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Flexible Generation Facility
Barugh, Barnsley

Environmental Noise Impact Assessment

19 July 2017

PROJECT: Flexible Generation Facility
Barugh, Barnsley

Environmental Noise Impact Assessment

CLIENT: Reliance Energy
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1.0 EXECUTIVE SUMMARY

This report provides an assessment of the environmental noise impact likely to be occurring at surrounding noise sensitive receptors, due to the operation of the proposed Flexible Generation Facility (FlexGen) located off Whaley Road in Barugh, Barnsley.

This environmental noise assessment is in part based on the results obtained from benchmark noise survey at the existing site and surrounding area, namely the residential premises as located on Parsonage Lane as carried out during weekdays and weekend, daytime and night time periods between 20th April and 24th April 2017 (inclusive).

Based on the pre-existing noise climate around the site, environmental noise limits ("Rating Levels" as defined by BS 4142: 2014) for the various noise-emitting plant and equipment associated with the Development proposals have been determined, such that the Rating Level does not exceed the pre-existing background noise level in any instance. In accordance with BS4142, where the Rating Level does not exceed the background sound level, this is an indication of a low acoustic impact on the surrounding noise sensitive receptors.

Based upon the noise level data available for the proposed generators and ancillary plant, the predicted noise level impact at each of the identified noise sensitive premises has been predicted. It has been identified that additional noise mitigation will be required to be implemented in order to be capable of meeting the specified noise level limits at each of the identified noise sensitive receptors, in the form of additional acoustic attenuation to the generator casing and the remote radiators. The Client has committed to implementing the specified outline terms noise mitigation measures.

2.0 INTRODUCTION

Sol Acoustics Ltd (Sol) has been commissioned by Reliance Energy (RE) via GP Planning Limited (GP) to conduct an environmental noise assessment to establish the environmental noise impact likely to be occurring on the surrounding environment from the operation of the proposed Flexible Generation Facility located on Whaley Road in Barugh, Barnsley. The purpose of this assessment is as follows:

- To identify the nearest pre-existing noise sensitive housing to the site (i.e. receptors), which are most likely to be affected by environmental noise arising from plant and/or processes associated with the Development Site during the proposed operating periods (e.g. daytime weekdays and weekends).
- To determine the prevailing daytime background noise climate at the nearest receptors (weekday and weekend periods).
- To identify all potentially significant proposed noise sources to be installed at the site and obtain suitable source noise level data.
- To calculate the resultant environmental noise contribution and impact arising at nearest noise sensitive receptors to the site as during the proposed hours of operation.
- To carry out an environmental noise assessment of the proposed development in accordance with the methodology prescribed in relevant Standards and guidance (i.e. British Standard 4142: 2014) to determine the significance of the potential environmental noise impact generated (likelihood of complaint).
- Should a significant impact be identified, determine suitable noise mitigation measures (in outline and performance specification terms) in order to control the anticipated noise emissions from the site to ensure that appropriate environmental noise levels can be achieved at the nearest (and all) noise sensitive receptors.

3.0 DESCRIPTION OF SITE

3.1 General Overview and Noise Sensitive Receptors (NSRs)

The proposed Development Site for the Flexible Generation Facility is located to the east of the existing industrial estate on Whaley Road in Barugh, Barnsley. The development site is currently open and undeveloped land.

The nearest existing noise sensitive premises to the Development Site are as follows:

- Residential estate located on Claycliffe Road located approximately 420 metres to the west of the Development Site Boundary.
- Residential estate located approximately 390 m to the south east of the Development Site Boundary.

In addition to the above existing residential premises, a new residential estate is currently proposed and yet to be built after consented, Application Number: 2013/0280, to the north west of the site off Dearne Hall Road, at a distance of approximately 425m to the north west of the proposed development.

Figure 1 below indicates the location of the development site in relation to the nearest proposed and existing noise sensitive premises, and also the location of the noise monitoring positions used in order to inform the assessment (discussed in Section 3).

