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Flexible Generation Facility  
Barugh, Barnsley

Environmental Noise Impact Assessment

2 May 2017

PROJECT: Flexible Generation Facility  
Barugh, Barnsley

Environmental Noise Impact Assessment

CLIENT: Reliance Energy  
59 St Marks Road  
Henley on Thames  
Oxon  
RG9 1LP

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## CONTENTS

<b>1.0</b>	<b>INTRODUCTION .....</b>	<b>2</b>
<b>2.0</b>	<b>DESCRIPTION OF SITE .....</b>	<b>3</b>
<b>3.0</b>	<b>DETAILS OF INVESTIGATION .....</b>	<b>7</b>
<b>4.0</b>	<b>NOISE SURVEY RESULTS SUMMARY .....</b>	<b>8</b>
<b>5.0</b>	<b>ENVIRONMENTAL NOISE IMPACT ASSESSMENT .....</b>	<b>10</b>
<b>6.0</b>	<b>NOISE IMPACT ASSESSMENT .....</b>	<b>12</b>
<b>7.0</b>	<b>NOISE MITIGATION .....</b>	<b>14</b>
<b>8.0</b>	<b>CONCLUSION.....</b>	<b>17</b>
	<i>APPENDIX A .....</i>	<i>18</i>
	<i>APPENDIX B .....</i>	<i>20</i>

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## 1.0 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.

## 2.0 DESCRIPTION OF SITE

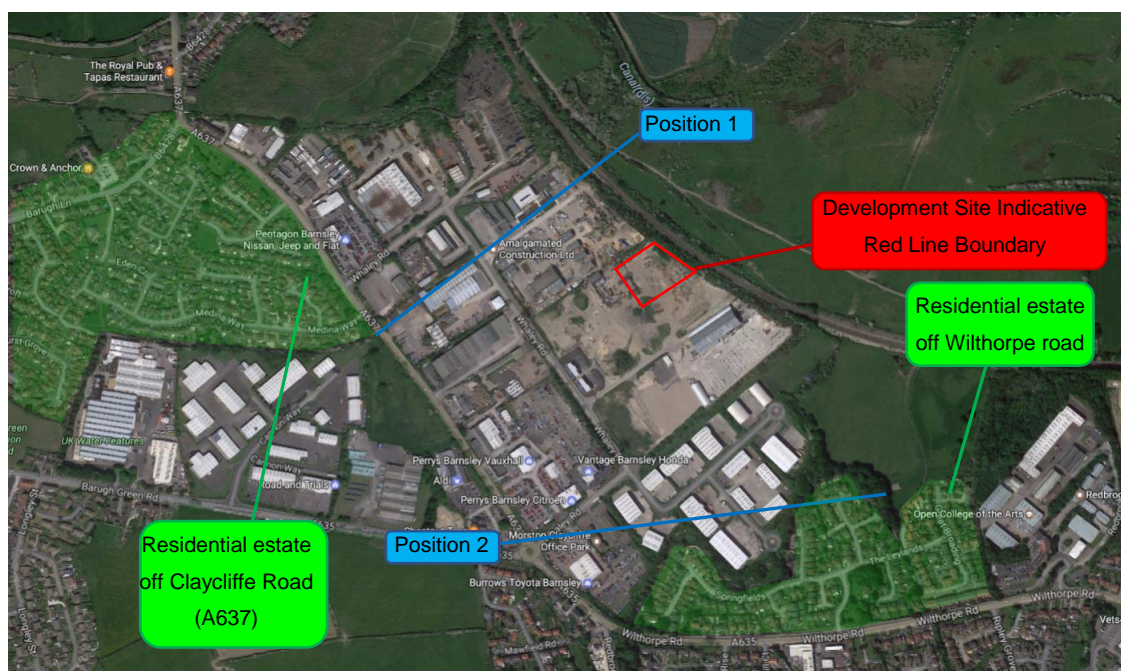
### 2.1 General Overview and Noise Sensitive Receptors (NSRs)

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 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.

Figure 1 below indicates the location of the Development Site in relation to the nearest noise sensitive premises and the location of the noise monitoring position used to inform the assessment (discussed in Section 3).



