

NOISE ASSESSMENT

PROPOSED ALTERATIONS TO CLINICAL WASTE TREATMENT FACILITY, BRADMAN ROAD, KNOWSLEY

STERICYCLE

NOVEMBER 2022

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Revision	Prepared By	Date
1.1	L Jephson BEng (Hons) MIOA	3/11/22
1.0	L Jephson BEng (Hons) MIOA	9/8/22

This report has been prepared using all reasonable skill and care within the resources and brief agreed with the client. LF Acoustics Ltd accept no responsibility for matters outside the terms of the brief or for use of this report, wholly or in part, by third parties.

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1. Introduction

LF Acoustics Ltd have been appointed by Stericycle to undertake a noise assessment in support of a planning application for alterations to their clinical waste treatment facility located at Bradman Road, Knowsley.

The facility is presently operational on a 24 hour basis. Stericycle are seeking to make alterations to the existing buildings to facilitate the installation of additional waste treatment plant to increase throughput.

There are no noise sensitive dwellings in close proximity to the facility. The closest residential properties are located on Depot Road to the north, adjacent to the North Mersey Business Centre, and approximately 250 metres away from Stericycle. This report presents an assessment of the existing and proposed noise levels at the properties and demonstrates that the proposed alterations would result in acceptable noise levels being maintained.

The following section of this report summarises the standards and guidance applicable to this development, with a description of the site and its surroundings provided within Section 3. Section 4 presents a summary of a noise monitoring exercise carried out to establish the noise levels attributable to the plant presently operating within the facility and at the surrounding residential properties. Section 5 presents the results of calculated noise levels attributable to the operation of the facility and assesses the levels against the relevant criteria. Finally, Section 6 provides a summary of the report.

The measurements and assessment were carried out by L Jephson BEng (Hons), MIOA, Director of LF Acoustics Ltd.

2. Applicable Standards and Guidance

2.1. A description of the noise units referred to in this report is provided in Appendix A.

2.2. National Planning Policy Framework

The National Planning Policy Framework (NPPF), revised in July 2021 [1], sets out the Government's planning policies for England and how these should be applied. It provides a framework upon which locally-prepared plans for housing and other development can be produced.

The purpose of the planning system is to contribute to the achievement of sustainable development and at the heart of the Framework is a presumption in favour of sustainable development.

With regards noise, the NPPF advises that local planning policies and decisions should contribute to and enhance the natural and local environment by:

- preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels noise pollution.
- mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development (including cumulative effects) – and avoid noise giving rise to significant adverse impacts on health and the quality of life;
- identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

Reference is made within the NPPF to the Noise Policy Statement for England [2] (NPSE), which sets out the long term vision of the Government noise policy. Further information has been provided on the assessment of noise within recent Planning Practice Guidance, published in March 2014 and available on the Government planning web site. Whilst this guidance does not provide any objective criteria upon which to base noise assessments, the guidance provides a description of the relevant Effects Levels identified within the NPPF and NPSE and this is reproduced in Table 2.1.

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not noticeable	No Effect	No Observed Effect (NOEL)	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 (LOAEL)	
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; where there is no alternative ventilation, having to close windows for some of the time because of the noise. 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 (SOAEL)	
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. 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 Adverse 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, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

Table 2.1 Significance Criteria

2.3. British Standard BS 4142

BS 4142 [3] is the British Standard for rating and assessing noise of a commercial or industrial nature and is relevant to the noise associated with the operation of the proposed plant.

BS 4142 is a comparative standard in which the estimated noise levels from the proposed development are compared to the representative / typical background noise level from existing uses.

BS 4142 presents a methodology for deriving an initial estimate of the potential for adverse noise impacts based upon the difference between the Rating Level of the noise being assessed and the background noise level. The initial assessment is subsequently modified due to context of the area.

The background noise level is the L_{A90} noise level, usually measured in the absence of noise from the source being assessed, but may include other existing industrial or commercial sounds. The background noise levels should generally be obtained from a series of measurements each of not less than 15 minute duration.

The Rating Level of the noise being assessed is defined as its L_{Aeq} noise level (the 'specific noise level'), with the addition of appropriate corrections should the noise exhibit a marked impulsive and/or tonal component or should the noise be irregular enough in character to attract attention. The extent of the correction is dependent upon the degree of tonality or character in the noise and is determined either by professional judgement, where the plant is not operational at present, or by measurement.

Where the noise is tonal in nature, the standard imposes the following penalties when assessing the rating level:

- 2 dB for a tone which is just perceptible;
- 4 dB where the tone is clearly perceptible; and
- 6 dB where the tone is highly perceptible.

Where noise exhibits other sound characteristics, the Standard advises a penalty of 3 dB should be applied.

During the daytime, the specified noise levels are determined over a reference time interval of 1 hour, with a 15 minute reference period adopted when assessing night-time noise.