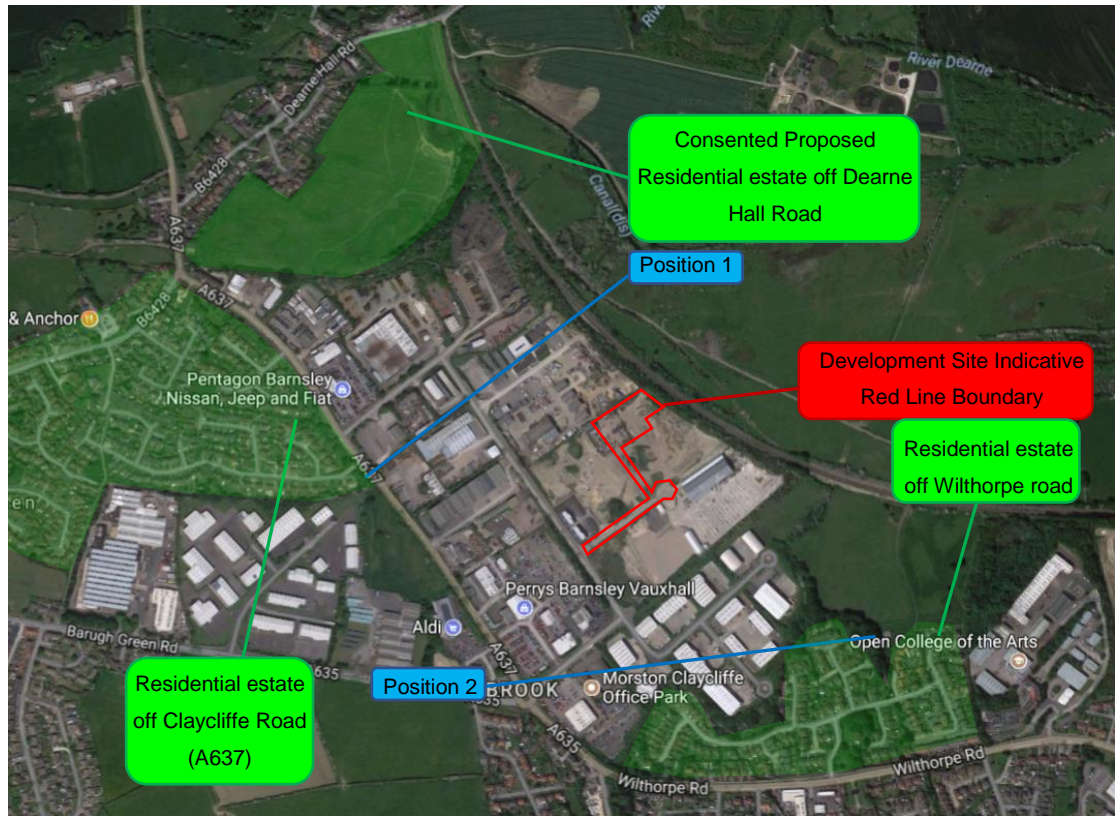


Figure 1: Proposed development site in relation to key noise sensitive receptors

2.2 Characteristics of the Installation

The purpose of the development is to provide reliable power to the National Grid on demand and as required. It is proposed that 20 x 1042 kW Perkins TRS2 gas powered generators will be installed on the site. It should be noted that an application for a separate FlexGen facility on an adjacent parcel of land has been withdrawn. The generators would only be required to operate between the hours of 07:00 – 23:00 but could operate 7 days a week. The operator is content to accept a planning condition restricting operation to between the hours of 07:00-23:00. It should be noted that the generators would only be expected to operate when there is a demand to do so and as such would not be expected to operate continuously.

The generators will be powered from mains gas and as such, other than for occasional visits from maintenance workers etc., the development is not expected to generate any operational phase site traffic.

Figure 2 shows a detailed view of the proposed development site indicating the location of each proposed generator.

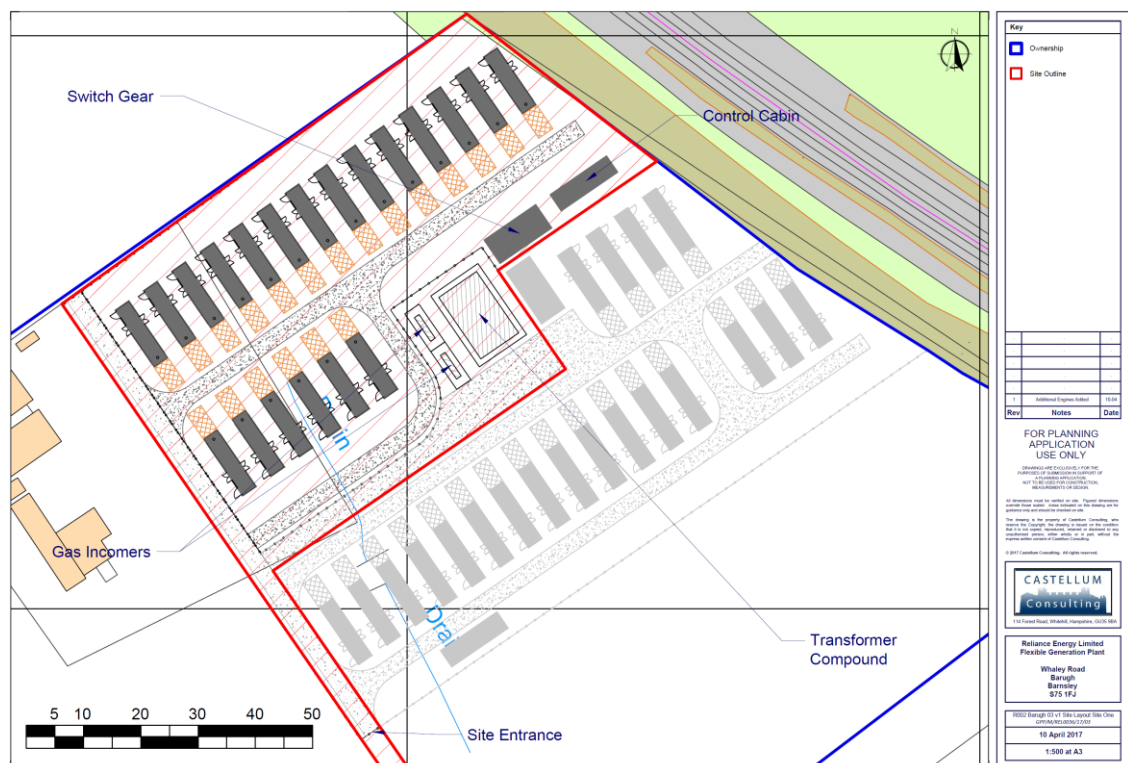


Figure 2: Proposed site layout

Acoustic product test data provided by LA indicates that a generator located within their standard enclosure package provides an average A-weighted sound pressure level of 86.8dB at 1.13m from the enclosure of the generator. Whilst this measured noise level includes the noise contribution from the air intake penthouse louvre, the extract louvre and the engine exhaust, it is not possible to ascertain from the noise measurement the individual noise level contribution from the generator enclosure, air intake penthouse louvre and air outlet louvres, or the engine exhaust.

