Noise Assessment Report

LON1 Phase B Environmental Permit Variation Application

NTT Global Data Centers EMEA Limited

London East-UK Business and Technical Park, Yewtree Avenue, Dagenham, RM10 7FZ

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Basis of Report

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Acronyms and Abbreviations

Term	Description
dB (decibel)	The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio of the root-mean-square pressure of the sound and a reference pressure (2x10-5 Pa).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
C_{tr}	A weighting curve applied to level differences to account for low frequency noise, typically associated with traffic noise. This is often applied as an addition to $D_{nT,w}$ and R_w ratings used to describe levels of sound insulation.
Frequency Octave bands (and Third Octave bands)	Sound can occur over a range of frequencies extending from the very low, such as the rumble of thunder, up to the very high such as the crash of cymbals. Sound is generally described over the frequency range from 63 Hz to 4000 Hz (4 kHz). This is roughly equal to the range of frequencies on a piano. Frequency is often divided into ('first') octave bands for analysis, with the range above considered within 7 octave bands with centre frequencies at 63 Hz, 125 Hz, 250 Hz, 1 kHz, 2 kHz and 4 kHz. 'Third' octave bands split this further into smaller frequency bands.
$L_{Aeq, T}$	L_{Aeq} is defined as the notional steady sound level which, over a stated period of time (T), would contain the same amount of acoustical energy as the A-weighted fluctuating sound measured over that period.
L_{A10} & L_{A90}	If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The Ln indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L_{A10} is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L_{A90} is the 'average minimum level' and is often used to describe the background noise. It is common practice to use the L_{A10} index to describe traffic noise. The 'A' in the notation indicates a single weighted figure using the 'A' weighting to compensate for the varying sensitivity of the human ear to sound at different frequencies.
L_{AFmax}	L_{AFmax} is the maximum A-weighted sound pressure level recorded over the period stated. L_{AFmax} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall L_{Aeq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using a 'fast' response.
R_w	Weighted sound reduction index. A single number rating of the sound insulation performance of a specific building element. R_w is measured in a laboratory. R_w is commonly used by manufacturers to describe the sound insulation performance of building elements such as plasterboard and concrete.
Sound pressure level (SPL)	Represents a noise level that can be measured directly, the result of pressure variations in the air achieved by the sound waves, on a dB scale.

1.0 Introduction

NTT Global Data Centers EMEA Limited (NTT) has appointed (via RED Engineering Design Limited) SLR Consulting Limited (SLR) to undertake a noise assessment in support of an environmental permit (EP) variation application for an NTT Global Data Centers EMEA Limited owned and NTT Global Data Centers EMEA UK Limited operated data centre facility located at London-east-UK Business and Technical Park, Yewtree Avenue, Dagenham, UK, RM10 7FZ (the 'Site').

Electricity for operation of the data centre is provided from connections to the national electricity transmission network; however, given the nature of data centres and their requirement to have an available energy supply at all times, the data centre also incorporates a number of diesel-fired stand-by generators (SBGs).

The EP currently permits a total of 42 SBGs. As detailed within the Best Available Techniques and Operating Techniques document, the SBGs are to be installed in phases.

- **Current EP activities (based on the initial EP application)**: The initial EP application related to Phase A of the LON1 development (**LON1A**). Of the 42 permitted SBGs (as stated in the EP), to date 12 have been installed (generator model SDMO KD1800). The installation of the remaining SBGs (up to a maximum of 28 SBGs) will be completed as required, based on customer demands.

- **EP Variation (submitted March 2023)**: An EP variation relating to a change in the number, model and capacity of the remaining 28 SBGs to be installed in **LON1A** was submitted to the Environment Agency (EA) in March 2023 (SLR project reference 410.V62278.00001). The variation application related to NTT's intention to now install 16 larger SBGs to that which was applied for in the initial EP application; NTT intends to install 16 Kohler KD83V16 SBGs. The 16 SBGs will be installed in two phases, 9 SBGs initially, followed by the remaining 7 SBGs. This variation application has yet to be determined by the EA.

- **Current EP variation application**: This current EP variation application (SLR project reference 410.V61547.00001) relates to Phase B of the LON1 data centre development (**LON1B**). LON1B will involve the construction of a new data centre building located to the south LON1A, and the installation of 24 new SBGs within this. The SBGs will be fuel by hydrogenated vegetable oil (HVO), with Selective Catalytic Reduction (SCR) abatement installed on the SBGs to reduce emissions of oxides of nitrogen (NO_x). It should be noted that if HVO is not available then the SBGs will be operated on diesel.

The SBGs will provide power to the data centre in the event of an emergency situation such as a brown- or black-out of the local electricity transmission network where there are fluctuations or loss of the electrical power provided by the network. On occurrence of such an event, there is the potential for a delay between fault detection and initial operation of the SBGs; on-site battery arrays will provide a temporary uninterruptible power supply in order to cover such delays and the potential for a loss/reduction in the power supply to the on-site equipment.

1.1 Noise Assessment

An EP variation is required as the number and capacity of the SBGs to be installed has changed compared to that stated in the EP. The SBGs that will be installed at the Site is as follows:

- 12 x KD1800 (already installed in LON1A);
- 16 x KD83V16 (proposed for LON1A (phases 2 and 3);
- 22 x DS3600 IT generators (proposed for LON1B); and

- 2 x DS1650 house generators (proposed for LON1B).

As part of the application, a noise assessment has been undertaken to determine the potential impact at the nearest sensitive receptors. The assessment has been undertaken in accordance with the guidance from BS4142 and the EA, and considers the potential cumulative impact from all SBGs installed at LON1A and LON1B.

