

BS4142 Noise Assessment

Report No: 3291-R1 Titanium Road, Swansea, SA5 4SF – 07/05/2015

Client: GF Energy Ltd

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1. Introduction

Clover Acoustics Ltd has been appointed by GF Energy Ltd to carry out a BS4142 noise assessment at the site of a proposed Gas Fuelled Capacity mechanism Embedded Power Plant consisting of 37 gas fuelled generators at land off an existing generating facility at Titanium Road, Swansea, SA5 4SF. The equipment is designed to respond to demand for electricity at times of peak demand and has the capacity to operate during day and night-time hours.

A baseline noise survey has been carried out over a representative period in order to establish the existing background noise levels. The survey was conducted at one monitoring location covering a typical quiet night-time period between Thursday 30th April 2015 and Friday 1st May 2015.

The purpose of this report is to demonstrate that due consideration for noise affecting neighboring residential properties has been made and to assess the significance of any noise impact from the operation of the units

2. Assessment Methodology

BS4142:2014 Methods for rating and assessing industrial and commercial sound.

BS4142 gives a method for rating sound from industrial and commercial sources affecting people inside or outside dwellings or premises used for residential purposes. An initial estimate of the significance of the sound from the industrial/commercial nature can be assessed by subtracting the measured background noise level from the rating level (this is the specific sound level of the source with any corrections or penalties for distinctive acoustic characteristics). Typically, the greater the difference, the greater the magnitude of the 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.
- 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 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.

3. Site Description

The proposed site is located adjacent an existing generating site within an industrial area. The site is industrialized to aspects to varying degrees. The proposal is to install 37 x Generator Units in dedicated acoustic enclosures to respond to electricity needs at times of peak demand. The location of the proposed installation is identified in figure 1 below.

Residential properties have been identified as being approximately 520m from the site to the south on Roseland Road.

Figure 1 shows the site location:



Figure 1 – Site Location and Background Monitoring Position

4. Survey Information

Measurement Instrumentation

The measurement instrumentation used on the survey was as follows:

Equipment	Manufacturer & Type	Serial Number	Calibration Certificate
Sound Level Meter	Norsonic 118	28952	08074
Acoustic Calibrator	Norsonic 1251	32856	U16611

The equipment was calibrated to comply with section 4.2 of BS7445:1-2003 before and after the surveys. The calibration was as follows:

Meter	Serial	Before		After	
Norsonic 118	28952	113.9	-26.2	113.9	-26.2

Measurements & Timescales

During the survey 5-minute measurements were made over a typical 24-hours period between Thursday 30th April 2015 and Friday 1st May 2015 at a location deemed to be representative of the nearest sensitive receiver.

The following measurements are reported: $L_{Aeq,T}$, $L_{A90,T}$, $L_{Amax,T}$

The measurements and their interpretation shall be in accordance with BS 7445: Parts 1 and 2. All sound pressure levels are in dB (re 20 μ Pa).

Meteorology

Wind speed measurements were recorded during the background survey close to the noise monitoring location. Wind speed measurements were below 5m/s⁻¹.

Temperature was recorded at 13°C and there was no precipitation during the measurement period. Cloud cover was estimated at 20%.

Position of Monitoring Equipment

The equipment was mounted free field 1.5m from the ground at a location representative of the nearest receivers. Figure 2 shows the site boundary plan.

