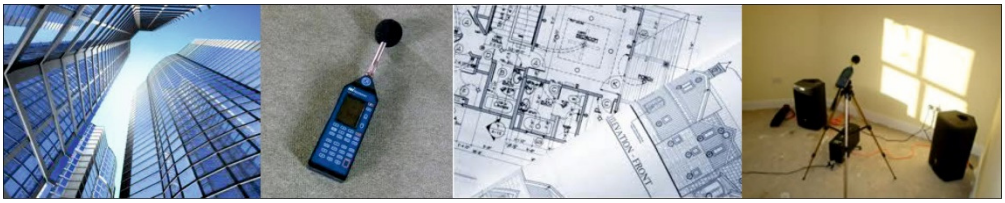
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INSTALLATION OF NEW GENERATOR SETS
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S75 1HT

ACOUSTIC DESIGN SPECIFICATION
v.6

Client:
PEAK POWER CONNECTIONS

19 June 2017
Ref: M3680-BN

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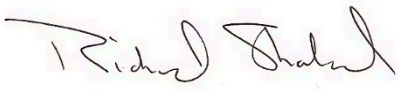
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Project Reference	M3680-BN
Issue No.	6
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1. SUMMARY

1.1 An assessment of noise has been undertaken at Whaley Road, Barnsley, where an array of electricity generator sets and associated equipment is proposed.

1.2 The gas-powered generators are intended to support the national grid during peak periods of demand when renewables and other sources of electricity generation cannot meet the required system demand. The generators will most likely be required during periods of maximum system demand, which, normally occurs during the winter months between 1700 - 1930 hrs Monday to Friday.

1.3 However, these facilities could be used to keep the lights on at other times in the event of a national emergency on the national grid network due to a failure of a major power station or part of the national grid network being stressed (see attached planning letter – Appendix I). The generator sets would normally run for short periods to allow the National grid to ramp up other major power stations to cope with new requirement for power. It is therefore confirmed here that the equipment proposed would not normally be operated between the hours of 2300 and 0600, other than in the event of a national or systems emergency.

1.4 The expected operational window, within which these plants are potentially expected to be called upon, is normally a total period of up to 2000/2500 hours per annum, with much higher probabilities of operation during the winter months as specified in Section 1.2.

1.5 Ambient noise levels have been measured during weekday and weekend periods, and this exercise suggests that the background noise level, L_{A90}, at various noise sensitive locations may fall to a minimum level of 36 - 40 dB(A) during the day time period of 07.00 - 23.00 hrs, and 32 - 36 dB(A) during the night time period, 23.00 - 07.00 hrs.

1.6 Calculations of noise radiating from the proposed generators have predicted levels of up to 44 dB(A) at 1m from the facade of the worst affected residential properties, which are located both to the south east of the proposed compound.

1.7 A formal assessment of the predicted noise during day time periods has been conducted at each of five residential areas in the vicinity, in accordance with the methodology of BS4142:2014 "Methods for rating and assessing industrial and commercial sound". This concludes that, at worst, there would be between an 'adverse impact depending on context' and a 'significant adverse impact, depending on context'.

1.8 The specific context for this proposal would be the limited impact due to restricted operating hours, the duration and the frequency of use of the generators. Appendix II provides further details on this information.

1.9 In exceptional emergency demand, the generators may operate at night. A similar assessment to BS4142 would, at the worst affected properties, give an indication of 'a significant adverse impact, depending on context'. Once again, the context of the noise would be the call for a Fast Frequency response by the national grid to avoid a catastrophic failure of the power supply due to a failure of a major power station or part of the national grid network being stressed (see Appendix II).

1.10 In absolute terms, the assessment of the predicted noise indicates that levels would be below the WHO and British Standard guidelines for residential occupation for the daytime and 1 dB above the equivalent standard during any night-time operation.

1.11 Consideration of noise affecting adjacent commercial buildings indicates that residual levels from the generators would be similar to the typical day time noise in the area. Whilst the noise would be audible if windows are open, it should have a limited impact on the adjacent offices of Wordsworth Crushing & Excavations. It is noted that the offices appear to be air-conditioned and it may be the case that the ventilation strategy presumes closed windows. In those conditions, residual noise levels internally should be considered quite reasonable for offices.

1.12 It is therefore concluded that the proposed installation of the generators would have some limited impact on the neighbouring residential and commercial properties if operating during the day, and some adverse impact only if called upon to operate at night (in extreme circumstances).

2. INTRODUCTION

2.1 An assessment has been undertaken by Ian Sharland Limited on behalf of Peak Power Connections, to assess the impact of noise from new electricity generating sets on neighbouring properties.

2.2 The proposed location of the generator sets lies within an industrial estate at Whaley Road, Barnsley. Figure 1 indicates the location of the site and the proposed compound within. The aerial photograph also highlights the location of the nearest residential and commercial properties.

2.3 The project under consideration here is being carried out by Peak Power Connections, a company which provides additional electricity to the mains grid during periods of peak demand. The proposed installation will consist of 10 gas-engine containerised generators and will also include the installation of associated equipment including containers holding the switch gear and the fuel tank (Figure 2).

2.4 It is important to understand that the generators themselves will only be expected to operate when called upon to support either the national or local electricity networks. Operation outside this requirement will be exceptional, and Appendix II contains a statement of predicted running hours.

2.5 Given the presence of residential buildings in the locality of the proposed scheme, it will be necessary to ensure that the operation of the new generators will have no significant adverse impact on the occupiers. Consideration should also be given to any adjacent commercial neighbours. An acoustic study has therefore been conducted to ensure that the installation will meet these requirements.

2.6 The objectives of the present exercise may therefore be summarised as follows:

(a) To determine the existing ambient noise levels in the area;
(b) To determine the likely noise emitted from the new generators;
(c) Where appropriate, to recommend forms of noise control that will limit emissions to an acceptable level;
(d) To assess the emitted noise in accordance with relevant standards.

2.7 This report describes the work carried out on each of those objectives and summarises the conclusions that can be drawn from the results.

3. SURVEY OF AMBIENT NOISE LEVELS

3.1 To assess the ambient background noise levels, a noise survey was undertaken at the nearest residential property.

3.2 A Rion NL-31 sound level meter was set up at the boundary of the first bungalow on Medina Way, in a position considered to the representative of the noise affecting the nearest residential properties (see Figure 1) The microphone was set at a height of 1.5m above ground level in free field conditions.