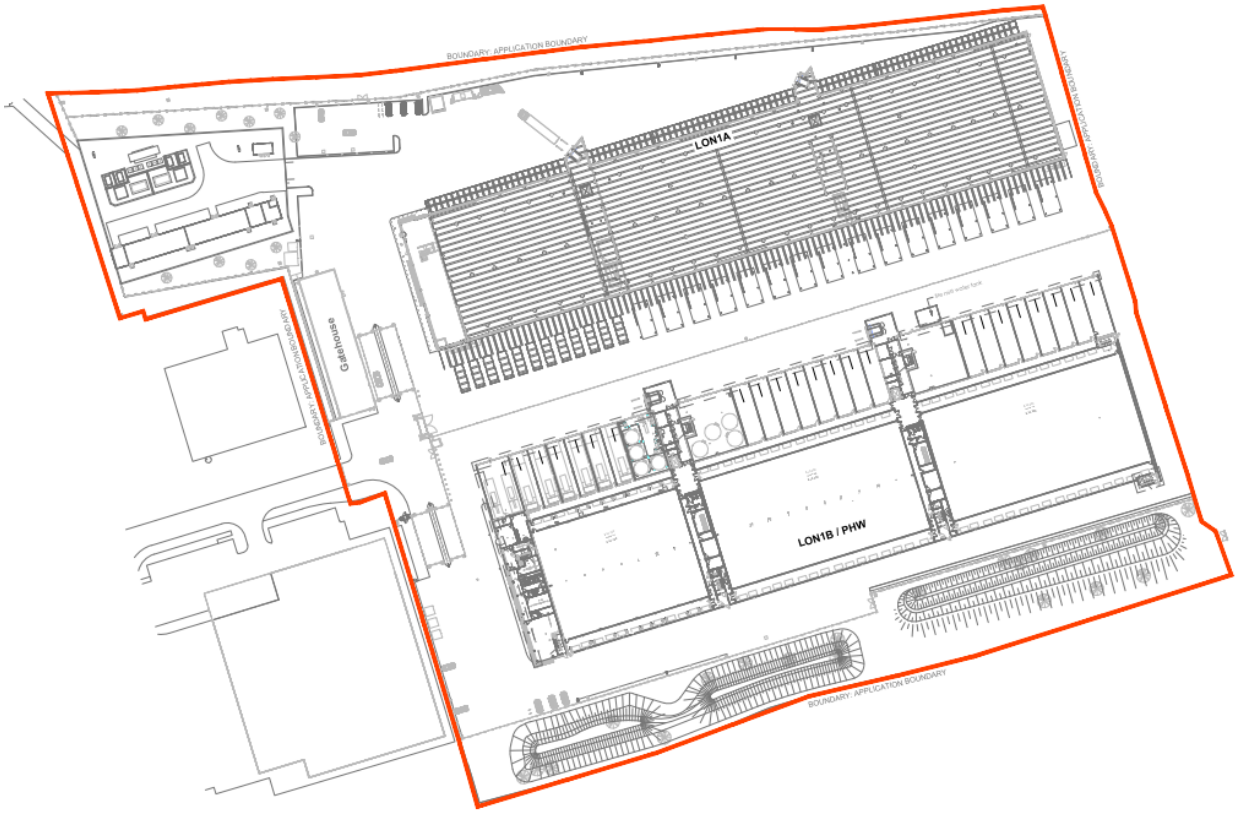
Whilst reasonable effort has been made to ensure that this report is easy to understand, it is technical in nature; to assist the reader, a glossary of terminology is included in the **Acronyms and Abbreviations** section.

2.0 Site Description

The Site is located off Yew Tree Avenue, Dagenham, RM10 7XS.To the north and east, the site is bordered by open land, which includes The Chase Nature Reserve, and football pitches associated with M & B Sports Social Club. To the west, the Site is bordered by the existing industrial and commercial units on the London East business and technical park. To the south, the Site is bordered by a railway line, servicing the District Line and other national rail routes to Dagenham East Station.

The Site comprises two main data centre buildings, known as LON1A and LON1B, as shown on Figure 1 below.

Figure 1 Site Layout Plan



The following drawings accompany this application to vary the EP for the Site:

- Drawing 001 – Site Location;
- Drawing 002 – Site Layout and Emission Points; and
- Drawings 003 – Environmental Permit Boundary.

2.1 LON1A

In January 2020, SLR prepared a noise report (ref 410.10114.00001 V1) to support an EP application, for a total of 42 diesel standby generators (SBG) at the data centre.

An EP variation was sought in early 2023, to change the remaining permitted SBGs to be installed in LON1A Phases 2 and 3, to 16 No. Kohler KD3500 (engine model KD83V16). This was also supported by a noise report, prepared by SLR dated January 2023 (ref 410.V62278.00001).

At LON1A, the enclosed (containerised) SBGs are located externally, at ground floor level to the south of the building. Further information regarding the SBGs at LON1A, is detailed within Section 5.2 of this report.

2.2 LON1B

A new data centre building LON1B will be constructed to the south of the existing LON1A data centre building; 24 new SBGs will be install in LON1B. The SBGs will be fuelled by HVO, with SCR abatement installed on the SBGs to reduce emissions of oxides of nitrogen (NO_x) to atmosphere. It should be noted that if HVO is not available then the SBGs will be operated on diesel.

The SBGs will be located internally, within the northern part of the building. Each will be located within an individual ground floor generator room. Further information regarding the SBGs at LON1B is detailed within Section 5.3 of this report.

2.3 Receptors

The nearest noise sensitive receptors (NSR) are identified as:

- **NSR1** Residential properties to the south, off Western Avenue.
- **NSR2** Residential properties to the west of the Site, off Winstead Gardens.
- **NSR3** Residential properties to the north of the Site, off The Chase.
- **NSR4** Residential properties to the east of the Site, off Rainham Road.

The location of the Site is provided in Figure 2 below, along with the location of each NSR.

Figure 2 Site Location and NSR Plan

3.0 Methodology

A summary of the requirements outlined in the Environment Agency (EA) guidance document 'Noise and vibration management: environmental permits, January 2022', and the assessment methodology outlined in BS4142 are provided below.

3.1 Noise and vibration management: environmental permits

The EA published the guidance document Noise and vibration management: environmental permits, in January 2022, replacing the previous guidance. The EA guidance details when a noise assessment is required, the competency required to undertake an assessment and how to carry out a noise impact assessment.

The EA guidance details when a noise assessment is required, the competency required to undertake an assessment and how to carry out a noise impact assessment.

The EA guidance references BS4142 as the appropriate assessment methodology, and it outlines how context should be taken into account in the assessment, and notes that *"whilst context allows you to interpret impact thresholds (to a degree), there are practical limits to the extent of the interpretation. It is unlikely you could adjust the assessment outcome beyond the next band (for example, modifying a BS 4142 outcome of more than 10dB to be less than an 'adverse impact')."*

Determining the outcome of the assessment the following should be considered:

- Weekdays rather than weekends.
- What the sound 'means' – meaningful sound is one that conveys an unpleasant meaning beyond its mere acoustic content, for example noise from an abattoir.
- Time of day.
- The absolute sound level.
- Where the sound occurs.
- New industry or new residences.
- Intrinsic links between the source and receptor, for example the source is the resident's place of work.
- Local attitudes.
- The residual acoustic environment.
- The land use at the receptor (for example, gardens rather than yards).
- The exceedance (traditional BS 4142).
- Whatever else might be particular to that individual situation.

Based on the results of the BS4142 assessment the EA guidance has three distinct requirements as detailed in Table 1 below.

Table 1 EA Assessment Guidance

EA Guidance Result	BS4142 Descriptor	Next Stage
Unacceptable level of audible or detectable noise	The closest corresponding BS 4142 descriptor is 'significant adverse impact'	You must take further action or you may have to reduce or stop operations. The environment agencies will not issue a permit if you are likely to be operating at this level.
Audible or detectable noise	The closest corresponding BS 4142 descriptor is 'adverse impact'	Your duty is to use appropriate measures to prevent or, where that is not practicable, minimise noise. You are not in breach if you are using appropriate measures. But you will need to rigorously demonstrate that you are using appropriate measures.
No noise, or barely audible or detectable noise	The closest corresponding BS 4142 descriptor is 'low impact or no impact'	Low impact does not mean there is no pollution. However, if you have correctly assessed it as low impact under BS 4142, the environment agencies may decide that taking action to minimise noise is a low priority.

