Noise Impact Assessment

Palace Theatre, Manchester

Reference: 50-662-R1-1

Date: July 2022

NOISE IMPACT ASSESSMENT

Palace Theatre
Manchester

Prepared for:

ATG

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EXECUTIVE SUMMARY

BACKGROUND

Site Address	Palace Theatre, Oxford Street, Manchester M1 6FT
National Grid Reference	E 384105 N 397639
Proposed Development	Installation of new roof mounted plant consisting of two Air Handling Units and one Chiller Unit.
Report Objectives	The objectives of this report are to: • Identify, measure and assess the potential impact of any proposed sound sources associated with the development upon existing receptors in the immediate vicinity of the Site. The report follows current and relevant British Standards to provide a robust assessment.

ASSESSMENT

Surveys Completed	E3P have undertaken an unattended background and ambient sound survey in a position considered representative of the closest existing receptors over a 4-day period including for weekend.
Assessments	A 3D noise model has been constructed to assess potential commercial sound impact associated with the operation of the new Air Handling and Chiller Units. Given that the receptors are in close proximity and subject to existing roof mounted plant from the Palace Theatre, the assessment looks to ensure that any new plant items do not exceed existing sound levels or, as a minimum, do not result in unacceptable internal noise levels.
Mitigation Requirements	The assessment determined that the predicted noise levels from the new plant items would not result in an increase in noise levels at existing receptors. As such, there is considered no adverse impact above and beyond the existing situation. Furthermore, acceptable internal noise levels are achieved whilst in operation.

CONCLUSIONS

This assessment has shown that no adverse impact is predicted during the day at the receptors due to the proposed plant items.

As such, sufficient information has been provided in order to consider potential noise impact and found no adverse impact is expected.

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1. INTRODUCTION

1.1. BACKGROUND

E3P were commissioned by ATG to undertake a Noise Impact Assessment for a planning application for the installation of two Air Handling Units (AHU) and a Chiller Unit on the existing flat roof of the Palace Theatre in Manchester, to be referred to hereafter as *'the Site'*.

This assessment looks to determine the key noise sources associated with the proposed development and to assess their impact, if any, upon existing residential receptors and to specify mitigation measures, where required.

1.2. PROPOSED DEVELOPMENT

The client is looking to install two AHUs and one chiller on the northern flat roof area of the site to the immediate east of the existing operational plant.

The key sources of sound associated with the proposed development is the steady state sound from the AHUs and Chiller impacting upon existing receptors surrounding the site.

It is noted that St James, to the north and north west of the development site is for office use only. This is also true of Bridgewater House to the east. The closest noted residential receptor is to the west on Oxford Street where habitable room windows and balconies are located.

1.3. LIMITATIONS

Where a noise or vibration survey is required to inform an assessment, E3P will endeavour to ensure that all noise and vibration measurements taken are robust, representative and reliable in order to inform an accurate assessment at the time.

E3P will endeavour to capture all existing and proposed sources of sound and vibration at the time of the surveys and/or assessments. However, should new sources of sound be introduced, existing sources modified/changed, or characteristics of the sound be altered following completion of such, E3P cannot be held accountable for this.

Where mitigation measures are specified in this report, it should be noted that these measures are relative to a specific sound or vibration source, both in terms of the measured sound pressure and vibration level and the character of the sound source. Where either the sound pressure level or the character of the sound varies following completion of the sound survey, E3P cannot be held responsible for any subsequent variations in the proposed mitigation performance, for either absolute levels or frequency content.

2. ASSESSMENT METHODOLOGY

2.1. NATIONAL PLANNING POLICY FRAMEWORK

To prevent unacceptable risks from pollution, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be considered.

The national planning policy framework states that planning policies and decisions should aim to:

- Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development.
- Mitigate and reduce to a minimum, other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions.
- Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established.
- Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

2.2. NATIONAL PLANNING PRACTICE GUIDANCE

Noise needs to be considered when new developments may create additional noise and when new developments would be sensitive to the prevailing acoustic environment. When preparing local or neighbourhood plans, or taking decisions about new development, there may also be opportunities to consider improvements to the acoustic environment.

