

Noise Impact Assessment Report for Discharge of Condition 12 Pertaining to Building C

Former Akzonobel Decorative Paints Facility, Wexham Road,
Slough, SL2 5DB

Report Reference 20309.NIA-RPT.01

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Report Title	Noise Impact Assessment Report for Discharge of Condition 12 Pertaining to Building C
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EXECUTIVE SUMMARY

ES Acoustics Ltd (ESA) have been commissioned by Yondr Group to prepare a noise impact assessment in support of a reserved matters submission for Building C of the proposed data centre development at Wexham Road, Slough SL2 5DB, as required by Planning Condition 12 of outline planning permission reference: P/00072/096. The prevailing sound conditions in the area have been determined by WYG as part of the noise impact assessment for the outline planning application (Report Reference A114100, dated December 2019), from which ESA have established the parameters set by the Planning Condition.

The full commercial aspect of the scheme to which Planning Condition 12 relates comprises 3 no. data centre buildings (Buildings A, B and C) with an associated substation and mechanical yard. A previous noise impact assessment was prepared for Buildings A and B, the Substation, and Mechanical Yard of the development by Sweco (report reference 66202273-SWE-ZZ-XX-YA-RP-0002, Rev.: P02, dated 19/03/2021). Based on the outcome of this report, it is understood that Planning Condition 12 has been discharged in relation to Buildings A and B.

This report details the resultant noise emissions from the plant associated with Building C, allowing the full noise emissions from the site to be understood to such that Planning Condition 12 can be discharged in relation to Building C.

The overall noise emissions from the full scheme have been established by adding the calculated noise emissions from Building C (undertaken by ES Acoustics) with the calculated noise emissions from Buildings A and B, the Substation, and Mechanical Yard (undertaken by Sweco).

The resultant noise emissions from the full site at the closest noise sensitive receptors are compliant with the requirements of Planning Condition 12.

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1 INTRODUCTION

ES Acoustics Ltd (ESA) have been commissioned by Yondr Group to prepare a noise impact assessment in support of a reserved matters submission for Building C of the proposed data centre development at Wexham Road, Slough SL2 5DB, as required by Planning Condition 12 of outline planning permission reference: P/00072/096. The prevailing sound conditions in the area have been determined by WYG as part of the noise impact assessment for the outline planning application (Report Reference A114100, dated December 2019), from which ESA have established the parameters set by the Planning Condition.

The full commercial aspect of the scheme comprises 3 no. data centre buildings (Buildings A, B and C) with an associated substation and mechanical yard. A previous noise impact assessment was prepared for Buildings A and B, the substation, and mechanical yard of the development by Sweco (report reference 66202273-SWE-ZZ-XX-YA-RP-0002, Rev.: P02, dated 19/03/2021). Based on the outcome of this report, it is understood that Planning Condition 12 has been discharged in relation to Buildings A and B.

Planning Condition 12 relates to the whole commercial scheme including the aspects assessed by Sweco as noted above, and Building C, which is assessed within this report. Therefore, the overall noise emissions from the full scheme would be established by calculating the noise emissions associated with Building C, and adding this to the noise emissions levels calculated by Sweco for the remainder of the commercial scheme, to establish the overall noise impact (as required by the Planning Condition). Full details of the Condition are presented in Section 2.2.

The Client and Design Team have engaged ESA at an early stage to ensure that the development proposals for Building C have been reviewed in context of the full scheme and the requirements of Planning Condition 12. Building C has therefore been designed from the outset to ensure the requirements of the Planning Condition are met, and suitable mitigation measures incorporated into the design accordingly.

The preparation of this report has benefitted from initial correspondence and meetings held between Sweco and Slough Borough Council (SBC), detailed within the Sweco report, whereby the scope and methodology of the assessment were agreed. Confirmation was also provided that the use of the outline planning noise survey data is appropriate, and it assumed that this is still the case given that this report relates to the same Planning Condition.