3.2 British Standard 4142

The British Standard BS 4142:2014 +A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound (BS 4142) notably describes methods for rating and assessing sound of an industrial or commercial nature.

The scope of BS 4142 recognises that human response to sound can be subjective as affected by many factors, both acoustic and non-acoustic. The significance of its impact can depend on various factors such as the exceedance to the background level, its absolute level, time of day and change in environment, as well as local attitudes to the source of sound and character of the neighbourhood.

Certain acoustic features can increase the significance of impact from a comparison of the specific sound level to the background sound level where these features are likely to affect perception and response. Where such features are present at the assessment location, a character correction (or penalty) to the specific sound level is made to obtain the rating level. This can be approached from subjective, objective and reference methods.

- Tonality: A correction of 0 dB to + 6 dB for sound ranging from not tonal to prominently tonal.
- Impulsivity: A correction of up to + 9 dB can be applied for sound that is impulsive.
- Intermittency: A penalty of + 3 dB can be applied if on/off conditions are readily distinctive within the reference time interval over the period of the greatest amount of on-time.
- Other characteristics: A penalty of + 3 dB can be applied in the absence of all other defined characteristics, where the specific sound contains a distinctive feature in the residual acoustic environment.

The rating sound level is equal to the specific sound level if there are no acoustic features present or expected to be present.

The significance of sound depends upon both the margin by which the rating level exceeds the background sound level and the context in which the sound occurs. An initial estimate of the impact of the specific sound is made by subtracting the measured background sound level from the rating level. Typically, the greater the difference, the greater the magnitude of the impact;

- A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context;
- A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context; and
- 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 level, this is an indication that the specific sound source will have a low impact, depending on the context.

Where the initial estimate of the impact needs to be modified due to context, BS4142 states that all pertinent factors should be taken into consideration, including:

- The absolute level of sound;
- The character and level of the residual sound compared to the character and level of the specific sound; and
- The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions.

BS4142:2014+A1:2019 notes that:

"*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*."

3.3 ISO 9613-2:1996

The levels of sound generated by the operation of the proposed Plant has been predicted in accordance with the prediction framework within ISO 9613-2:1996 *Acoustics – Attenuation of Sound during Propagation Outdoors– Part 2: General Method of Calculation*. This method of calculation takes into account the distance between the sound sources and the closest receptors, and the amount of attenuation due to atmospheric absorption. The methodology also assumes downwind propagation, i.e. a wind direction that assists the propagation of sound from the source to the receiver.

4.0 Environmental Sound Survey

As part of the outline planning application for the development, an acoustic statement was prepared by Black & White Engineering (BWE) in January 2018 (ref BW-E-P20010-3-REP-000003-1). The assessment included an environmental sound survey, to determine the baseline noise levels at the noise sensitive receptors.

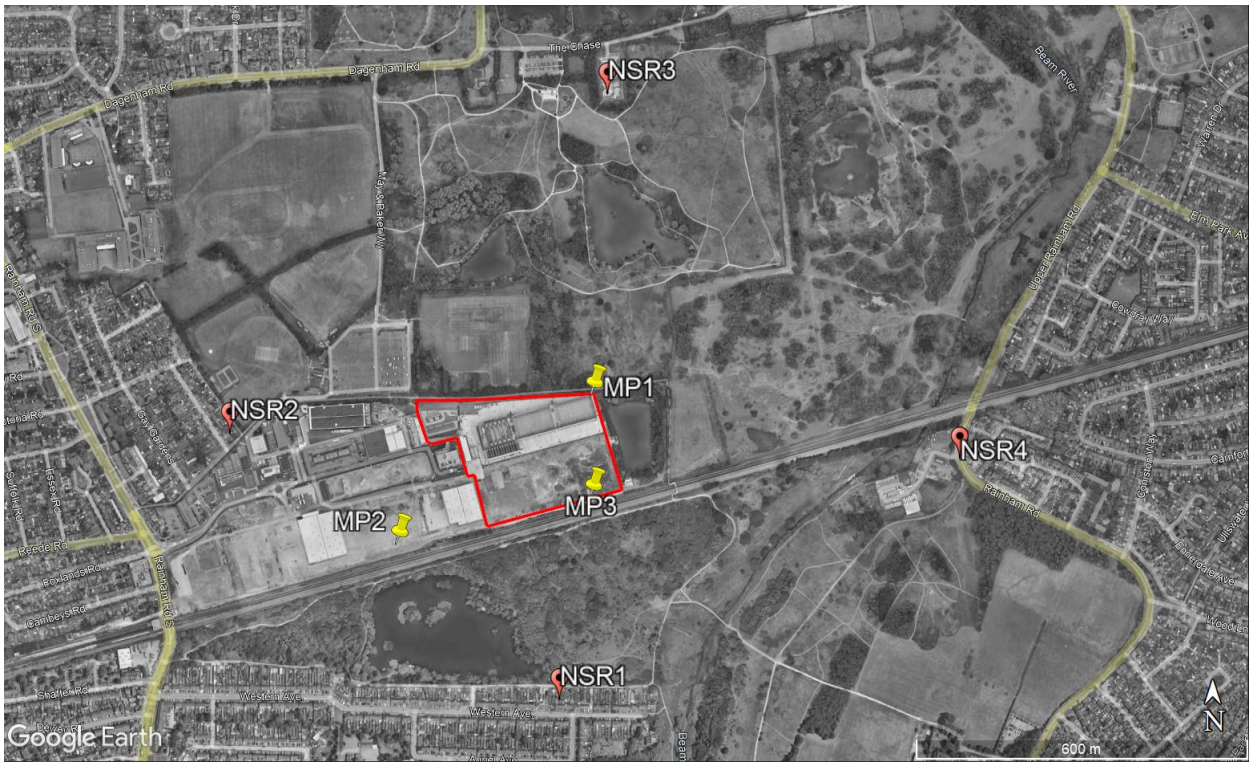
The report states that sound level measurements were undertaken between 28th November 2017 and 29th November 2017. While the data is around 6 years old, it is still considered representative for use in this assessment as it presents the baseline sound levels prior to any development on the site, including LON1A which is currently operational.

4.1 Monitoring Locations

Short-term attended measurements were undertaken by BWE at two positions, and long-term unattended measurements were undertaken at one position. The monitoring locations are shown on Figure 3, and detailed below:

- MP1 – short-term measurement at northern perimeter of the site;
- MP2 – short-term measurement at perimeter of the site and 15m from the railway track; and
- MP3 – long-term unattended measurement, representative of nearest noise-sensitive residential receptors (NSR).