Local planning authorities' plan-making and decision-making should take account of the acoustic environment and in doing so consider:

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

In line with the explanatory note of the NPSE, this would include identifying whether the overall effect of the noise exposure (including the impact during the construction phase, where applicable) is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation.

The "observed effect levels" are as follows:

- **Significant observed adverse effect level:** This is the level of noise exposure above which significant adverse effects on health and quality of life occur.
- **Lowest observed adverse effect level:** This is the level of noise exposure above which adverse effects on health and quality of life can be detected.
- **No observed effect level:** This is the level of noise exposure below which no effect at all on health or quality of life can be detected.

Table 2.1 summarises the noise exposure hierarchy, based on the likely average response.

TABLE 2.1 NOISE EXPOSURE HIERARCHY

PERCEPTION	EXAMPLES OF OUTCOMES	INCREASING EFFECT LEVEL	ACTION
Not Noticeable	No effect.	No observed effect	No specific measures required
Noticeable and Not Intrusive	Noise can be heard but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No observed adverse effect	No specific measures required
Lowest Observed Adverse Effect Level			
Noticeable and Intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g., turning up volume of television, speaking more loudly, or having to close windows for some of the time because of the noise where there is no alternative ventilation. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed adverse effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Noticeable and Disruptive	The noise causes a material change in behaviour and/or attitude, e.g., avoiding certain activities during periods of intrusion, having to keep windows closed most of the time because of the noise where there is no alternative ventilation. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant observed effect	Avoid
Noticeable and Very Disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g., regular sleep deprivation/awakening, loss of appetite, significant/medically definable harm (auditory and non-auditory).	Unacceptable adverse effect	Prevent

The subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any situation. These factors include the following:

- The source and absolute level of the noise together with the time of day it occurs. Some types and level of noise will cause a greater adverse effect at night than if they occurred during the day. The adverse effect can also be greater simply because there is less background noise at night.
- For non-continuous sources of noise, the number of noise events, and the frequency and pattern of occurrence of the noise can be important.
- The spectral content of the noise and the general character of the noise. The local topology and topography should also be considered along with the existing and, where appropriate, the planned character of the area.

More specific factors to consider when relevant:

- Where applicable, the cumulative impacts of more than one source should be considered along with the extent to which the source of noise is intermittent and of limited duration.
- Consideration should also be given to whether adverse internal effects can be completely removed by closing windows and, in the case of new residential development, if the proposed mitigation relies on windows being kept closed most of the time. In both cases, a suitable alternative means of ventilation is likely to be necessary.
- If external amenity spaces are an intrinsic part of the overall design, then the acoustic environment of those spaces should be considered so that they can be enjoyed as intended.

2.3. BS 4142: 2014+A1:2019 'METHODS FOR RATING AND ASSESSING INDUSTRIAL AND COMMERCIAL SOUND'

This standard describes methods for rating and assessing sound of an industrial or commercial nature which includes:

- Sound from industrial and manufacturing processes.
- Sound from fixed installations which comprise mechanical and electrical plant and equipment.
- Sound from the loading and unloading of goods and materials at industrial and / or commercial premises; and
- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from processes or premises, such as that from forklift trucks, or that from train or ship movements on or around an industrial or commercial Site.

The procedure detailed in the standard compares the measured or predicted specific noise level from any of the above with the background sound level at a residential dwelling. The measured background sound level at a receptor should be reliable and should not necessarily ascertain a lowest measured background sound level, but rather to quantify what is typical.

The specific noise level also acknowledges the reference time intervals depending upon whether the noise source operates during daytime (1-hour) or night-time (15-minute) periods.

There are several 'penalties' which can be attributed to the specific sound level depending upon the 'acoustic features' of the sound level under investigation as follows:

Tonality

- +2 dB: where the tonality is just perceptible.
- +4 dB: where the tonality is clearly perceptible; and
- +6 dB: where the tonality is highly perceptible.

Impulsivity

- +3 dB: where the impulsivity is just perceptible.
- +6 dB: where the impulsivity is clearly perceptible; and
- +9 dB: where the impulsivity is highly perceptible.