In the absence of any additional noise data, it has been assumed for the purposes of this acoustic assessment that, *as standard*, the generator enclosure, air inlet penthouse louvre, air outlet louvre and the engine exhaust each emit a sound pressure level of 86.8dB(A) at 1.13m.

LA have also provided specific noise level data for the proposed remote radiator unit which is rated with sound power level of 90dB(A).

Table 1 summarises the noise level data assumed for each identified noise source associated with the proposed 1042 kW Perkins TRS2 Gas Powered Generator:

Identified Noise Source	Noise Level Data
Generator Enclosure (including Air Outlet Louvre)	86.8dB $L_{Aeq,T}$ at 1.13m
Air Inlet Penthouse Louvre	86.8dB $L_{Aeq,T}$ at 1.13m
Engine Exhaust	86.8dB $L_{Aeq,T}$ at 1.13m
Remote Radiator	90dB L_{WA}

Table 1: Assumed 1042 kW Perkins TRS2 Gas Powered Generator Noise Level Data

4.0 DETAILS OF INVESTIGATION

In order to inform the assessment, an environmental noise survey has been conducted by Sol between 20th April and 24th April 2017. The purpose of these measurements was to determine the prevailing background noise levels expected at the nearest noise sensitive premises to the development site, for environmental noise benchmarking and assessment purposes.

Two environmental noise measurement positions were selected to inform the survey:

- **Noise Monitoring Position 1:** The microphone was positioned approximately 400m to the west the Development Site Boundary and just to the east of the residential premises on Medina Way. The microphone was installed at a height of approximately 2.4m above location ground level. The background noise levels measured at this position are considered to be representative of those expected at the residential estate on the west side of Claycliffe Road.
- **Noise Monitoring Position 2:** The microphone was positioned approximately 420m to the south east the Development Site Boundary and approximately 20 m just to the east of the residential premises on Coppice Avenue. The microphone was installed at a height of approximately 3m above location ground level. The background noise levels measured at this position are considered to be representative of those expected at the residential estate off Wilthorpe Road as well as that expected at the proposed new residential development located off Dearne Hall Road.

The location of the noise monitoring positions is shown in Figure 1.

The noise survey was carried out using Type 1 Precision Grade noise monitoring equipment, and the complete measuring systems were field calibrated immediately prior to, and following the noise survey period. (Full details of the noise monitoring systems are retained on file by Sol, including traceable calibration records; these are available for review if needed).

During all environmental noise measurements, the prevailing weather conditions remained favourable for the purposes of environmental noise assessment throughout the entire survey period, with a light breeze (with a mean wind speed of 1m/s) and no rain occurring. Further details of the identified weather conditions are provided in Appendix A.

Notwithstanding the weather conditions recorded, the microphone systems were entirely weatherproofed and fitted with all-weather environmental windshields, each with bird spike.

5.0 NOISE SURVEY RESULTS SUMMARY

5.1 Background Noise Climate

Table 2 provides a basic summary of the typical overall, A-weighted noise levels measured at the various noise monitoring locations, in L_{Aeq} and L_{A90} terms, as during daytime and night time periods, weekdays and weekends. The specific, measured noise levels pertinent to the BS4142 environmental noise assessment are highlighted in **bold, italic** text. The key observations are provided below:

Position	Date	Daytime (07:00 - 23:00)		Night Time (23:00 – 07:00)	
		dB $L_{Aeq,16hour}$	dB $L_{A90,15min}$ (Typical)	dB $L_{Aeq,8hour}$	dB $L_{A90,15min}$ (Typical)
1	Thursday 20 April 2017	62*	48	58	44
	Friday 21 April 2017	62	50	57	35
	Saturday 22 April 2017	63	44	56	35
	Sunday 23 April 2017	62	44	57	36
	Monday 24 April 2017	64*	58	-	-
2	Thursday 20 April 2017	48*	43	49	39
	Friday 21 April 2017	53	43	48	27
	Saturday 22 April 2017	51	37	48	31
	Sunday 23 April 2017	49	38	49	36
	Monday 24 April 2017	64*	48	-	-
* Measurement not conducted for the full 16-hour assessment period					

Table 2: Summary of Typical, Measured Broadband Environmental Noise Levels

Appendix A provides further information, including detailed noise time-history graphs for all the measured receptor daytime, night time, weekday and weekend background noise survey data.

It should be noted that the night time background noise levels are presented for completeness but do not form part of the assessment as the Development will only operate during daytime hours, namely as between 07:00 – 23:00 hours.

The typical weekday daytime background noise levels measured during the proposed hours of operation were 48dB $L_{A90,15min}$ and 43dB $L_{A90,15min}$ at Measurement Position 1 and 2 respectively.

The typical weekend daytime background noise levels measured during the proposed hours of operation were 44dB $L_{A90,15min}$ and 37dB $L_{A90,15min}$ at Measurement Position 1 and 2 respectively.

These measured background noise levels form the benchmark for the environmental noise assessment.

6.0 ENVIRONMENTAL NOISE IMPACT ASSESSMENT

6.1 BS4142 Assessment Methodology and Adopted Environmental Noise Targets

BS 4142: 2014: *Method for rating and assessing Industrial and commercial sound* (BS 4142) is intended to be used to assess noise of an industrial nature, which includes sound from fixed installations, which comprise mechanical and electrical plant and equipment.