Figure 3 Noise Monitoring and NSR Location Plan



Details of the measurement positions from the BWE report are reproduced below:

- *Position 1 and 2 were selected for short term measurements at the perimeter of the site.*
- *Position 3 was selected for longer term unattended measurements, and is representative of the background noise level at the nearest residential receptors.*
- *Location 2 was 15m from the railway track and location 3 was 8m from the track.*

- *At all positions the microphone was located 1.5m above the ground level and were away from other reflecting surfaces such that the measurements are considered free-field.*'
- *During the survey the temperature was 5 degrees during the day, the maximum wind speed was 1.1m/s and it was dry, but overcast.*

It was noted that '*the most significant noise sources were rail traffic on the line directly to the south of the site with some construction and offloading activity audible at locations 1 and 2*."

The results of the survey are detailed in Table 2 below; which has been reproduced from Table 2 of the Black & White Engineering report.

Table 2 Summary of Measured Noise Levels, dB

Location	Time Period	LAmax,15min	LAeq,T	LA90,15min
MP1	15:30 to 16:00	54 to 61	48	43
MP2	16:00 to 16:30	66 to 76	57	43
MP3	16:15 to 23:00	78 to 80	64	39 to 44
	23:00 to 07:00	45 to 80	59	36 to 45
	07:00 to 11:30	78 to 80	64	46 to 55

4.2 Background Sound Level

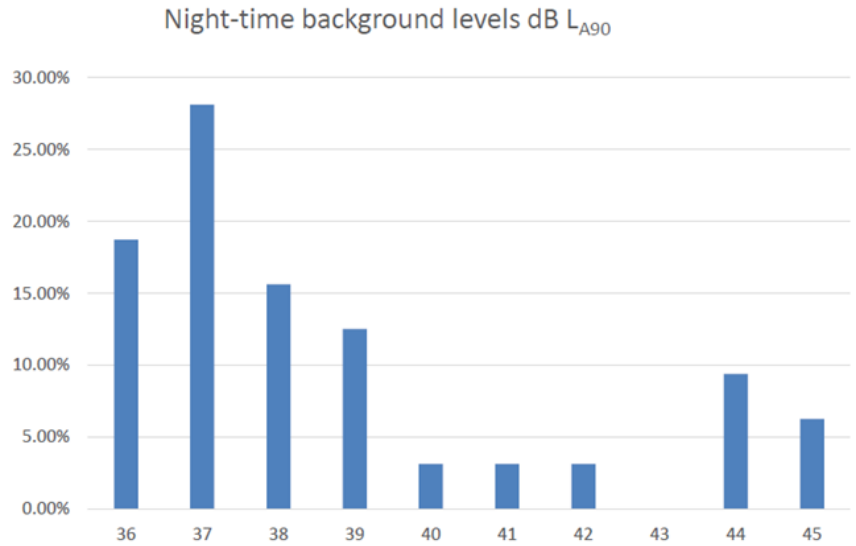
4.2.1 Daytime

Full survey data has not been provided in the BWE report, therefore as a worst-case, the lowest measured background sound level of **39dB L_{A90}** measured at position MP3 during the daytime, is considered representative of all receptors.

4.2.2 Night-time

BWE undertook a statistical analysis of the results of all the $L_{A90,T}$ night-time data to determine a background sound level considered representative of the assessment period. Based on the results shown on Figure 4 below, the typical night-time background sound level of **37dB** $L_{A90\ 15mins}$, is considered representative of all receptors.

Figure 4 Statistical analysis of Night-time Background Sound Levels



5.0 Noise Assessment

An industrial noise assessment has been undertaken to determine the potential impact at the receptors. It has been undertaken in accordance with the guidance found within BS4142, and the EA guidance, and considers the potential cumulative impact from all SBGs installed at LON1A and LON1B.

5.1 Noise Model Assumptions

The sound predictions in this assessment have been undertaken using the modelling software CadnaA, which implements the full range of UK noise calculation methods. The calculation algorithms set out in ISO 9613-2:1996 *Acoustics – Attenuation of sound during propagation outdoors – Part 2 General method of calculation* have been used and the model assumes:

- A ground absorption factor of 0.5 for mixed ground;
- A receptor height of 1.5m during the daytime and 4m at night; and
- A reflection factor of 2.

It should be noted that the noise model also assumes that all SBGs will operate all together, and therefore presents a worst-case scenario.

Site buildings and other buildings situated between the Site and receptor locations have been included in the noise model.

5.2 LON1A - Noise Sources

The EP variation sought would allow for a total of 28 SBGs to be installed at the LON1A building, and would compromise the following:

- Phase 1 – 12 x Kohler KD1800
- Phases 2 & 3 – 16 x Kohler KD3500 (Engine Type KD83V16).

5.2.1 Kohler KD1800

The previous noise assessment for the Site, prepared for the EP application, used the KD1800 noise source data detailed in Table 3 below. For the purpose of the EP variation, the same source data has been used.

Table 3 LON1A - Sound Power Data of the Kohler KD1800, dB

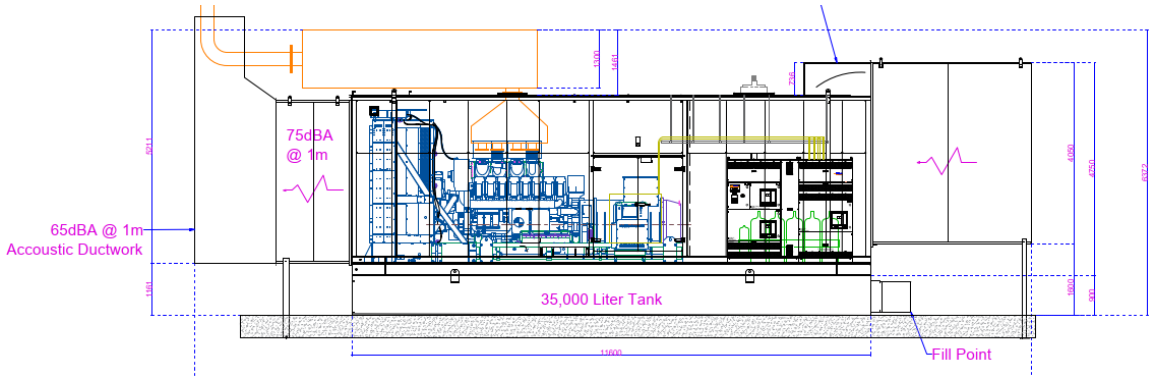
Generator Type	31.5Hz	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	Sound Power Level LWA
KD1800	87.5	83.6	89.2	90.4	88.0	80.2	76.1	72.0	68.5	88.2

For the purpose of this noise assessment, based on the separating distances to the nearest noise-sensitive receptors, each KD1800 generator has been modelled as a point source.

5.2.2 Kohler KD3500

With regard to the KD3500 SBGs, each SBG will be fitted with SCR abetment, which includes a primary and secondary silencer, before the SBG stack. The technical specification of the equipment states a noise level of 75dB(A) at a distance of 1m from the SBG container, and 65dB from the SCR ductwork, as shown in Figure 5 below.

