Philip Dunbavin Acoustics Ltd
3 Bridgewater Court
Barsbank Lane
Lymm
WA13 0ER

ACOUSTIC CONSULTANTS

NOISE IMPACT ASSESSMENT REPORT

STANDBY GAS GENERATION PLANT, CARRINGTON

REPORT REFERENCE NO. J003485-5077-ECE-02

AUGUST 2021

Tel: 01925 759380 **Email:** enquiries@pdaltd.com **Web:** www.pdaltd.com

Registered Number 2302847 England
Registered Office: 3 Bridgewater Court, Barsbank Lane, Lymm WA13 0ER

Document Control Sheet

Details of Assessment	
Client	Forsa Energy Gas Holdings Ltd
Document Title	Noise Impact Assessment, Standby Gas Generation Plant, Carrington
Report Reference	J003485-5077-ECE-02

Client Address:	Company Address:
Forsa Energy Gas Holdings Ltd, Clyde View (Suite F3), Riverside Business Park, 22 Pottery Street, Greenock, PA15 2UZ	Philip Dunbavin Acoustics Ltd 3 Bridgewater Court Barsbank Lane Lymm WA13 0ER

Issue	Date	Author	Remark	Status
01	31/07/2021	ECE	Initial Issue	Issued
02	14/08/2021	ECE	Updated following client comments	Issued

	Name	Position
Prepared By	Edmund Evenden BSc (Hons) MIOA	Director
Checked By	Tom Dixon BEng MIOA	Consultant

This report has been prepared based upon a scope of works and associated resources agreed between the client and Philip Dunbavin Acoustics Ltd (PDA). This report has been prepared with all reasonable skill, care and diligence and has been based upon the interpretation of data collected. This has been accepted in good faith as being accurate and valid at the time of the collection. This report has been based solely on the specific design assumptions and criteria stated herein.

CONTENTS

1.0 SUMMARY

At the request of Forsa Energy Gas Holdings Ltd a noise impact assessment has been undertaken for the proposed new revised location and generator change in relation to 89321/FUL/16 for a Standby Gas Generator Plant at Carrington, Manchester.

The Assessment has been undertaken following the guidance contained within BS4142:2014 – 'Methods for rating and assessing industrial and commercial sound'.

The proposed development will comprise of 9 x 4.5MW standby gas generation plant and associated ancillary equipment. Based upon the noise emissions from the proposed plant we have undertaken noise modelling to assess the noise emissions at the nearest residential properties. It is understood that the original consent (89321/FUL/16) will no longer be constructed.

This predicted level has subsequently been compared with previous noise measurements undertaken at the site to assess the impact on the proposed scheme. Our assessment has indicated that the proposed plant will be 3 dB below the existing background sound level during the night-time period.

It is noted that the recommendations within BS4142:2014 indicate that the following:

"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.

Where the rating level does not exceed the background level, this is an indication of the specific sound source having a low impact, depending on the context."

In accordance with the requirements of The National Planning Policy Framework (NPPF) and the Noise Policy Statement for England (NPSE) indicates that planning policies should mitigate and reduce to a minimum potential adverse impact resulting from noise from new development and avoid noise giving rise to significant adverse impacts on health and the quality of life. In addition the NPSE indicates that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development. However the NPSE indicates that this does not mean that such adverse effects cannot occur.

It is noted that the assessment results with mitigation have indicated the rating level is below the background and therefore in accordance with BS4142 is below the level considered to be an adverse impact.

Therefore based upon the estimated noise emissions provided within this report we would consider that the noise emissions from the new plant would not result in an adverse impact on the surrounding residential receivers.