Intermittency

- +3 dB: where the intermittency is readily distinctive against the acoustic environment.

In addition to the above, there is a penalty for 'other sound characteristics' of +3 dB where a sound exhibits characteristics that are neither tonal nor impulsive, though are readily distinctive against the acoustic environment. BS 4142 goes on to state that the rating level is equal to the specific sound level if there are no such features present or expected to be present.

Assessment of the rating level relative to the background sound level can yield the following commentary:

- Typically, the greater this difference (between the rating level and the background sound level), the greater the magnitude of 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; and
- 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. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact.

3. SURVEY RESULTS

The measurement position is detailed in Figure 1 of Appendix III.

3.1. UNATTENDED BACKGROUND AND AMBIENT SOUND SURVEY

E3P has undertaken an unattended background and ambient sound survey in a position considered representative of the existing residential receptors overlooking the flat roof area and existing plant. The survey was carried out over the following period:

- 11:00 Thursday 14th July to 11:00 15th July 2022.

The following noise measurement position was chosen for the Background and Ambient Sound Survey:

- Noise Measurement Position 1 (NMP1): Located on the existing flat roof in the north east corner on existing railings. The measurement position was approximately 25 m from the existing plant on the roof. The microphone was installed in free-field conditions. The sound climate was dominated by existing plant sound and road traffic along the local road network.

The position is considered representative of receptors to the north and east. For residential receptors to the west, these are subject to high levels of noise from Oxford Street and Whitworth Street. Furthermore, the receptors are approximately 32 m from the existing plant and so the noise levels measured at NMP1 are likely to be similar or potentially lower than those at the residential receptors.

Table 3.1 details the modal measured values for each respective period following statistical analysis. Hourly data is shown in Appendix II and full datasets are available upon request. Levels highlighted in bold represent those to be used in the assessment.

TABLE 3.1 STATISTICAL VALUES FOR EACH DAYTIME AND NIGHT-TIME PERIOD

DATE	ASSESSMENT PERIOD	MODAL BACKGROUND SOUND LEVEL, $L_{A90,T}$ (dB)	RANGE OF MEASURED BACKGROUND SOUND LEVEL, $L_{A90,T}$ (dB)
Thursday 14th July 2022	Daytime	57	54.2-58.7
	Night-time	54	53.9-55.3
Friday 15th July 2022	Daytime	57	55.9-60.7
	Night-time	56	55.4-58.4
Saturday 16th July 2022	Daytime	58	54.9-58.3
	Night-time	53	**53.1**-57.2
Sunday 17th July 2022	Daytime	57	54.8-58.0
	Night-time	54	53.8-54.6

The above levels were dominated by the existing plant associated with the Palace Theatre. As such, the lowest measured background sound level, associated with the plant, is used in the assessment. Specifically, 53 dB.

The equipment outlined in Table 3.2 was used for the noise survey.

TABLE 3.2 NOISE MEASUREMENT EQUIPMENT AND CALIBRATION DATES

MEASUREMENT POSITION	EQUIPMENT DESCRIPTION	MANUFACTURER & TYPE NUMBER	SERIAL NUMBER	CALIBRATION DUE DATE
NMP1	Sound Level Meter	01 dB CUBE	11119	17th January 2024
	Pre-amplifier	01 dB PRE22	1610356	
	Microphone	GRAS 40CD	287749	
	Calibrator	01 dB CAL21	34675325	8th February 2023

The sound level meter was field calibrated on site using the above-mentioned calibrator prior to and after noise measurements were taken. No significant drift was witnessed as noted above. Calibration certificates are available upon request.

4. NOISE IMPACT ASSESSMENT

For the purposes of this assessment, E3P has used noise modelling software, CadnaA 2022 MR1, to determine the impact of noise from the proposed sound sources associated with the development, specifically, the proposed AHUs and Chiller unit.

The following noise level data has been provided:

TABLE 4.1 OCTAVE BAND DATA FOR PROPOSED SOURCES

TYPE	INFORMATION	63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz	8 kHz
AHU	Casing noise breakout – resultant linear sound level at 3 m	46.0	51.0	44.0	28.0	21.0	17.0	14.0	11.0
Chiller	Sound pressure level at 1 m	57.3	62.2	61.4	59.1	58.2	56.0	53.4	47.7

The above values have been used to calculate the resultant sound power level in octave bands and inputted as a spectrum for each sound source within the noise model with appropriate directivity applied.