2 POLICY, STANDARDS AND GUIDANCE

2.1 Policy, Standards and Guidance Review

A full review of relevant National Policy, Local Policy, British Standards and Good Practice Guidance has been undertaken, as outlined in Appendix B. A summary of the documentation reviewed is as follows:

- *National Planning Policy Framework (NPPF)*
- *Noise Policy Statement for England (NPSE)*
- *National Planning Practice Guidance (NPPG)*
- *The Local Plan for Slough including The Core Strategy Development Plan Document, Site Allocations Development Plan Document and Local Plan Saved Policies*
- *BS 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound'*
- *BS 8233:2014 'Guidance on sound insulation and noise reduction for buildings'*

2.2 Noise Assessment Criteria

2.2.1 Normally Operating Plant and Operational Noise

This noise impact assessment is based on the requirements of Planning Condition 12 of the outline planning consent (P/00072/096), which states:

Planning Condition 12 - Noise assessment for commercial area

Alongside each first reserved matters application for each individual part within the commercial area a detailed noise assessment and mitigation scheme shall be submitted to and approved by the Council in writing.

a) *The scheme will demonstrate:*

- how the overall sound rating level from normally operating plant will not exceed 2 dB(A) above the background noise levels at existing noise sensitive receptors; and*
- how noise levels from normal external operations will not exceed 55 dB $L_{Aeq}(1\text{ hr})$ during the daytime (07:00 – 23:00); or 45 dB $L_{Aeq}(1\text{ hr})$ during the night-time (23:00 – 07:00); or 60 dB $L_{Amax}(15\text{ mins})$ during the night-time (23:00 – 07:00) as determined by measurement or calculation at free field locations representing facades of dwellings at existing noise sensitive receptors.*

b) *Cumulative noise from the operational use of the commercial development will not exceed 2 dB(A) above background noise levels at noise sensitive receptors. Noise levels from external operations will not exceed 55 dB $L_{Aeq}(1\text{ hr})$ during the daytime (07:00 – 23:00); or 45 dB $L_{Aeq}(1\text{ hr})$ during the night-time (23:00 – 07:00); or 60 dB $L_{Amax}(15\text{ mins})$ during the night-time (23:00 – 07:00) as determined by measurement or calculation at free field locations representing facades of existing noise sensitive receptors.*

The noise impact assessment will be undertaken in accordance with BS 4142:2014+A1:2019. Further calculations would also be undertaken to consider the indoor ambient noise levels for residential properties as suggested in BS 8233:2014.

The approved noise mitigation scheme will be fully implemented in the construction and operation of the development and thereafter retained indefinitely.

2.2.2 Emergency Plant

It is understood that further to a pre-application meeting held by Sweco and Slough Borough Council (SBC) for the previous elements of the commercial scheme, SBC requested that specific criteria for emergency plant were not used for the scheme, and that the emergency operating condition noise levels should be calculated and stated at each receptor with windows open and windows closed so that a judgement of suitability could be made.

Section 5.4.3 of the Sweco report notes the following (with context changed accordingly):

- *There are no noise criteria for noise emissions during emergency operating conditions. To assist in the understanding the noise levels that will occur during the emergency condition, predictions would be made of the worst-case ambient plant noise levels at the receptor façades (façade incident levels), inside the residential receptors when windows are closed, and inside the residential receptors when windows are open. This has been requested by SBC.*
- *Exact predictions of noise break-in to the residential receptors would require detailed knowledge on the receptor's building envelope specifications, and internal room dimensions/finishes. This level of detail is not available, and therefore assumptions are made with regards to the reductions achieved in both scenarios.*
- *Standard double glazing is known to achieve a sound reduction index of approximately 30 – 34 dB R_w . The external walls would typically achieve a higher sound reduction performance than the windows. As a typical worst-case, a reduction of 30 dB would be applied where windows are closed.*
- *A typical reduction of 15 dB would be applied where the receptor's windows are open. This value is applicable to partially open windows and is taken from a range stated in the 1999 version of BS 8233. This value was confirmed as suitable by SBC in the pre-applicable meeting.*

ESA would follow the same methodology, calculating the worst-case ambient plant noise levels at the receptor façades, inside the residential receptors when windows are closed, and inside the residential receptors when windows are open.

The predicted internal noise levels (with windows open and closed) would be compared against the recommended internal noise levels for residential dwellings presented in BS 8233:2014 for informative purposes only. The levels are reproduced in Table 1.