Figure 5 KD3500 Noise Data Specification



To accurately predict the noise level of the complete SBG, it is necessary to develop a noise model that includes the SBG containers, exhausts, and fans.

As the technical data does not include a breakdown of the noise sources that contributed to the measured noise level of 75dB(A) at 1m, SLR has used archive noise data measured from a containerised diesel generator , with similar equipment as that proposed.

Measurements were made at 1m from the façade of operational containerised generator, at heights of 1.5m, and 5m above ground. The source levels used within the noise model are presented in Table 4 below.

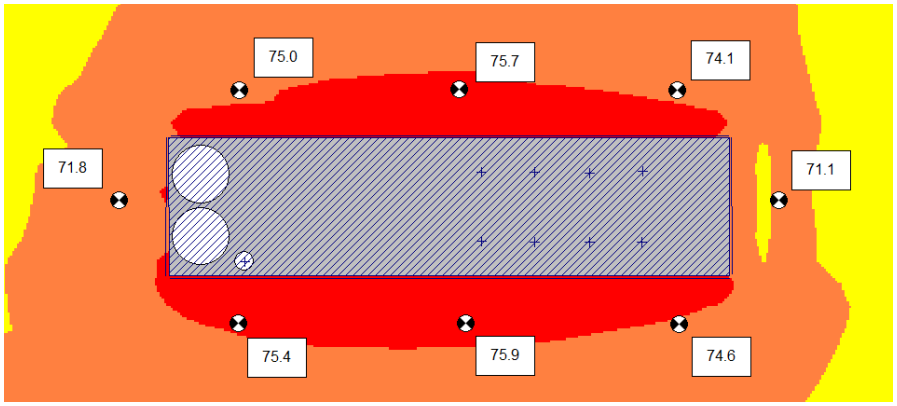
Table 4 LON1A - Sound Power Levels of the Kohler KD3500, dB

Element	31Hz	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	Sound Power Level L_{wA}
Container Sides	94.1	100.8	92.7	84.1	78.7	75.1	72.8	71	67.7	83.5
Container Stack End	93.6	97.0	94.0	83.0	74.3	70.8	68.1	66.1	63.1	81.5
Container Non-Stack End	92.5	92.0	84.6	76.8	74.0	73.7	69.7	69.2	71.3	79.4
Cooling Fans	83.2	77.6	78.2	70.2	70.1	67.6	64	58.4	49.9	72.6
Stack (roof level)	102.6	112.4	105	93.5	95.7	84.9	85.7	85.7	81.0	96.7

A noise model with a one engine configuration, using the data detailed above, is shown in Figure 6 below (at a height of 1.5m).

The logarithmic average of the eight predicted measurements at 1m at a height of 1.5m is 74.5dB(A). This is comparable to the noise level of 75dB(A) at 1m, based on the technical specification detailed above.

Figure 6 LON1A Noise Model of One Containerised Engine



5.3 LON1B – Noise Sources

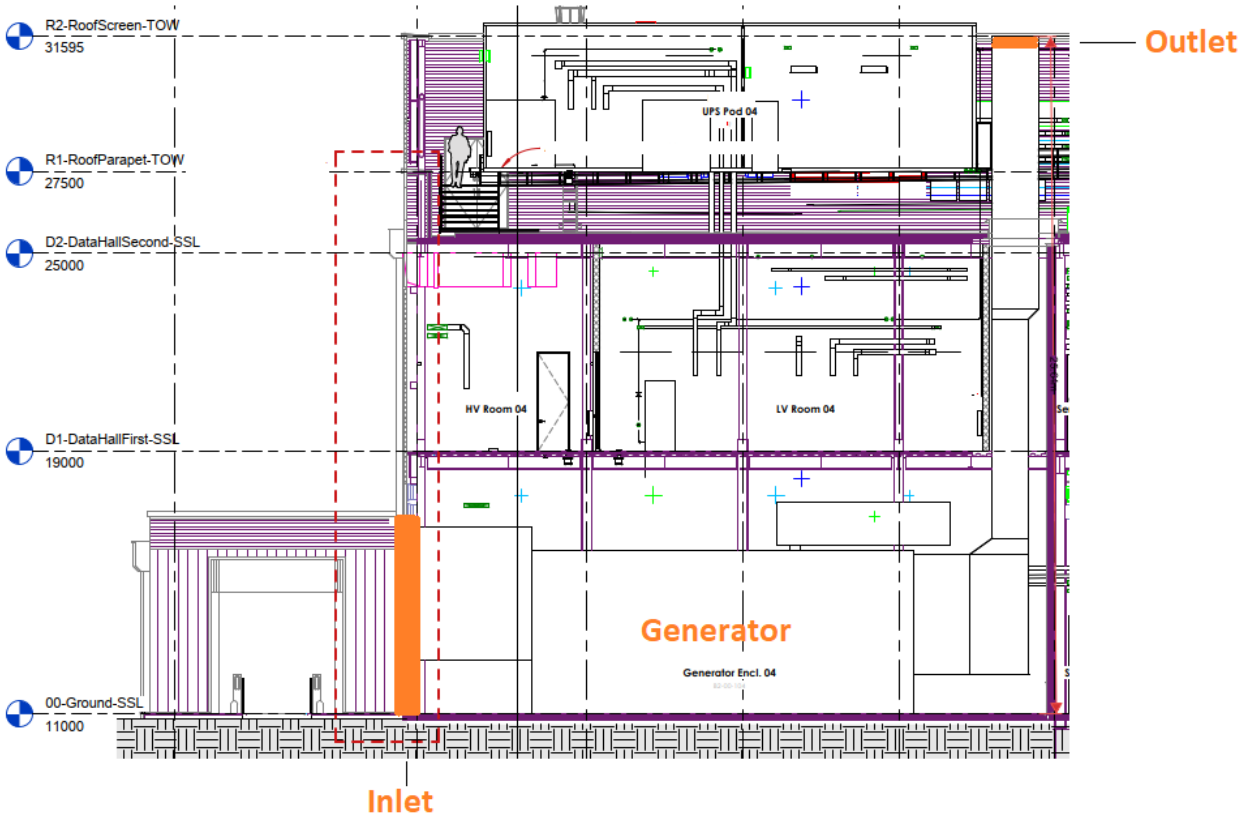
The EP variation sought would allow for a total of 24 SBGs to be installed in the LON1B building, and would compromise the following:

- 22 x DS3600 generators (each being 7.6MWth @100% load);
- 2 x DS1650 house generators (each being 3.8MWth @ 100% load).

As detailed within Section 2.2, the SBGs will be located within the northern part of the building, within individual generator rooms. The 2-storey building comprises of a ground floor and first floor, with additional plant located at roof level, which is surrounded by a 5m high screen wall.

The generator rooms will be located at ground floor level as shown in the cross-section plan in Figure 7 below. With inlet points at ground floor levels, and outlet points at roof level.

