Hydrock

Longcross North- Data Centre Site

Generator Noise Assessment

For Ark Data Centres Limited

Date	*22 March 2024*
Doc ref	*21162-HYD-XX-ZZ-RP-Y-1002 – Generator Noise Assessment*

Document control sheet

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Client	Ark Data Centres Limited	
Project name	Longcross North - Data Centre Site	
Title	Generator Noise Assessment	
Doc ref	21162-HYD-XX-ZZ-RP-Y-1002 – Generator Noise Assessment	
Project number	21162	
Status	S3	
Date	22/03/2024	

Document production record		
Issue number	P03	Name
Prepared by		James Glen MASNZ AMIOA
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Document revision record			
Issue number	Status	Date	Revision details
P03	S3	22/03/2024	Issue 3 – further minor changes made following the review comments from ARK.
P02	S2 DRAFT	12/03/2024	Second Issue – Minor changes made following the review comments from ARK.
P01	S2 DRAFT	10/08/2023	First Issue - DRAFT

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1. Executive Summary

This assessment has been prepared to accompany the Environment Agency Permit (EA ref. SP3004SB) for the Proposed Development (PD) which is situated at the Longcross Park Data Centre, Chobham Lane, Longcross, Chertsey, KT16 0EE.

Following a submission in 2013, Crest Nicholson and Arriva secured hybrid planning permission in August 2014 for the demolition of existing buildings and the redevelopment of the whole Longcross North site.

In 2020, Ark purchased a 4.1ha parcel of the site which was identified in the approved masterplan as the location of the proposed data centre campus (and which would form Phase 3 of the proposals). The previously developed land sits at the front of the Longcross North site and is bounded to the south by Chobham Road, to the east by the main vehicular entrance from Chobham Road, and to the north and west by a mix of occupied and vacant buildings.

This report encompasses the overall development, and assesses the cumulative noise from all three parts of the development (DC01, DC02 and DC03). DC03 includes a further data centre to the west of the development.

For the purpose of this report follows the EA guidance for permit applications which is as follows:

- **Stage 1**: Desktop Risk Assessment – This includes identification of NSRs and sources which could give rise to adverse noise effects.
- **Stage 2:** Off-site monitoring survey – This section describes the procedure and results of an off site monitoring survey to examine the prevailing noise environment.
- **Stage 3:** Source assessment – This section combines Stage 1 and 2 to assess the noise from the proposed generators, cognisant of other sources on site.
- **Stage 4:** BAT or appropriate measures justification – Following the assessment in Stage 3 this section describes the measures undertaken for Best Available Technology.

Two scenarios were assessed for the Stage 3 assessment which were as follows:

- **Scenario 1:** Testing and maintenance – 28 generators tested monthly / annually
- **Scenario 2:** Emergency running – 24 generators operating continuously for 72 hours (2 generators in each group of 14 don't operate as they are for redundancy)

For both scenarios, following the assessment procedure it was identified that the noise emissions with the proposed mitigation indicate a '**Low Impact'** or '**No noise, or barely audible or detectable noise**' in terms of the EA guidance, subject to context. The contextual items that were considered were as follows:

- Character and Level of Sound – The level of sound is significantly masked by the high existing noise environment.
- Frequency of Operation – The generators are not a continuous noise source and will only be used during testing or a power outage.
- Sensitivity of Receptors – While residential receptors are classified as medium to high, the existing noise environment would likely mean that behavioural mechanisms to control noise would likely already been in place (closing windows during night periods etc.)

A summary of the Best Available Technologies was also provided where it was identified that measures required to achieve the more stringent planning criteria were adequate to control noise effects.

2. Policy and Guidance

2.1 Environment Agency Guidance

The Environment Agency's Data Centre Headline Approach states that there are no specific rules for data centre noise, compared to any other sources that are subject to a permit application (i.e. industrial noise) etc.

The Environment Agency has published online guidance (updated January 2022) on when and how noise assessments should be undertaken. The guidance provides an overall assessment methodology including a four-staged approach to noise and vibration assessments. This report has been structured to be in line with the recommended assessment methodology.