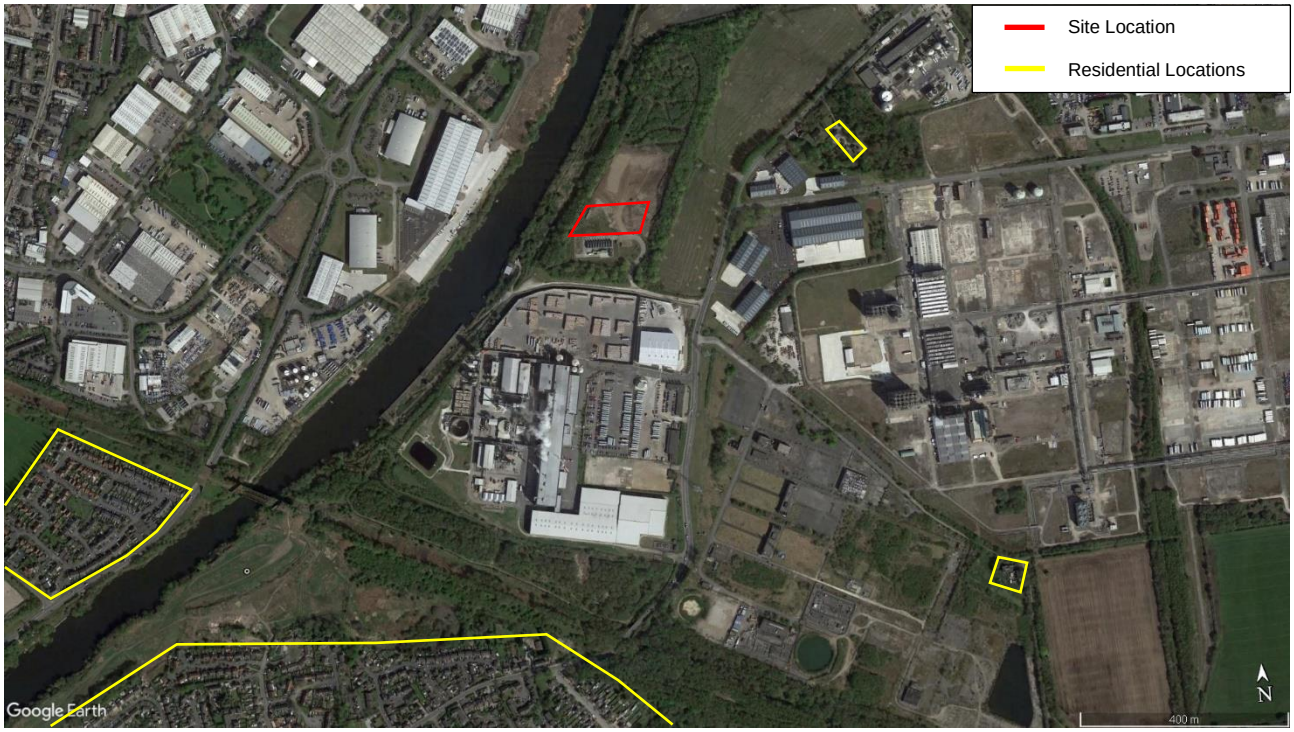
2.0 INTRODUCTION

The proposed development is for the construction of 9 x 4.5MW standby gas generators, located in Carrington, Manchester. The original consent for 20 x 2MW (89321/FUL/16) will no longer be constructed.

The local area around the proposed site is of existing industrial use. The nearest residential receivers to the site are the Old Vicarage approximately 430m to the east of the site, residential receivers on Manchester Road 850m south of the site and the residential receivers on Cadishead Way to the south west of the site.

The proposed site layout showing the location of the site and surrounding local area including the closest residential receivers are shown in Figure 1 below.

Figure 1. Proposed Site Location with Nearest Residential Receiver



3.0 NOISE ASSESSMENT CRITERIA

3.1 National Planning Policy Framework (NPPF)

National Planning Policy is guided by the National Planning Policy Framework (NPPF) updated in July 2021. With regard to Noise the Framework states the following;

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 of soil, air, water or noise pollution or land instability.*

  Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

- *mitigate and reduce to a minimum potential adverse impact resulting from noise from new development – 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.*

The terms '*significant adverse impact*' and '*adverse impact*' are defined in the explanatory notes of the 'Noise Policy Statement for England (NPSE) which states;

There are two established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation. They are:

NOEL – No Observed Effect Level

This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected.

Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse effect level.

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur.

The notes also offer an explanation of the term 'other adverse impacts' as follows;

… refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development (paragraph 1.8). This does not mean that such adverse effects cannot occur.

It should be noted that no specific noise limits for LOAEL and SOAEL have yet been specifically defined; however guidance from other acoustic standards may be employed to determine suitable levels within the overall principal of the National Planning Policy Framework.