Figure 7 LON1B - SBG Cross Section



The bare engines will be located within individual generator rooms, with combustion air supplied from a large inlet vent on the northern façade (as indicated above). The air inlet will measure 6m high and 4m wide, and ducts to the SBG will be via an attenuator located within the plant room.

The combustion air outlet and engine exhaust, discharge at roof level (as indicated above) via a work riser, and both will also be fitted with an inline attenuator.

5.3.1 Modelled Data

At LON1B the SBGs are located internally, therefore only the inlet and outlet points, have been considered as the principal noise emission points.

For the purpose of this assessment, the SBGs have been modelled based on the maximum permissible noise levels detailed in Table 5 below, and which is to be used as the target during the design stage, and future commissioning stage.

Table 5 LON1B - SBG Sound Power Data, dB

Plant	No.	Location	Frequency (Hz)								Sound Power Level L_{wA}
			63	125	250	500	1k	2k	4k	8k	
Generator vent inlet	24	Inlets on northern façade – Modelled as vertical area source 6x4m.	103	101	90	89	83	78	73	76	91
Generator vent exhaust	24	Outlets at roof level (20.5m). Modelled as point source.	81	108	79	76	75	72	65	54	93
Generator engine exhaust	24	Outlets at roof level (20.5m). Modelled as point source.	88	95	90	74	69	66	63	45	84

5.3.2 Generator Rooms

The SBGs will be located within individual generator rooms, each with an approximate floor area of 18m x 6m, and a height of 7m. Based on the noise data provided for the SBGs, the predicted reverberant internal noise level within the generator rooms will be 121 dB(A).

Based on the information provided by the client, it is understood that the shell and core construction of the generator rooms includes the following:

- A weather louvre on the external northern façade;
- 240mm wall panels to create internal wall partitions; and
- 150mm thick concrete slab floor, and ceiling.

Combustion fresh air to serve the generator is supplied via a large aperture in the façade of the plant room, which is fitted with an in-line splitter type attenuator. The exhaust air is ducted via a builder's work riser to discharge at roof level and will also be fitted with an in-line splitter type attenuator.

Noise emissions are controlled via the inlet attenuator on the façade and the exhaust attenuator in the air ducting, which will be designed to reduce noise levels effectively. This ensures that noise levels remain within the maximum permissible limits as specified in Table 5 above.

Regarding acoustic performance, the weather louvres will not contribute to attenuating the internal noise (i.e. breakout noise). However, it is important to note that the majority of the louvre area of the generator room will be used by the 6 meters by 4 meters generator vent inlet.

It is understood that the remaining area of the northern louvre façade, will receive adequate noise mitigation measures to enhance the facade (i.e. a solid blockwork wall) during the future design and commissioning phases.

This will be to prevent significant noise breakout from the generator rooms (and this includes noise breakout to internal office areas). Additionally, enhanced mitigation will be utilised on the western façade, to prevent excessive noise breakout from the house generators (GEN-01-HA and GEN-01-HB).

As a result, noise from within the generator rooms is not expected to have an impact on the predicted noise levels.

5.3.3 Louvre Generated Noise

With regard to air regenerated noise, for example from air flow over the inlet louvres, it is understood that the noise levels detailed in Table 5 are inclusive of this.

As a guide, based on typical louvre manufacturer data, with a face area of 6 x 4m, a volume flow rate of 52 m^3/s, and therefore a face velocity of 2.2 m/s, air regenerated noise from the inlet weather louvre will be at least 10 dB below the sound power level assessed for the SBG vent inlet. Therefore, it will have no contribution to the overall noise and no adjustment is required.

5.4 Specific Level at Receptor

Based on the source details stated above, the specific sound level from all SBGs at LON1A and LON1B has been predicted at each identified receptor location. Daytime levels have been predicted at 1.5m above ground representative of ground floor areas, and night-time levels at 4.0m above ground representative of first floor bedrooms.

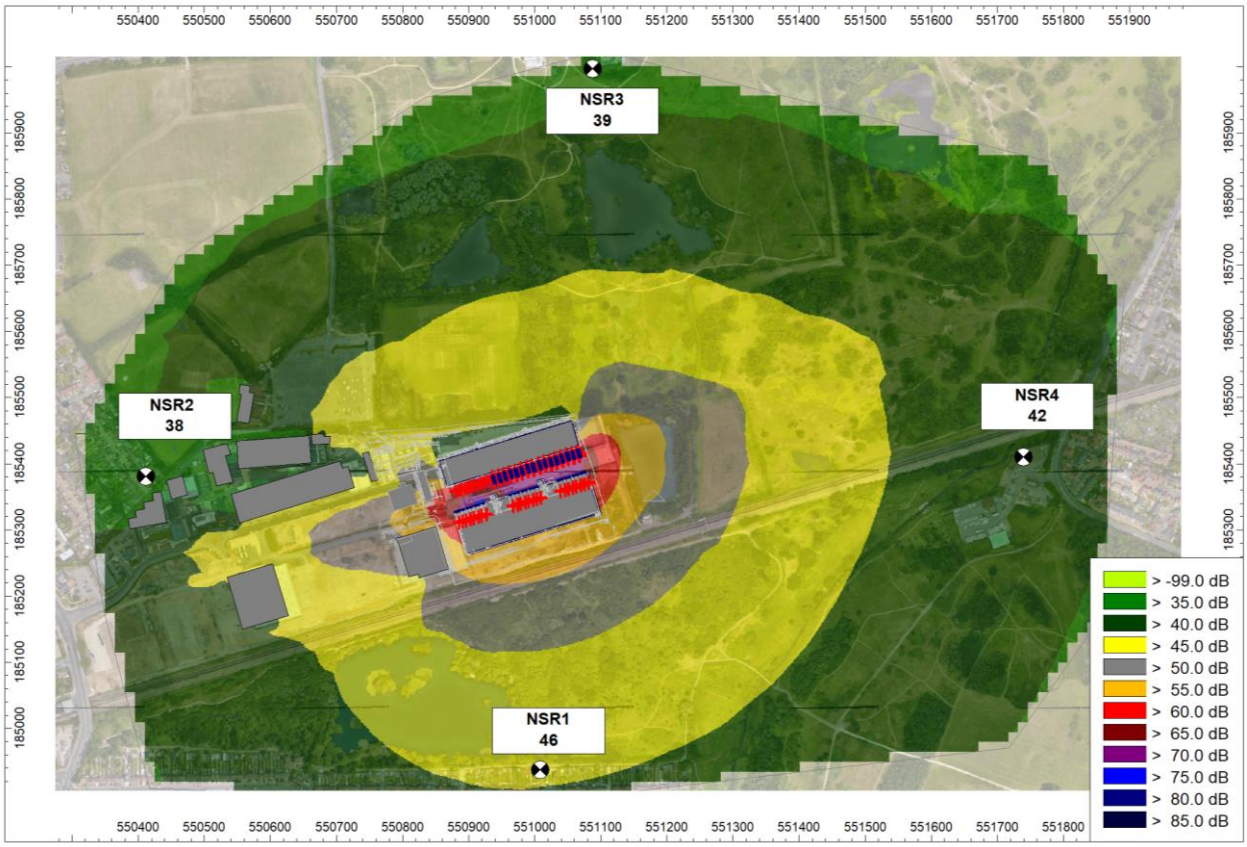
The predicted specific sound level is presented in Table 6.