The four stages are as follows:

- **Stage 1**: Desktop Risk Assessment
- **Stage 2:** Off-site monitoring survey
- **Stage 3:** Source assessment
- **Stage 4:** BAT or appropriate measures justification

Stage 1 should include identifying plant that could be audible at any known Noise Sensitive Receiver (NSR), the noise sources should then be described and ranked in terms of their potential noise impacts. A review of NSRs should then be undertaken and details included.

Stage 2 should include an off-site noise monitoring survey at the NSRs using the standards defined in BS4142. This must include a comprehensive, subjective description of the acoustic environment.

Stage 3 This includes the assessment of the proposed source using the guidance principles within BS 4142. The EA includes guidance on assessment levels which correspond to BS4142, these are presented in Table 1 below.

Table 1: Environment Agency Noise Assessment Table

EA Descriptor	Examples of outcomes	BS4142 Descriptor
Unacceptable level of audible or detectable noise	This level of noise means that noise pollution is being (or is likely to be) caused at a receptor. 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.	Significant Adverse Impact
Audible or detectable noise	This level of noise means that noise pollution is being (or is likely to be) caused at a receptor. 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.	Adverse Impact
No noise, or barely audible or detectable noise	This level of noise means that no action is needed beyond basic appropriate measures or BAT.	Low Impact *Note that BS 4142 is unlikely to be the appropriate methodology on its own to assess low frequency noise.*

Stage 4 using Stages 1 -3 justify the Best Available Technology proposed or used to meet the requirements. The BAT justification is the critical part of any noise impact assessment submitted to the environment agencies.

2.2 NPSE

Published in March 2010, the Noise Policy Statement for England (NPSE) sets out the long-term vision of Government noise policy as follows:

> *"Promote good health and good quality of life through the effective management of noise within the context of Government policy on sustainable development."*

The NPSE identifies three observed effect levels, names "No Observed Effect Level" (NOEL), "Lowest Observed Adverse Effect Level" (LOAEL) and "Significant Observed Adverse Effect Level" (SOAEL).

The NPSE contains little detail on assessment methodologies and specific parameters at which the varying observed effect levels would occur in the context of a residential development.

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

BS 4142 describes methods for rating and assessing the impact of industrial and commercial sound on dwellings, including fixed plant installations.

The methods use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.

A BS 4142 assessment is made by determining the difference between the specific noise under consideration and the background sound level, as represented by the L_{A90} parameter, determined in the absence of the commercial sound. The L_{A90} parameter is defined as the level exceeded for 90% of the measurement time. This parameter therefore excludes short duration noise events, such as individual vehicle movements, and represents the underlying continuous noise.

The commercial or industrial sound is assessed in terms of the equivalent continuous noise level, L_{Aeq}. The equivalent continuous noise level (L_{Aeq}) of the commercial or industrial sound, over the applicable assessment period, is known as the specific sound level.

A character correction penalty can be applied to the specific sound level where the commercial noise exhibits distinguishable tones, impulsiveness, intermittency or other characteristics which "are otherwise readily distinctive against the residual acoustic environment".

The specific noise level with the character correction (if necessary) is known as rating level (L_{Ar}) and the difference between the background noise and the rating level is determined to make the BS 4142 assessment. The following is then considered.

> *"Typically, the greater this difference, the greater the magnitude of impact. A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
>
> *A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.*
>
> *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."*

The standard highlights the importance of considering the context in which a sound occurs. Factors including the absolute sound level, the character of the sound, the sensitivity of the receptor and the existing acoustic character of the area should be considered when assessing the noise impact.

3. Stage 1: Desktop Study

3.1 Identification of Noise Sensitive Receptors

The PD site is located to the North-West of the M3 motorway and is bounded by the Longcross Studios to the west, and the Chobham Lane to the south.

The nearest Noise Sensitive Receptors (NSRs) are residential areas at an approximate distance of 200m from the site. NSRs are identified in Table 2 and Figure 1 below.