The initial assessment of impact identifies if the Rating Level of the noise being assessed exceeds the background level by 10 dB or more BS 4142 advises that there is likely to be an indication of a significant adverse impact, depending upon context. A difference between background level and Rating Level of around 5 dB is likely to be an indication of an adverse impact, depending upon context. The lower the Rating Level is, relative to the background noise level, the less likely the specific source will have an adverse or significant adverse impact. Where the Rating Level does not exceed the background noise level is an indication of a low impact, depending upon context.

The assessment method outlined above is intended for the assessment of external noise levels and is not intended to assess the extent of impact at internal locations.

Where the initial assessment of impact, based upon and assessment of the external noise levels, needs to be modified due to the context, all pertinent factors should be taken into account, including:

- The absolute level of sound;
- 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; and
- The sensitivity of the receptor and whether the premises will already incorporate measures to ensure good internal and/or external acoustic conditions.

The current revision of BS 4142 does not define low background or rating levels. The previous 1997 revision of the Standard described very low background sounds as being less than 30 dB L_{A90} and low rating levels as being less than 35 dB $L_{Aeq,T}$. The Association of Noise Consultants have prepared a technical note to accompany the current revision of BS 4142 [4]. The document advises that it would not be unreasonable to adopt similar lower limits when assessing noise levels against the current revision of the Standard

2.4. British Standard BS 8233

BS 8233 [5] recommends design aims for noise levels to be achieved in buildings.

For residential properties, the guidance recommends the following internal design aims for the daytime (07:00 – 23:00) and night-time (23:00 – 07:00) periods:

- 35 dB $L_{Aeq,T}$ within living rooms and bedrooms during the daytime (07:00 – 23:00);
- 40 dB $L_{Aeq,T}$ within dining areas / rooms during the daytime (07:00 – 23:00);
- 30 dB $L_{Aeq,T}$ within bedrooms during the night-time (23:00 – 07:00) and
- 50 – 55 dB $L_{Aeq,T}$ within gardens and patios.

2.5. World Health Organisation Guidelines

The World Health Organisation guidance [6] provides additional guidance upon potential effects in relation to noise.

The guidance advises:

- few people are moderately annoyed by noise levels of below 50 dB L_{Aeq} during the daytime;
- for a good night's sleep, noise levels within bedrooms should not exceed 30 dB L_{Aeq} , with individual noise events not exceeding 45 dB L_{Amax} ; and
- special attention should be given to noise sources in an environment with low background noise levels and to noise sources with low frequency components.

Assuming an open window provides a reduction in noise levels of between 10 – 15 dB(A), during the night-time the WHO guidance indicates that external noise levels should remain below 40 – 45 dB L_{Aeq} to maintain the restorative processes of sleep.

The WHO produced additional noise guidance in relation specifically to night-time noise in 2009 [7]. This report provides a description of the no observed adverse effect level (which is equivalent to NOEL) and advises for night-time noise (which is considered to be the most sensitive period of the day) that this concept is less useful, as the adversity of effects are less clear. Instead, it advises the use of the observed effects thresholds, above which an effect starts to occur or shows itself to be dependent upon the exposure level.

The guidance is presented in terms of external and internal recommendations to minimise any potential adverse effects. Externally, the guidance advises that an average night-time noise level L_{night} (the $L_{Aeq, 8\text{ hour}}$) of 40 dB is equivalent to the lowest observed adverse effect level and advises this guideline value is recommended for the protection of public health from night-noise. However, below this level there was no change in the small number of awakenings identified and hence a reason for considering that the NOEL was not an appropriate descriptor in noise terms for identifying adverse effects and hence recommend the use of the observed effects threshold as an appropriate descriptor to identify the potential for the onset of adverse effects.

The guidance, however, advises that an external night-time noise level of 30 $L_{Aeq, 8 \text{ hour}}$ would be equivalent to the NOEL (note that the guidance does not apply any penalty for characteristic noise), as their research indicated that there were no detectable effects internally, below a level of 32 dB L_{Amax} , with no physical awakenings identified below a level of 42 dB L_{Amax} internally.

3. Site Description and Development Proposals

3.1. Site Description

The clinical waste treatment facility is located along Bradman Road, Knowsley. The site location is indicated on Figure 1.

As indicated on the figure, the unit is located centrally within the northern part of an industrial area and is surrounded by other commercial / industrial land uses.

The facility is operational on a 24 hour basis, with waste processing carried out internally overnight.

During daytime periods, there are regular van and HGV movements into the site, bringing waste into the site, which are offloaded through the loading bays along the northern façade of the premises. There are a number of roller shutter doors, which are presently manually operated and tend to be left open during the daytime period and closed overnight. At present, there are up to 28 loads delivered to the site daily, equating to 56 van / HGV movements.

Whilst the main processing operations are carried out within the building, there is presently a waste compactor located externally, adjacent to the loading bay doors, which is operated during the day.

Internally, there is a single waste processing line, which is operational on a 24 hour basis. The processed waste is presently loaded into ro-ro waste containers using two compactors located within the building. In addition, there are two bin washers located within the northern part of the building. The operation of the waste processing plant is the main source of noise internally, principally attributable to the waste shredders.