Room	Daytime (07:00-23:00)	Night-time (23:00-07:00)
Living Room	≤ 35 dB L _{Aeq,16hr}	N/A
Dining Room	≤ 40 dB L _{Aeq,16hr}	N/A
Bedroom	≤ 35 dB L _{Aeq,16hr}	≤ 30 dB L _{Aeq,8hr}

Table 1 BS 8233:2014 indoor ambient noise levels for dwellings

Indicative noise targets at the façade of the closest nearby receptors, and within the property of the closest noise sensitive property, for emergency plant would therefore be as follows:

Time	Worst-case Internal Noise Target	Receptor Window Open / Closed	Sound Reduction from Outside to Inside	Suggested Maximum Permissible Level at the Façade
Daytime 07:00-23:00	≤ 35 dB L _{Aeq,16hr}	Closed	30 dB	65 dB(A)
		Open	15 dB	50 dB(A)
Night-time 23:00-07:00	≤ 30 dB L _{Aeq,8hr}	Closed	30 dB	60 dB(A)
		Open	15 dB	45 dB(A)

Table 2 Internal noise targets and maximum permissible emergency plant noise level at the façade

3 SITE CONTEXT AND BACKGROUND INFORMATION

3.1 Site Description

The site is located to the east of Wexham Road and falls within the jurisdiction of Slough Borough Council. The surrounding area is a mixture of commercial and residential uses.

Building C forms part of a wider development which includes the Substation and Buildings A and B of the commercial scheme, as well as an area with outline permission for residential development to the south.

Figure 1 presents the red line boundary for the previous part of the scheme (Building A, Building B and the Substation) and a green boundary line for the area where Building C will be constructed.