Table 2: Noise Sensitive Receptor Locations

NSRs	Receptor Location	Approximate Distance from the PD (meters)
NSRs A	Cheiftain Road	200
NSRs B	Albury Close	200

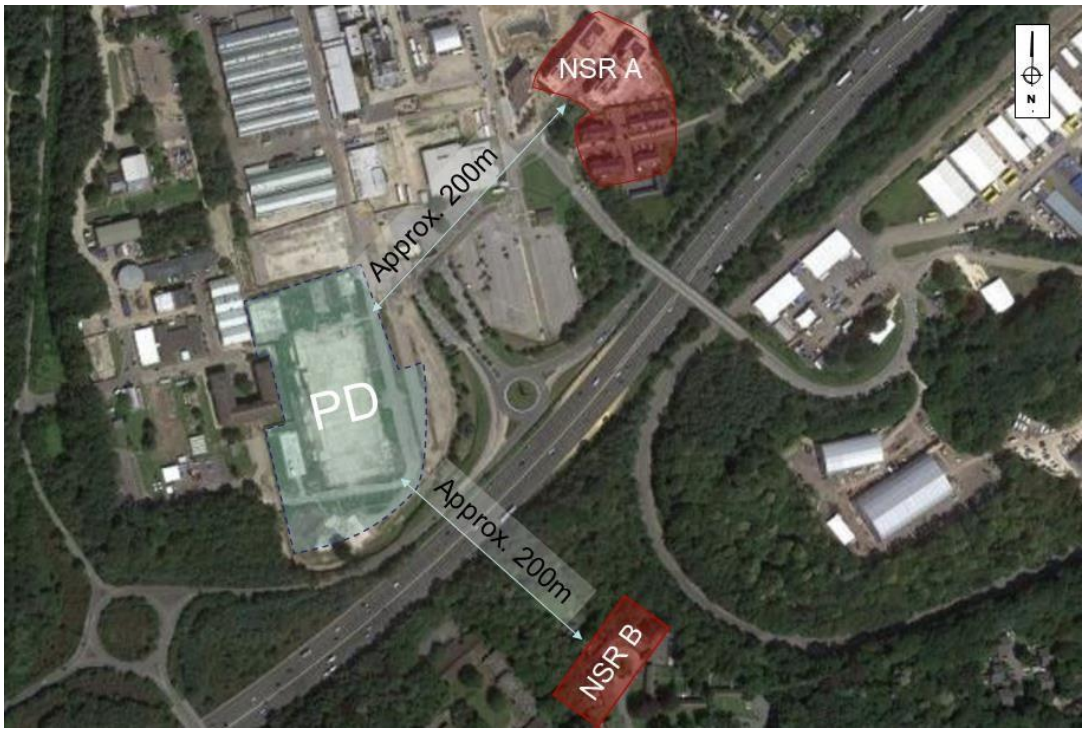

Figure 1 Noise sensitive receptors (NSRs) and the Proposed Development

3.2 Identification and Classification of Noise Sources

3.2.1 Introduction

This assessment is intended to be a permit application for the generators only as all other sources fall outside of the permit boundary. As per the EA guidance, all noise sources should be assessed cumulatively, including existing sources associated with the overall site. The noise sources have therefore been ranked into primary and secondary sources, being those which are specifically under assessment (primary) and those which contribute to the cumulative noise generated by the overall site. Secondary sources are not considered for BAT as they fall outside the scope of this permit application.

3.2.2 Primary Sources

The primary sources reviewed in this assessment are 28 generators which are used for emergency purposes such as during power outages or supply issues. For consistency with the wider permitting application, we have been advised that two scenarios require assessment. These are as follows:

- **Scenario 1:** Testing and maintenance – 28 generators tested monthly / annually
- **Scenario 2:** Emergency running – 24 generators operating continuously for 72 hours (2 gens in each group of 14 don't operate as they are just redundancy)

The generators have been modelled with a sound power level of 86 dB L_{WA} as per the proposals. The sources (inlet, exhaust and outlet) have been modelled on the eastern façade for the purposes of this assessment. Final review of exhaust stack selections will be required to ensure the benefit of any screening is included. Alternative approaches may be acceptable subject to review from an acoustic engineer. It should be noted that no exact spectrum or requirements have been defined at this stage to allow sufficient flexibility for pricing and/or supply chain.

It is understood that the generators only require to operate at 25% capacity when tested. This assessment does not consider implications of this, but typically noise levels might be in the order of 5 – 10 dB lower. This is likely to offset any uncertainty introduced by not using an exact spectrum.