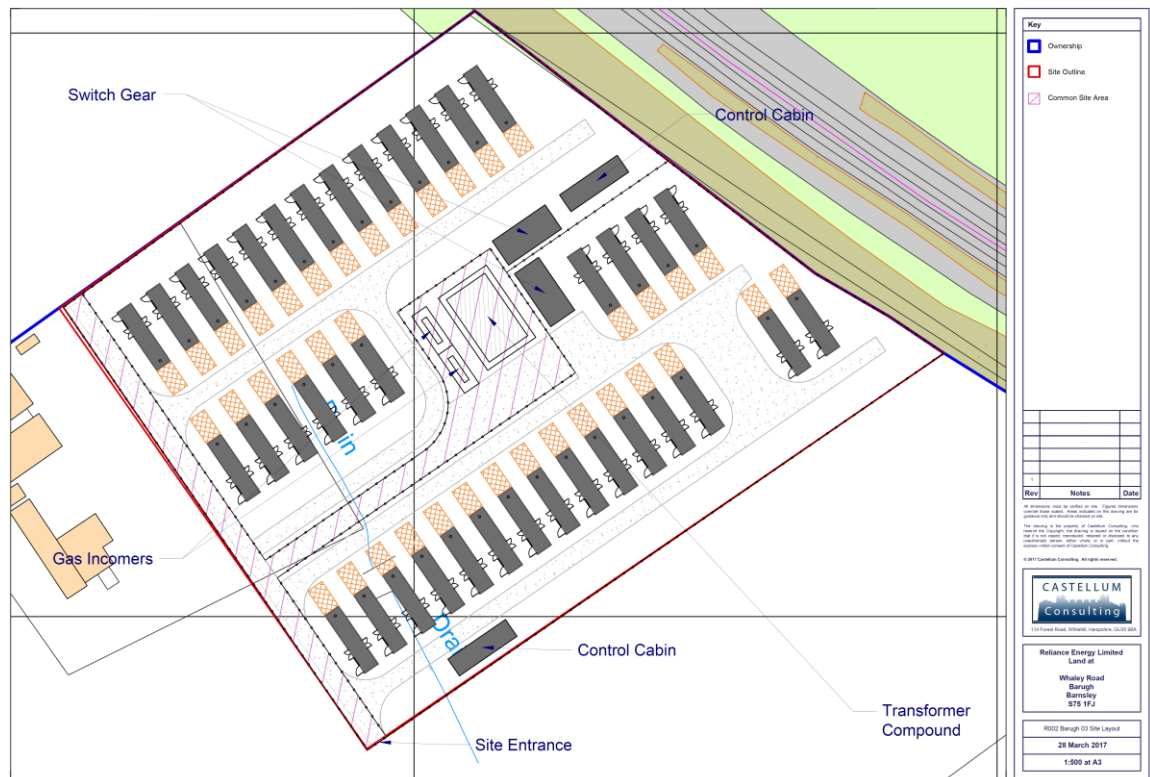
**Figure 1:** Proposed Development Site in Relation to Key Noise Sensitive Receptors

## 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 38 x 1042 kW Perkins TRS2 gas powered generators will be installed on the site. The generators would only be required to operate between the hours of 07:00 – 23:00 but could operate 7 days a week. 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 phase site traffic.