3.2 Planning Practice Guidance – Noise

The UK Planning Practice Guidance on noise offers further guidance on the typical levels which constitute the NOEL, LOAEL and SOAEL and is reproduced in the table below;

Table 1. Planning Practice Noise Level Guidance

Perception	***Examples of Outcomes***	***Increasing Effect Level***	***Action***
Not present	No Effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. 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			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, 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 small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, 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
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

3.3 BS4142:2014

The effect of plant noise emissions on the nearest noise sensitive residences can be assessed in accordance with BS4142:2014 – '*Methods for rating and assessing industrial and commercial sound*'.

The standard describes a method of determining the level of a noise of commercial or industrial nature, together with procedures for assessing the impact of such a noise outside nearby noise sensitive areas.

The standard provides a procedure for comparing the noise from commercial sources with background noise levels in the absence of the commercial noise and determining the likely impact of the noise on noise sensitive areas.

In accordance with BS 4142 the background noise level is the typical A-weighted sound pressure level at the assessment position that is exceeded for 90% of a given time interval (L_{A90}). The specific noise level is the equivalent continuous (L_{Aeq}) sound pressure level at the assessment position produced by the noise source over a given time interval.

Certain acoustic features can increase the impact over that expected from a simple comparison between the specific noise level and the background level. Where such features are present, these are considered by adding corrections to the specific noise level.

The corrections are applied based on whether the following features occur, or are expected to be present. The correction values can either be determined subjectively, or by various objective measurement procedures.

- The noise contains a distinguishable, discrete, continuous tone (whine, hiss, screech, hum, etc.). 0 – 6 dB penalty
- The noise contains distinct impulses (bangs, clicks, clatters, or thumps).
- 0 – 9 dB penalty.
- The noise is irregular enough to attract attention. 0 – 3 dB penalty.
- Other features. 0 – 3 dB penalty.

From the addition of the above penalties where appropriate the rating level is established, this being the value that is compared with the background noise.

According to BS 4142 an initial estimate of the impact is given for a rating level of:

- 10 dB(A) or more above the background is an indication of significant adverse impact, depending on the context.
- 5 dB(A) above the background is an indication of an adverse impact, depending on the context.
- where the rating level does not exceed the background level, this is an indication of the specific sound source having a low impact, depending on the context.

The above initial assessment may then be modified depending on the context to take into account;

- The absolute level of the sound.
- The character and level of the residual sound compared to the character and level of the specific sound.
- The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:
    1. Façade insulation treatment
    2. Ventilation and / or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and
    3. Acoustic screening

3.4 WHO Guidelines for Community Noise

In 1999, the WHO (World Health Organisation) published Guidelines for Community Noise, stating the following internal noise levels are applicable to dwellings.

Table 2. WHO Guidelines for Community Noise criteria

Specific Environment	Critical Health Effect(s)	L_{Aeq} dB	Time Base (hours)*
Outdoor living area	Serious annoyance, daytime and evening	55	16
	Moderate annoyance, daytime and evening	50	16
Outside Bedrooms	Sleep disturbance, window open (outdoor values) night time	45	8

* Typically taken to be daytime/evening - 07:00 – 23:00 hours, and night time 23:00 – 07:00 hours.

WHO guidelines state, 'To protect the majority of people from being seriously annoyed during the daytime, the outdoor sound level from steady, continuous noise should not exceed 55 dB L_{Aeq} on balconies, terraces and in outdoor living areas. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound level should not exceed 50 dB L_{Aeq}.'

4.0 BACKGROUND SOUND SURVEY DETAILS

Previous baseline acoustic surveys have been undertaken covering the existing residential receptors to the north and south of the proposed application site. We have been provided with a noise survey for a previous application for this site that was undertaken in July 2016 undertaken by RPS Planning.