Ark Data Centers confirm that the generators which are being procured for this development satisfy the specification.

Notwithstanding the above, it is recommended that a confirmatory review is undertaken prior the final selections and installation, to ensure the exact specification is equivalent to the specification described. Hydrock are engaged to provide this review.

Figure 2 below is an extract from the permit application and zoomed in to show the generators. The green line shows the permit boundary and the red line is the legal boundary of the site.

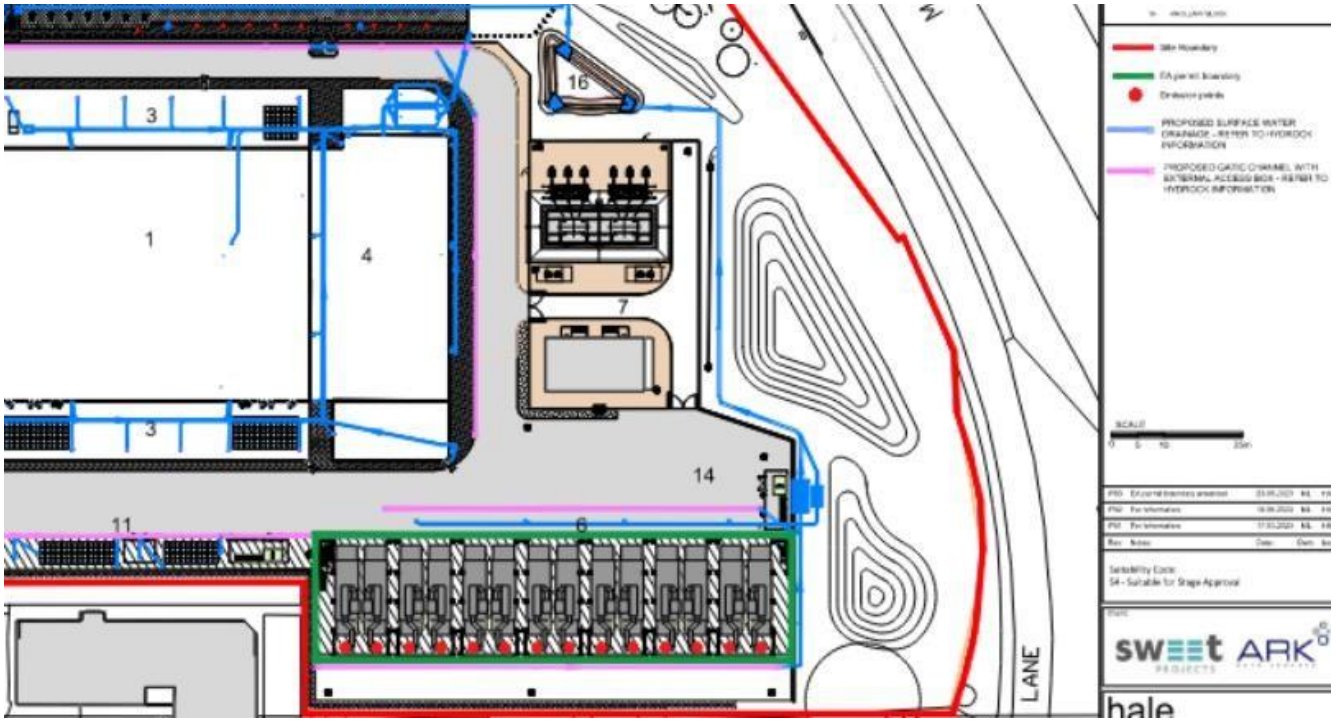

Figure 2: Generator drawing from permit application drawing.

3.2.3 Secondary Sources

These sources fall outside of the permit boundary and are therefore only considered for cumulative assessment in line with the EA guidance.

Chillers/Rooftop Plant

It is understood that the proposed development will have no.8 roof mounted chillers which will be running during daytime period only with 80% capacity,

It is also understood that an additional no.2 free cooling chillers are proposed which will be running during night-time period only with 75% capacity.

The selections for the chiller models and sound power levels as provided by the MEP engineer repeated below in Table 3.