The operational periods for the plant are considered to be 24/7 in line with the existing operational times of the existing plant.

The following inputs have been included in the model:

- Ground elevations have been taken as existing by way of a 2 m grid Digital Terrain Model (DTM) which contains public sector information licensed under the Open Government License v3.0.
- Existing buildings have been included in the model and assumed to have a structured façade.
- With regards commercial/industrial sound, corrections have been applied to the inputted sound power levels to account for acoustic characteristics, as per BS 4142:2014+A1:2019. As such, the model output is the Rating Level, $L_{A,r}$.
- A reflection order of 2 has been used in all calculations.
- The proposed louvred enclosure is not included in order to inform a worst-case assessment.
- Ground absorption is set at 0.
- Noise levels generated using ISO 9613-1 and ISO 9613-2 "*Acoustics – Attenuation of sound during propagation outdoors*" as incorporated into CadnaA software.

Given that existing plant is already operational and audible at the existing receptors, no penalties are applied to the new equipment.

The lowest background sound level, which is considered representative of the continuously running plant and does not account for existing intermittent sound, is noted to be 53 dB. Given that receptors are slightly further from the plant and that residential receptors are partially shielded, a correction is applied to this level for the residential receptors to the west. As such, the lowest background sound level to be used in the assessment is 47 dB (53 – 5 dB for partial line of sight and -1 dB for additional distance).

Figure 2 should be used to view the rating level at the height of the proposed plant with façade noise levels shown for all elevations and floors (the figures in the model relate to the highest noise level per orientation and floor.

As can be seen, the highest predicted façade noise level is 39 dB for offices and 31 dB for residential.

With regards to office space, internal noise levels would be less than 26 dB with windows open, this falls well below the criteria for any sort of office space. As such, no adverse impact is predicted.

IN relation to the residential receptors, namely balconies during the day, the resultant rating level would be 31 dB, which is 16 dB below the calculated background sound level. Furthermore, not accounting for existing sound levels, this rating level would be considered low and not typically assessed in accordance with BS 4142. Furthermore, internal noise levels at night, with windows open, would be no more than 18 dB, well below the night-time criterion.

Considering the above assessments, no adverse impact is predicted associated with the new plant.

Furthermore, and finally, the resultant noise levels fall well below, at least 14 dB, existing sound levels in close proximity to the site. This is a positive indication that the new noise sources would not influence the existing sound climate.

5. CONCLUSION AND RECOMMENDATIONS

E3P were commissioned by ATG to undertake a Noise Impact Assessment for proposed roof mounted plant at the Palace Theatre in Manchester.

An unattended background and ambient sound survey has been undertaken to be representative of the closest receptors to the site.

A 3D noise model has been constructed to assess commercial sound impact associated with the proposed plant items. The model has been used to predict the specific noise level at the existing facades to determine whether the new plant will be equal to or lower than the existing plant noise.

The assessment determined that the predicted specific noise level would fall well below the existing sound levels with acceptable internal noise levels expected. This is a positive indication of no adverse impact. As such, no mitigation measures are required.

As such, sufficient information has been provided in order to consider potential noise impact and found no adverse impact is expected.

END OF REPORT

APPENDIX I
GLOSSARY OF ACOUSTIC TERMINOLOGY

NOISE

Noise is defined as unwanted sound. Human ears are able to respond to sound in the frequency range 20 Hz (deep bass) to 20,000 Hz (high treble) and over the audible range of 0 dB (the threshold of perception) to 140 dB (the threshold of pain). The ear does not respond equally to different frequencies of the same magnitude but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting mechanism is used. This reduces the importance of lower and higher frequencies, in a similar manner to the human ear.