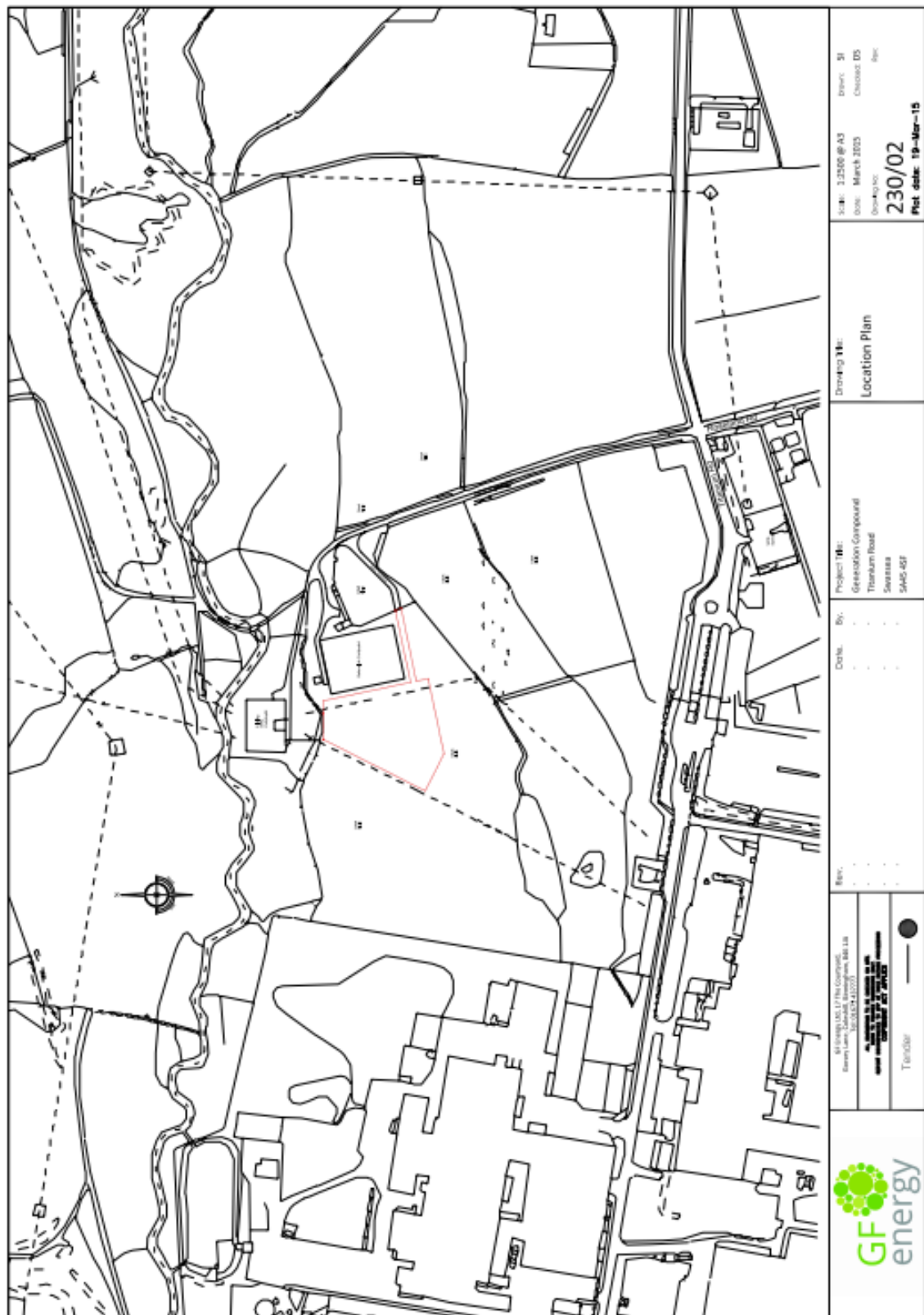


Figure 2 – Site Location Plan

5. Survey Results

Background Noise Summary

The following tables show the summary of the background noise levels monitored. The reported results represent the free field sound pressure levels at the receivers.