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

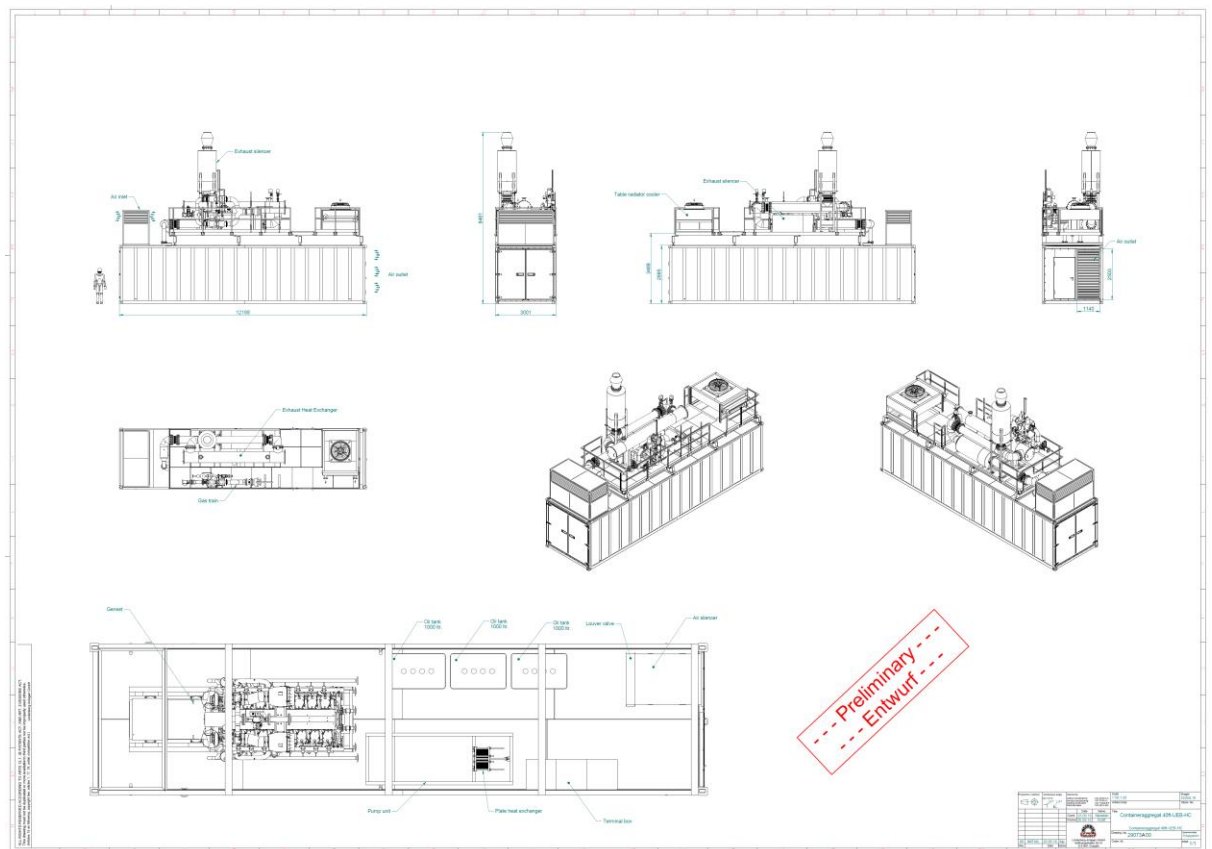


**Figure 2:** Proposed Site Layout

Sol have been in discussions with Energy Circle (Supplier) and Lindenberg Anlagen (Manufacturer) of the proposed 1042 kW Perkins TRS2 gas powered generators in order to obtain accurate information of the layout and configuration of the proposed generators, as well as to obtain representative noise level data of the generators in order to inform the assessment.

Based upon these discussions it is understood that, in basic terms, each Generator consists of a gas engine which is to be housed within an acoustic enclosure of dimensions: 12188mm (L) x 3001mm (W) x 2503mm (H). Intake air to the generator is provided via a roof mounted penthouse louvre. The air outlet is proposed to be mounted on the wall of the generator enclosure. The engine exhaust is to be roof mounted, with the exhaust tailpipe at a height of 8461mm above local ground level. A single remote radiator will be mounted onto the roof of each generator enclosure in order to provide cooling for the engine.

The preliminary indicative general arrangement of each complete, packaged generator plant is provided in Figure 3:



**Figure 3:** Preliminary General Arrangement of the Generators

With regards to plant noise level data, Lindenberg Anlagen (LA) have confirmed that there are no test reports currently available for the proposed 1042 kW Perkins TRS2 gas powered generators but have supplied Sol with noise measurement data of a similar unit (988 kW unit).

Test data provided by LA indicates that a generator located within the standard enclosure package provides an average A-weighted sound pressure level of 86.8 dB at 1.13m from the enclosure of the generator. Whilst this measured noise levels 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 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 86.8 dB(A) at 1.13m.

LA have also provided specific noise level data the proposed remote radiator unit which is rated with sound power level of 90 dB(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)	86.8 dB $L_{Aeq,T}$ at 1.13m
Air Inlet Penthouse Louvre	86.8 dB $L_{Aeq,T}$ at 1.13m
Engine Exhaust	86.8 dB $L_{Aeq,T}$ at 1.13m
Remote Radiator	90 dB $L_{wA}$

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

### 3.0 DETAILS OF INVESTIGATION

In order to inform the assessment, an environmental noise survey have been conducted by Sol between 20<sup>th</sup> and 24<sup>th</sup> 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.

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.

## 4.0 NOISE SURVEY RESULTS SUMMARY

### 4.1 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*	<b>48</b>	58	44
	Friday 21 April 2017	62	50	57	35
	Saturday 22 April 2017	63	<b>44</b>	56	35
	Sunday 23 April 2017	62	<b>44</b>	57	36
	Monday 24 April 2017	64*	58	-	-
2	Thursday 20 April 2017	48*	<b>43</b>	49	39
	Friday 21 April 2017	53	<b>43</b>	48	27
	Saturday 22 April 2017	51	<b>37</b>	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.

## 5.0 ENVIRONMENTAL NOISE IMPACT ASSESSMENT

### 5.1 BS4142 Assessment Methodology and Adopted Environmental Noise Targets

BS 4142: 2014: Method for assessing 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 likelihood of complaints 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'.