Alterations are proposed to the building to allow the throughput to be increased.

Internally, it is proposed to install two additional waste treatment lines, which will be installed adjacent to the existing line within the eastern part of the building. The additional lines would generate an equivalent noise level to the existing plant, noting that appropriate mitigation measures may need to be considered to ensure noise levels internally remain acceptable, to minimise exposure to the employees, with regards to the Noise at Work Regulations. For the purposes of this assessment, no account of any additional mitigation measures internally has been made, to provide a worst case assessment.

Additional bin washers are also proposed to be installed alongside the existing ones. Initially two are proposed, with the potential to add an additional 2 in the future. For the purposes of this assessment, 4 additional ones have been assumed (i.e. 6 bin washers in total).

The internal compactors are to be replaced by a new building extension which would house two walking floor trailers. The processed waste would be conveyed into the containers, where it would be loaded, thus eliminating the requirement for the existing compactors.

Additional loading bay doors are to be installed along the northern façade of the building, to allow more efficient unloading of the vehicles. All the loading bay doors would be fitted with rapid action roller shutter doors. These doors would be closed at all times during the day and night-time periods, unless a vehicle was unloading, thus ensuring potential noise breakout from the building is removed.

A canopy would also be constructed over the unloading bays.

Externally, the waste compactor would be removed.

The additional capacity would result in an increase in vehicle movements from 28 loads per day (56 van / HGV movements per day) to 39 loads per day (78 van / HGV movements), which would be distributed throughout the day. For the purposes of the assessment, it has been assumed that the equivalent hourly movements would increase from 8 per hour to 12 per hour, which would represent worst case conditions.

3.2. Noise Sensitive Receptors

As indicated previously, the unit is located within an existing industrial / commercial area, which is operational on a 24 hour basis.

There are no noise sensitive premises in close proximity to the facility.

The closest residential premises are located to the north, along Depot Road, adjacent to the North Mersey Business Centre and approximately 250 metres from the site. The location of the properties in relation to the site is indicated on Figure 1.

4. Baseline Noise Monitoring

A noise monitoring exercise was carried out between 21-22 June 2022 to establish the noise levels attributable to the existing plant operating on the site and to monitor noise levels at the properties along Depot Road.

Weather conditions for the survey were good, remaining fine, dry and calm throughout and thus suitable for undertaking an environmental noise assessment.

The measurements were made using a Rion NL-52 Class 1 Sound Level Analyser (Serial No. 00231657), which was calibrated before and after each measurement exercise using a Rion NC-74 Class 1 Acoustic Calibrator (Serial No. 35125830). Both instruments had been laboratory calibrated in accordance with National Standards within the past 12/24 months. All measurements were made with the instrument set on a tripod, 1.2 metres above the ground.

4.1. Measurements Within Existing Facility

Noise measurements were taken at a number of positions within the existing facility to establish the noise levels associated with the present operations. The results of the measurements have been subsequently used as the basis of the calculations and assessment.

Internally, noise levels were observed to be principally attributable to the operation of the waste processing plant, with the main source of noise identified to be attributable to the shredders at the start of the process. Once shredded, the waste is treated with heat before being conveyed to the internal waste compactors.

Measurements obtained at a distance of 2 metres from the shredders indicated a level of 83.1 dB L_{Aeq} .

A measurement was also taken at a distance of 1 metre from one of the waste compactor motors, which indicated a level of 81.9 dB L_{Aeq} , whilst operational.

Measurements were also obtained within the building, close to the loading bay doors whilst a vehicle was being unloaded, which indicated a level of 75.2 dB L_{Aeq} . Again, the noise levels were principally associated with the operation of the main treatment plant, with the unloading operations having minimal influence on the measured noise levels. This was confirmed from a measurement made whilst the plant was not operating, which indicated a level of 69.1 dB L_{Aeq} .

It was not possible to measure the noise levels associated with the operation of a bin wash. Noise levels have been obtained previously within a similar Stericycle facility, which indicated a level of 75 dB L_{Aeq} at a distance of 1 metre, whilst operational.

Externally, a measurement was made adjacent to the waste compactor, which is presently operated during daytime periods. This measurement indicated a level of 72.7 dB L_{Aeq} at a distance of 5 metres.

4.2. Noise Monitoring at Properties

Attended noise measurements were taken adjacent to the properties along Depot Road during the day and night-time periods. The measurement position was to the west of the properties, with the meter positioned along the rear of the footpath, approximately 3 metres from the kerb. The monitoring position was selected to ensure a line of sight into the industrial estate and to ensure the background (L_{A90}) noise levels were representative of the noise level at the properties.

Measurements were obtained over a period of 1 hour on each occasion, with 4 x 15 minute measurements taken, in accordance with the methodology within BS 4142.

The results of the noise monitoring are presented in Table 4.1 below.