Table 6 Predicted Specific Sound Levels, Free-field, dB

Noise Sensitive Receptor	Predicted Specific Sound Level, dB $L_{Aeq, T}$	
	Daytime (0700 to 2300 hours)	Night-time (2300 to 0700 hours)
NSR1 Western Avenue	45	46
NSR2 Winstead Gardens	38	38
NSR3 The Chase	39	39
NSR4 Rainham Road	41	42

The predicted specific sound level during the night-time, at a height of 4.0m above ground, is also shown in Figure 8.

Figure 8 Night-time Specific Sound Level - Contour Plot



5.5 Character Corrections

The character of the proposed source, and the corrections that will be applied in the BS4142 assessment, is detailed below in Table 7 below.

Table 7 BS4142 Character Correction

Sound Tonality	Sound Impulsivity	Sound Has Other Characteristic	Sound Intermittency	Comment
Given the noise climate in the area it is considered that tones may be just perceptible (2dB penalty).	With appropriate servicing of the generators they should not produce any impulsive sound.	No other sound characteristics are considered applicable.	There should be no requirement for the generators to be switching on and off.	Based on the individual characteristics, a total penalty of +2dB is considered appropriate.

5.6 BS 4142 Assessment

The character corrections presented above in Section 5.5, have been added to the predicted specific levels presented above, to derive the rating levels at each of the nearest noise-sensitive receptors. The rating levels have been compared to the daytime and night time background sound levels and assessed accordingly.

The results of the BS4142 assessment are shown in Table 8. It should be noted that the rating levels and the representative background sound levels have been rounded to the nearest decibel.

Table 8 BS4142 Assessment at Receptors, dB

NSR	Period	Specific Sound Level	Rating Level	Background Sound Level	Difference
NSR1 Western Avenue	Daytime	45	47	39	+8
	Night-time	46	48	37	**+11**
NSR2 Winstead Gardens	Daytime	38	40	39	+1
	Night-time	38	40	37	+3
NSR3 The Chase	Daytime	39	41	39	+2
	Night-time	39	41	37	+4
NSR4 Rainham Road	Daytime	41	43	39	+4
	Night-time	42	44	37	+7

During the daytime, the results of the BS4142 assessment above indicates that at worst, sound from the SBGs would be 8dB above the background level at NSR1, which is an indication of an adverse impact, **depending on the context**.

During the night-time, the results of the BS4142 assessment above, indicates that at worst, sound from the SBGs would be 11dB above the background level at NSR1, which is an indication of a significant adverse impact, **depending on the context**.

The specific sound level at the remaining receptors is less than 5dB above the background sound level, which is an indication of a low impact, **depending on the context**.

5.7 BS4142 Context Assessment

BS4142 states:

"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. An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur."

5.7.1 Testing Regime

In the first instance, it should be reminded that the purpose of the SBGs is to provide back-up power to the data centre in the event of an emergency situation such as a brown or black-out of the national electricity transmission network, therefore the SBGs will not typically operate.

However, there will be a requirement to run the SBGs as part of the typical operating regime for testing and maintenance. A summary of the SBG operating hours at LON1A and LON1B, is presented in Table 9 and Table 10 respectively.

Table 9 LON1A - SBG Maintenance and Testing Operation Hours

Operational Requirement	Annual Operational Hours per SBG (12 existing permitted SBGs serving Suite 1)	Annual Operational Hours per SBG (proposed 16 KDKD83V16 SBGs serving Suites 2, 3, 4 & 5)
Monthly on-load Testing (1 hour per month)	12	n/a
Monthly off-load Testing (1 hour per month)	n/a	12
Annual UPS wrap around maintenance	6	1
Black-building test	1	4
Annual Load Test (4 hours annually)	4	1
Operational hours for planned maintenance and testing per year per SBG	23	18
Operational hours for planned maintenance and testing per year (all 28 SBGs)	561	

Table 10 LON1B - SBG Maintenance and Testing Operation Hours

Event	Detail	Event Operational Time per LON1B SBG
Monthly on-load testing (60% load)	Each SBG is run for 30 minutes (if the SBG has not run within the month at a minimum of 30% load. Each SBG is tested individually.	30 minutes (per month)
Annual on-load testing (100% load)	Each SBG is run loaded at rated capacity (100%) for minimum of one hour. Each SBG is tested individually.	4 hours (once annually)
Black building testing (75% load)	Each SBG is run loaded at rated capacity (75%) for one hour. All SBGs tested simultaneously.	1 hour (once annually)
Annual UPS Maintenance (75% load)	Each SBG is run loaded at rated capacity (75% load) for 10 hours per UPS with their being 2 UPS's per line up/SBG. Each SBG is tested individually.	20 hours (once annually)
HV maintenance (75% load)	Each SBG is run loaded at rated capacity (75% load). Each SBG is tested individually.	10 hours (once annually)
LON1B operational hours for planned testing per year (per SBG)		41 hours
LON1B operational hours for planned testing per year (all 24 SBGs)		984 hours

At LON1A, each SBG is run for 1 hour per month, with other annual testing occurring for 4 hours per year also completed. However, testing is limited to 1 unit per day.

At LON1B, each SBG is run for 30 minutes per month, with annual 4 hour testing also completed. However, testing is again limited to individual SBGs.

The proposed regimes at LON1A and LON1B will operate separately, but it is possible that individual SBGs could be simultaneously tested at LON1A and LON1B (i.e. 2 SBGs in total).

An annual black building test is undertaken at LON1A and LON1B individually, but this is limited to 1 hour, with the SBGs running at 75% load.

However, it should be noted that the noise model assumes that all SBGs will operate simultaneously, as a worst-case scenario. Therefore, the predicted impacts in Table 8, would

only occur during an emergency situation such as a brown- or black-out, which is an indication that the predicted impacts can be reduced.

5.7.2 Absolute Level of Sound

It is also relevant to consider the absolute level of sound (i.e. the residual plus the specific) at the receptors, especially during the night-time period. With regard to this, BS4142 states:

"Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night."

Night-time noise levels were measured at location 3, during the full night-period. The measured background level was 37dB L_{A90}, and the measured residual level during the full period was **59dB L_{Aeq}**.

During the night-time, the highest specific level of 46dB L_{Aeq}, was predicted to occur at NSR1 Western Avenue. When the two levels are adding together logarithmically, this would result in an absolute level of **59dB L_{Aeq}**. Therefore, there would be no increase to the residual noise level during operational activities.