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 magnitude of the likelihood of noise complaints:

- 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.
- d) 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 fifteen minute period at night. The daytime and night-time periods are defined as 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 $L_{A,r,T_r}$	Weekend Daytime (07:00-23:00) Maximum Permissible Rating Level Limit, dB $L_{A,r,T_r}$
Residential Estate on Claycliffe Road	48	44
Residential estate off Wilthorpe Road	43	37

**Table 3:** Daytime Maximum Permissible Noise Rating Level Limit

## 6.0 NOISE IMPACT ASSESSMENT

### 6.1 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. 3<sup>rd</sup> 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.

## 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 +3 dB has been applied to the specific noise level to determine the Rating Level to account for possible tonal character associated with the noise level emissions expected from the generators. Whilst individual generator units are expected switch on / off as required between 07:00 – 23:00 hours, in order to meet power demands, no correction for the acoustic character associated with the intermittent operation of the generators has been applied in this assessment. It is considered that the acoustic characteristics associated with individual generators switching on/off is only expected to be noticeable when there are few/no other generators operating, and will in any event be relatively very infrequent. In this instance, the specific noise level generated from the site would be expected to be much lower (at least 3 dB lower assuming that fewer than half of the generators are operating) negating the effect any acoustic character correction applied for intermittent operation.

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	55 (+3)	48	10
	Weekend	55 (+3)	44	14
Residential estate off Wilthorpe Road	Weekday	56 (+3)	43	16
	Weekend	56 (+3)	37	22

\* 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.

## 7.0 NOISE MITIGATION

### 7.1 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.

## 7.2 Remote Radiators

Based upon the above maximum permissible noise level emissions for the generator, the background noise levels at the nearest noise sensitive receptors is capable of being achieved without the need for any further noise mitigation to be applied to the remote radiators. However, in order to be capable of meeting the more stringent weekend noise rating limits, further noise mitigation to the remote radiators *will* be required, assuming that the Development is required to operate during weekend daytime periods.

In order to be capable of meeting the 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 85 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. 83% of maximum (to be confirmed by remote radiator/fan supplier).

### 7.3 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 for each assessment period (and mitigation option, where appropriate) are provided in Appendix B.

Residential Dwellings	Assessment Period	Predicted Rating Level, dB $L_{Ar,Tf}$ *	Typical Background Noise level, dB $L_{A90}$	Exceedance, dB
Residential Estate on Claycliffe Road	Weekday	37 (+3)	48	-
	Weekend	34 (+3)	44	-
Residential estate off Wilthorpe Road	Weekday	38 (+3)	43	-
	Weekend	34 (+3)	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.

## **8.0 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 <sup>th</sup> April 2017	12:00 hrs to 23:59 hrs	7 to 16°C, Wind: 1 m/s mean, 6 m/s max
21 <sup>st</sup> April 2017	00:00 hrs to 23:59 hrs	7 to 16°C, Wind: 1 m/s mean, 7 m/s max,
22 <sup>nd</sup> April 2017	00:00 hrs to 23:59 hrs	7 to 14°C, Wind: 1 m/s mean, 6 m/s max,
23 <sup>rd</sup> April 2017	00:00 hrs to 23:59 hrs	10 to 16°C, Wind: 1 m/s mean, 5 m/s max
24 <sup>th</sup> 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*

