



NOISE IMPACT ASSESSMENT OAK ROAD, WREXHAM

REC REFERENCE: AC106340-1R3

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EXECUTIVE SUMMARY

A weekday and weekend Background Sound Survey has been completed in a location representative of the nearest sensitive receptors.

Additionally, REC have been supplied with source noise measurements of the proposed engines at the Site.

The CHP Engine may activate during any 07:00-23:00 daytime and 23:00-07:00 night-time period during both weekdays and weekends. As such, the lowest median measured background sound levels for daytime and night-time inform the assessment.

The Noise Impact Assessment has indicated that the rating level during the daytime and night-time falls comfortably below the typical background sound levels at the closest receptors.

BS4142:2014 provides the following advice:

“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.”





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1. INTRODUCTION

Resource and Environmental Consultants (REC) Limited have been commissioned by Conrad Energy Limited to undertake a Noise Impact Assessment for the proposed development of 6No. Gas Engines to generate up to 9.9MW at a Site off Oak Road in Wrexham, to be referred to hereafter as '*the Site*'.

This assessment has been undertaken to identify the noise impact due to associated engine upon existing noise-sensitive receptors in the vicinity of the Site.

All acronyms used within this report are defined in the Glossary presented in Appendix II.

1.1 Site Location and Proposed Development

The Site is located immediately adjacent to existing industrial units and is bound to the south by Oak Road. Abbey Road borders to the west and existing industrial units lie to the north and east. The closest receptors to the Site are located to the east on Bryn Lane.

A layout of the 6 engines has been provided and used to inform the assessment.

The proposed engine has an envisaged use of c.1500 hours a year, with capacity to operate during any weekday/weekend time period.

1.2 Limitations

Where a noise survey is required to inform the assessment, REC will endeavour to ensure that all noise measurements taken are robust, representative and reliable in order to inform an accurate noise impact assessment. Where limitations or constraints exist which prevent a suitable noise survey being completed, REC will take all reasonable steps to make the client fully aware of any such limitations or constraints with a view to achieving the best possible outcome for the client. Where additional sound surveys are required, over and above those specified in our scope of works, then REC reserves the right to charge additional fees.

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

Further limitations of this report are presented in Appendix I.

1.3 Confidentiality

REC has prepared this report solely for the use of the Client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from REC; a charge may be levied against such approval.





2. ASSESSMENT METHODOLOGY

2.1 Planning Guidance (Wales), Technical Advice Note (Wales) 11, Noise

This note provides advice on how the planning system can be used to minimise the adverse impact of noise without placing unreasonable restrictions on development or adding unduly to the costs and administrative burdens of business. It outlines some of the main considerations which local planning authorities should take into account in drawing-up development plan policies and when determining planning applications for development which will either generate noise or be exposed to existing noise sources.

Local authorities should adopt a corporate approach and ensure close co-operation between planning and environmental health departments when considering noise and noise generating developments.

Noise Exposure Categories (NECs) have been derived to assist local planning authorities in their consideration of planning applications for residential development near transport related noise sources.

Local planning authorities must ensure that noise generating development does not cause an unacceptable degree of disturbance. They should also bear in mind that if subsequent intensification or change of use results in greater intrusion, consideration should be given to the use of appropriate conditions.

Noise characteristics and levels can vary substantially according to their source and the type of activity involved. In the case of industrial development, for example, the character of the noise should be taken into account as well as its level. Sudden impulses, irregular noise or noise which contains a distinguishable continuous tone will require special consideration. In addition to noise from aircraft landing and taking off, noise from aerodromes is likely to result from engine testing as well as ground movements. The impact of noise from sport, recreation and entertainment will depend to a large extent on frequency of use and the design of facilities.

Local planning authorities should consider whether proposals for new noise-sensitive development would be incompatible with existing activities, taking into account the likely level of noise exposure at the time of the application and any increase that may reasonably be expected in the foreseeable future. Such development should not normally be permitted in areas which are, or are expected to become, subject to unacceptably high levels of noise and should not normally be permitted where high levels of noise will continue throughout the night.

Measures introduced to control the source of, or limit exposure to, noise should be proportionate and reasonable, and may include:

1. engineering: reduction of noise at point of generation (e.g. using quiet machines and/or quiet methods of working); containment of noise generated (e.g. insulating buildings which house machinery and/or providing purpose-built barriers around sites); protection of surrounding noise-sensitive buildings (e.g. improving sound insulation in these buildings and/or screening them by purpose-built barriers);
2. lay-out: adequate distance between noise source and noise-sensitive building or area; screening by natural barriers, other buildings, or non-critical rooms in a building;





3. administrative: limiting operating time of noise source; restricting activities allowed on the site; specifying an acceptable noise limit.