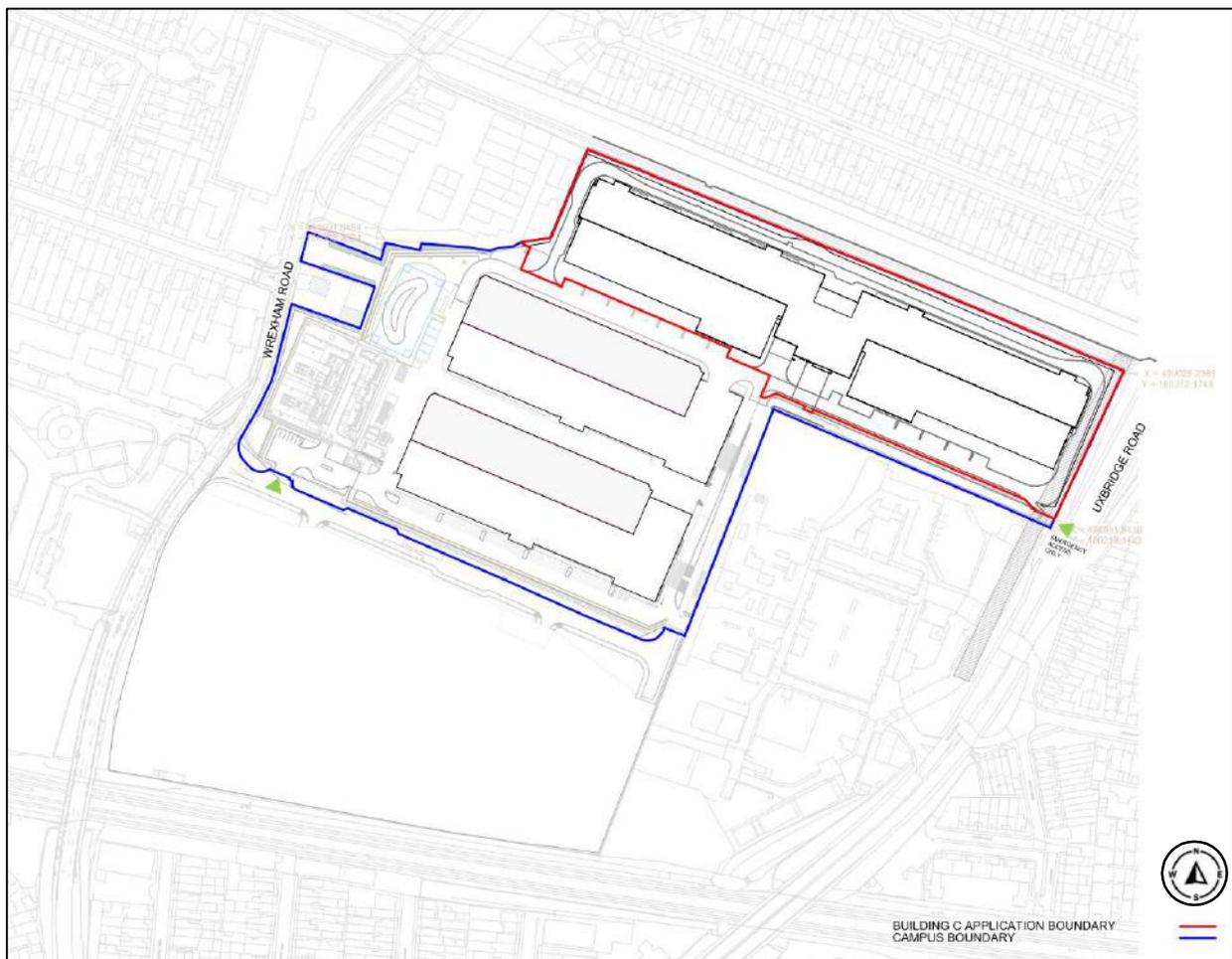


Figure 1 Site location plan

3.2 Closest Receptor Properties

The closest noise sensitive receptors to Building C are the residential properties on Hazlemere Road to the north (R1), the residential properties on Uxbridge Road to the east (R2), the area to the south of Buildings A, B and C with outline planning consent for future residential development (R3), and the residential properties on Wexham Road to the west (R4).

The receptor references are kept in line with those used within the previous noise impact assessment reports for the scheme for consistency.

In order to ensure that appropriate mitigation is specified, all receptor locations would be assessed to provide a clear picture of noise emissions from Building C.

The receptor locations are identified in Figure 2.



Figure 2 Closest receptor locations

3.3 Proposed Development

Building C would deliver a 40MW data centre comprised of data halls at ground and first floors and facilities support/office spaces at first floor level.

The data halls would be cooled by Chillers which are located on a raised gantries to either side of the central facilities support and office core.

Generators are proposed to provide backup power in the event of emergencies, externally at ground floor level to the south side of the data halls. Generators will be tested regularly under normal operating conditions and all generators will run in the event of a power outage.

Containerised Electrical Plantrooms (CEPs) are proposed externally at equivalent first floor level, positioned above the Generators and adjacent to the Chillers. Each CEP would be served by two external condenser units positioned at a central position on top of the unit, and two extract fans positioned at high levels on the sides of the units.

It is understood that there will also be a selection of Facilities Support Plant which will be located at ground floor level underneath the Chiller gantries.

Ground and first floor layouts are shown in the proposed plans below:



Figure 3 Ground (top), first-floor (middle) and roof (bottom) plans

4 BASELINE NOISE LEVELS

4.1 Measurement Location and Procedure

The prevailing sound conditions in the area have been determined by WYG as part of the noise impact assessment for the outline planning application (Report Reference A114100, dated December 2019).

The WYG report presents and uses two data types for background noise, including numerous long-term and short-term monitoring locations to determine the noise climate across the development. It is understood that for the long-term monitoring positions, the typical background noise level is presented as the modal average of 5-minute sample periods which were measured continuously throughout the day and night-time periods. For short-term measurements, 15-minute sample periods were used, and measurements were undertaken at each location during the daytime, evening and night-time periods.

The typical background noise levels presented by WYG in the outline application are considered representative and robust. Note that the noise levels measured by WYG were subsequently used by Sweco as part of their noise assessment for the Substation and Buildings A and B, as agreed by SBC.

Full details of the survey, including survey methodology, equipment used, survey results and time history graphs are presented in the WYG noise assessment. A summary of the typical background noise levels and ambient noise levels captured are presented in the figures below. Note that the redline boundary indicated is from the outline permission and not indicative of the current application for Building C only.