Operational noise from the Site is likely to be inaudible, and will be masked by other ambient noise sources such as road and rail traffic. It is expected that the sound would be largely unnoticeable, or just perceptible during the most noise sensitive periods. If the sound is audible, it is not expected to cause any change in behaviour or attitude at the receptor locations, due to the low level of sound from the site.

This is again an indication that the predicted impacts in Table 8 can be reduced, as there would be no change in absolute noise levels at the receptors.

6.0 Conclusion

NTT Global Data Centres EMEA Limited has appointed (via RED Engineering Design Limited) SLR to undertake a noise assessment in support of an EP variation application for the LON1 data centre located at London-east-UK Business and Technical Park, Yewtree Avenue, Dagenham, UK, RM10 7FZ.

Electricity for operation of the data centre is provided from connections to the national electricity transmission network; however, the data centre also incorporates a number of diesel-fired SBGs. The SBGs will provide power to the data centre in the event of an emergency situation such as a brown- or black-out of the national electricity transmission network.

An EP variation application (in relation to the LON1B phase of the data centre development) is required as the number and capacity of the SBGs to be installed has changed compared to that stated in the previous EP variation.

An industrial noise assessment has been undertaken to determine the potential impact at the receptors, and considers the potential cumulative impact from all SBGs installed at LON1A and LON1B. It has been undertaken in accordance with British Standard 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound,* and EA technical guidance.

The report is based on the results of a noise survey, undertaken by Black & White Engineering in November 2017.

Based on the source data provided, the specific sound level has been modelled at each receptor location. Daytime levels have been predicted at 1.5m above ground representative of ground floor areas, and night-time levels at 4.0m above ground representative of first floor bedrooms.

During the daytime, the results of the BS4142 assessment above, indicates that at worst sound from the SBGs would be 8dB above the background level, which is an indication of an adverse impact, depending on the context.

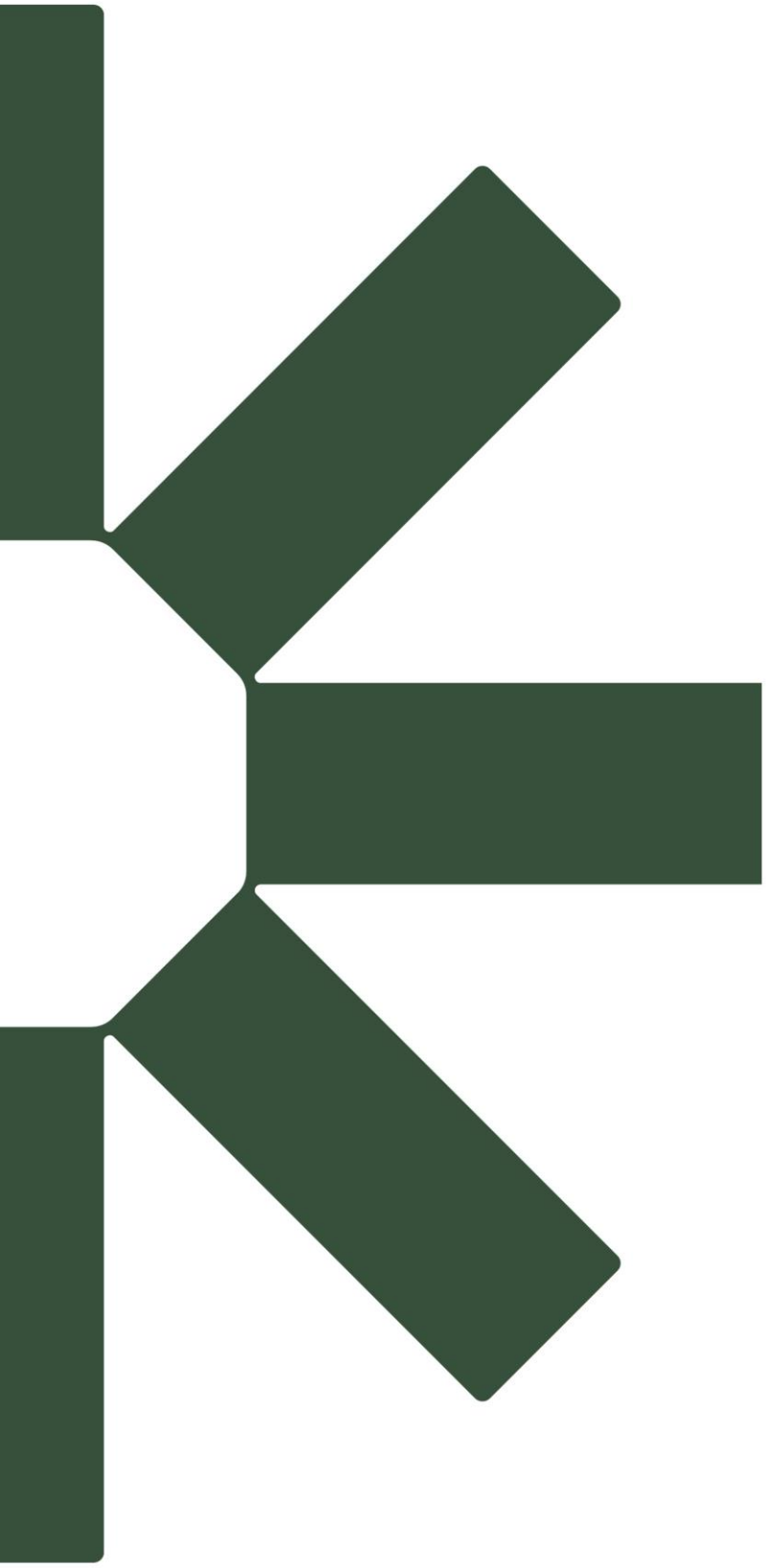
During the night-time, the results of the BS4142 assessment above, indicates that at worst sound from the SBGs would be 11dB above the background level, which is an indication of a significant adverse impact, depending on the context.

The specific sound level at the remaining receptors is less than 5dB above the background sound level during the night-time, which is an indication of a low impact, depending on the context.

When considering the context, operational sound from the Site is expected to be largely unnoticeable, or just perceptible during the most noise sensitive periods. Sound from the Site will likely be masked by the existing residual sound, including sources such as road and rail traffic. If the sound is audible, it is not expected to cause any change in behaviour or attitude at the receptor locations, due to the low level of sound from the site.

Furthermore, outside of limited SBG testing and maintenance regime, the SBGs sole purpose is to provide back-up power, and the proposed testing at LON1A and LON1B involves individual SBGs tested for a limited number of hours per year; with no proposals to undertake testing of the full site at once (i.e. all SBGs operating simultaneously as modelled).Therefore, the predicted impacts would only occur during an emergency situation such as a brown- or black-out, which is an indication that the predicted impacts can be reduced.

In accordance with BS4142, when considering the context of the acoustic environment which the sound occurs, the noise impact of the SBGs is considered to be low and unlikely to cause a significant noise impact at the identified receptors.



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