3.3 The equipment was calibrated before and after the measurements were taken, and showed no significant variation.

3.4 The survey ran from Monday 18th July 2016 to Tuesday 19th July 2016.

3.5 The weather conditions during the survey were as follows:

Date	Ave Temp °C	Rainfall mm	Ave Wind Speed m/s	Prevailing Wind Direction
Monday 18/7	20	0	2.8	W
Tuesday 19/7	22	0	2.5	S/E

3.6 The meter was configured to measure 15 minute samples of the following acoustic parameters:

L_{Aeq} The A-weighted equivalent continuous sound pressure level which, over the sample period, contains the same acoustic energy as the time-varying signal being recorded.

L_{Amax} The A-weighted maximum sound pressure level recorded during each sample period (as measured on fast response).

L_{A90} A statistical parameter, representing the A-weighted noise level exceeded for 90% of each sample period. This gives a measure of the underlying noise, and is commonly used to describe the ambient background noise.

3.7 The variation of measured noise levels is shown graphically in Figure 3, and the results are provided numerically in Appendix III.

3.8 The key measurement for this exercise is the minimum value of the background noise recorded. The levels were found to fall to the following minimum typical values[1]:

Period	Minimum Typical Value L_{A90}
07.00 – 23.00	43
23.00 – 07.00	36

3.9 At the time of this survey, spot checks of background noise were made at two further positions in the residential neighbourhood, to clarify the variation around the site. The levels are quoted below, alongside the contemporaneous measurement at the end of Medina Way:

	Background Noise Level, $L_{A90,\ 5\ mins}$		
Location / Time	**Claycliffe Avenue**	**Coppice Avenue**	**Medina Way**
00.00 - 00.10	38.5 - 37.8		38.1 - 38.3
00.20 - 00.30		32.2 - 32.5	37.7 - 38.3
09.30 - 09.40	48.1 - 48.3		53.3 - 54.8
09.50 - 10.00		36.1 - 36.5	52.2 - 53.8

3.10 In response to further queries from the Local Authority, a further series of spot checks were undertaken on the night of Sunday 23rd October 2016.

3.11 This was a still, dry night, with light winds only. Noise levels were measured at a number of locations in the vicinity of the development, to clarify whether conditions are significantly quieter on a weekend.

3.12 Measurements were made with a Norsonic 140 Type 1 sound level meter, which was calibrated before and after the survey.

3.13 The findings of the survey are summarised below:

	Background Noise Level, $L_{A90,\ 10\ mins}$				
Location	**Claycliffe Avenue**	**Springfields**	**Woodacres**	**Coppice Avenue**	**Medina Way**
Time					
00.30 - 00.40	36.2				
00.45 - 00.55		35.4			
01.00 - 01.10			33.9		
01.15 - 01.25				32.2	
01.35 - 01.45					35.9

3.14 For the purpose of this assessment, therefore, the following background noise levels will be adopted:

[1] Values quoted represent the lower 95% percentile of the background noise level measurements.

	Minimum Typical Background Noise Level, $L_{A90, 10\ mins}$				
Location / Time	**Claycliffe Avenue**	**Springfields**	**Woodacres**	**Coppice Avenue**	**Medina Way**
07.00 - 23.00	40	39	38	36	43
23.00 - 07.00	36	35	34	32	36

3.15 Section 6 of this report will discuss these noise levels, in respect of appropriate targets for limiting new noise emissions.

4. PREDICTION OF GENERATOR NOISE

4.1 The proposal for the site here involves the installation of 10 gas engine generator sets. The engines (MTU 16V-4000 L64) and alternators are to be housed within a bespoke acoustically lined ISO container (nom. 3300 x 15000 x 3400H), the ventilation apertures of which are silenced. The engine exhaust will discharge, via bespoke attenuators, into a stack, one per set, which is confirmed to be 7m high.

4.2 Peak Power Connections Limited have confirmed that the generators and their containers will be designed to a level of no more than 80 dB(A) @ 1m from the outside of the container, on full load. This would equate to an overall sound power level of 100 dB(A). The table below indicates the frequency spectrum associated with this noise, as determined by measurement of similar gas-powered generators sets, both in the laboratory and operating in-situ:

Frequency	Hz	31.5	63	125	250	500	1K	2K	4K	8K
SWL	dB	105	103	110	98	95	92	90	85	80

4.3 The engine exhaust silencers will be attenuated to a noise level of 65 dB(A) @1m from the top of each stack (broadly equivalent to a sound power radiated level of 75 dB(A)).

4.4 In this project, the generator sets and transformer will be located in an enclosed compound (Figure 2). It is proposed that a 4.5m high close boarded timber fence[2] be erected around the perimeter of the plant compound.

4.5 The distance from the generator compound to the nearest noise sensitive residential properties are shown in the following table (see Figure 1):

PROPERTY	DISTANCE (m)	DIRECTION
Median Way	275	North-West
Claycliffe Avenue	300	South-West
Springfields	375	South-East
Woodacres/Coppice Avenue	480	South-East
Commercial Garages on Claycliffe Road	75	South-West
Offices of Wordsworth Crushing	50	East
Offices of Compass Engineering	100	North-West

4.6 The Wölfel IMMI modelling software has then been used to provide predictions of noise emanating from the compound to the facade of the residential buildings. The software follows the methodology of BS EN ISO 9613: 2007 Acoustics - 'Description, measurement and assessment

[2] The specification of the barrier would be 25mm thick timber boarded panels, butt-edged with a 25mm thick x 200mm wide sealing panel fixed behind each joint. The inside face of the barrier will be lined with an acoustically absorptive foam.

of environmental noise - Part 2: Determination of environmental noise levels'. Figure 4 provides an extract from the model.

4.7 The results of the predictions are as follows:

Receptor	**Predicted Facade Noise Level $L_{Aeq, t}$**
Residential:	
Median Way	34 dB(A)
Claycliffe Avenue	44 dB(A)
Springfields	40 dB(A)
Woodacres	40 dB(A)
Coppice Avenue	36 dB(A)
Commercial:	
Garages on Claycliffe Road	60 dB(A)
Offices of Wordsworth Crushing	61 dB(A)
Offices of Compass Engineering	48 dB(A)

5. PLANNING POLICY & CRITERIA OF ACCEPTABILITY

5.1 National Planning Policy Framework (March 2012)

5.1.1 The recently introduced National Planning Policy Framework defines the Government's planning policies for England and how these are expected to be applied. It sets out the Government's requirements for the planning system only to the extent that it is relevant, proportionate and necessary to do so. It provides a framework within which local people, and their answerable councils can produce their own distinctive local and neighbourhood plans, which reflect the needs and priorities of their communities.

5.1.2 Section 123 states

Planning policies and decisions should aim to:

- *avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;*

- *mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;*

- *recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established; and*

- *identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.*

5.1.3 The Framework states that the planning system should contribute to and enhance the natural and local environment by preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of noise pollution. It does not, however, provide any specific formal guidelines.