Table 3: Proposed Chiller Units

Plant	Type	Description	Noise Design Option	Sound Power Level 100% Design Duty (L_{WA} dB)	Sound Power Level Stated Design Duty[1] (L_{WA} dB)	No
Chillers	Quantum A1700	Running at 80% Capacity. Only daytime.	Low Noise	92	87	8
Free Cooling Chillers	Quantum A1700 FreeCool	Running at 75% Capacity. Only Night-time	Super Silent	92	87	2
DC01 Admin VRF	Mitsubishi PURY EM-250YNW	Daytime	-	87	87	2
DC03	Mitsubishi PURY EM-300YNW	Daytime	-	87	87	1

Notes: [1] reductions for design duties have been based off manufacturers tests for typical condensing units.

Air Handling Units (AHUs) are also likely to be installed to allow ventilation from inside. Noise emission from these units is expected to have less impact when compared to the rooftop mounted chillers. AHUs can be enclosed and ducted to atmosphere via acoustic attenuators such that noise contributions could be negligible if necessary. Therefore, AHUs are not considered for the purposes of this outline assessment.

Cooling Units proposed for the East & West Gantries of DC 01, DC 02 and DC 03

It is understood that cooling units will be proposed to the East and West Gantries of each building. The sound pressure levels of the proposed cooling units and the number of units proposed for each floor of each building provided by BladeRoom Group are shown within Table 4 overleaf.

Table 4: Proposed Cooling Units for the Gantries of each Data Centre

Data Centre / Gantry		Floor Level	Number of Cooling Units (per floor)	Sound Pressure Levels @15m away from the inlet (dBA)[1]
DC 01	East Gantry	Ground floor	3	32
	East Gantry	First floor	5	36
	East Gantry	Second Floor	5	36
	West Gantry	Ground floor	-	-
	West Gantry	First floor	5	36
	West Gantry	Second Floor	5	36
DC 02	East Gantry	Ground floor	3	32
	East Gantry	First floor	5	36
	East Gantry	2nd - 4th Floor	5	36
	West Gantry	Ground floor	-	-
	West Gantry	First floor	5	36
	West Gantry	2nd - 4th Floor	5	36
DC 03	East Gantry	Ground floor	2	36
	East Gantry	First floor	2	36
	East Gantry	2nd - 4th Floor	2	36

Notes: [1] Assumes moderate filter condition.

During the design phase for this stage, significant design coordination has been undertaken with Bladeroom Group to minimise noise levels from the Air Optimiser fans. Sample measurements were undertaken to determine the effect of 'air straighteners' and it was shown that these do not significantly increase or decrease the noise produced a typical system.

Consideration was also given to operating condition of the fans, and a moderate case filter condition was chosen to be representative of site (with noise levels lower when filters are clean).

4. Stage 2: Offsite Noise Survey

4.1 Survey Overview

An unattended noise survey was undertaken at the PD site between 10:00 hrs on the 23rd and 11:15 hrs on the 27th September, 2022.

Noise measurements were made using Class 1, integrating averaging sound level meters. Microphones were mounted on tripods or poles at least 1.2m above ground and at least 3.5m from any vertical sound reflecting surfaces. Sound level meters were calibrated to a reference level of 94 dB at 1kHz, both prior to, and on completion of noise measurements. No significant drift in calibration was noted during the survey (≤ 0.5 dB).

All measurement equipment has been laboratory calibrated within the appropriate calibration interval.

The weather conditions throughout the unattended and attended surveys were conducive to environmental noise monitoring; with light winds (< 5.0 m/s) and no significant rain as shown in meteostat.net/

Details of the equipment used for the environmental noise measurements are shown in Table 5.

Table 5: Environmental Noise Survey Equipment

Measurement Locations	Manufacturer	Instrument	Type	Serial No./Version	Due Laboratory Calibration
ML1	01dB	Sound Level Meter	Fusion	12242	19/07/2023
		Microphone	40CD	347053	
AMLs (All attended measurements locations)	Rion	Sound Level Meter	NL52	775959	19/07/2023
		Pre-Amplifier	NH25	54394	
		Microphone	UC59	11689	
ML1 & AMLs	Rion	Acoustic Calibrator	NC74	35157400	12/07/2023

4.2 Survey Procedure

For the purposes of this assessment, and in accordance with current guidance, daytime hours are taken to be 07:00 to 23:00 hours and night-time hours to be 23:00 to 07:00 hours.