Furthermore, the perception of noise may be determined by a number of other factors, which may not necessarily be acoustic. In general, the impact of noise depends upon its level, the margin by which it exceeds the background level, its character and its variation over a given period of time. In some cases, the time of day and other acoustic features such as tonality or impulsiveness may be important, as may the disposition of the affected individual. Any assessment of noise should give due consideration to all of these factors when assessing the significance of a noise source. The most widely used weighting mechanism that best corresponds to the response of the human ear is the "A"-weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or L_{Aeq}, L_{A90} etc., according to the parameter being measured.

The decibel scale is logarithmic rather than linear, and hence a 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective but, as a general guide, a 10 dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB(A) is generally regarded as the minimum difference needed to perceive a change under normal listening conditions. An indication of the range of sound levels commonly found in the environment is given in the following table.

TABLE A1 TYPICAL SOUND PRESSURE LEVELS

SOUND PRESSURE LEVEL	LOCATION/EXAMPLE
0	Threshold of hearing
20–30	Quiet bedroom at night
30–40	Living room during the day
40–50	Typical office
50–60	Inside a car
60–70	Typical high street
70–90	Inside a factory
100–110	Burglar alarm at 1 m away
110–130	Jet aircraft on take off
140	Threshold of pain

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TABLE A2 TERMINOLOGY

DESCRIPTOR	EXPLANATION
dB (decibel)	The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure (2E-05 Pa).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e., "A" weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
$L_{Aeq, T}$	L_{Aeq} is defined as the notional steady sound level which, over a stated period of time (T), would contain the same amount of acoustical energy as the A-weighted fluctuating sound measured over that period.
L_{Amax}	L_{Amax} is the maximum A-weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise where occasional loud noises occur, 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} and L_{90}	If a non-steady noise is to be described, it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L_{10} is the level exceeded for 10% of the time and as such can be regarded as the "average maximum level". Similarly, L_{90} is the "average minimum level" and is often used to describe the background noise. It is common practice to use the L_{10} index to describe traffic noise.
Free-field Level	A sound field determined at a point away from reflective surfaces other than the ground with no significant contributions due to sound from other reflective surfaces. Generally, as measured outside and away from buildings.
Fast	A time weighting used in the root-mean-square section of a sound level meter with a 125-millisecond time constant.
Slow	A time weighting used in the root-mean-square section of a sound level meter with a 1000-millisecond time constant.

APPENDIX II
MEASURED BACKGROUND SOUND LEVELS

TABLE A1: HOURLY AMBIENT AND BACKGROUND SOUND LEVEL DATA

PERIOD START	AMBIENT SOUND LEVEL, $L_{Aeq,1hr}$ (dB)	BACKGROUND SOUND LEVEL, $L_{A90,1hr}$ (dB)
14/07/2022 11:00	58.0	56.7
14/07/2022 12:00	58.9	56.6
14/07/2022 13:00	57.7	56.5
14/07/2022 14:00	57.9	56.8
14/07/2022 15:00	59.3	57.9
14/07/2022 16:00	57.7	56.8
14/07/2022 17:00	57.8	56.9
14/07/2022 18:00	59.3	58.6
14/07/2022 19:00	59.3	58.5
14/07/2022 20:00	59.4	58.7
14/07/2022 21:00	60.0	58.7
14/07/2022 22:00	58.7	54.2
14/07/2022 23:00	55.2	54.2
15/07/2022 00:00	54.8	53.9
15/07/2022 01:00	54.8	54.0
15/07/2022 02:00	55.0	54.2
15/07/2022 03:00	54.8	54.3
15/07/2022 04:00	55.2	54.4
15/07/2022 05:00	55.5	54.6
15/07/2022 06:00	56.4	55.0
15/07/2022 07:00	56.9	55.9
15/07/2022 08:00	59.1	56.9
15/07/2022 09:00	60.1	59.5
15/07/2022 10:00	60.2	59.6
15/07/2022 11:00	60.2	59.6
15/07/2022 12:00	60.6	59.8
15/07/2022 13:00	61.7	60.7
15/07/2022 14:00	59.8	58.3
15/07/2022 15:00	59.2	58.6
15/07/2022 16:00	59.7	58.8
15/07/2022 17:00	60.3	59.8
15/07/2022 18:00	60.8	59.4