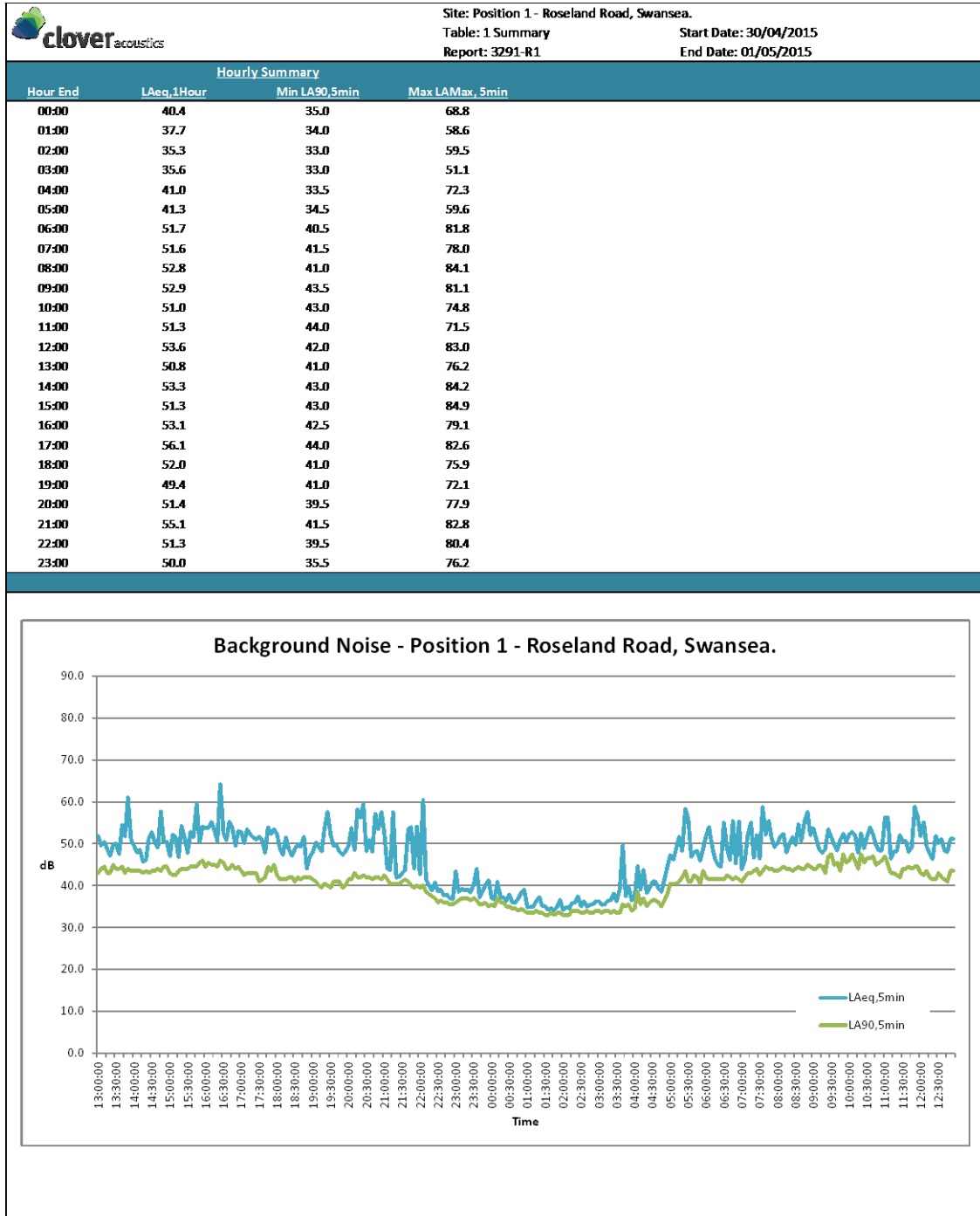


Table 1 – Background Monitoring Results

Monitoring Position 1	
Lowest Daytime dB LA90,5min	36
Lowest Night Time dB LA90,5min	33

6. Noise Assessment

BS4142:2014 Methods for rating and assessing industrial and commercial sound.

Specific Noise Source

The client has indicated that 37 containerised generator units in dedicated acoustic enclosures are to be installed and an indicative layout is included below:

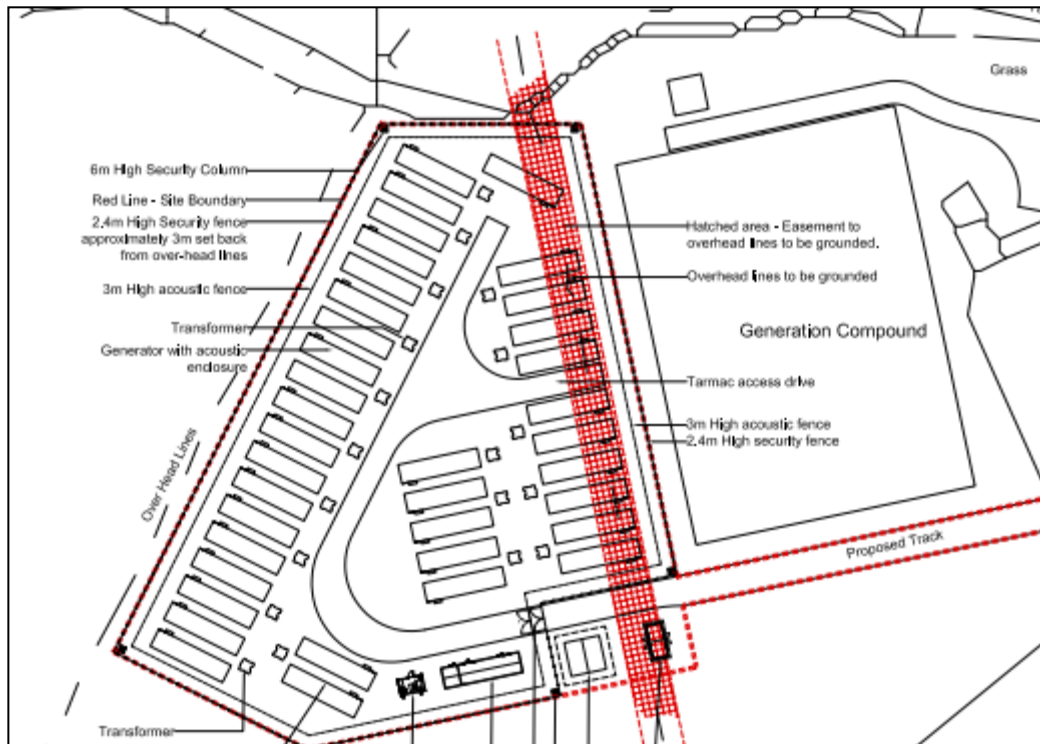


Figure 3 – Proposed Layout

It is understood that the client has commissioned bespoke acoustic enclosures to limit noise output from the units to 75dB(A) @ 1meter. On this basis the resultant sound pressure level for 37 units combined is a noise level of 91dB(A). The *lowest* background noise level monitored during the night-time monitoring period was 33dB $L_{A90,5min}$.

Acoustic Feature Correction

BS4142:2014 allows for a character correction to be applied to the specific sound level where acoustic features are present at the assessment location. The specific sound level can be considered a steady source and has been predicted to be below the existing background. In this instance we estimate the source may be considered barely perceptible and it would therefore be prudent to include a 2dB penalty.

Context

The receivers are some distance from an industrial complex with multiple units and varied noise producing activities. The proposed site is next to an existing generating facility.

Barrier Attenuation

Screening of the site to prevent line of sight to the source would reduce noise levels at the receiver. In this case a 4m¹ close boarded fence is identified. It is understood the client has specified a “deceunick” walling system which would be a suitable barrier. For this assessment -10dB attenuation through screening has been accounted for.

Distance Attenuation

The nearest sensitive receivers identified to the south will be approximately 520m from the proposed equipment. Distance attenuation of -54dB can be calculated using the following formula

$$L_{p2} = L_{p1} + 20 \log \left(\frac{r_1}{r_2} \right)$$

BS4142 Assessment

Installing units with a combined noise output of 91dB and applying the factors discussed above would predict a noise rating level of 29dB(A) at the receiver. This would give an assessment level of 4dB below the measured existing background noise level. BS4142 advises, “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 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”.

BS4142 Assessment		dB(A)
Specific Noise Level at Receiver		91
Distinctive Penalty		2
Distance Attenuation		-54
Barrier Attenuation		-10
Rating Level		29
Background Level L_{A90}		33
Rating Below Background		-4

¹ The layout plan identifies a fence height of 3m however this should be increased to 4m

7. Recommendations

The barrier fence height is to be 4 meters with a minimum superficial mass of 15Kg/m² to ensure the barrier attenuation is not compromised by sound passing through the barrier. The barrier should be of solid construction with timber thickness of at least 20mm in all places. 25mm timber boards mass is around 16Kg/m². The timber boards should continue across fence posts and with large overlaps to prevent gaps appearing over time. It is understood that Decoroc acoustic walling system has been specified on some of the clients' sites and this would also prove a suitable 4m barrier.