2.2 BS4142: 2014 '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 noise level 'the specific noise level' from any of the above detailed noise sources 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 following reference time intervals depending upon whether the noise source operates during daytime or night-time periods:

- ▶ Daytime (07:00 – 23:00) 1 hour; and
- ▶ Night-time (23:00 – 07:00) 15 minutes.

There are a number of 'penalties' which can be attributed to the specific sound level depending upon the 'acoustic features' of the sound level under investigation as follows. These penalties vary in their weighting depending upon the severity of the acoustic feature, as follows:

Tonality

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

Impulsivity

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

Intermittency

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

In addition to the above acoustic features, there is a penalty for 'other sound characteristics' of +3dB where a sound exhibits characteristics that are neither tonal nor impulsive, though are readily distinctive against the acoustic environment.





BS4142 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 noise 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 +10dB or more is likely to be an indication of a significant adverse impact, depending on the context;
- ▶ A difference of around +5dB 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.

With the above in mind, it is common that a LPA will specify their own criteria for the rating level relative to the background sound level and, where this is the case, this criteria usually takes precedence over a simple comparison of the rating level against the background sound level.





3. NOISE SURVEYS

3.1 Background Sound Survey

REC has undertaken a full weekday/weekend background sound survey at a location deemed representative of the receptors on Bryn Lane. The survey was carried out during the following time period:

- ▶ 16:00 Friday 28th September to 15:00 Monday 1st October 2018.

The following location was chosen for the survey:

- ▶ Noise Measurement Position 1 (NMP1): Located within the redline boundary of the Site in a location deemed representative of the existing receptors on Bryn Lane, equidistant from Oak Road as the receptors. The main sound source here is road traffic and industrial sound, to which the receptors are exposed. This location was chosen as it was considered a suitably secure location to leave unattended throughout the weekend period.

A summary of the range of measured 1-hour daytime background sound pressure levels for the proposed extended hours are presented in Table 2 below. A full tabulated representation is shown in Table A3 of Appendix IV.

Table 1 Range of Measured Background Sound Pressure Levels

Date	Period	Range of Measured Ambient Sound Pressure Level (dB) <i>L_{Aeq,T}</i>	Range of Measured Background Sound Pressure Level (dB) <i>L_{A90,T}</i>
Friday 28 th September 2018	Daytime (16:00 – 23:00)	48.9 – 58.4	44.3 – 48.0
	Night-time (23:00 – 07:00)	46.3 – 54.1	44.6 – 48.6
Saturday 29 th September 2018	Daytime (07:00 – 23:00)	45.9 – 52.8	40.8 – 46.9
	Night-time (23:00 – 07:00)	40.8 – 53.1	38.0 – 46.6
Sunday 30 th September 2018	Daytime (07:00 – 23:00)	48.1 – 52.6	43.9 – 46.1
	Night-time (23:00 – 07:00)	42.4 – 57.4	40.6 – 52.1
Monday 1 st October 2018	Daytime (09:00 – 15:00)	52.5 – 62.3	47.4 – 52.0

Weather conditions were fine throughout the survey period with wind speeds below 12mph for the majority of the survey and no rain reported.





Table 2 Noise Measurement Equipment

Measurement Position	Equipment Description	Manufacturer & Type No.	Serial No.	Calibration Due Date
NMP1	Sound Level Meter	Duo	10522	13 th March 2020
	Pre-amplifier	01dB PRE22	10329	
	Microphone	GRAS 40CD	154578	

The sound level meter was field-calibrated on Site prior to and after noise measurements were taken. No significant drift was witnessed. Calibration certificates are available upon request.





4. NOISE IMPACT ASSESSMENT

For the purposes of this assessment, REC have used noise modelling software, CadnaA 4.2, to determine the impact of noise from the proposed engines on the Site upon the nearest sensitive receptors. A noise model has therefore been constructed in order to calculate the specific sound level at each location.

A detailed plan has been used to determine the locality of the engines and inputted into the model.

REC Ltd have been supplied with the following information:

- ▶ Containerised Engine Noise Spec of 67dBA @ 10m; and
- ▶ Approximate Height of 5m.