5.2 Noise Policy Statement for England (March 2010)

5.2.1 The document "Noise Policy Statement for England", referenced within the NPPF sets out the following vision for on-going noise policy:

> *"Promote good health and quality of life through the effective management of noise within the context of Government policy on sustainable development."*
>
> *This vision should be achieved through the following Noise Policy Aims:*
>
> *"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development: avoid significant adverse impacts on health and quality of life; mitigate and minimise adverse impacts on health and quality of life; and where possible, contribute to the improvement of health and quality of life".*

5.2.2 To achieve these objectives the Noise Policy Statement sets out three noise levels to be defined by the assessor:

- **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.

- **SOAEL** - Significant Observed Adverse Effect Level
  This is the level above which significant adverse effects on health and quality of life occur.

5.2.3 The Noise Policy Statement considers that noise levels above the SOAEL would be seen to have, by definition, significant adverse effects and would be considered unacceptable. Where the assessed noise levels fall between the LOAEL and the SOAEL noise levels, the Policy Statement 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... .. This does not mean that such adverse effects cannot occur."*

5.2.4 Where noise levels are below the LOAEL it is considered there will be no adverse effect. Once noise levels are below the NOEL there will be no observable change. No objective values are offered within the NPSE, as the document does indicate that each site should be considered on its own merits.

5.2.5 Guidance as to a numerical definition of LOAEL may therefore be given by the following Standards.

5.3 DCLG Guidance Note, 2013 - 'Noise'

5.3.1 The Department of Communities and Local Government provided further guidance to support the NPPF. The section, Noise, published in August 2013 advises:

> *Noise needs to be considered when new developments may create additional noise and when new developments would be sensitive to the prevailing acoustic environment. When preparing local or neighbourhood plans, or taking decisions about new development, there may also be opportunities to consider improvements to the acoustic environment.*
>
> *Noise may override other planning concerns in certain circumstances, neither the Noise Policy Statement for England nor the National Planning Policy Framework (which reflects the Noise Policy Statement) expects noise to be considered in isolation, separately from the economic, social and other environmental dimensions of proposed development.*
>
> *Local planning authorities' plan-making and decision taking should take account of the acoustic environment and in doing so consider:*
>
> - *whether or not a significant adverse effect is occurring or likely to occur;*
> - *whether or not an adverse effect is occurring or likely to occur; and*
> - *whether or not a good standard of amenity can be achieved.*
>
> *This would include identifying whether the overall effect of the noise exposure is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation.*
>
> *At the lowest extreme, when noise is not noticeable, there is by definition no effect. As the noise exposure increases, it will cross the no observed effect level as it becomes noticeable. However, the noise has no adverse effect so long as the exposure is such that it does not cause any change in behaviour or attitude. The noise can slightly affect the acoustic character of an area but not to the extent there is a perceived change in quality of life. If the noise exposure is at this level no specific measures are required to manage the acoustic environment.*
>
> *As the exposure increases further, it crosses the lowest observed adverse effect level boundary above which the noise starts to cause small changes in behaviour and attitude, for example, having to turn up the volume on the television or needing to speak more loudly to be heard. The noise therefore starts to have an adverse effect and consideration needs to be given to mitigating and minimising those effects (taking account of the economic and social benefits being derived from the activity causing the noise).*
>
> *Increasing noise exposure will at some point cause the significant observed adverse effect level boundary to be crossed. Above this level the noise causes a material change in*

behaviour such as keeping windows closed for most of the time or avoiding certain activities during periods when the noise is present. If the exposure is above this level the planning process should be used to avoid this effect occurring, by use of appropriate mitigation such as by altering the design and layout. Such decisions must be made taking account of the economic and social benefit of the activity causing the noise, but it is undesirable for such exposure to be caused.

At the highest extreme, noise exposure would cause extensive and sustained changes in behaviour without an ability to mitigate the effect of noise. The impacts on health and quality of life are such that regardless of the benefits of the activity causing the noise, this situation should be prevented from occurring.

5.3.2 The table below summarises the noise exposure hierarchy, based on the likely average response:

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

5.3.3 The subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any particular situation. These factors include:

- *the source and absolute level of the noise together with the time of day it occurs. Some types and level of noise will cause a greater adverse effect at night than if they occurred during the day – this is because people tend to be more sensitive to noise at night as they are trying to sleep. The adverse effect can also be greater simply because there is less background noise at night;*

- *for non-continuous sources of noise, the number of noise events, and the frequency and pattern of occurrence of the noise;*

- *the spectral content of the noise (i.e. whether or not the noise contains particular high or low frequency content) and the general character of the noise (i.e. whether or not the noise contains particular tonal characteristics or other particular features). The local topology and topography should also be taken into account along with the existing and, where appropriate, the planned character of the area.*

5.3.4 The adverse effects of noise may be mitigated in one of the four broad approaches:

- *engineering:*
- *layout:*
- *using planning conditions/obligations to restrict activities; and*
- *mitigating the impact on areas likely to be affected by noise.*

5.3.5 The noise impact on residential developments may be partially off-set if the residents of those dwellings have access to:

- *a relatively quiet facade (containing windows to habitable rooms) as part of their dwelling, and/or;*

- *a relatively quiet external amenity space for their sole use, (e.g. a garden or balcony). Although the existence of a garden or balcony is generally desirable, the intended benefits will be reduced with increasing noise exposure and could be such that significant adverse effects occur, and/or;*

- *a relatively quiet, protected, nearby external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings, and/or;*

- *a relatively quiet, protected, external publically accessible amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5 minutes walking distance).*

5.4 BS 4142:2014: Methods for rating and assessing industrial and commercial sound

5.4.1 Any formal assessment of commercial noise affecting residential properties would in all likelihood be based upon the recommendations of British Standard 4142:2014 "Methods for rating and assessing industrial and commercial sound".

5.4.2 In brief, this rating method determines "specific sound level" generated by the new plant, assessed immediately outside the residential properties most likely to be affected. For daytime (07.00 – 23.00) only operation of the new plant, this would be the equivalent continuous noise level of the new noise, evaluated over a 1 hour sampling period, its $L_{Aeq,1hr}$. For plant operating during the night-time (23.00 – 07.00) only the reference time interval is 15 minutes.

5.4.3 Corrections of up to + 9 dB (A) are then made to this “specific sound level” if the new noise has certain acoustic features such as; tonality, impulsivity, intermittency and any other sound characteristics, to give the "rating level".

5.4.4 An assessment of the impact of the specific sound level can be determined by subtracting the measured background level from the rating level, and consider the following;

a) Typically, the greater this difference, the greater the magnitude of the impact.

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.

NOTE: Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact.