Continuous automated noise monitoring was undertaken on the PD site. Additional short term attended measurements were made on the street close to the following residential receptors:

- Chieftain road (NSRs A)
- Albury Close (NSRs B)

The details of each measurement location are further detailed in Table 6.

Table 6: Measurement Locations Summary

Measurement Location	Description	Monitoring Period
ML	Unattended free-field monitoring was undertaken at the south boundary of the site. Traffic noise from the M3 was dominant at this location.	10:00 23/09/2022 to 11:15 27/09/2022
AML 1	Short term attended measurement was undertaken at the nearest noise sensitive receptors located to the northeast of the PD. M3 traffic noise was predominate noise source.	10:15 to 10:30 23/09/2022
AML 2	Short term attended measurement was undertaken at the nearest noise sensitive receptors located to the southeast of the PD. M3 traffic noise was predominate noise source.	10:45 to 11:00 23/09/2022

All attended measurement locations (AMLs), long-term monitoring location (ML), and the nearest NSRs are shown on Figure 3 below.

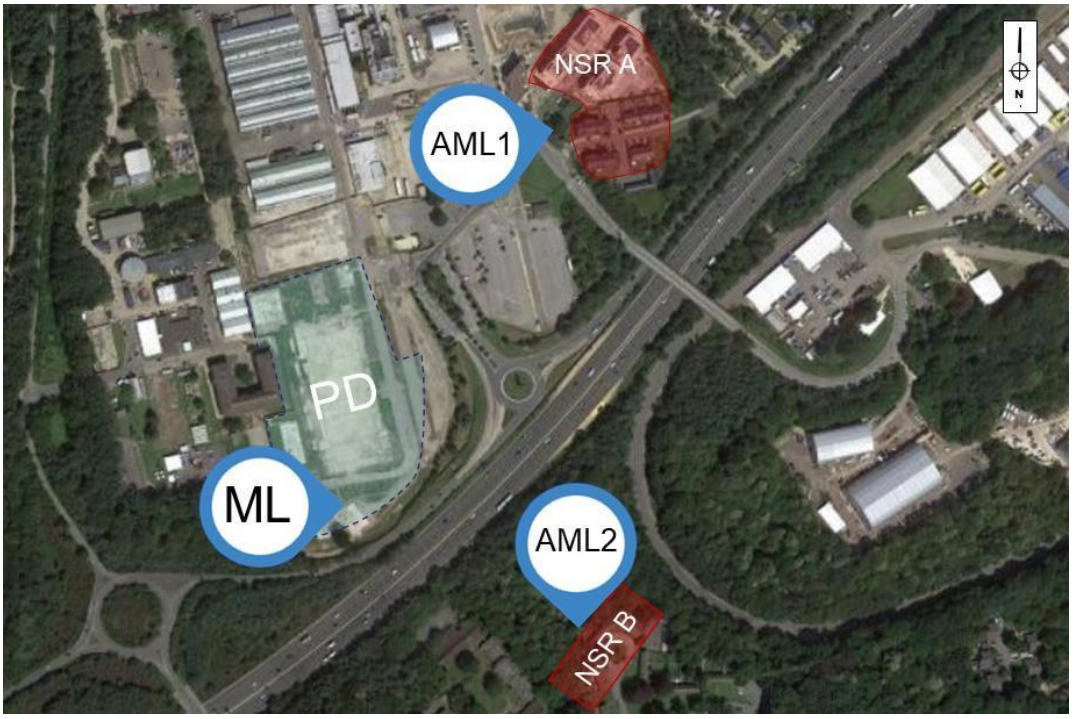

Figure 3: Noise sensitive receptors (NSRs), attended measurement locations (AMLs), long term measurement location (ML) and proposed development location (PD).

4.3 Noise Survey Results

15-minute background sound levels ($L_{A90,15\ min}$ dB) were measured during weekday and weekend periods for each day and night.