Time Period	Measured Noise Levels [dB]		
	$L_{Aeq,T}$	$L_{Amax,F}$	L_{A90}
15:00	62.0	76.3	46.3
15:15	62.4	79.8	45.4
15:30	60.6	72.8	45.2
15:45	64.1	76.2	45.3
23:30	37.1	47.2	35.6
23:45	37.9	50.6	34.8
00:00	36.5	54.9	34.9
00:15	37.9	50.6	35.7

Table 4.1 Results of Noise Monitoring at Properties

During the daytime period, ambient (L_{Aeq}) noise levels were noted to be principally influenced by road traffic travelling along Depot Road and other surrounding roads, principally Perimeter Road to the north, with general noise from the industrial area clearly audible. Noise from the operations at Stericycle were not audible during the daytime period. During the daytime, the results indicate a typical background noise level of 45 dB L_{A90} .

Overnight, noise levels were observed to be lower. There was no traffic travelling along Depot Road, with minimal traffic movements within the industrial estate observed, with typically 1 – 2 vehicle movements observed during a 15 minute period. There was general plant noise audible which was constant throughout. The other identifiable noise source was associated with the operation of the distribution unit, located to the east of Depot Road, with loading activities audible throughout, including horns sounding on forklifts and reversing beepers as vehicles reversed, although noted to be of low level. Again, noise from the operation of Stericycle was not audible during this period. Observations made during this survey period, indicated that the noise levels monitored were consistent with the general overnight noise environment. The results indicate a typical background noise level overnight of 35 dB L_{A90} .

5. Calculation and Assessment of Operational Noise Levels

5.1. Calculated Noise Levels

Noise models for the existing and proposed site operations have been modelled within the SoundPlan computer modelling package. The model utilises the calculation methodology from ISO 9613-2 and takes account of the intervening ground conditions. Ground heights for the site and surrounding area have been taken from LiDAR mapping data.

As indicated previously, the site is operational on a 24 hour basis, with waste processing operations undertaken internally overnight. On this basis, calculations have been prepared for the day and night-time periods.

For the existing operations, it has been assumed that the loading bay doors would be open during the day and closed at night (as advised by Stericycle), with the processing plant operating internally continuously. Externally, it has been assumed that the waste compactor would be operational 25% of the time. Vehicle movements have been proportioned throughout the day, with 8 movements assumed per hour.

For the proposed operation, internally, it has been assumed that there would be three waste treatment lines operating continuously throughout the day and night-time periods, all generating an equivalent noise level to the existing plant. The calculations have also assumed 6 bin washers operational within the building. It has been assumed that each loading bay door would be open 25% of the time during the daytime period, which is a realistic worst case assumption, as the doors would all be rapid closing. Overnight, it has been assumed that the doors would remain closed, as existing. Vehicle movements have been proportioned throughout the day, with 12 movements assumed per hour.

Calculations of the noise levels attributable to the operation of the existing facility are provided on Figures 2 and 3 for the day and night-time periods. Noise levels attributable to the proposed operation are presented on Figures 4 and 5.

The calculated noise levels at the dwellings are summarised below.

Time Period	Calculated Noise Levels [dB L _{Aeq,T}]	
	Existing	Proposed
Daytime	36	36
Night-time	29	32

Table 5.1 Calculated Noise Levels at Dwellings Along Depot Road

5.2. Assessment

The results of the existing noise level calculations presented on Figures 3 and 4 indicate low levels of noise at the properties, which is consistent with the observations made during the noise surveys.

The noise associated with the operation of the site is not uncharacteristic when considered against the general noise environment within the industrial area, with the operation not generating any characteristic or tonal noise which was distinguishable externally at the site boundaries. On this basis, it has not been considered necessary to apply any corrections when deriving the rating level of noise upon which the BS 4142 assessment has been made.

The initial assessment of the existing rating noise levels indicates that they are 9 dB(A) below the prevailing noise levels during the daytime period and 6 dB(A) below the background noise levels overnight. This is a positive indication that the current operations are unlikely to result in adverse noise impacts at the dwellings.

Noise levels calculated from the proposed operations indicates that there would be no change in the daytime noise levels at the dwellings. On this basis, the rating noise levels would remain 9 dB(A) below the prevailing background noise levels and indicate a low potential for adverse impacts.

Overnight, noise levels would increase as a result of the additional plant operating within the building. The calculations indicate that the noise levels would increase by 3 dB(A) at the dwellings.

An initial assessment indicates that the operational noise levels would remain very low and based upon the worst case operating conditions would remain 3 dB(A) below the prevailing background noise levels overnight. This provides a positive indication of a low potential for adverse impacts, when assessed against the BS 4142 guidance.

BS 4142 advises that the context of the noise should be considered when determining potential impacts. Furthermore, BS 4142 advises when 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.

A level of 32 dB $L_{Aeq,T}$ is a low level of noise during the night-time periods and would remain below the 35 dB(A) lower limit advised within technical guidance which accompanies BS 4142, thus providing a further indication that any potential impacts would be low.

Given the low levels of noise predicted and the fact that the properties are within an industrial / commercial location, the assessment has considered the absolute levels of noise at the properties.