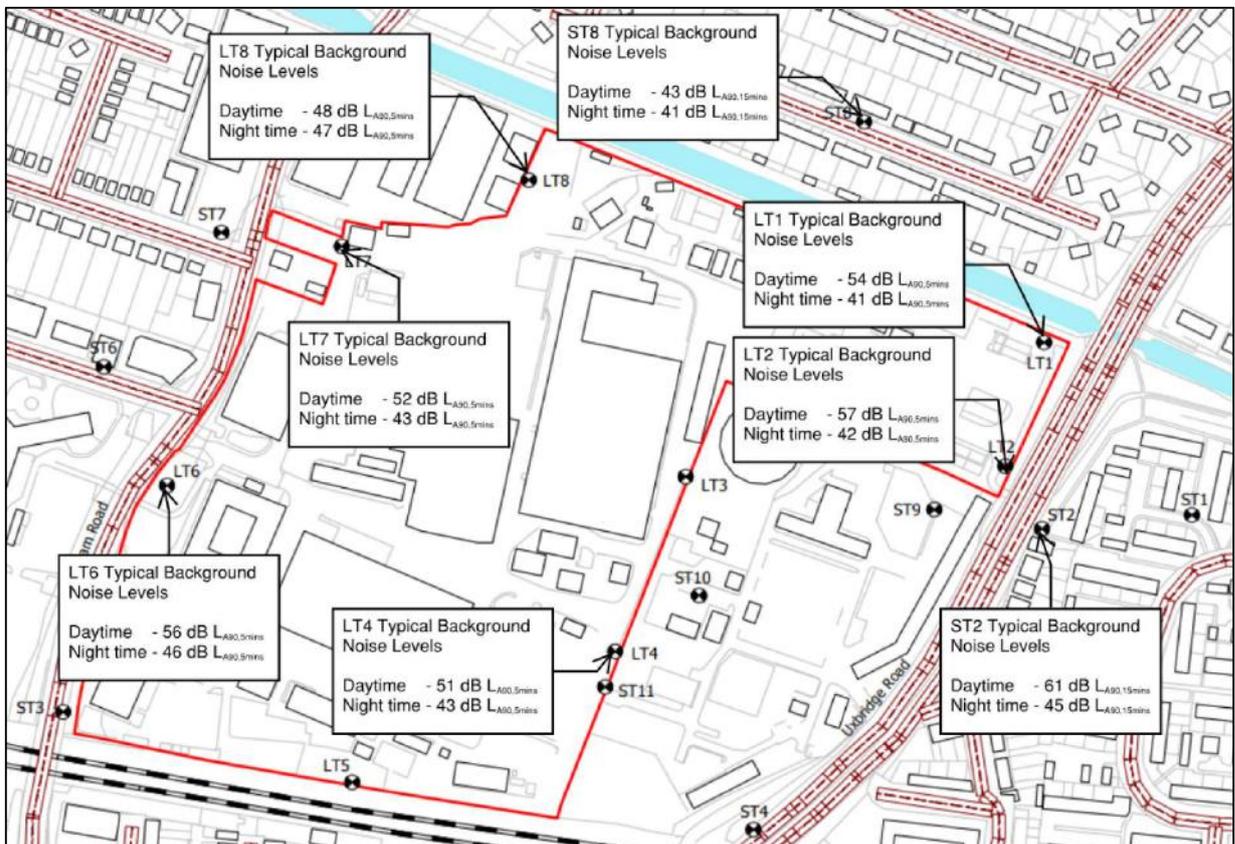


Figure 4 Background noise levels (L_{A90})