To inform the assessment, the lowest value of the most commonly occurring (typical) background sound levels measured each day and night period ($L_{A90,T}$ levels) have been derived from the survey results.

The background sound levels measured at ML for daytime (07:00 to 23:00 hours) and night time (23:00 to 07:00 hours) periods are presented in Table 7 below. Further statistical analysis and graphical time histories of measured levels are provided in Appendix B.

Table 7 Summary of the Measured Noise Levels at the Unattended Long-term Measurement Location (ML)

Location	Daytime 07:00-23:00 Hrs	Night time 23:00-07:00 Hrs
	$L_{A90,15min}$ dB	$L_{A90,15min}$ dB
ML	62	51

The background sound levels measured at NSRs during the daytime period are presented in Table 8. These have been compared to the simultaneous level measured on site to determine the difference between the sound levels at the development site and the nearest noise sensitive receptors.

Table 8: Short Term Attended Measurements Results

Measurement Location	Noise Sensitive Receptor Location (NSR)	Start Time	Background Sound Levels measured at NSRs ($L_{A90,15min}$ dB)	Simultaneous measurement on site ($L_{A90,15min}$ dB)	Average Level Difference (dB)
AML 1	NSRs A (Chieftain Road)	10:15 23/09/2022	51	64	13
AML 2	NSRs B (Albury Close)	10:45 23/09/2022	62	64	2

As seen in Table 8 above, the expected background sound levels at the nearest noise sensitive receptors are up to 13 dB lower at Chieftain Road and 2 dB lower at Albury Close when compared to background sound levels measured at the development site.

The background sound level differences from Table 5 have been subtracted from the measured background sound levels at the long-term measurement location (ML) to estimate the typical background sound levels at the NSRs during full daytime and night-time periods. This approach provides an accurate indication of typical background sound levels at receptor in this case as the M3 was the dominant noise source in all measurement positions.

The predicted typical background sound levels at each noise sensitive receptor are presented in Table 9.

Table 9: Predicted Typical Background Sound Levels at the NSRs.

Noise Sensitive Receptor Locations (NSRs)	Time Period	Typical Background Sound Level at the development site (ML), $L_{A90,T}$ dB	Average Difference (dB)	Predicted Background Sound Level at NSRs $L_{A90,T}$ dB
NSRs A (Chieftain road)	Daytime (07:00 - 23:00)	62	13	49
	Night-time (23:00 - 07:00)	51		38
NSRs B (Albury Close)			2	60
				49

5. Stage 3: Source Assessment

5.1 Noise Modelling

Calculations are based on the cumulative noise emissions of the generators (primary sources) and the secondary sources including chillers mounted on the roof of the Energy Centre building and the cooling units mounted at the locations provided via GAs by the MEP engineer at each gantry for DC01, DC02 and DC03.

The buildings were modelled in height and dimensions provided by the architectural drawings, with the plant represented as omnidirectional point sources.

To estimate the noise emissions from site to the surrounding areas, including the NSRs, a noise model has been created using DataKustik CadanaA environmental noise prediction and mapping software.

The following prediction methodologies and assumptions were adopted and implemented in to the acoustic model:

- Scale mapping of the Site and the surrounding area was calibrated into the noise model based on information provided by the design team together with Ordinance Survey vector mapping grid reference points;
- A Digital Terrain Model (DTM) has been created within the acoustic model based on eMap Terrain 2m resolution topographical data of the site and surrounding area;
- Existing buildings that will not be demolished as part of the proposed development are incorporated within the acoustic model to allow prediction of any reflection or screening effects across the Site. Buildings are assumed to have fully reflective facades;
- Noise propagation is predicted in accordance with ISO 9613-2:1996 'Acoustics – Attenuation of sound during propagation outdoors – Part 2: General Method of calculation' (ISO9613);
- 1st order reflections included in predictions;
- Ground absorption set to 0.8
- Order of reflection set to 1

Results of the operational noise modelling of the chillers are presented in Appendix C. Predicted noise levels are shown at the façade of each receptor dwelling. The presented noise levels are the greatest at any height on the façade. The calculated noise levels include the cumulative noise emissions from both primary and secondary sources.