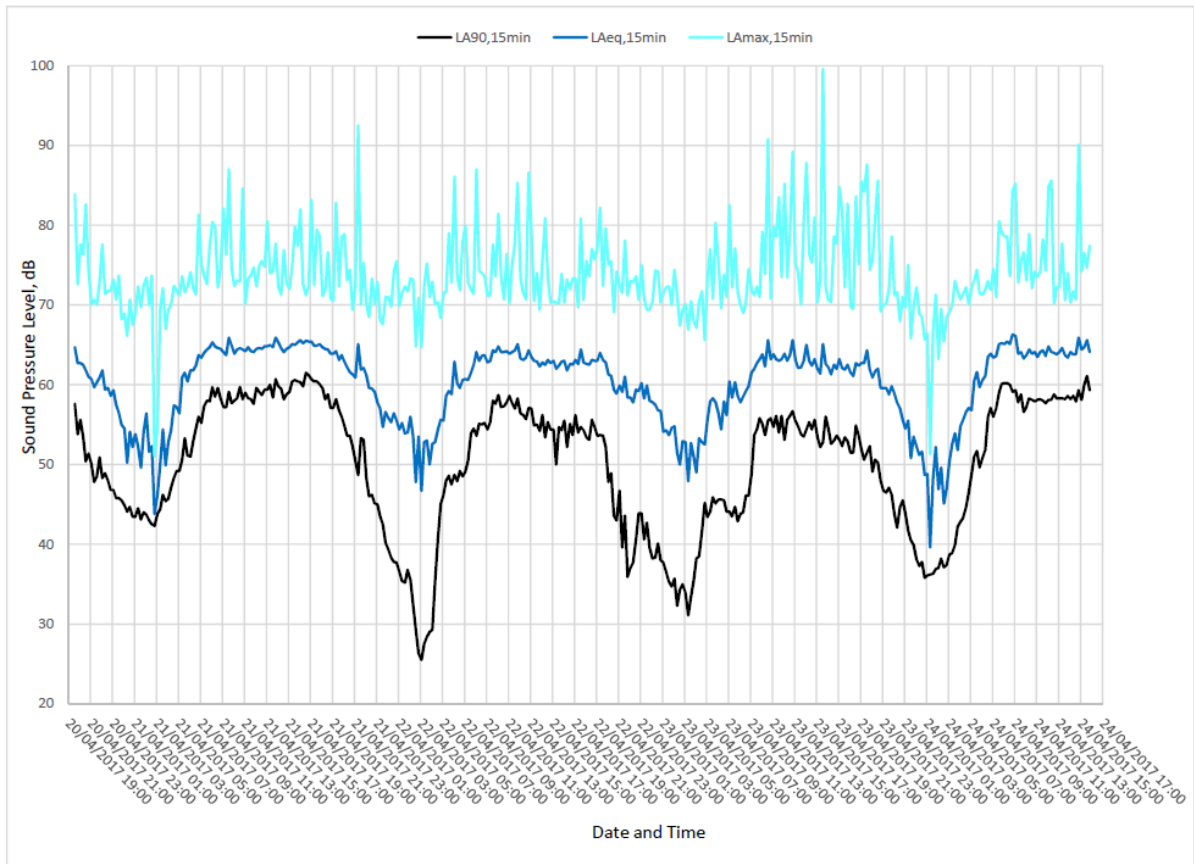
01 dB DUO Sound level meter (serial no. 10151)  
01 dB DUO Microphone capsule (serial no. 136919)  
01 dB CAL 21 Acoustic calibrator (serial no. 35183003)

### METHODOLOGY

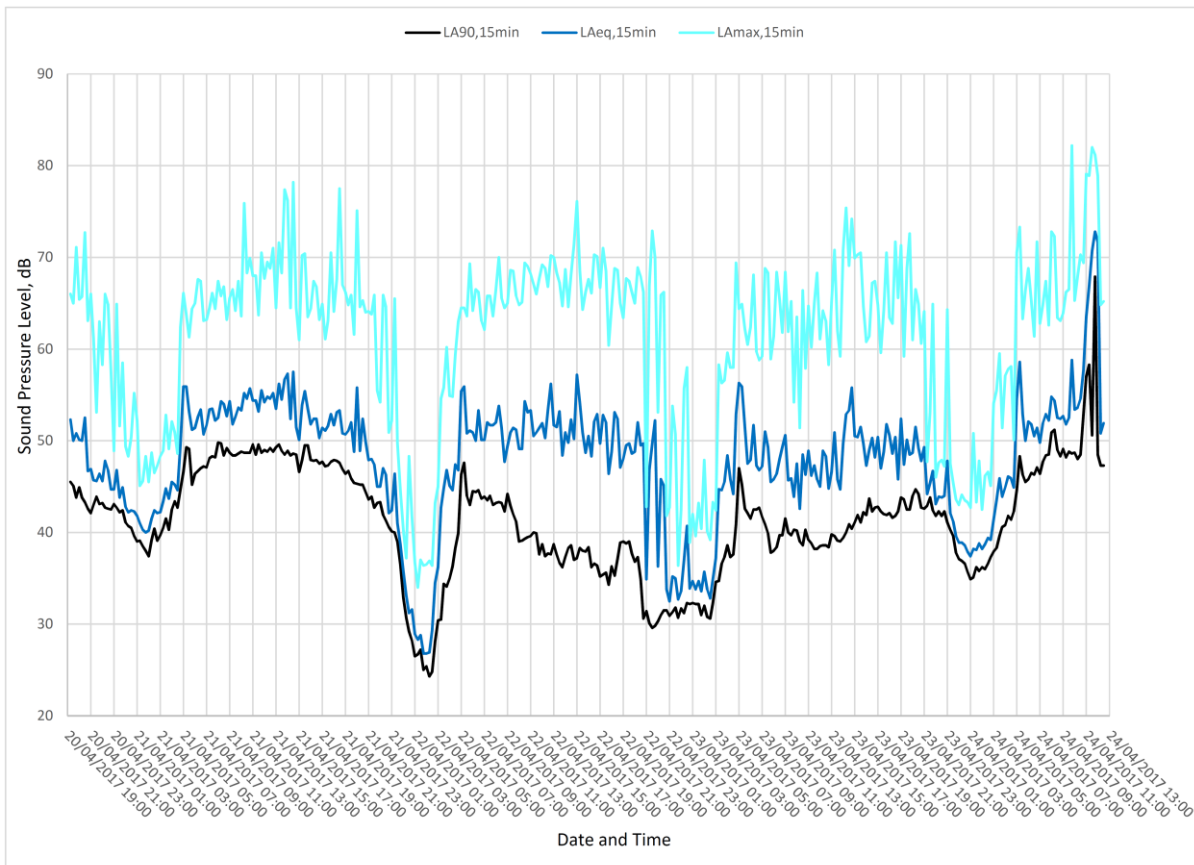
Before and after the measurements the noise monitoring equipment was calibrated to an accuracy of  $\pm 0.3$ dB using the Cal 21 Calibrator. The calibrator produces a sound pressure level of 94dB re  $2 \times 10^{-5}$  Pa @ 1kHz.