5.4.5 It is likely that the Local Authority would seek to avoid marginal situations at the planning stage, and may try to ensure a positive likelihood that no complaints would be forthcoming. As such, they might recommend a noise target which limits the Rating Noise Level to a maximum which is as low as 5 - 10 dB(A) below the minimum background level currently experienced.

5.5 BS8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings

5.5.1 There is much guidance on the levels of intrusive noise which would be considered acceptable within residential accommodation such as this. Typical advice is found in British Standard 8233:2014 “Guidance on Sound Insulation and Noise Reduction for buildings”. Following similar guidance in the 1999 World Health Organisation report "Guidelines for Community Noise", the Standard sets out the following limits for indoor ambient noise levels within living rooms and bedrooms. This suggests:

BS 8233 Guideline Values

Activity	Location	0700 - 2300	2300 - 0700
Resting	Living Room	35 dB(A) LAeq, 16 hr	-
Dining	Dining room/Area	40 dB(A) LAeq, 16 hr	-
Sleeping	Bedroom	35 dB(A) LAeq, 16 hr	30 dB(A) LAeq, 8 hr

5.5.2 It is usually considered that an open window will provide a reduction of some 10-15 dB(A)[3]. Therefore the 'good' internal standards quoted above would broadly equate to the following targets immediately outside the buildings:

Activity	Location	0700 - 2300	2300 - 0700
Resting	Living Room	48 dB(A) LAeq, 16 hr	-
Dining	Dining room/Area	53 dB(A) LAeq, 16 hr	-
Sleeping	Bedroom	48 dB(A) LAeq, 16 hr	43 dB(A) LAeq, 8 hr

5.5.3 BS8233 recognises that, where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB, and reasonable conditions will be achieved.

5.5.4 It should be noted that the levels quoted in BS8233 are intended to reflect the acceptability of steady, continuous noise. Sources of intermittent and tonal noise may generate greater annoyance for a similar overall magnitude. Whilst BS8233 does not explicitly state a correction for those circumstances, it may be appropriate to consider that the Good and Reasonable standards would be achieved with levels which are perhaps 5 dB lower than stated in the table above.

5.5.5 It is also noted that BS8233 was written from a view of designing new buildings to protect occupants from existing noise sources. This does necessarily infer, however, that the acceptability of an occupant to an absolute noise level within a building will be different if the introduction of the noise source post-dates the construction of the building. Other factors may be relevant in certain circumstances, and they are covered in large part by BS4142, discussed above.

[3] Reference PPG24 Planning & Noise, which adopted a mid-range value of 13 dB(A)

5.5.6 In respect of office buildings, BS8233 indicates that noise levels within private offices should not exceed 35 - 40 dB(A) L_{Aeq}. Adopting a typical loss of 13 dB(A) through an open window, this target equates to an equivalent level of 48 - 53 dB(A) L_{Aeq} externally.

5.6 World Health Organisation Guidelines

5.6.1 Further advice is provided in the 1999 WHO report "Guidelines for Community Noise"

5.6.2 This indicates that the steady noise level in external amenity areas, such as gardens or outdoor living areas should not exceed 55 dB(A) $L_{Aeq, t}$, and should preferably be designed below 50 dB(A) $L_{Aeq, t}$.

5.6.3 The document also provides guidance on the impact of peak noise levels on sleeping conditions. This suggests that levels above 45 dB(A) L_{Amax} inside a bedroom would be disturbing to sleep. With windows open, this would equate to a level of approximately 58 dB(A) L_{Amax} externally.

6. ASSESSMENT OF PREDICTED NOISE LEVELS

6.1 Residential Properties

6.1.1 The prediction of generator noise at the most affected residential property (Claycliffe Avenue, to the south) is 43 dB(A).

6.1.2 In absolute terms, and assuming residential windows are open, it is confirmed that such a level is 5 dB below the recommended standard indicated by BS8233 for day time operation (ref. Para 5.4.2) and equal to the equivalent night time limit (if the generators were to run at night in extreme circumstances).

6.1.3 This is a good indicator of limited adverse impact on residential properties

6.1.4 In respect of the guidelines of BS4142, a formal assessment of the noise predicted noise would be as follows:

Day Time Operation:

	Median Way	Claycliffe Avenue	Springfields	Woodacres	Coppice Avenue
Predicted Facade Noise Level, $L_{Aeq, t}$	34 dB(A)	44 dB(A)	40 dB(A)	40 dB(A)	36 dB(A)
Correction for Tonality[4]	+4 dB	+4 dB	+4 dB	+4 dB	+4 dB
Rating Noise Level	38 dB(A)	48 dB(A)	44 dB(A)	44 dB(A)	40 dB(A)
Minimum Background Level, L_{A90}	43 dB(A)	40 dB(A)	39 dB(A)	38 dB(A)	36 dB(A)
RATING	**-5 dB**	**+8 dB**	**+5 dB**	**+6 dB**	**+4 dB**

Night Time Operation:

	Median Way	Claycliffe Avenue	Springfields	Woodacres	Coppice Avenue
Predicted Facade Noise Level, $L_{Aeq, t}$	34 dB(A)	44 dB(A)	40 dB(A)	40 dB(A)	36 dB(A)
Correction for Tonality	+4 dB	+4 dB	+4 dB	+4 dB	+4 dB
Rating Noise Level	38 dB(A)	48 dB(A)	44 dB(A)	44 dB(A)	40 dB(A)
Minimum Background Level, L_{A90}	36 dB(A)	36 dB(A)	35 dB(A)	34 dB(A)	32 dB(A)
RATING	**+2 dB**	**+12 dB**	**+9 dB**	**+10 dB**	**+8 dB**

[4] BS4142 correction for tonality which is clearly perceptible.

6.1.5 During day time operation and at the worst affected receptor, BS4142 would suggest that the noise emitted by the generators would have between 'an adverse impact, depending on context' and 'a significant adverse impact, depending on context'. Here, it would be appropriate to give considerable weighting to the limited frequency and duration of the possible use when considering the context of the noise.

6.1.6 The generators are not expected to operate at night. Were this to happen, however, the Rating Noise Level would show an excess of some 10 dB over the lowest night time background noise level at the worst affected receptor. This level is likely to be an indication of a 'significant adverse impact, depending on the context'.

6.1.7 As discussed before, however, night time operation would be expected to be linked to national power supply emergency, rather than a short-term excess of demand over supply, and the frequency of this occurring would be very seldom. For example, one similar sites reported just 4 operating occasions, each for a 30-minute period, over the last 12-month period.

6.1.8 Finally, it is confirmed that the predicted noise levels within amenity spaces linked to the residential properties will fall significantly below the threshold values offered in the WHO guidance.