The following inputs have been included in the model:

- ▶ Site Location;
- ▶ Site elevations have been taken as existing;
- ▶ The engines emit a sound pressure of 67dBA @10m;
- ▶ Engine height at 5m;
- ▶ Engine noise input as a point source;
- ▶ A reflection order of 2 has been used in all calculations;
- ▶ Daytime Grid Noise maps are calculated at a height of 1.5m;
- ▶ Night-time Grid Noise maps are calculated at a height of 4m; and
- ▶ Noise levels generated using ISO 9613-1 and ISO 9613-2 “Acoustics – Attenuation of sound during propagation outdoors” as incorporated into CadnaA software.

4.1 BS4142 Assessment

The grid noise map determined that the highest predicted specific noise levels at the closest receptors on Bryn Lane are 35dB during the daytime and night-time. Figures 2 and 3 of Appendix III illustrate the daytime and night time grid noise maps respectively.

For the BS4142: 2014 assessments, penalties are applied to the specific sound level in order to provide the rating level. These penalties relate to the acoustic features of the sound source. Accordingly, the following features have been accounted for in the assessment, in accordance with the subjective methods detailed in BS4142: 2014, for the units as a whole operation.

Table 4 determines the applicable penalties for the proposed engine.





Table 3 Identification of Acoustic Penalties

Source	Penalty	Applicable?	Attributable Penalty	Comment
CHP Engines	Tonality	Yes	2	Tones may be slightly perceptible at the receptors.
	Impulsivity	No	-	No impact noise associated with the engines running is anticipated.
	Intermittency	No	-	While the engines have the capability to switch on/off, it is expected that they will remain either active or dormant for prolonged periods of time. Therefore, a penalty for intermittency has not been applied.
	Other Sound Characteristics	No	-	Not applicable as other penalties have been assigned.

4.1.1 Daytime Assessment

Table 5 calculates the Rating Level at the closest exposed garden area for Bryn Lane. The lowest median background sound level has been used for the daytime period.

Table 4 Calculation of Rating Level and Comparison with Background Sound Level – Daytime

Receptors	Specific Sound Level, $L_{Aeq,1hr}$ (dB)	Total Penalty (dB)	Total Rating Level $L_{A,r}$ (dB)	Lowest Median Measured Background Sound Level $L_{A90,1hr}$ (dB)	Criteria, $L_{A,r} = L_{A90}$ (dB)	Difference +/- (dB)
Bryn Lane	35	2	37	44	44	-7

Table 5 demonstrates that the rating level will fall below the existing measured background by approximately 7dB for receptors at Bryn Lane.

BS4142:2014 provides the following advice:

“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.”

As such, no mitigation measures are required.



4.1.2 Night-time Assessment

Table 6 calculates the Rating Level at the closest 1st floor façades for Bryn Lane, as it is expected that inhabitants will be in bedrooms during the hours of 23:00 and 07:00. The lowest median background sound levels have been used.

Table 5 Calculation of Rating Level and Comparison with Background Sound Level – Night-time

Receptors	Specific Sound Level, $L_{Aeq,15mins}$ (dB)	Total Penalty (dB)	Total Rating Level $L_{A,r}$ (dB)	Typical Measured Background Sound Level $L_{A90,15mins}$ (dB)	Criteria, $L_{A,r} = L_{A90}$ (dB)	Difference +/- (dB)
Bryn Lane	35	2	37	42	42	-5

Table 7 demonstrates that the rating level will fall below the existing measured background by approximately 5dB for receptors at Bryn Lane.

BS4142:2014 provides the following advice:

“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.”

As such, no mitigation measures are required.





5. CONCLUSION

REC Limited have been commissioned by Conrad Energy to undertake a Noise Impact Assessment for a proposed development of 6No. Gas Fired Engines to generate up to 9.9MW at a Site on Oak Road in Wrexham.

A weekday and weekend Background Sound Survey has been completed in a location representative of the nearest sensitive receptors.

Additionally, REC have been supplied with source noise measurements of the proposed engines at the Site.

The CHP Engine may activate during any 07:00-23:00 daytime and 23:00-07:00 night-time period during both weekdays and weekends. As such, the lowest median measured background sound levels for daytime and night-time inform the assessment.

The Noise Impact Assessment has indicated that the rating level during the daytime and night-time falls comfortably below the typical background sound levels at the closest receptors.