The World Health Organisation advises for night-time noise, that an external level of 30 dB $L_{Aeq,T}$ represents a No Observed Effects Level, with a level of 40 dB $L_{Aeq,T}$ representing the Lowest Observed Effects Level. On this basis, the noise associated with the proposed operations would result in No Observed Effects.

Consideration has also been given to the noise levels within bedrooms overnight, on the basis of an open window providing a reduction of between 10 – 15 dB(A) between outside and in. Internal noise levels within bedrooms would be below 22 dB $L_{Aeq,T}$ and thus at least 8 dB(A) below a level which would represent a good standard of noise, when assessed against the guidance within BS 8233 and WHO guidelines. Again, this would be a strong indication that the proposed operation would not result in any adverse impacts at the dwellings.

As discussed previously, the calculations have been based upon worst case operating conditions within the building and assuming the additional waste treatment lines would generate noise levels equivalent to the existing plant. With all three lines operational, noise levels within the building are likely to be high and it is anticipated that additional noise mitigation measures will be required for the new plant to ensure an acceptable standard of noise for the employees working inside the building, to comply with the Noise at Work Regulations. With additional mitigation provided internally, the overall noise levels externally and at the properties would be further reduced to those calculated within this assessment.

In summary, the noise levels attributable to the operation of the site would be very low at the surrounding residential properties. The noise levels would not result in any adverse noise impacts during the daytime or more sensitive night-time periods. The proposals would therefore be fully compliant with the requirements of the NPPF.

6. Summary

LF Acoustics Ltd were appointed by Stericycle to undertake a noise assessment in support of a planning application for alterations to their clinical waste treatment facility located at Bradman Road, Knowsley.

The facility is presently operational on a 24 hour basis. Stericycle are seeking to make alterations to the existing buildings to facilitate the installation of additional waste treatment plant to increase throughput.

A noise monitoring exercise was carried out to establish the noise levels attributable to the operation of the existing plant and at the closest noise-sensitive receptors, located along Depot Road to the north.

Noise levels associated with the existing and proposed operation of the site have been calculated, taking account of noise within the building and associated with the external vehicle movements.

The calculated noise levels have been assessed against the requirements of BS 4142 to identify any potential adverse impacts. The assessment indicated that the proposed operation of the site would continue to generate very low levels of noise at the neighbouring residential properties, which would result in no adverse effects, when assessed against other absolute noise standards.