The procedure contained in BS 4142 for assessing the impact is to compare the measured or predicted noise level from the source in question, the 'Specific Noise Level' immediately outside the noise sensitive premises, with the background noise level. Where the noise contains attention attracting characteristics such as tonal, impulsive, intermittent elements, it may be appropriate to apply a correction to the specific noise level to obtain the 'Rating Level'.

The Standard advises that where 'specific sound features' are present, a penalty of +3dB can be applied to the Specific Sound Level (i.e. the total, calculated, aggregate plant noise level at each NSR in this instance, daytime and night time), in order to obtain the Rating Level.

BS 4142 states 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. Typically, the greater this difference, the greater the resulting environmental noise impact:

- a) Typically, the greater this difference, the greater the likelihood of complaint.
- b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- c) A difference of around +5 dB 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 a 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.

For the daytime, this assessment is carried out over a one-hour period, and over a 15 minute period at night. The daytime and night-time periods are defined as occurring between 07:00 to 23:00 hours and 23:00 to 07:00 hours respectively.

Thus, in BS4142 assessment terms, it is considered appropriate to limit the combined *Rating Level* from the Development Site to not exceed the typical measured weekday and weekend daytime background noise levels.

On this basis, and based upon the results of the environmental noise survey, the following daytime maximum permissible Rating Level limits apply at the nearest noise sensitive premises:

Residential Dwellings	Weekday Daytime (07:00-23:00) Maximum Permissible Rating Level Limit, dB $L_{Ar,Tr}$	Weekend Daytime (07:00-23:00) Maximum Permissible Rating Level Limit, dB $L_{Ar,Tr}$
Residential Estate on Claycliffe Road	48	44
Residential estate off Wilthorpe Road	43	37
Proposed Residential premises off Dearne Hall Road	43	37

Table 3: Daytime Maximum Permissible Noise Rating Level Limit

7.0 NOISE IMPACT ASSESSMENT

7.1 Methodology and Basis for the Assessment

In order to predict the likely resultant environmental noise levels impinging noise sensitive receptors, 3D computer based environmental noise models were created using the DataKustik 'CadnaA' Noise Mapping software. The following assumptions have been made in the generation of the noise models:

- The noise model was set up to apply the noise prediction methodology set out in ISO 9613-2: *Acoustics – Attenuation of Sound propagation outdoors – Part 2: General Method of Calculation*.
- The model was set to include up to second order reflected noise from solid structures.
- The existing land topography of the development site and surrounding area up to and including the nearest noise sensitive premises has been taken into consideration in the assessment. 3rd party topographical information has been obtained from emapsite.com.
- Acoustic screening afforded by nearby buildings and solid structures located between the proposed Development Site and the noise sensitive receptors have been considered in the assessment.
- For the purposes of the assessment, and to present the worst case, it has been assumed that all proposed generators are in full operation between the consented hours of operation 07:00-23:00 seven days a week.
- The generator enclosure has been modelled as a 5-sided 3D noise radiating object, based upon the dimensions stated for the unit, assuming uniform noise propagation from each surface. The sound power level of the unit was determined to ensure that the unit provided a sound pressure level of 86.8 dB(A) at 1.13m.
- The air intake penthouse louvre, exhaust and remote radiator have been modelled as separate and additional point sources, mounted at the appropriate height on top of the generator.
- Octave band noise level data is not available for any of the identified noise source at this stage. As such, each noise source has been entered into the acoustic model as an A-weighted sound power level at 250Hz. The noise levels from generator engines and fans are typically higher in this octave band and noise at lower frequencies can be more difficult to attenuate. Furthermore, any acoustic screening afforded by any intervening buildings and barriers, as well as any attenuation due to atmospheric/environmental factors (such as air and ground absorption), is typically lower at the low frequencies and as such this assumption is considered to present the worst case in the absence of full octave band noise data.

6.2 Predicted Daytime Environmental Noise Level Impact at Receptors

Table 4 presents the predicted overall A-weighted, BS4142-defined 'Rating Level' at the identified noise sensitive receptors from the Development. In all cases, the noise levels have been predicted at 4m above local ground level. The corresponding noise map is provided in Appendix B.

Note that a correction of +4 dB has been applied to the Specific Noise Level to determine the Rating Level to account for any "clearly perceptible" tone associated with the noise level emissions expected from the generators.

The potential acoustic character associated with the impulsive operation of the generators has also been considered as part of the assessment, although no specific correction has been applied. It is reasonable to suggest that the intermittent operation of individual generators is not expected to be audible when the majority/all of the other generators are operating. Given that there are 20 generators proposed, the combined noise level produced by all generators operating will be approximately 13dB higher than that produced by any individual generator and as such the intermittent character of the noise of individual generators switching on/off is not expected to be discernible when the remainder of the generators are operating.

The acoustic character associated with the intermittent operation of generators could be expected to be more discernible when the majority/all of the other generators are switched off. However, in this instance, the specific noise level generated from the site would be lower and would not result in a higher noise level impact than that expected when all generators are operating. For example, applying an additional correction of +3dB for the intermittent operation of generators switching on/off but assuming that only up to, say, approximately 25% of the generators are operating (-6 dB correction) would result in a lower noise rating level at the nearest noise sensitive premises than that expected when all generators are operating simultaneously.