### MEASUREMENT RESULTS

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

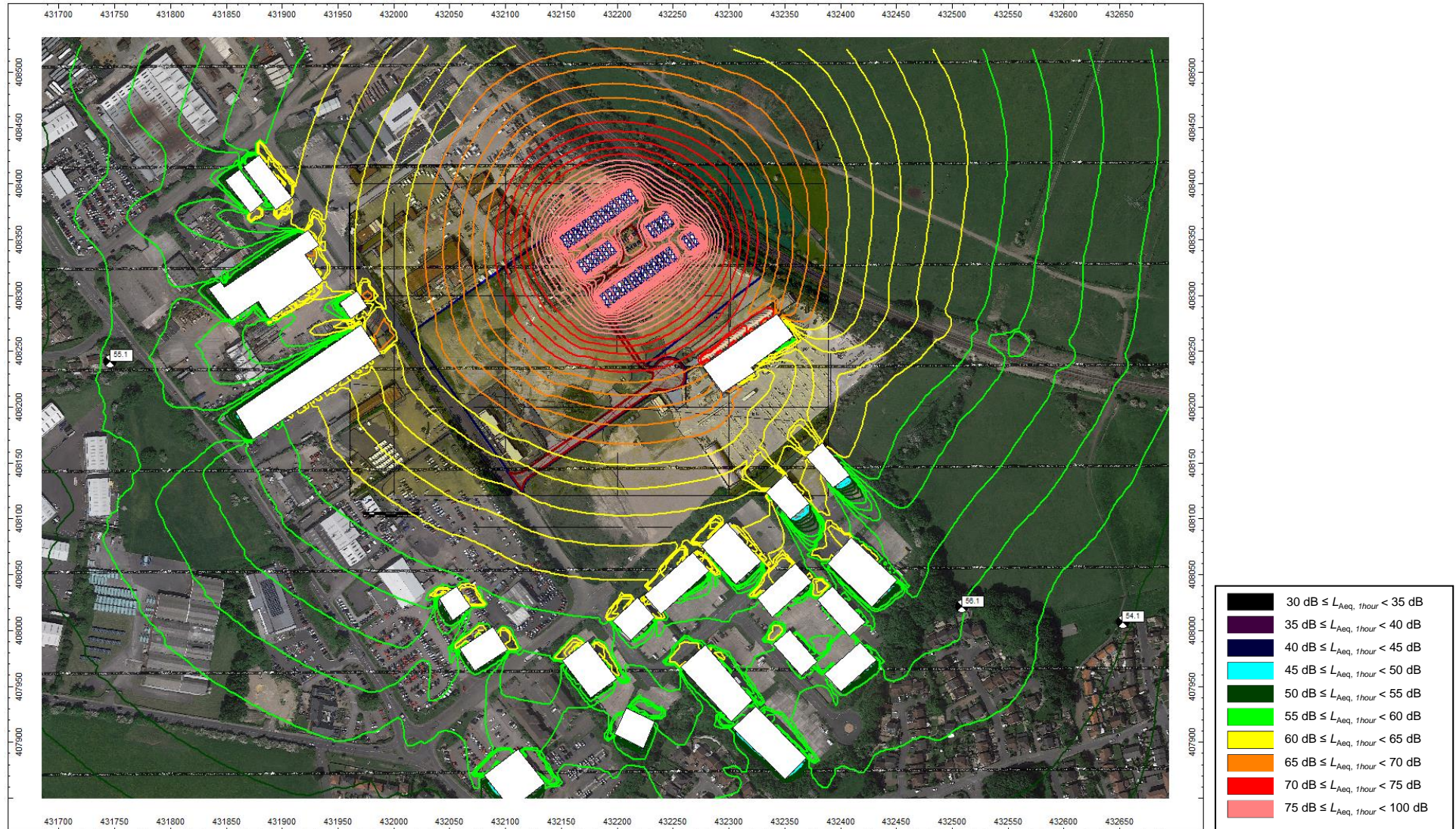


Graph A1: Position 1, 