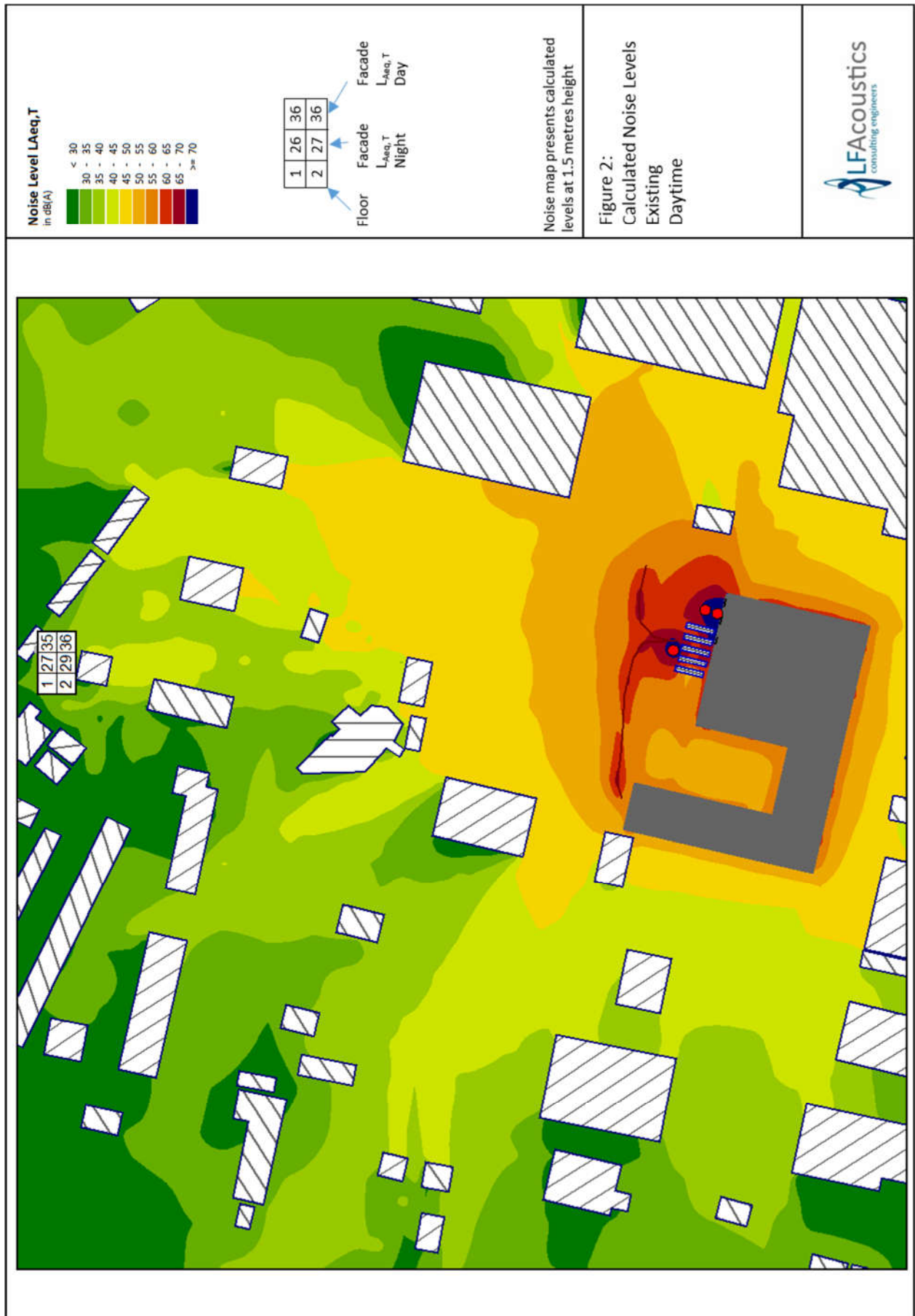
References

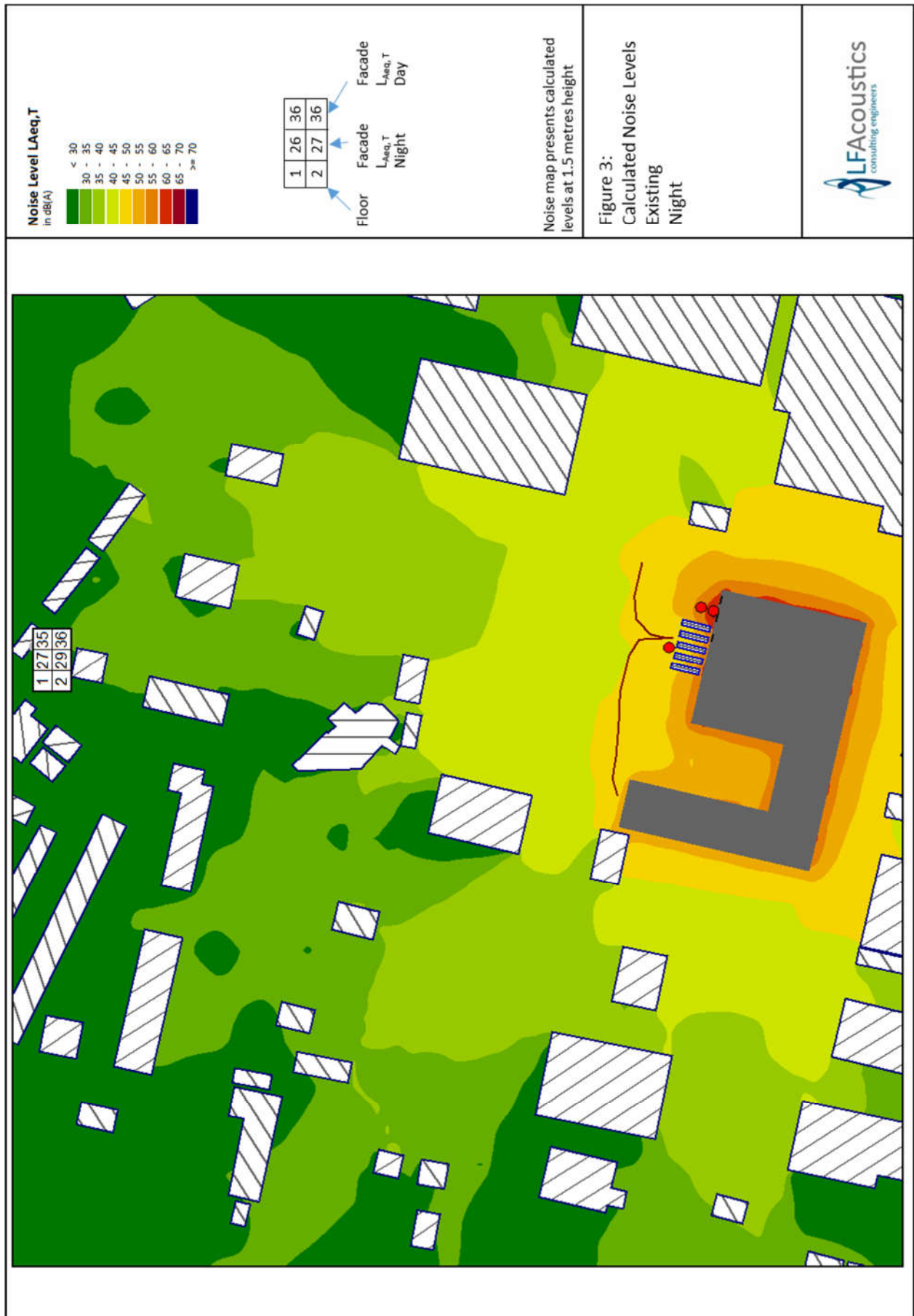