PERIOD START	AMBIENT SOUND LEVEL, $L_{Aeq,1hr}$ (dB)	BACKGROUND SOUND LEVEL, $L_{A90,1hr}$ (dB)
15/07/2022 19:00	59.1	57.0
15/07/2022 20:00	58.3	56.9
15/07/2022 21:00	60.0	59.0
15/07/2022 22:00	59.0	56.6
15/07/2022 23:00	57.0	56.1
16/07/2022 00:00	57.3	55.9
16/07/2022 01:00	56.4	55.8
16/07/2022 02:00	56.3	55.7
16/07/2022 03:00	56.4	55.6
16/07/2022 04:00	56.1	55.5
16/07/2022 05:00	56.1	55.5
16/07/2022 06:00	56.7	55.5
16/07/2022 07:00	58.7	58.3
16/07/2022 08:00	58.7	58.2
16/07/2022 09:00	59.2	58.0
16/07/2022 10:00	57.7	56.5
16/07/2022 11:00	57.9	56.7
16/07/2022 12:00	57.0	56.3
16/07/2022 13:00	57.2	56.4
16/07/2022 14:00	57.6	56.6
16/07/2022 15:00	58.4	56.7
16/07/2022 16:00	59.2	58.2
16/07/2022 17:00	58.7	58.0
16/07/2022 18:00	58.7	58.0
16/07/2022 19:00	58.6	58.0
16/07/2022 20:00	58.9	58.2
16/07/2022 21:00	59.6	58.2
16/07/2022 22:00	58.7	54.9
16/07/2022 23:00	55.1	54.1
17/07/2022 00:00	57.5	54.0
17/07/2022 01:00	55.4	53.9
17/07/2022 02:00	55.8	53.7
17/07/2022 03:00	54.8	53.6

PERIOD START	AMBIENT SOUND LEVEL, $L_{Aeq,1hr}$ (dB)	BACKGROUND SOUND LEVEL, $L_{A90,1hr}$ (dB)
17/07/2022 04:00	54.4	53.4
17/07/2022 05:00	54.1	53.2
17/07/2022 06:00	55.2	53.3
17/07/2022 07:00	57.9	57.2
17/07/2022 08:00	57.7	57.2
17/07/2022 09:00	57.7	57.1
17/07/2022 10:00	58.7	57.4
17/07/2022 11:00	58.2	57.6
17/07/2022 12:00	58.4	57.7
17/07/2022 13:00	58.4	57.9
17/07/2022 14:00	58.3	57.6
17/07/2022 15:00	59.3	57.5
17/07/2022 16:00	58.5	57.4
17/07/2022 17:00	58.1	57.4
17/07/2022 18:00	59.0	58.0
17/07/2022 19:00	58.6	57.9
17/07/2022 20:00	58.7	57.8
17/07/2022 21:00	58.9	57.9
17/07/2022 22:00	57.8	54.8
17/07/2022 23:00	55.6	54.3
18/07/2022 00:00	54.8	54.1
18/07/2022 01:00	54.6	54.0
18/07/2022 02:00	54.6	53.9
18/07/2022 03:00	54.3	53.9
18/07/2022 04:00	54.4	53.9
18/07/2022 05:00	54.5	54.0
18/07/2022 06:00	55.1	54.2
18/07/2022 07:00	56.1	54.8
18/07/2022 08:00	56.2	52.7
18/07/2022 09:00	57.9	57.2
18/07/2022 10:00	60.0	57.2