20<sup>th</sup> to 24<sup>th</sup> April 2017



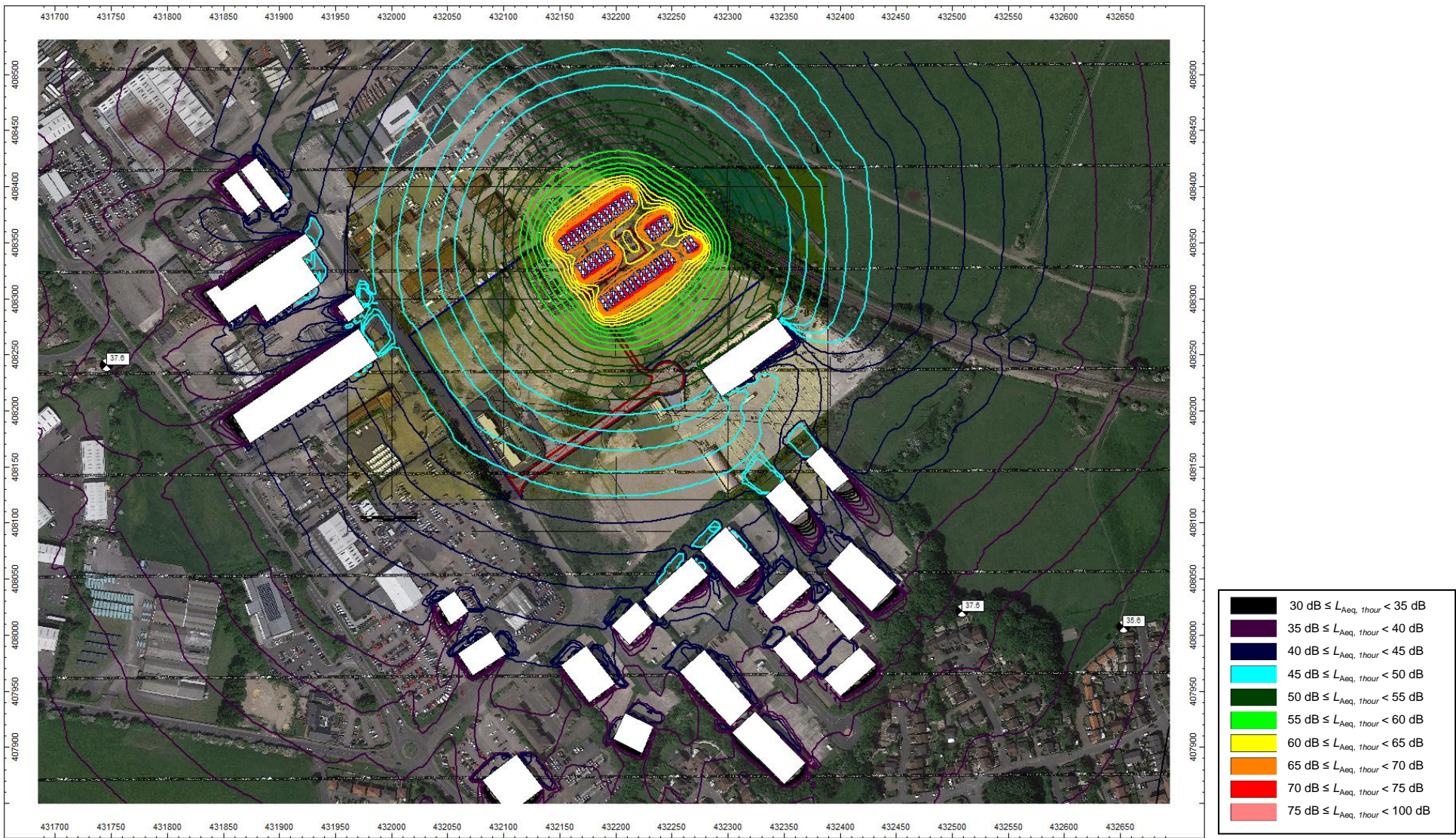
Graph A2: Position 2, 20<sup>th</sup> to 24<sup>th</sup> April 2017