On this basis, the assessment has assumed that all generators are operating simultaneously, with no correction applied for the acoustic character associated with the intermittent operation of generators as this scenario represents the worst case.

Residential Dwellings	Assessment Period	Predicted Rating Level, dB $L_{Ar,Tr}$ *	Typical Background Noise level, dB L_{A90}	Exceedance, dB
Residential Estate on Claycliffe Road	Weekday	53 (+4)	48	9
	Weekend	53 (+4)	44	13
Residential estate off Wilthorpe Road	Weekday	53 (+4)	43	14
	Weekend	53 (+4)	37	20
Proposed residential estate off Dearne Hall Road	Weekday	54 (+4)	43	15
	Weekend	54 (+4)	37	21

* Noise levels are presented as Specific Sound Levels. The correction to be applied for acoustic character is provided in the parenthesis which such be added to the Specific Sound Level to determine the Rating Level.

Table 4: Predicted Operational Noise Levels at Receptors, at 4m height

It can be seen from Table 4 that the predicted rating level is expected to exceed the existing background noise level at each of the identified noise sensitive receptors during both the weekday and weekend periods. As such further noise mitigation will be required. Recommendations for noise mitigation are provided in the following section.

8.0 NOISE MITIGATION

8.1 Generator

The 3D computer based environmental noise model has been used to determine a suitable noise mitigation strategy for the scheme. In order to be capable of meeting the noise level limits at each of the identified noise sensitive premises, Table 5 specifies the recommended maximum permissible noise level emissions for each of the identified noise sources associated with the generator:

Identified Noise Source	Recommended Maximum Permissible Noise Level Emissions
Generator Enclosure (including Air Outlet Louvre)	60 dB $L_{Aeq,T}$ at 1m
Air Inlet Penthouse Louvre	60 dB $L_{Aeq,T}$ at 1m
Engine Exhaust	65 dB $L_{Aeq,T}$ at 1m

Table 5: Recommended maximum noise level emissions for the generator

The above recommended maximum permissible noise level emissions from the generator will need to be controlled through the careful design of the generator casing, and the appropriate specification of air inlet and outlet and exhaust attenuators. However, it is understood through Sol's discussions with the generator suppliers that the above noise level limits can be achieved and are practicable.

8.2 Remote Radiators

In order to be capable of meeting both the weekday and weekend background noise level limits at the nearest noise sensitive premises, the remote radiators will need to be controlled to not exceed a sound power level of 86 dB(A) L_w . This could be achieved using either a quieter remote radiator with the required sound power level rating, or by reducing the operating fan speed of the currently proposed remote radiator (rated at 90 dB(A) L_w) to c. 86% of maximum (to be confirmed by remote radiator/fan supplier).

8.3 Predicted Daytime Environmental Noise Level Impact at Receptors, With Mitigation

Based upon the above noise mitigation measures, Table 6 presents the predicted overall A-weighted, BS4142-defined 'Rating Level' at the identified noise sensitive receptors from the Development. In all cases, the noise levels have been predicted at 4m above local ground level. The corresponding noise maps are provided in Appendix B.

Residential Dwellings	Assessment Period	Predicted Rating Level, dB $L_{Ar,Tr}$ *	Typical Background Noise level, dB L_{A90}	Exceedance, dB
Residential Estate on Claycliffe Road	Weekday	32 (+4)	48	-
	Weekend	32 (+4)	44	-
Residential estate off Wilthorpe Road	Weekday	31 (+4)	43	-
	Weekend	31 (+4)	37	-
Proposed residential estate off Dearne Hall Road	Weekday	33 (+4)	43	-
	Weekend	33 (+4)	37	-

* Noise levels are presented as Specific Sound Levels. The correction to be applied for acoustic character is provided in the parenthesis which such be added to the Specific Sound Level to determine the Rating Level.

Table 6: Predicted operational noise levels at receptors, with mitigation, at 4m height

It can be seen from Table 6 that with the proposed noise mitigation in place, the predicted Rating Level from the site is not expected to exceed the existing background noise level at any of the identified noise sensitive premises during the proposed hours of operation.

It will need to be confirmed by the manufacturer of the remote radiators and the supplier of the generators that the above fans speed reductions can be accommodated without impacting on the operation of the site.

9.0 CONCLUSION

Sol Acoustics Ltd (Sol) has been commissioned by Reliance Energy (RE) via GP Planning Limited (GP) to conduct an environmental noise assessment to establish the environmental noise impact likely to be occurring on the surrounding environment from the operation of the proposed Flexible Generation Facility located on Whaley Road in Barugh, Barnsley.

The assessment has shown that based upon the current proposed generators, the maximum ascertained and permissible Rating Level noise limits are expected to be exceeded and as such, additional noise mitigation will be required.

Recommendations for noise mitigation have been provided within this report in terms of specific plant noise limits and performance specifications in respect of limiting the noise levels by the proposed generators and ancillary plant. It will need to be confirmed by the supplier of the generators and the remote radiators that the proposed noise mitigation can be implemented.

APPENDIX A NOISE SURVEY DETAILS AND SUMMARY RESULTS

LOCATION

Barugh, Barnsley

DATES, TIMES AND WEATHER CONDITIONS

20 th April 2017	12:00 hrs to 23:59 hrs	7 to 16°C, Wind: 1 m/s mean, 6 m/s max
21 st April 2017	00:00 hrs to 23:59 hrs	7 to 16°C, Wind: 1 m/s mean, 7 m/s max,
22 nd April 2017	00:00 hrs to 23:59 hrs	7 to 14°C, Wind: 1 m/s mean, 6 m/s max,
23 rd April 2017	00:00 hrs to 23:59 hrs	10 to 16°C, Wind: 1 m/s mean, 5 m/s max
24 th April 2017	00:00 hrs to 20:00 hrs	4 to 13°C, Wind: 1 m/s mean, 8 m/s max

No precipitation was recorded throughout.