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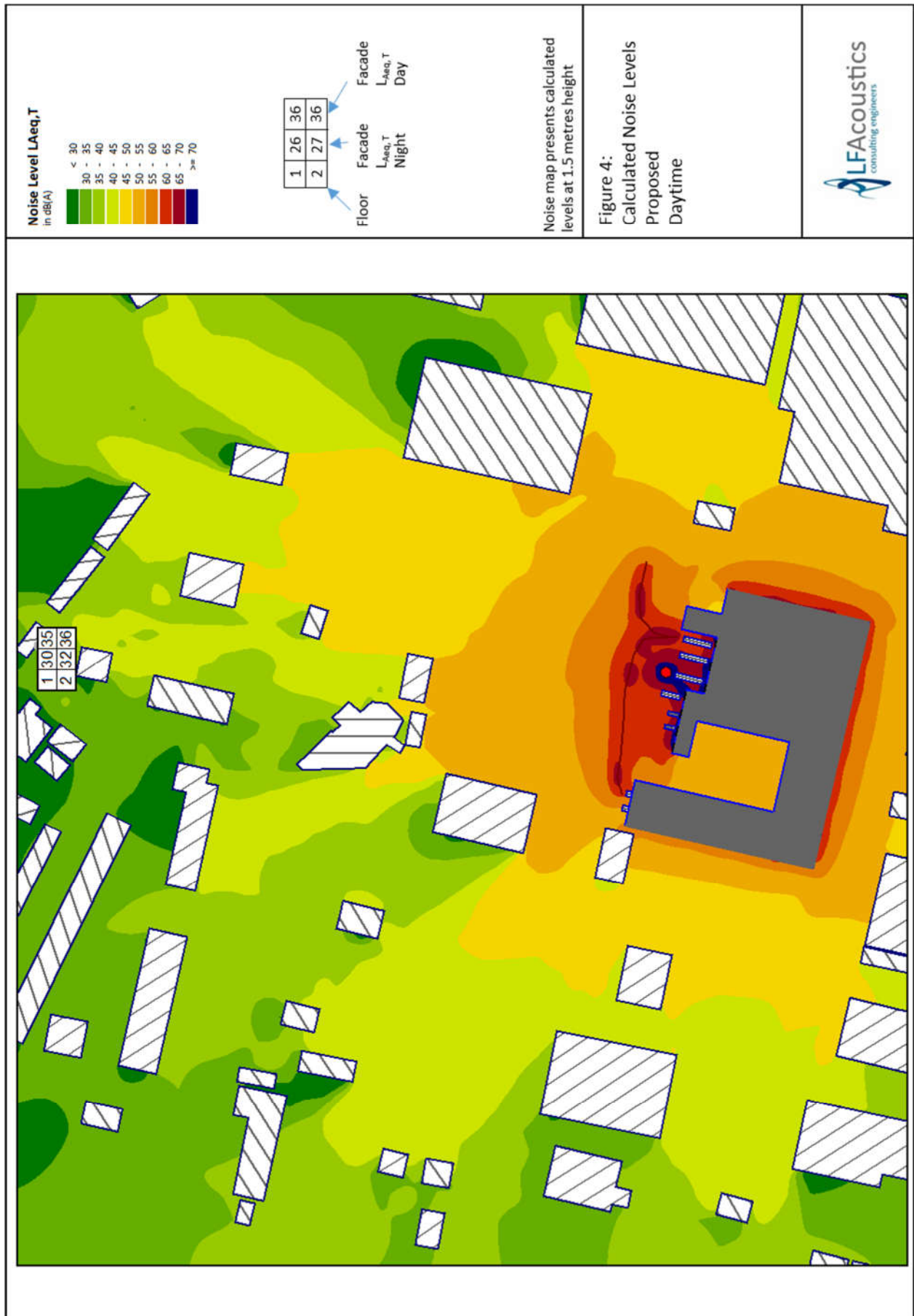
Figures