6.2 Commercial Properties

6.2.1 The predicted noise level at the facade of the nearest commercial buildings, taken to be the offices of Wordsworth Crushing & Excavations to the east, is 61 dB(A). Levels at the next nearest offices, those of Compass Engineering, are significantly lower (52 dB(A)) due to the screening of intervening buildings. Also, noise levels at the nearest workshop building is predicted to be 60 dB(A).

6.2.2 The higher predictions are above the recommended guideline limits for office buildings, as specified in BS8233 (para 5.4.6) - based on windows being open. In such circumstances, noise from the generators would therefore be audible within the Wordsworth offices.

6.2.3 However, it is noted that the existing ambient noise level during working hours was found to be in the order of 60 dB(A), and that the occupants of the offices would experience broadly similar noise levels internally without the contribution.

6.2.4 However, it is noted that the sales literature for the office buildings indicates air conditioning cassette units to all offices, indicating that windows would not need to be opened for thermal comfort cooling. If the office windows are closed and the space is ventilated mechanically, the relative contribution of the generators to the general ambient noise will remain the same but the absolute levels internally should then fall within the BS guideline values

7. UNCERTAINTY

7.1 The variability or uncertainty in each element of this noise assessment needs to be considered, the measurements themselves, the noise predictions and the assessment of likely impacts. Guidance and good practice is given in BS4142:2014 (Method of rating and assessing industrial and commercial sound) Annex B for reducing uncertainty.

7.2 The table below provides a discussion of the key points relating to uncertainty for this assessment:

Consideration	Comments
Complexity of the sound source and the residual acoustic environment	The generators generate a relatively constant level of noise when operating, allowing for a secure assessment. As a predictive assessment, rather than an in-situ measurement, the source data provides a robust baseline for the calculation.
Measurements Location and Duration	Ambient background noise survey was conducted over an extended period, including day time and night time. As such, this should reflect all situations experienced by the residents. The dominant noise sources in respect of the residential properties appeared to be road traffic noise.
Weather Conditions	In respect of the specific measurements of the background conditions, weather conditions were acceptable during the site surveys
Instruments	All instruments used were Class 1 sound level meters, carrying valid third-party calibration. All instruments were calibrated before and after the surveys were undertaken.
Calculations	All calculations have been completed using an industry standard noise mapping software (IMMI) which implements validated calculation methodologies. Open land has been modelled as semi-hard, in line with a conservative approach in estimating ground absorption effects over distance.
Overall	It is considered that the assessment will be accurate to a level of +/- 3 dB. All of the predictions therefore include a +3dB correction.