Details of these measurements described as follows:

4.1 Survey undertaken by RPS Planning (Report Ref: JAT9091-REPT-12-R0)

Unattended sound monitoring was undertaken from 13th to 24th July 2016 at Old Vicarage Nursery and Garden just off Manchester Road. Whilst these measurements were undertaken 5-years ago it would be our expectation that there would be little variation between the period when the survey was undertaken and current conditions. There is potential the noise climate may have increased due to an increase in development in the area, therefore using these background sound levels as the baseline for the assessment would be considered conservative. Based upon the report the measurement location is as follows:

Figure 2. RPS Planning report Measurement Location

Based upon the results of this survey it indicates the following baseline noise levels:

Table 3. RPS Planning Baseline Sound Levels

Period	Parameter	Measurements at LT1
Daytime (0700 – 1900)	Ambient sound level, dB L_{Aeq}	50
	Background sound level, dB L_{A90}	48
Evening (1900 – 2300)	Ambient sound level, dB L_{Aeq}	48
	Background sound level, dB L_{A90}	46
Night-time (2300 – 0700)	Ambient sound level, dB L_{Aeq}	46
	Background sound level, dB L_{A90}	45

In addition in relation to other noise sensitive receivers that are at a greater proximity to the proposed site the report states the following:

"Due to the likely presence of a local or industrial noise source at Old Vicarage (inferred from the low variation of measured noise levels at LT1) it is considered that the noise environments at Liverpool Road, Manchester Road and Mona Way could differ significantly from the noise environment at Old Vicarage. Therefore 10 dB has been subtracted from the noise metrics determined at Old Vicarage in order to provide a robust assessment of potential noise effects at the remaining three locations"

Therefore based upon the above comments we have assumed that the sound level at the other receivers will be 10dB below the measurements described above.

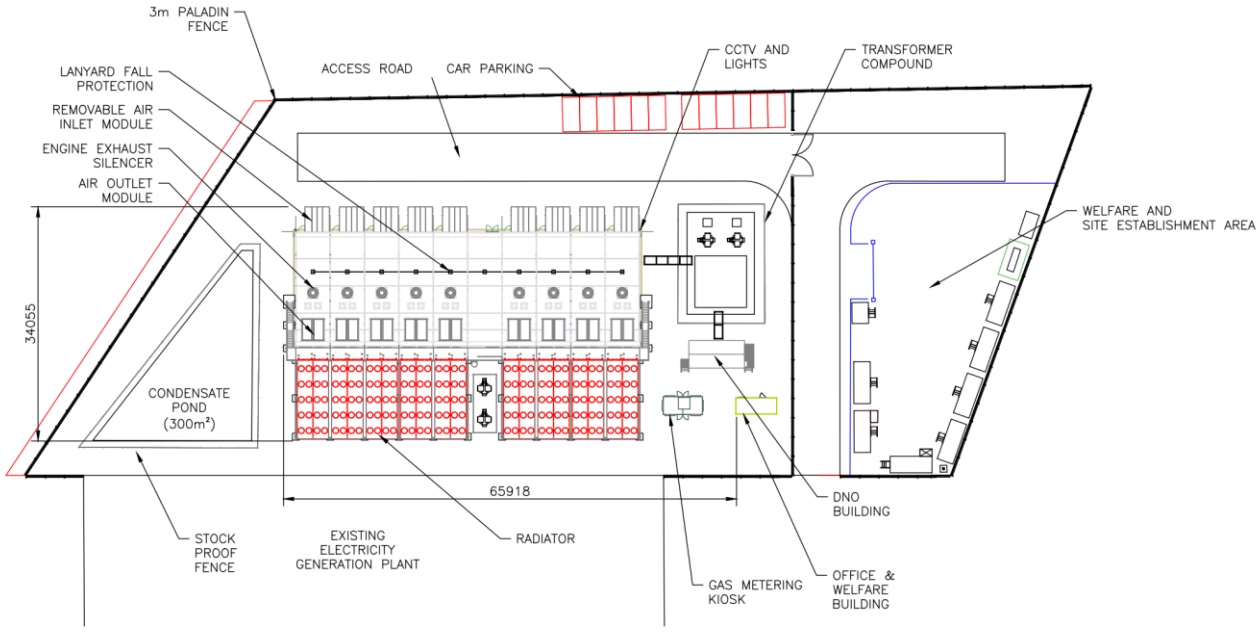
5.0 SPECIFIC NOISE LEVEL CALCULATION

The proposed scheme will consist of 9 x 4.5MW standby gas generation plant and associated ancillary equipment.