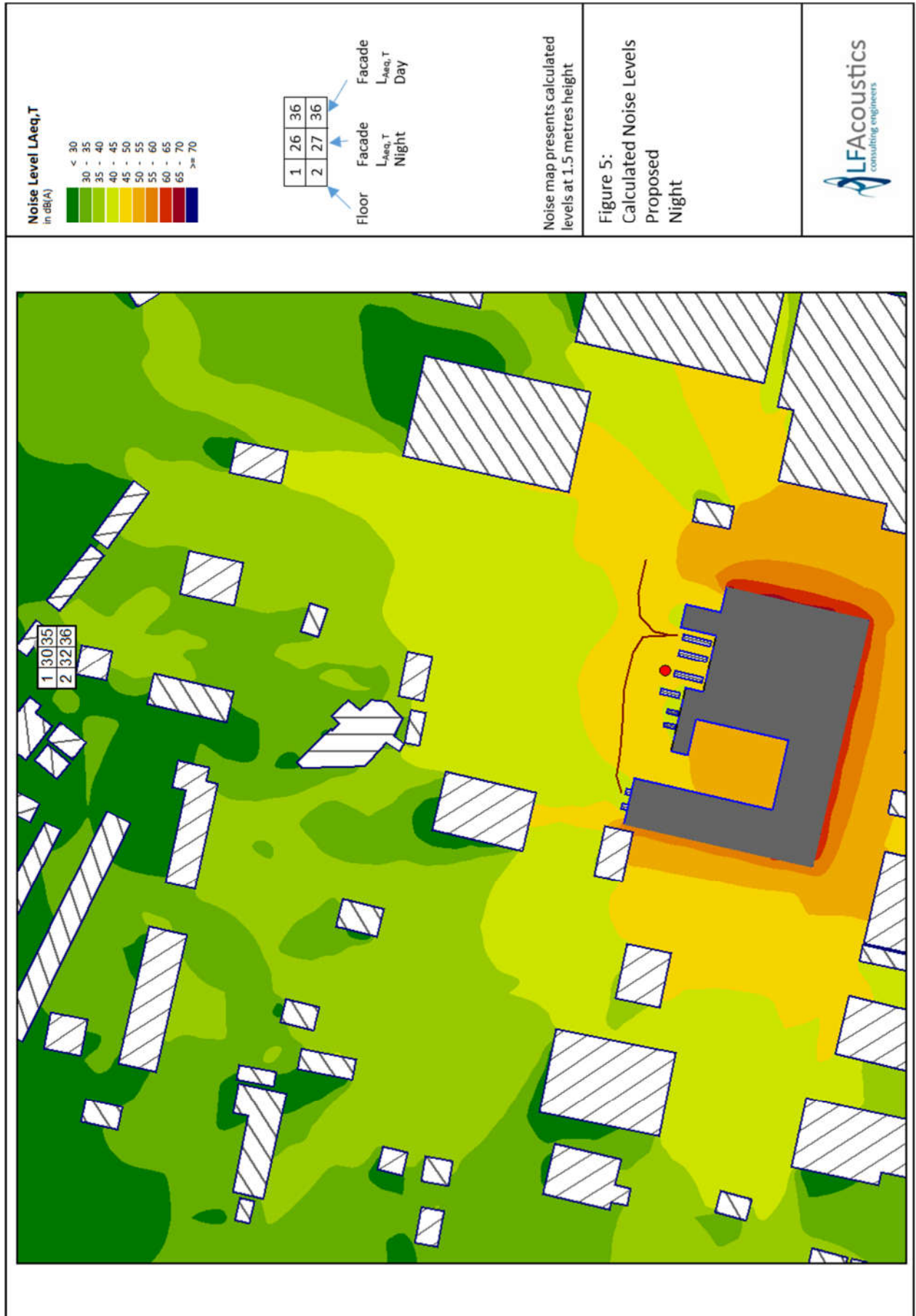
Figure 1:
Site Location











Appendix A

Noise Units

Decibels (dB)

Noise can be defined as unwanted sound. Sound in air can be considered as the propagation of energy through the air in the form of oscillatory changes in pressure. The size of the pressure changes in acoustic waves is quantified on a logarithmic decibel (dB) scale firstly because the range of audible sound pressures is very great, and secondly because the loudness function of the human auditory system is approximately logarithmic.

The dynamic range of the auditory system is generally taken to be 0 dB to 140 dB. Generally, the addition of noise from two sources producing the same sound pressure level, will lead to an increase in sound pressure level of 3 dB. A 3 dB noise change is generally considered to be just noticeable, a 5 dB change is generally considered to be clearly discernible and a 10 dB change is generally accepted as leading to the subjective impression of a doubling or halving of loudness.

A-Weighting

The bandwidth of the frequency response of the ear is usually taken to be from about 18 Hz to 18,000 Hz. The auditory system is not equally sensitive throughout this frequency range. This is taken into account when making acoustic measurements by the use of A-weighting, a filter circuit which has a frequency response similar to the human auditory system. All the measurement results referred to in this report are A-weighted.

Units Used to Describe Time-Varying Noise Sources (L_{Aeq} , L_{A90} and L_{Amax})

Instantaneous A-weighted sound pressure level is not generally considered as an adequate indicator of subjective response to noise because levels of noise usually vary with time.

For many types of noise the Equivalent Continuous A-Weighted Sound Pressure Level ($L_{Aeq,T}$) is used as the basis of determining community response. The $L_{Aeq,T}$ is defined as the A-weighted sound pressure level of the steady sound which contains the same acoustic energy as the noise being assessed over a specific time period, T.

The L_{A90} is the noise level exceeded for 90% of the measurement period. It is generally used to quantify the background noise level, the underlying level of noise which is present even during the quietest part of the measurement period.

The L_{Amax} is the maximum value that the A-weighted sound pressure level reaches during a measurement period. $L_{Amax,F}$, or Fast, is averaged over 0.125 of a second.