APPENDIX III
FIGURES

Figure 1 - Noise Survey Measurement Positions



Project:
Palace Theatre

Project-No:
50-662

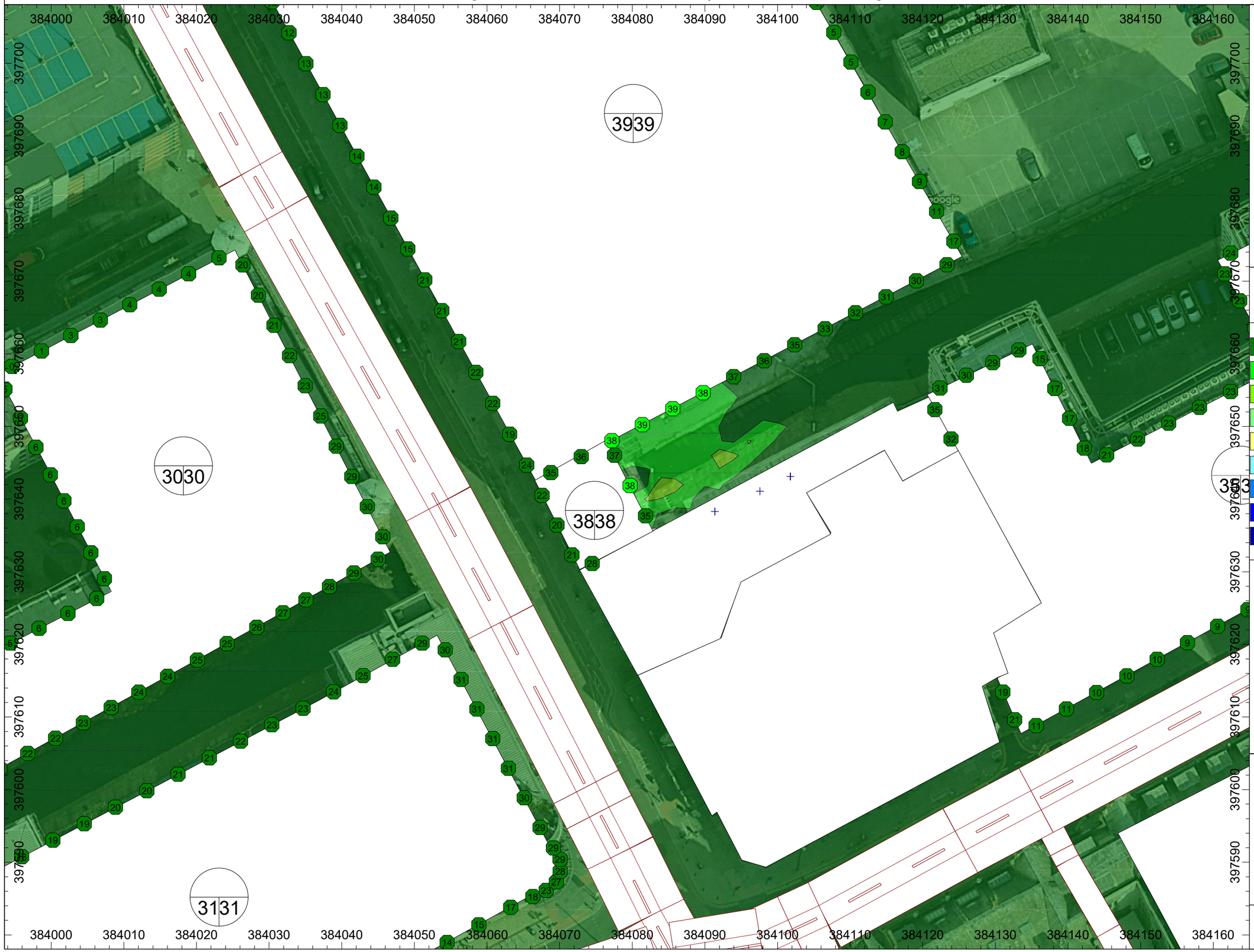
Client:
ATG

N

e3p

Project Engineer: L Faulkner
Date: 25/07/2022

Figure 2 - Fixed Plant Sound Grid Noise Map - Calculation at 15m above ground level



Project:
Roof Mounted PLant, Palace Theatre

Project-No:
50-662

Client:
ATG

Rating Level, LA,r (dB)

- ... <= 38
- 38 < ... <= 40
- 40 < ... <= 42
- 42 < ... <= 45
- 45 < ... <= 48
- 48 < ... <= 50
- 50 < ... <= 52
- 52 < ... <= 55
- 55 < ...

Noise Map Objects

- Point Source
- Road
- Building
- Contour Line
- Building Evaluation
- Calculation Area

e3p

Project Engineer: L Faulkner
Date: 25/07/2022