8. Conclusion

A BS4142 noise assessment has been carried out at the nearest receivers to a proposed gas fueled power plant at Titanium Road, Swansea, SA5 4SF to assess the impact of the proposed installation. A background noise survey was conducted during Thursday 30th April 2015 and Friday 1st May 2015 at a location representative of the nearest sensitive receivers.

An assessment has been made in accordance with BS4142 which has shown that the proposed installation would predict a noise rating level of 4dB below the local background. According to BS4142 this is indicative of the proposed source having a low impact.



Steve Clow MIOA
Acoustic Consultant

9. Appendix

Glossary of Terms

Specific Noise Source

The noise source under investigation for assessing the likelihood of complaints.

Specific Noise Level, $L_{Aeq,T}$

The equivalent continuous A-weighted sound pressure level at the assessment position produced by the specific noise source over a given reference time interval.

Rating Level, $L_{A,T}$

The specific noise level plus any adjustment for the characteristic features of the noise.

Background Noise Level, $L_{A90,T}$

The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90 % of a given time interval, T.

Residual Noise

The ambient noise remaining at a given position in a given situation when the specific noise source is suppressed to a degree such that it does not contribute to the ambient noise.

Ambient Noise

Totally encompassing sound in a given situation at a given time usually composed of sound from many sources near and far.

Reference Time Interval, T

The specified interval over which an equivalent continuous A-weighted sound pressure level is determined.

$L_{Aeq,T}$

The A-weighted equivalent continuous sound level – the sound level of a notionally steady sound having the same energy as the fluctuating sound over a specified measurement period, T.

$L_{A10,T}$

The A-weighted sound level exceeded for 10% of the specified measurement period, T.

L_{Amax}

The highest short duration A-weighted sound level recorded during a noise event.

A-Weighting

The 'A' weighting is a correction term applied to the frequency range in order to approximate to the sensitivity of the human ear to noise. It is generally used to obtain an overall noise level from octave or third octave band frequencies.

Octave Band

A frequency band in which the upper limit of the band is twice the frequency of the lower limit.

One-third-octave Band

A frequency band in which the upper limit of the band is 1/3 times the frequency of the lower limit.

Photo Appendix



Figure 4 – View towards receiver



Site: Position 1 - Roseland Road, Swansea.
Barrier Attenuation
Report: 3291-R1

Start Date: 30/04/2015
End Date: 01/05/2015

Barrier Attenuation

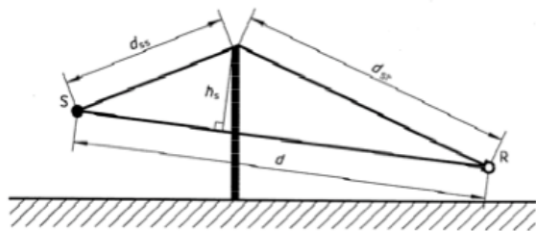


Figure 6 — Geometrical quantities for determining the pathlength difference for single diffraction

from ISO 9613-2:1996

Noise Source	Frequency	Hz	63	125	250	500	1000	2000	4000	8000
Description: LPG Engine in acoustic Container	Source Octave Spectrum	dB(A)	52	76	72	80	82	80	78	80
	Source LAeq	dB(A)	87.6							

Barrier Attenuation - Source 1				Frequency	Hz	63	125	250	500	1000	2000	4000	8000	
Source to Barrier	4	Receiver to Barrier	496	Barrier Attenuation	dB	5.4	5.9	6.8	8.1	10.0	12.3	14.9	17.7	
Source Height	3.3	Receiver Height	4	Effective Attenuation	dB	5.4	5.9	6.8	8.1	10.0	12.3	14.9	17.7	
Barrier Height	4			Resultant Noise Level	dB(A)	46.6	70.1	65.2	71.9	72.0	67.7	63.1	62.3	
Path Difference	0.060			Resultant LAeq	dB(A)	77.4		Barrier Attenuation dB						-10.3

Figure 5 – Barrier Calculation