Figure 1 - Aerial View of Site



Figure 2 - Proposed Compound Arrangement

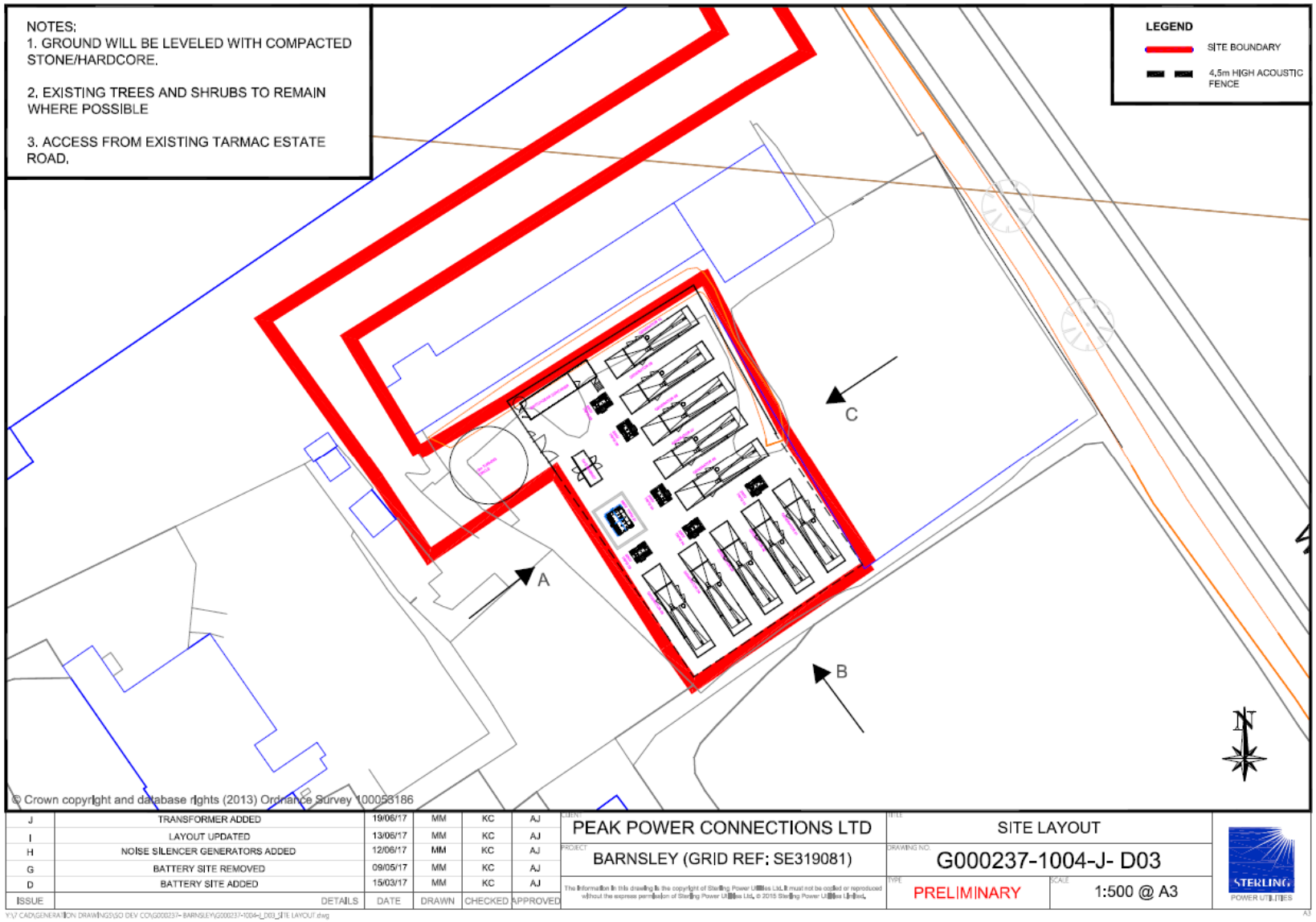


Figure 3 – Variation of Ambient Noise Levels

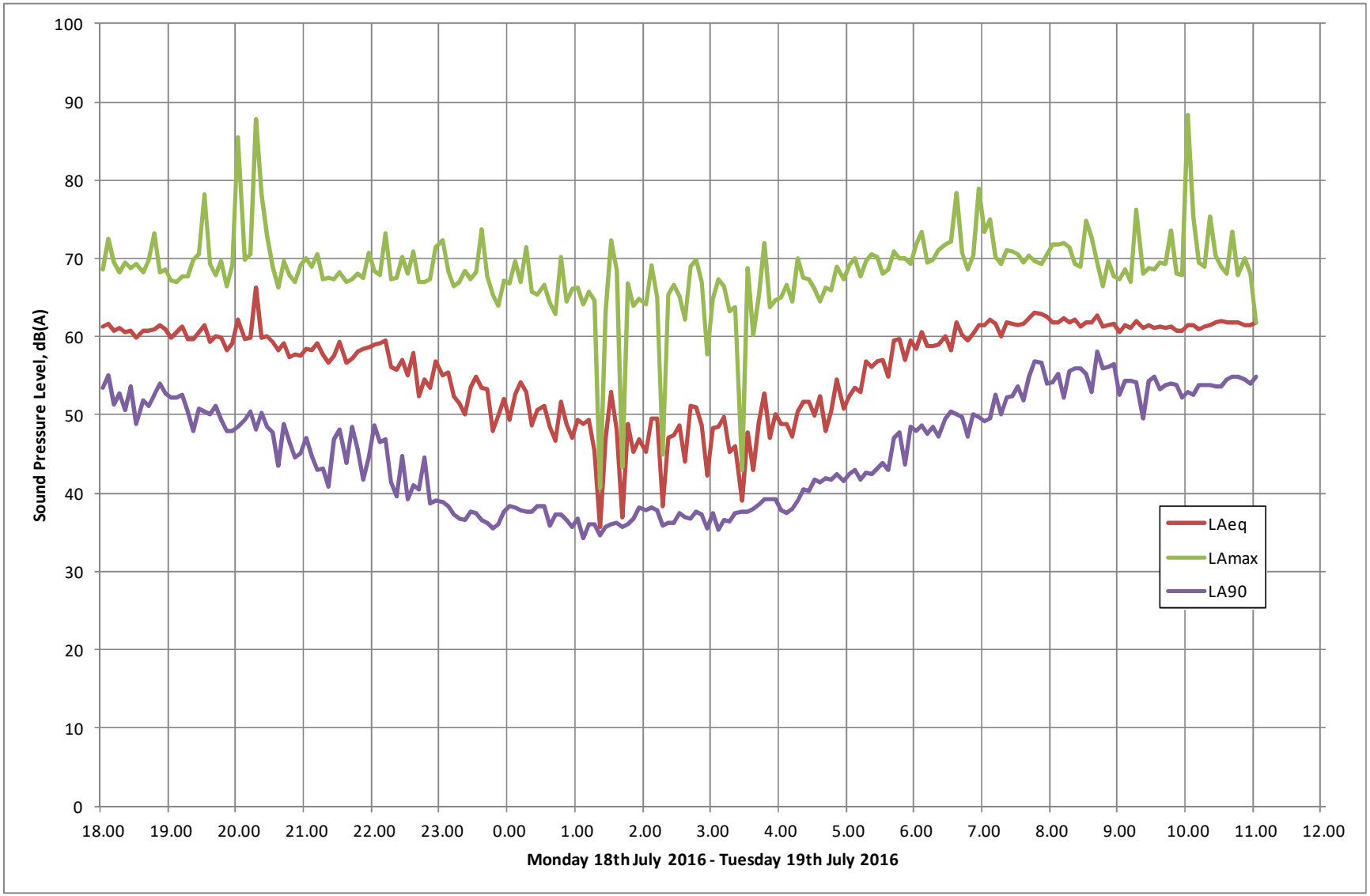
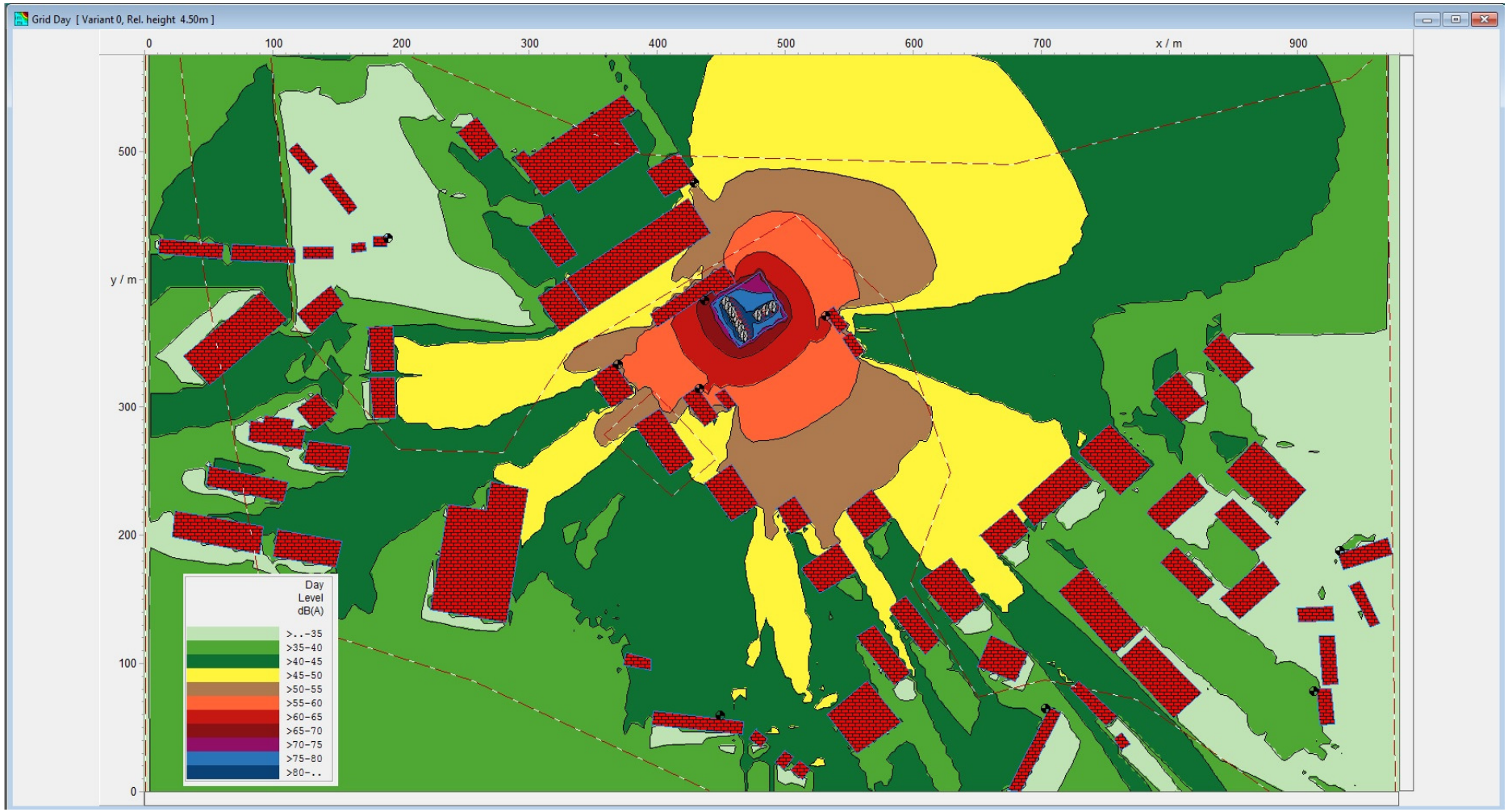