PERSONNEL PRESENT DURING MEASUREMENTS

Mark Greenhalgh – Sol Acoustics

Darren Clucas – Sol Acoustics

INSTRUMENTATION

Position 1

Norsonic 118 Sound level meter (serial no. 28260)
Norsonic 1206 Microphone preamplifier (serial no. 30962)
Norsonic 1225 Microphone capsule (serial no. 29923)
Norsonic 1251 Calibrator (serial no. 29917)

Position 2

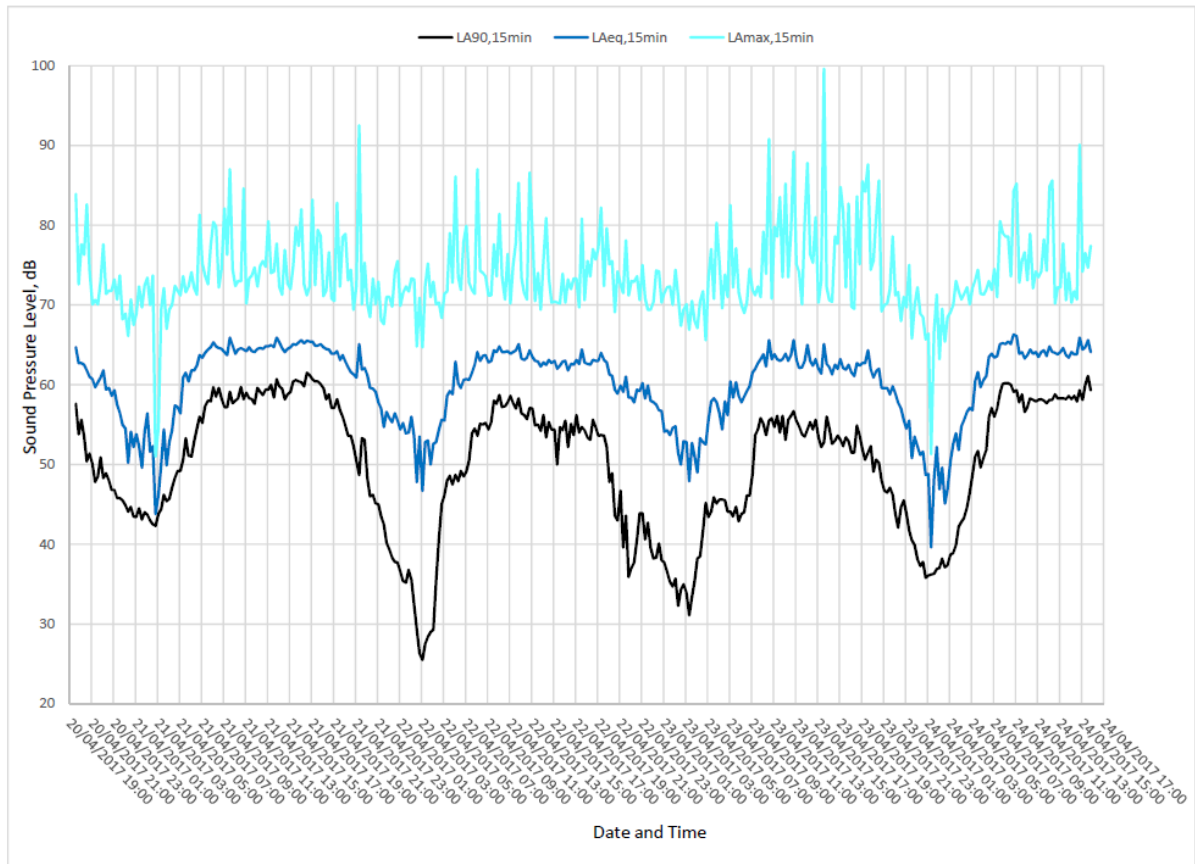
01 dB DUO Sound level meter (serial no. 10151)
01 dB DUO Microphone capsule (serial no. 136919)
01 dB CAL 21 Acoustic calibrator (serial no. 35183003)