5.1 Proposed Site Plan

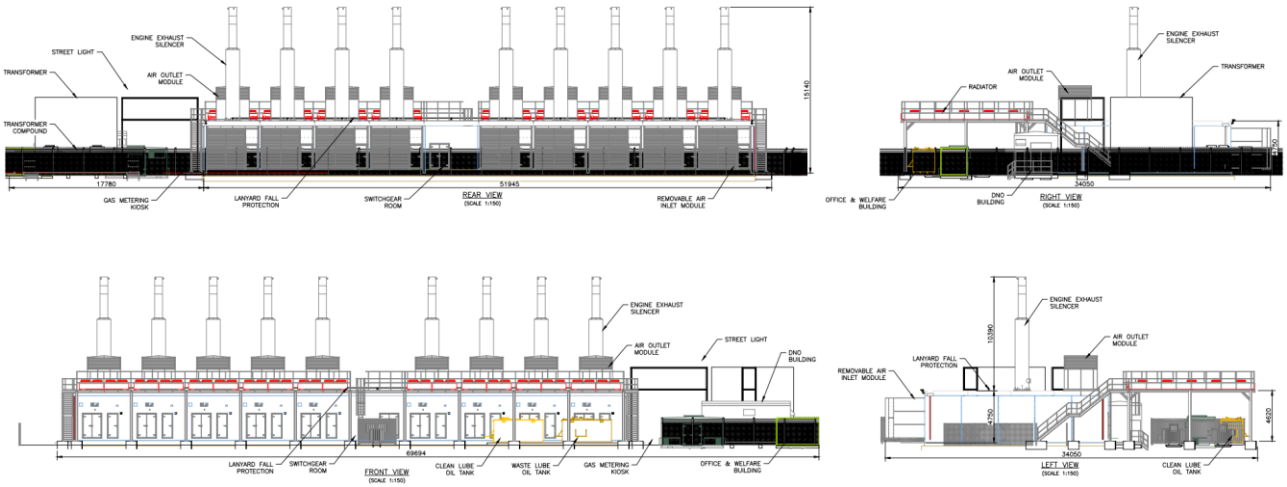
The proposed site plan is detailed within the following drawing:

Figure 3. Proposed Site Plan



Site plant elevations are detailed within the following figure:

Figure 4. Proposed Site Elevations



5.2 Source Sound Power Levels

We have been provided with the following sound power levels for the proposed plant equipment:

Table 4. Sound Power Noise level spectra of above for input into noise model

Element	Sound Power Level dB, Octave Band Centre Frequency Hz								Broadband dBA
	63	125	250	500	1k	2k	4k	8k	
Enclosed Engine	95	90	81	74	65	57	51	51	78
Air intake	100	92	76	64	63	62	73	88	88
Air outlet	100	92	76	64	63	62	73	88	88
Exhaust outlet	104	94	83	78	71	71	72	-	84
Radiator	84	90	94	89	84	80	77	72	91
Gas Skid	81	76	70	77	69	66	74	80	82
Transformer	82	87	86	86	80	75	70	63	86

In accordance with the drawings we have assumed that there will be 9 engines each with the associated noise level of the engine, air intake, air outlet, exhaust outlet and radiator. It has been assumed there is a single Gas Skid and Transformer on the site.

All noise sources will be located as detailed within Section 5.1 above.