**APPENDIX B**  
**CADNAA NOISE MAPS**



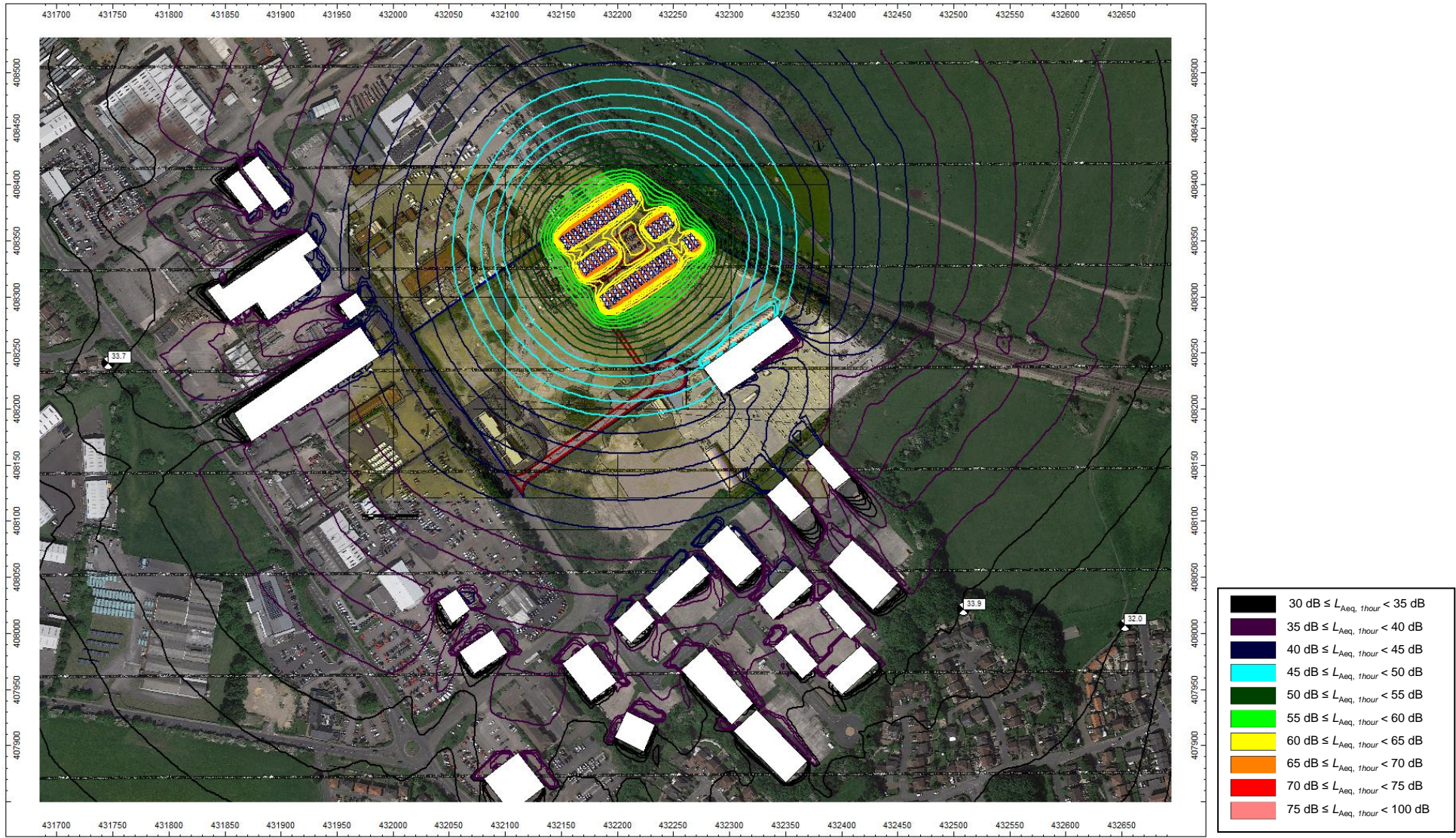
**Figure B1:** Predicted Daytime  $L_{Aeq,1hour}$  Noise Level Impact from the Site at 4m above Local Ground Level

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 ENVIRONMENTAL NOISE IMPACT ASSESSMENT  
 P1734-REP01-REV A-BDH



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

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 P1734-REP01-REV A-BDH



**Figure B3:** Predicted Weekend Daytime  $L_{Aeq,1hour}$  Noise Level Impact from the Site at 4m above Local Ground Level, With Mitigation