METHODOLOGY

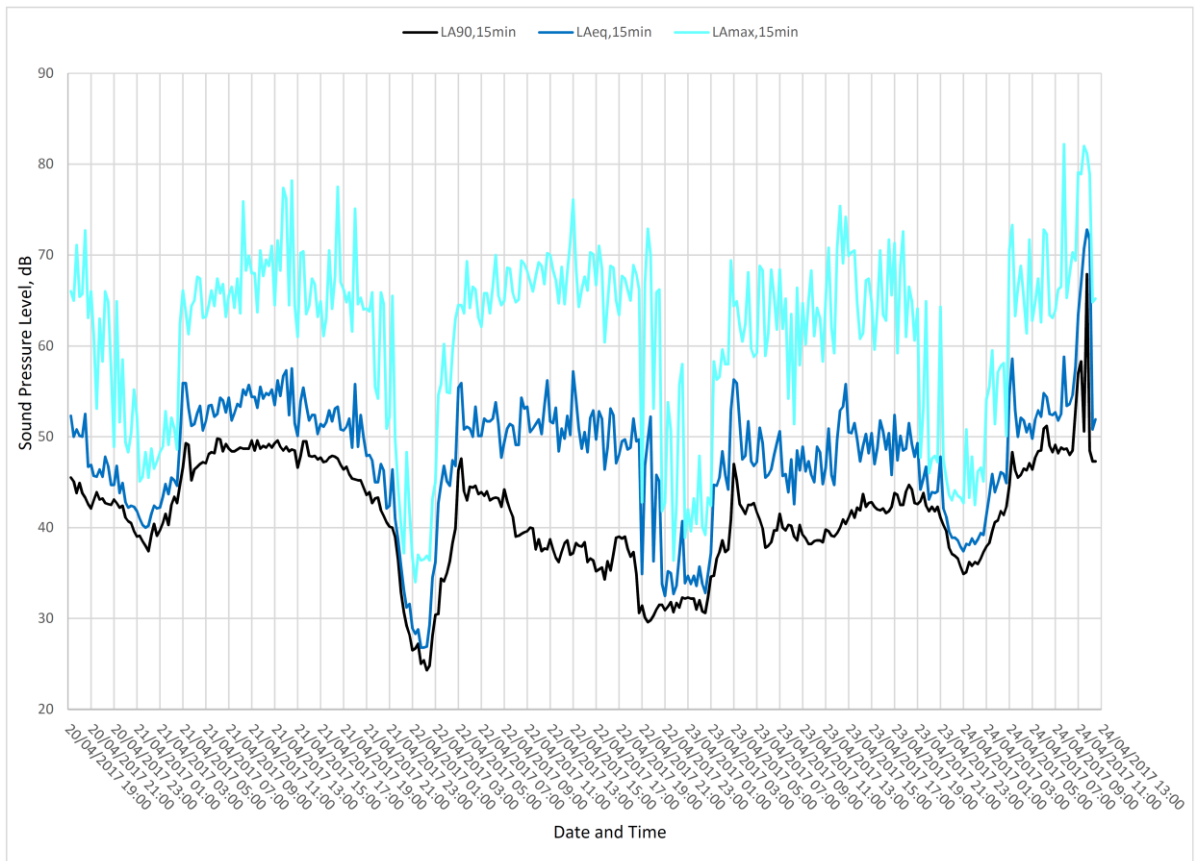
Before and after the measurements the noise monitoring equipment was calibrated to an accuracy of ± 0.3 dB using the Cal 21 Calibrator. The calibrator produces a sound pressure level of 94dB re 2×10^{-5} Pa @ 1kHz.

MEASUREMENT RESULTS

Graphs A1 and A2 summarise the results obtained at Monitoring Positions 1 and 2 respectively.