5.3 Noise Propagation Calculations

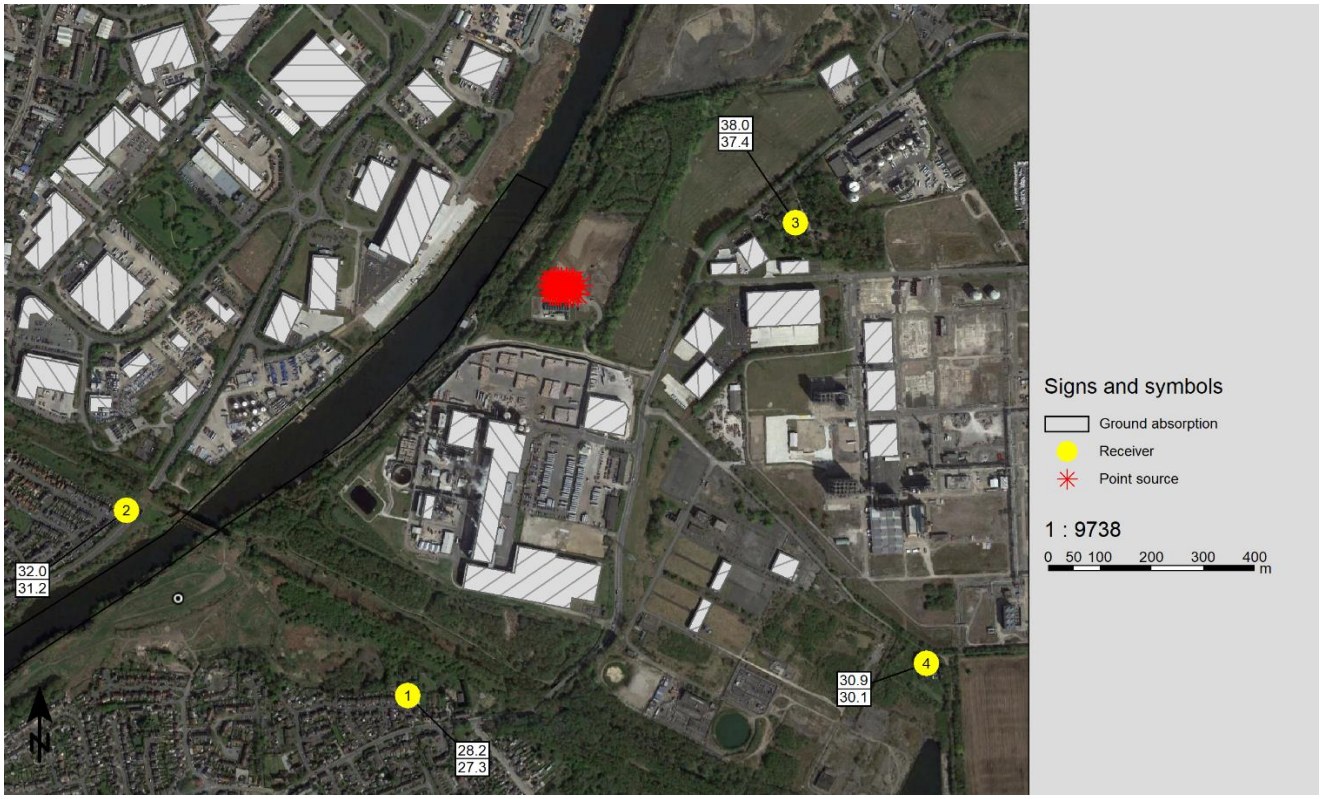
Utilising the source sound power levels and the sound insulation properties described above we have utilised Soundplan Essential v2.1 noise modelling software.

The software uses the method of ISO 9613 ‘Acoustics – attenuation of sound during propagation outdoors – general method of calculation’ and takes into account geometric spreading, ground effects, air attenuation, barrier attenuation and reflections. As the ground conditions between source and receiver are mixed between soft ground and hard ground associated with the industrial areas a ground absorption coefficient of 0.5 has been used representative of the intervening ground between the proposed site and the receivers. The exception to this is for the Manchester Ship Canal where we have used a ground absorption of 0 to represent the areas of water. It is noted that there is a disused railway on an elevated embankment that is likely to provide to the residential receivers to the south of the site. This has not been taken into account within our assessments and as such the results are conservative.

The gas powered engines are modelled as point sources with the exhausts at a height of 15m, the enclosed engines at a height of 2.3m, the air intake at a height of 2.3m, the air outlet at a height of 7m, the radiator at a height of 4.6m, the transformer at a height of 1.5m and the Gas skid at a height of 1.2m. The sound power levels and frequency spectra are as detailed in Section 5.2. It is assumed that all units will be operating continuously and simultaneously.

The Soundplan model would suggest the following noise levels calculated at the closest noise sensitive receivers. Noise levels are calculated at 1.5m for the ground floor level and an additional 2.8m for the floors above.

Figure 5. Calculated Specific Noise Levels



Note: The tables presented within the figure relate to the ground floor and the first floor at each residential location.

6.0 NOISE IMPACT ASSESSMENT

6.1 Initial BS4142 Assessment

Please refer to Figure 8 which details the results of the modelling calculation described above and compared these levels with the Background Sound Level derived within Section 6.3.