5.2 Assessment Results

The calculated noise levels from each of the proposed scenarios are compared to the background noise levels for each receptor in Table 9. For Scenario 1 the day time background levels have been assumed as it is understood that testing will only occur during the day time. For Scenario 2, night time background levels have been used as a worse case assessment. The assessment results for Scenarios 1 and 2 are presented in Table 10 and Table 11 overleaf respectively.

Table 10: Assessment of Noise Emissions from Generator Units (Scenario 1 Testing)

Description	NSRs A (Chieftain Road)	NSRs B (Albury Close)
Receptor noise levels at NSRs from **28** no. Generator Units installed on Generator Yard, predicted by computer noise model, (L_{Aeq}, dB)	34	42
Background Noise Level (L_{A90}) (Daytime)	49	60
Margin below background (dB)	15	18
BS4142 Assessment Description	Low Impact	Low Impact
EA Descriptor	No noise, or barely audible or detectable noise	No noise, or barely audible or detectable noise
Action:	This level of noise means that no action is needed beyond basic appropriate measures or BAT.	This level of noise means that no action is needed beyond basic appropriate measures or BAT.

Table 11: Assessment of Noise Emissions from Generator Units (Scenario 2 Emergency Operation)

Description	NSRs A (Chieftain Road)	NSRs B (Albury Close)
Receptor noise levels at NSRs from 24 no. Generator Units installed on Generator Yard, predicted by computer noise model, (L_{Aeq}, dB)	34	41
Background Noise Level (L_{A90}) (Night time worse case assumed)	38	49
Margin below limit (dB)	4	8
BS4142 Assessment Description	Low Impact	Low Impact
EA Descriptor	No noise, or barely audible or detectable noise	No noise, or barely audible or detectable noise
Action:	This level of noise means that no action is needed beyond basic appropriate measures or BAT.	This level of noise means that no action is needed beyond basic appropriate measures or BAT.

Noise emissions from the PD due to generator during testing and emergency are calculated to be below the background noise level which would be indicative of a 'Low Impact' in BS4142, subject to context considered in the following section.

5.3 Context

Character and Level of Sound

This section of the context assessment considers whether the specific sound is likely to be distinguishable, and will represent an incongruous sound in comparison to the residual acoustic environment.

Noise from the generators is likely to be significantly below the residual noise in the area due to the high noise levels present from the nearby road infrastructure.

The character of sound is likely to be masked by the continuous residual high noise environment.

Sensitivity of Receptors

Overall, the proposed receptors have moderate to high sensitivity given their residential nature. However, existing exposure to high noise levels will likely mask the generator noise.

Frequency

The generators are to be used only in an emergency situation or during routine testing. A receptors sensitivity to noise is likely to be less when the sound is not prevalent all the time.

6. Stage 4: BAT

This section identifies the Best Available Technologies incorporated into the design. The project has gone through an extensive planning process which has led to significant requirements for acoustic mitigation. A summary of the BAT as relates to the primary sources (generators) is listed below:

- The generators are located in a less sensitive area away from NSRs and towards the nearby noise sources.
- The generators are proposed to incorporated into an acoustic weather proof canopied set which includes attenuated inlet and outlet air paths and exhaust mufflers.
- The generators are to be used only in emergency purposes or during planned testing which can be scheduled in advance.

7. Conclusion

Hydrock is appointed by Sweet Projects to provide acoustic engineering services for the proposed Data Centre at Longcross Park, Chertsey. This report details a noise assessment for the permit application for the generator units.

For the purpose of this report follows the EA guidance for permit applications which is as follows:

- **Stage 1**: Desktop Risk Assessment – This includes identification of NSRs and sources which could give rise to adverse noise effects.
- **Stage 2:** Off-site monitoring survey – This section describes the procedure and results of an off site monitoring survey to examine the prevailing noise environment.
- **Stage 3:** Source assessment – This section combines Stage 1 and 2 to assess the noise from the proposed generators, cognisant of other sources on site.
- **Stage 4:** BAT or appropriate measures justification – Following the assessment in Stage 3 this section describes the measures undertaken for Best Available Technology.

With mitigation measures in place, the assessment shows that the noise from the proposed data centre will result in a low noise impact