Figure 4 - IMMI Noise Map



APPENDIX I - PLANNING LETTER

Technical Specification

Requirement for the plant Capacity Market for the government department, DEC

The plant will be used to supply electricity to the local and national grid at times of high system demand/stress, or when unexpectedly there is insufficient "traditional" generation available. The need for this sort of generation is growing over the next few years as the traditional fossil-fuelled plants are closed down due to environmental concerns and the new renewable, but non-firm, power sources begin to make a much more significant contribution to the UK electricity supply mix. In fact, for every 8kW of wind capacity installed, at least 1kW of new back-up generation is also required, to balance the requirements of the grid for the time when the wind suddenly doesn't blow. In the case of solar power obviously they produce virtually no electricity during the hours of darkness. The existence of back-up generation such as that proposed on this site will enable more renewable generation to be commissioned onto the grid system. The low number of hours and the economics mean these plants are not built as large independent power stations, but instead will be based on multiple sites connected into the local electricity distribution grid, giving additional local power support and security.

The need for such plants has been clearly demonstrated by the fact that National Grid now runs an annual-tender process and issued 15 years Contracts for such plants to be constructed and made available to them under this arrangement.

Outline Description

The new plant is expected to be required to support the system for only up to 2000/2500 hours per year, during Grid system peak periods of demand. The technology to be used is up to eleven modern high efficiency gas powered generator sets, which will be emission-optimised and housed in acoustic containers.

In addition to the eleven containers housing the generators, there will be another container to house the electrical switchgear and the whole area will be secured around the perimeter by a suitable acoustic fence, all enclosed within the overall Howard Road site.

Noise Impact/Acoustics

The MTU engines that will be used, are a modern, high efficiency machines and will operate in emission optimised mode. Each of the generator units, comprising the above engine plus generator, cooling and associated equipment, are mounted with an acoustic containerised enclosure as the Himoinsa HGM 2370 model with the following parameters:

dB(A)@1m	70 FFC
LWA	90 dB(A)
Dimensions	Nom. 3300 x 15000 x 3400 mm

APPENDIX II – OPERATING HOURS

Generator Sites Annual Running Hours

The vast majority of generator site running would take place during peak demand periods and, based on the proposed services that each site will provide (detailed below), the total annual running is estimated to be at maximum **2000/2500 hours whilst in normal circumstances the hours operation should be substantially less as per the National Grid information below**

Capacity Market Contracted Sites

Sites will service a 15-year Capacity Market Contract which calls for generation at extreme network "stress events" (or shortage of supply).

Extract from National Grid EMR Electricity Capacity Report June 2015

"4.5.7 Reliability Standard
The power generation backgrounds were developed for each of the scenarios based on the information gathered, as explained above. The 2015 power generations backgrounds are developed to both meet demand and to meet the Reliability Standard of 3 hours LOLE. In the years up to 2017/18, the generation backgrounds are driven by more granular intelligence and therefore LOLE can vary quite significantly year to year within this period. If during 2015/16 if LOLE is predicted to rise above 3 hours then National Grid, DECC and Ofgem have agreed the implementation of New Balancing Services to meet the Reliability Standard with discussions progressing on options for 2016/17 and 2017/18. From 2018/19 onwards, the backgrounds are developed to meet 3 hours LOLE. This means that ***post 2018/19****, taking into account the probability of power sources being available at times of system stress,* ***there will be on average an expectation (over a number of years) of 3 hours when supply doesn't meet demand****."*

Based on predicted requirements and financial constraints, the realistic operational availability expectation for these sets would be an average operation of window of 5.5 hrs per day

Other services

Sites may also supply other Grid support requirements, which call for fast response, but short term, running.

The frequency response capability required by National Grid requires our sites to start and be at full load within periods of between 30 seconds and three minutes if a national low frequency level is reached. The sites are called to run for a maximum of 30 minutes, during which time larger, but slower acting, sources of electricity generation come on line. This is a last resort service, offered 24/7/365, that is triggered by the national frequency dropping to such a level that, if not addressed, would cause a catastrophic failure of the whole UK electricity grid. (This was addressed in the past with small generators at the large power stations but these are disappearing with the closure of the large coal power plants).

This service has been called for nationally on average 2/3 times per year, normally only during the day, over recent years, with a maximum of 5/6 per annum envisaged.

A realistic total based on historic running and predicted requirements would be only **6 hrs per annum.**

APPENDIX III - MEASURED NOISE LEVELS AT MEDINA WAY

Measurment Time	LAeq	LAmax	LA90	Measurment Time	LAeq	LAmax	LA90
18.00	61.3	68.5	53.5	21.00	58.4	70	47.1
18.05	61.7	72.4	55.1	21.05	58.2	68.9	44.8
18.10	60.7	69.4	51.3	21.10	59.2	70.6	43
18.15	61.1	68.3	52.7	21.15	57.7	67.4	43.2
18.20	60.6	69.5	50.7	21.20	56.6	67.5	40.8
18.25	60.8	68.7	53.6	21.25	57.5	67.3	46.8
18.30	59.8	69.2	48.8	21.30	59.4	68.3	48.1
18.35	60.7	68.2	51.9	21.35	56.7	66.9	43.9
18.40	60.7	69.8	51.1	21.40	57.2	67.3	48.4
18.45	61	73.2	52.5	21.45	58	68.1	45.6
18.50	61.4	68.2	54	21.50	58.4	67.5	41.7
18.55	60.9	68.6	52.7	21.55	58.7	70.7	44.5
19.00	59.9	67.2	52.2	22.00	58.9	68.4	48.7
19.05	60.5	67	52.2	22.05	59.2	67.8	46.6
19.10	61.2	67.7	52.5	22.10	59.5	73.2	46.9
19.15	59.7	67.7	50.5	22.15	56.2	67.3	41.3
19.20	59.7	69.8	48	22.20	55.7	67.5	39.5
19.25	60.6	70.5	50.8	22.25	57	70.1	44.8
19.30	61.5	78.2	50.4	22.30	55.1	68	39.3
19.35	59.4	69.3	50.1	22.35	57.9	70.9	41
19.40	60	67.9	51.2	22.40	52.4	67	40.4
19.45	59.8	69.6	49.4	22.45	54.6	66.9	44.5
19.50	58.3	66.4	47.9	22.50	53.5	67.4	38.7
19.55	59.2	69.1	47.9	22.55	56.9	71.5	39
20.00	62.1	85.5	48.4	23.00	55	72.3	38.9
20.05	59.7	69.9	49.3	23.05	55.5	68.4	38.3
20.10	59.8	70.6	50.4	23.10	52.4	66.5	37.3
20.15	66.2	87.8	48.2	23.15	51.5	67	36.8
20.20	59.8	78.2	50.2	23.20	50.1	68.4	36.6
20.25	60	72.9	48.5	23.25	53.5	67.4	37.7
20.30	59.3	68.9	47.7	23.30	54.9	68.2	37.4
20.35	58.3	66.2	43.5	23.35	53.5	73.8	36.6
20.40	59.2	69.6	48.9	23.40	53.3	67.7	36.2
20.45	57.4	67.8	46.6	23.45	47.9	65.3	35.5
20.50	57.8	66.9	44.6	23.50	49.9	63.9	36.1
20.55	57.5	69.1	45.1	23.55	52	67.1	37.7