BS4142:2014 provides the following advice:

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APPENDIX I LIMITATIONS





1. This report and its findings should be considered in relation to the terms of reference and objectives agreed between REC Limited and the Client as indicated in Section 1.2.
2. The executive summary, conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the report in full.
3. REC cannot be held responsible for any use of the report or its contents for any purpose other than that for which it was prepared. The copyright in this report and other plans and documents prepared by REC is owned by them and no such plans or documents may be reproduced, published or adapted without written consent. Complete copies of this may, however, be made and distributed by the client as is expected in dealing with matters related to its commission. Should the client pass copies of the report to other parties for information, the whole report should be copied, but no professional liability or warranties shall be extended to other parties by REC in this connection without their explicit written agreement there to by REC.





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APPENDIX II 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 factory
100 - 110	Burglar alarm at 1m away
110 - 130	Jet aircraft on take off
140	Threshold of pain





Acoustic Terminology

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 (2x10 ⁻⁵ 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 Leq noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
L ₁₀ & 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 Ln 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 125millisecond time constant.
Slow	A time weighting used in the root mean square section of a sound level meter with a 1000millisecond time constant.



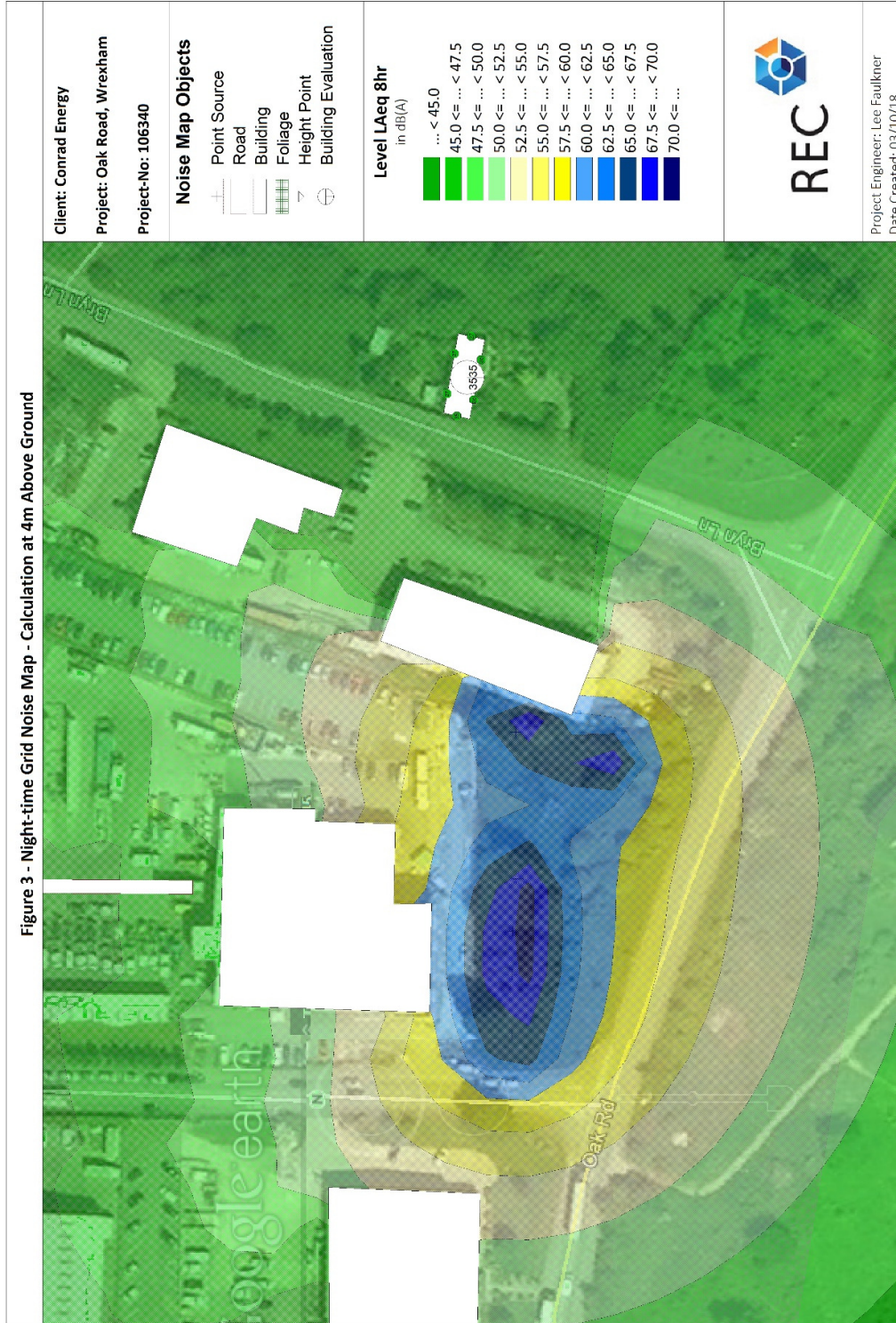


APPENDIX III FIGURES











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APPENDIX IV MEASURED BACKGROUND SOUND LEVELS





Table A3 Measured Background Sound Levels at NMP1

Period Start	Measured Sound Pressure Level, $L_{Aeq,1hr}$ (dB)	Measured Background Sound Level, $L_{A90,1hr}$ (dB)