Table 5. Comparison of proposed boiler house with background sound levels during the day

Location	Predicted Specific Sound Level $L_{Aeq,T}$ (dB)	Rating Level L_{Ar} (dB)[1]	Representative Background $L_{A90(15\text{-}min)}$ (dB)	Difference between Rating Level and Background (dB)
NSR 1 (Manchester Road)	28	28	38	-10
NSR 2 (Cadishead Way)	32	32	38	-6
NSR 3 (Old Vicarage)	38	38	48	-10
NSR 4 (Ashpodal Farm)	31	31	38	-7

Table 6. Comparison of proposed boiler house with background sound levels during the evening

Location	Predicted Specific Sound Level $L_{Aeq,T}$ (dB)	Rating Level L_{Ar} (dB)[1]	Representative Background $L_{A90(15\text{-min})}$ (dB)	Difference between Rating Level and Background (dB)
NSR 1 (Manchester Road)	28	28	36	-8
NSR 2 (Cadishead Way)	32	32	36	-4
NSR 3 (Old Vicarage)	38	38	46	-8
NSR 4 (Ashpodal Farm)	31	31	36	-5

Table 7. Comparison of proposed boiler house with background sound levels during the night

Location	Predicted Specific Sound Level $L_{Aeq,T}$ (dB)	Rating Level L_{Ar} (dB)[1]	Representative Background $L_{A90(15\text{-min})}$ (dB)	Difference between Rating Level and Background (dB)
NSR 1 (Manchester Road)	28	28	35	-7
NSR 2 (Cadishead Way)	32	32	35	-3
NSR 3 (Old Vicarage)	38	38	45	-7
NSR 4 (Ashpodal Farm)	31	31	35	-4

Notes:

1 Based upon manufacturers supplied third octave band data for similar engine models there is no indication that the proposed plant will emit any tonal component. In addition, the specific noise level is below the background sound level and would likely be below the existing ambient sound climate. We would therefore consider that it is likely that the perceptibility of any potential tonal element will be further reduced due to masking noise provided by the existing noise climate. It is considered that the specific sound will not be characterised as impulsive and will not have any intermittency that will be readily distinctive against the residual acoustic environment. We would therefore consider that it would not be appropriate to apply penalties for potential acoustic features

It is noted that BS4142 indicates the following:

10 dB(A) or more above the background is an indication of significant adverse impact, depending on the context.

5 dB(A) above the background is an indication of an adverse impact, depending on the context.

Where the rating level does not exceed the background level, this is an indication of the specific sound source having a low impact, depending on the context.

As the assessment has indicated that the Rating Level is 3dB below the representative Background Sound Level in the worst case time period, in accordance with BS4142:2014 an initial assessment estimate impact would indicate that the specific sound will be below a level that is considered to be an adverse impact and will have a low impact.

It should be noted however that that in accordance with BS4142:2014 this initial impact will need to be modified to account for context of the site.

6.2 Context

The BS4142 initial estimate is described within Section 6.1, however BS4142 indicates that this initial estimate of impact needs to be modified for context. With reference to the context BS4142 indicates that the significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs. BS4142 indicates that pertinent factors that could modify context would include: the absolute level of sound; the character and level of the residual sound compared to the character and level of the specific sound; the sensitivity of the receptor and whether dwellings or other premises used for residential purpose already incorporate design measurements that secure good internal and/or outdoor acoustic conditions.

We would note that whilst the character of the specific sound would be similar to the existing noise climate it is unlikely that the existing residential premises already incorporate design measures for good internal/external acoustic conditions.

However it is noted that the Proposed Development are for standby generators that will only operate during peak periods of electricity demand which would correspond to daytime hours only. The predominant usage will be during the winter months and peak times of use during the afternoon/evening between 1600 and 1800.

Whilst the Proposed Development can operate at any time of the day or night the likelihood of the facility being required to start up at night-time is extremely low as peak demand does not occur overnight.

We would therefore consider due to the rare occurrence of the Proposed Development operating at night would reduce the impact during this period.

6.3 Discussion

It is noted that the NPPF requires that significant adverse impacts due to a new development should be avoided and other adverse impact should be mitigated and reduced to a minimum. Based upon the above assessment it is concluded that the sound levels arising from the operations of the Proposed Development will not result in an adverse impact and will therefore comply with the requirements of the NPPF.