Measurment Time	LAeq	LAmax	LA90	Measurment Time	LAeq	LAmax	LA90
0.00	49.3	66.8	38.3	3.00	48.3	64.9	37.5
0.05	52.6	69.7	38.1	3.05	48.5	67.3	35.4
0.10	54.2	66.9	37.8	3.10	49.7	66.4	36.6
0.15	53	71.4	37.6	3.15	45.2	63.3	36.3
0.20	48.7	65.8	37.7	3.20	45.9	63.7	37.5
0.25	50.7	65.4	38.4	3.25	39	43	37.7
0.30	51.1	66.7	38.3	3.30	47.8	68.8	37.7
0.35	48.5	64.3	35.8	3.35	42.9	60.3	38
0.40	46.7	62.8	37.3	3.40	49.1	65.2	38.5
0.45	51.6	70.1	37.2	3.45	52.8	71.9	39.3
0.50	48.9	64.5	36.5	3.50	47.1	63.8	39.2
0.55	47	66.1	35.6	3.55	50.1	64.6	39.3
1.00	49.4	66.2	36.7	4.00	48.9	65	37.8
1.05	48.8	64.1	34.2	4.05	48.8	66.6	37.5
1.10	49.3	65.8	36	4.10	47.2	64.5	38
1.15	45.5	64.6	36.1	4.15	50.4	70	39
1.20	35.7	40.6	34.6	4.20	51.6	67.5	40.4
1.25	47	63.3	35.6	4.25	51.7	67.4	40.3
1.30	52.9	72.3	36	4.30	49.9	66	41.7
1.35	48.2	68.5	36.2	4.35	52.4	64.4	41.4
1.40	37	43.4	35.7	4.40	48	66.2	41.9
1.45	48.9	66.8	36.1	4.45	50.4	65.9	41.7
1.50	45.2	63.9	36.8	4.50	54.5	68.9	42.5
1.55	46.8	64.8	38.1	4.55	50.8	67.4	41.6
2.00	45.2	64.1	37.8	5.00	52.4	69.1	42.4
2.05	49.6	69.1	38.2	5.05	53.4	70	42.9
2.10	49.5	65.1	37.8	5.10	53	67.7	41.7
2.15	38.3	44.9	35.8	5.15	56.8	69.7	42.6
2.20	47.1	65.3	36.2	5.20	56.2	70.5	42.5
2.25	47.4	66.6	36.2	5.25	56.8	70.1	43.1
2.30	48.7	65.2	37.4	5.30	57.1	68.1	43.8
2.35	44.1	62.2	36.9	5.35	54.8	68.6	42.9
2.40	51.1	69	36.8	5.40	59.5	70.9	47
2.45	51	69.9	37.7	5.45	59.7	70	47.8
2.50	48.6	67	37.3	5.50	57.1	70	43.6
2.55	42.3	57.7	35.5	5.55	59.5	69.3	48.5

Measurment Time	LAeq	LAmax	LA90	Measurment Time	LAeq	LAmax	LA90
6.00	58.5	71.8	47.9	9.00	60.6	67.4	52.5
6.05	60.6	73.3	48.7	9.05	61.5	68.6	54.3
6.10	58.8	69.5	47.6	9.10	61.1	67	54.3
6.15	58.8	69.9	48.5	9.15	62	76.3	54.2
6.20	59	71.1	47.2	9.20	61.1	68.1	49.6
6.25	60	71.7	49.5	9.25	61.4	68.7	54.3
6.30	58.3	72.2	50.5	9.30	61.1	68.6	54.8
6.35	61.8	78.3	50	9.35	61.3	69.5	53.3
6.40	60.3	70.7	49.8	9.40	61.1	69.3	53.9
6.45	59.5	68.5	47.3	9.45	61.2	73.5	54
6.50	60.4	70.4	50	9.50	60.7	68	53.8
6.55	61.4	78.9	49.7	9.55	60.7	67.9	52.2
7.00	61.4	73.3	49.2	10.00	61.5	88.3	52.9
7.05	62.1	74.9	49.6	10.05	61.4	75.4	52.5
7.10	61.7	70.2	52.5	10.10	60.9	69.4	53.9
7.15	60.1	69.3	50.1	10.15	61.3	68.9	53.8
7.20	61.8	71	52.2	10.20	61.5	75.4	53.8
7.25	61.6	70.8	52.4	10.25	61.8	70.4	53.6
7.30	61.5	70.5	53.6	10.30	62	68.9	53.7
7.35	61.6	69.5	51.8	10.35	61.8	68	54.5
7.40	62.3	70.4	54.9	10.40	61.8	73.4	54.9
7.45	63	69.6	56.9	10.45	61.9	67.9	54.8
7.50	62.9	69.3	56.7	10.50	61.5	70	54.5
7.55	62.5	70.6	54	10.55	61.4	68	54
8.00	61.8	71.7	54.2	11.00	61.9	61.9	54.9
8.05	61.9	71.8	55.3				
8.10	62.4	72	52.2				
8.15	61.8	71.4	55.6				
8.20	62.2	69.3	55.9				
8.25	61.3	69	55.9				
8.30	61.9	74.8	55.2				
8.35	61.9	72.7	53				
8.40	62.7	69.4	58.1				
8.45	61.2	66.5	56				
8.50	61.5	69.7	56.2				
8.55	61.6	67.6	56.4				