28/09/2018 16:00	58.4	45.5
28/09/2018 17:00	53.1	46.1
28/09/2018 18:00	53.1	45.8
28/09/2018 19:00	50.4	44.3
28/09/2018 20:00	48.9	44.5
28/09/2018 21:00	51.1	45.8
28/09/2018 22:00	52	48
28/09/2018 23:00	50.1	48
29/09/2018 00:00	50.8	47.8
29/09/2018 01:00	50.4	46.9
29/09/2018 02:00	49.8	46.8
29/09/2018 03:00	49.5	47.4
29/09/2018 04:00	50.2	45
29/09/2018 05:00	52	45.4
29/09/2018 06:00	52.7	47.1
29/09/2018 07:00	52	46.9
29/09/2018 08:00	52.8	45
29/09/2018 09:00	52.1	44
29/09/2018 10:00	51.8	42.9
29/09/2018 11:00	52	41.6
29/09/2018 12:00	52.6	45.2
29/09/2018 13:00	51.3	45.2
29/09/2018 14:00	51.7	44.4
29/09/2018 15:00	50.9	44.4
29/09/2018 16:00	50.9	44.6
29/09/2018 17:00	52.7	45.4





Period Start	Measured Sound Pressure Level, L _{Aeq,1hr} (dB)	Measured Background Sound Level, L _{A90,1hr} (dB)
29/09/2018 18:00	51.4	44.5
29/09/2018 19:00	48.3	43.2
29/09/2018 20:00	47.3	40.8
29/09/2018 21:00	45.9	41.3
29/09/2018 22:00	47.8	44.3
29/09/2018 23:00	46.7	41.9
30/09/2018 00:00	43.6	39.9
30/09/2018 01:00	46.7	41.7
30/09/2018 02:00	45.7	41.4
30/09/2018 03:00	45.5	39.9
30/09/2018 04:00	42.7	39.1
30/09/2018 05:00	48.8	43.1
30/09/2018 06:00	51.1	45
30/09/2018 07:00	48.1	43.9
30/09/2018 08:00	50.1	45.2
30/09/2018 09:00	50.6	45
30/09/2018 10:00	50.5	45
30/09/2018 11:00	52.6	45.1
30/09/2018 12:00	52.2	45.6
30/09/2018 13:00	51.7	45.1
30/09/2018 14:00	51.8	45.3
30/09/2018 15:00	51.7	46.1
30/09/2018 16:00	52	46
30/09/2018 17:00	51.4	45
30/09/2018 18:00	51.4	45.7
30/09/2018 19:00	50.8	44.9





Period Start	Measured Sound Pressure Level, $L_{Aeq,1hr}$ (dB)	Measured Background Sound Level, $L_{A90,1hr}$ (dB)
30/09/2018 20:00	49.1	44.1
30/09/2018 21:00	48.2	44.1
30/09/2018 22:00	48.3	45
30/09/2018 23:00	48.8	44.3
01/10/2018 00:00	46.7	44
01/10/2018 01:00	47.3	43.2
01/10/2018 02:00	45.3	41.6
01/10/2018 03:00	46.6	42.1
01/10/2018 04:00	48.5	42
01/10/2018 05:00	53.4	45.5
01/10/2018 06:00	56.2	47.3
01/10/2018 07:00	57.6	52
01/10/2018 08:00	56.9	50.9
01/10/2018 09:00	52.5	47.6
01/10/2018 10:00	52.7	47.4
01/10/2018 11:00	53.9	48.1
01/10/2018 12:00	54.1	49.2
01/10/2018 13:00	55.8	50.6
01/10/2018 14:00	62.3	52