Graph A1: Position 1, 20th to 24th April 2017



Graph A2: Position 2, 20th to 24th April 2017

APPENDIX B
CADNAA NOISE MAPS

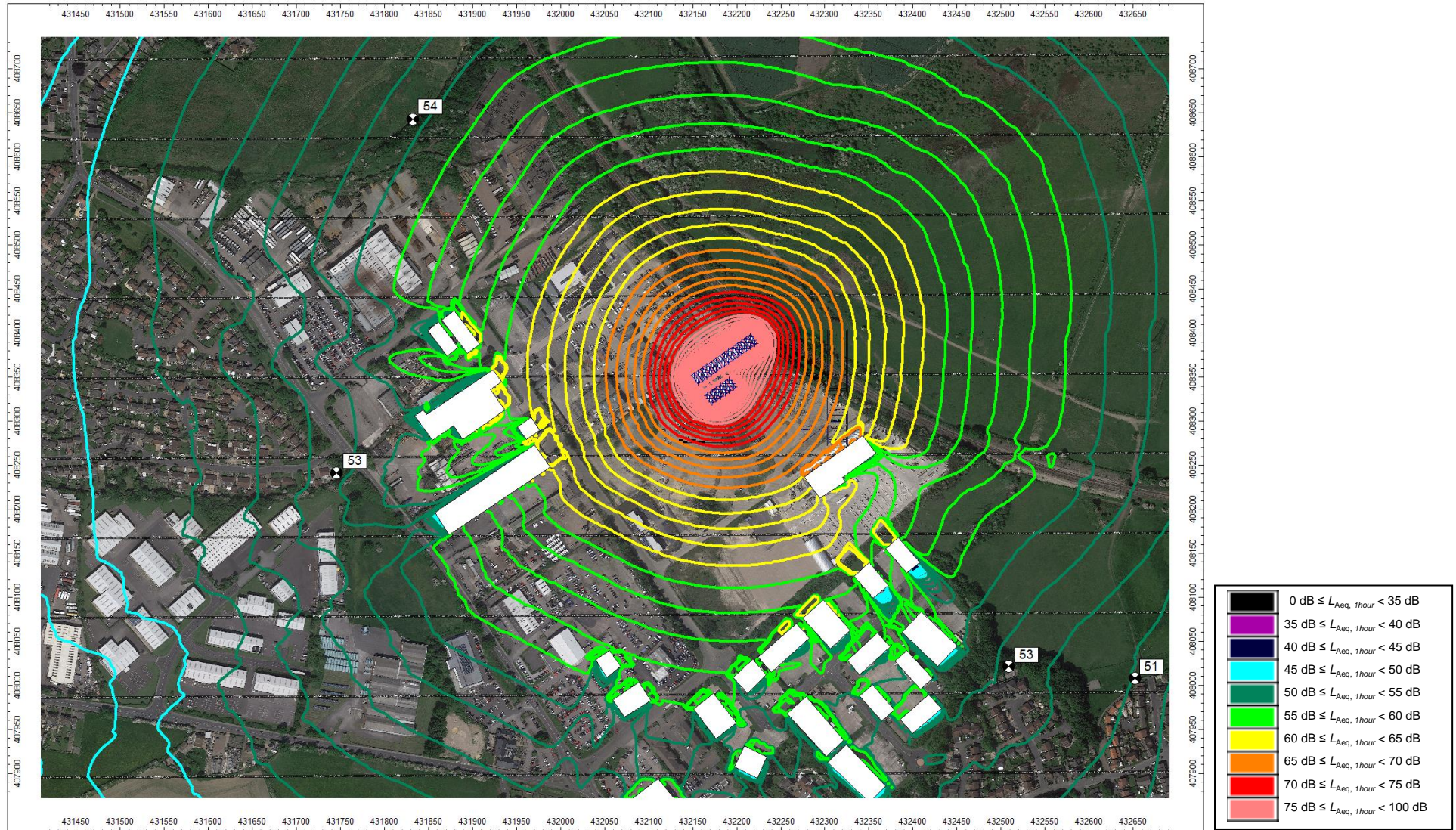


Figure B1: Predicted Daytime $L_{Aeq,1hour}$ Noise Level Impact from the Site at 4m above Local Ground Level

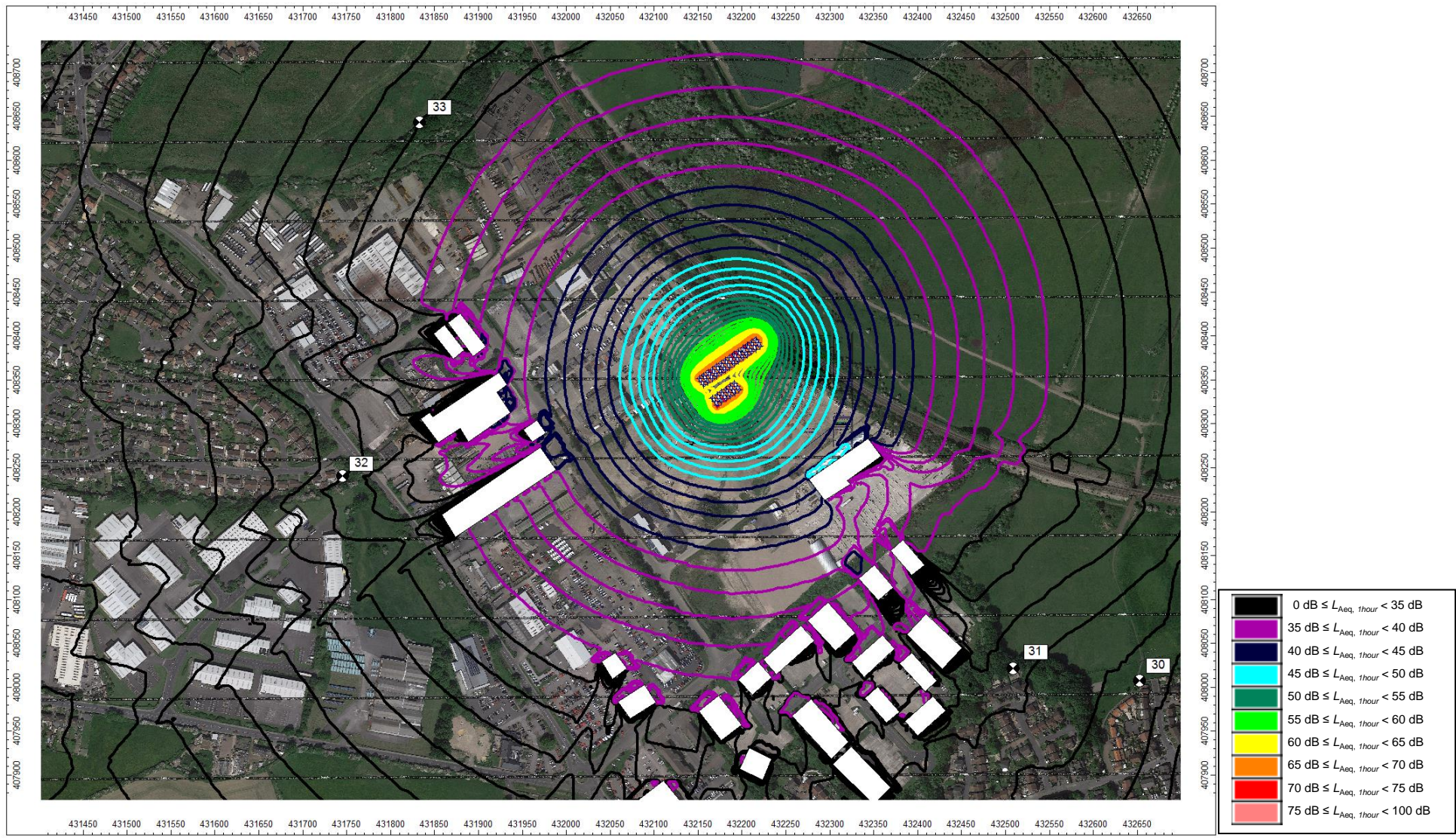


Figure B2: Predicted Daytime $L_{Aeq, 1hour}$ Noise Level Impact from the Site at 4m above Local Ground Level, With Mitigation