7.0 UNCERTAINTY

BS4142 indicates that an assessment of noise impact should consider uncertainty within the assessment. This uncertainty can arise from: uncertainty in measurements; uncertainty in sound emission and sound power level; and uncertainty in calculation method.

7.1 Uncertainty in Measurements

It is noted that the assessment has been based upon survey undertaken previously at this site. However reviewing the instrumentation used for the assessment, it conforms to Class 1 accuracy in accordance with IEC 61672. In addition, the instrumentation has been calibrated to national standards and was field calibrated at the time of the measurements. In addition the survey indicates that the measurements conformed to the requirements of BS 7445:2003.

It is noted that the measurements were undertaken at a single location and measurements have been derived at other locations based upon these results. However the assessment has subtracted 10dB of these measurements to assess these other locations in order to provide a robust assessment.

We would therefore consider that the effect of uncertainty on the measurement of background sound would be minimal.

7.2 Uncertainty in Sound Power Levels

We have been provided with sound power levels for the proposed plant items. It will need to be ensured that the noise emissions match the levels quoted within Section 5.2.

7.3 Uncertainty in Calculation Method

It is noted that the calculations have been undertaken utilising a known prediction method and have utilised the standard ISO 9613. In addition calculations have been undertaken utilising commercial prediction software. In addition where there is uncertainty in the assessment, we have undertaken these on a conservative basis. We would therefore consider that this would minimise uncertainty in the assessment.

8.0 CONCLUSION

At the request of Forsa Energy Gas Holdings Ltd a noise impact assessment has been undertaken for the proposed new Gas Generator Plant at Carrington, Manchester.

An assessment of the noise emissions from the proposed units has been undertaken and compared with the guidelines contained within BS4142:2014 *"Methods for rating and assessing industrial and commercial sound"*.

The assessment indicates that the development will not result in an adverse impact at the nearest noise sensitive receivers in accordance with the recommendation described within BS4142:2014. This is therefore an indication that the proposed scheme is compliant with the requirements within the National Planning Policy Framework.

APPENDIX A – DEFINITION OF ACOUSTIC TERMS

The decibel

This is the basic unit of noise, denoted dB.

A Weighting

This is a weighting process which simulates the human ear's different sensitivity at different frequencies. A weighting can be shown two typical ways, 50 dB(A) L_{eq} or 50 dB $L_{Aeq.}$ Both mean the same thing. (See below for a definition of L_{eq}). The dB(A) level can be regarded as the overall level perceived by human beings.

L_{eq} and $L_{eq(s)}$

This is the equivalent continuous noise level which contains the same acoustic energy as the actual time-varying sound. In other words it is a kind of average noise level. It is denoted dB L_{eq} or, for A-weighted figures dB(A) L_{eq} or dB L_{Aeq}. It can also be expressed in terms of frequency analysis (see later). $L_{eq(s)}$ is the sample L_{eq} level.

L_n

This is the level exceeded for n% of the time. It is denoted dB L_n or, for A-weighted figures dB(A) L_n or dB $L_{An.}$ It can be expressed in terms of frequency analysis (see later). L_{90} is the level exceeded for 90% of the time and is a measure of the lowest level typically reached. L_{10} is the level exceeded for 10% of the time and is the highest level typically reached. L_{50} is the level exceeded for 50% of the time and, mathematically, it is the median.

L_{max}

This is the maximum level reached during a measurement period. The "time constant", or the ability of the equipment to respond to impulses is usually expressed along with it, e.g. "Fast", "Slow", etc. It is denoted dB L_{max} or, for A-weighted figures dB(A) $L_{max,}$ dB $L_{Amax,}$ etc. It can also be expressed in terms of frequency analysis.

Frequency Analysis

Whereas dB(A) gives a very useful overall figure, it has its limitations in that it cannot be used to model or predict the effect of noise control and mitigation as this nearly always has radically different performance at different frequencies.

Frequency analysis expresses an overall noise level at each frequency or band of frequencies in the audible range. Octave band analysis divides the audible range into 10 bands from 31.5 Hz to 16 kHz and the noise level in each band can be expressed in any form e.g. L_{eq}, L_{90}, L_{max} etc. One third octave band analysis uses 30 bands.

Narrow band analysis takes the process to resolutions of less than 1 Hz. This is useful for identifying the existence of tones (whines, hums, etc.) and in pin-pointing the sources.