipment

- C.5 Details of the equipment used during the survey are provided in the table below. The sound level meter was calibrated before and after the survey; no significant change (+/-0.2 dB) in the calibration level was noted.

Description	Model / serial no.	Calibration date	Calibration certificate no.
Class 1 Sound level meter	Svantek 971 / 111625	18/06/2021	Factory conformation certificate
Condenser microphone	ACO Pacific 7052E / 80034		
Preamplifier	Svantek SV18 / 112630		
Calibrator	Rion NC-74 /34235932	23/09/2021	1500910-1

C.6 Weather conditions were determined both at the start and on completion of the survey. It is considered that the meteorological conditions were appropriate for environmental noise measurements. The table below presents the weather conditions recorded on site at the beginning and end of the survey.

Weather Conditions				
Measurement Location	Date	Description	22.00 hours	03.00 hours
As indicated on Appendix B	22.00 24/8/22 - 03.00 25/8/22	Temperature (°C)	19	17
Cloud Cover Symbol Scale in oktas (eighths)  0 Sky completely clear  1  2  3  4 Sky half cloudy  5  6  7  8 Sky completely cloudy  (9) Sky obstructed from view <td>Precipitation:</td> <td>No</td> <td>Light</td>		Precipitation:	No	Light
		Cloud cover (oktas – see guide)	7	8
		Presence of fog/snow/ice	No	No
		Presence of damp roads/wet ground	No	Yes
		Wind Speed (m/s)	<1	1.6
		Wind Direction	-	SE
		Conditions that may cause temperature inversion (i.e. calm nights with no cloud)	-	-

Results

The results of the survey are considered to be representative of the background sound pressure levels at the façades of the most affected noise sensitive receptors to the plant area during the quietest times at which the plant will operate. The noise climate at the measurement position was dominated by local road traffic and distant plant noise from surrounding industrial buildings.

Appendix D Plant layout



Appendix E Plant noise data

Plant Ref	Manufacturer / Model	Operating Hours
ACU1, ACU2	Toshiba / GM2801AT8-E1	Day and Night
ACU3	Toshiba / GP1401ATE1	Day and Night