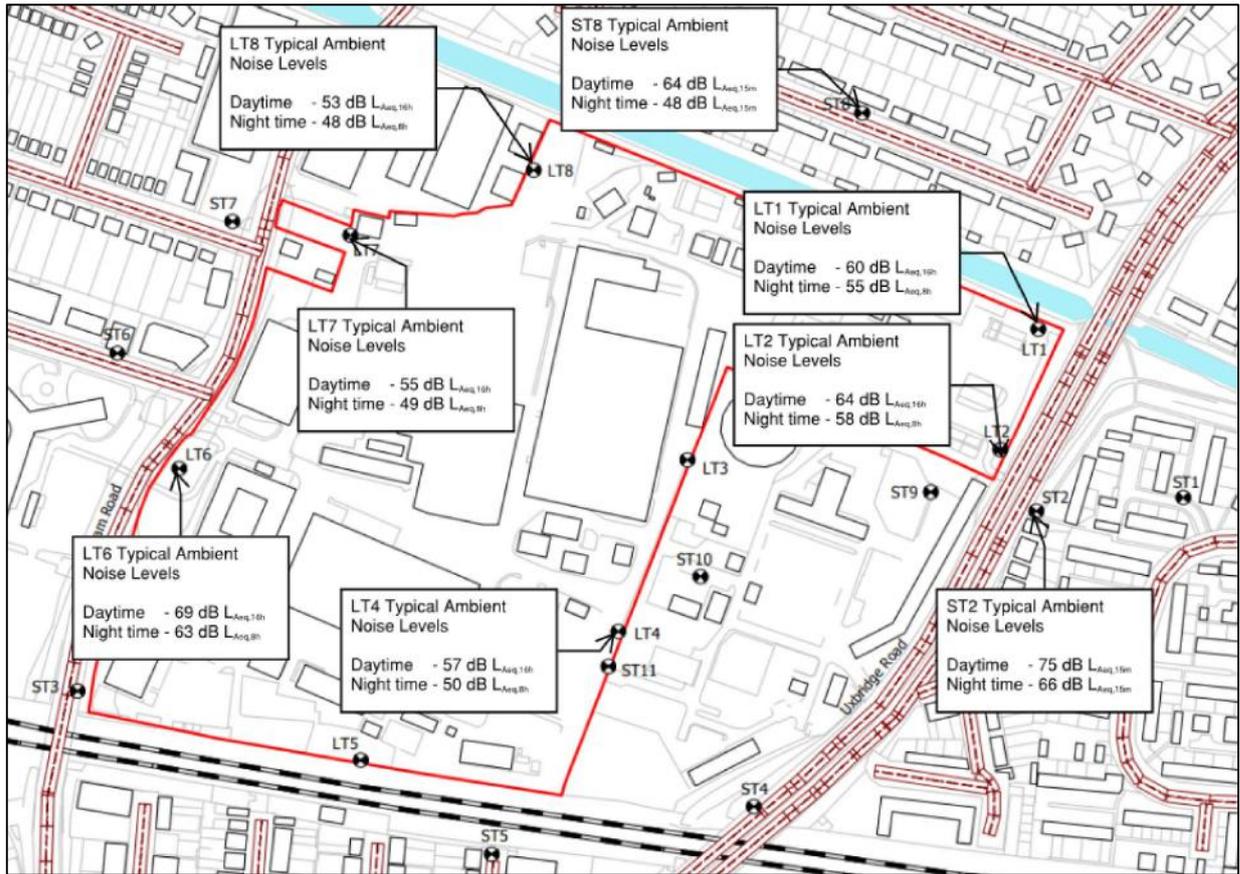


Figure 5 Ambient noise levels (L_{Aeq})

5 NOISE IMPACT ASSESSMENT

5.1 Assessment Criteria

5.1.1 Planning Condition 12 Criteria for the Full Scheme

The assessment criterion for each noise sensitive receptor for non-emergency plant have been set to ensure compliance with Planning Condition 12, which states:

“The overall sound rating level from normally operating plant will not exceed 2dB(A) above the background noise levels at existing noise sensitive receptors.”

In order to maintain consistency with the Sweco report prepared for Buildings A, B, the Substation and Mechanical Yard, the same background noise levels and limiting noise criteria are shown in the table below. This would ensure that the additive aspect of the noise assessment, to assess the combined noise emissions from all Buildings, remains consistent.

The only exception to this is the background sound level used during night-time hours at R2 (properties on Uxbridge Road to the east), where Sweco used a background sound level of 42 dB(A) based on the noise levels measured at LT2 (see Figure 4). ESA would instead propose to use the background sound level of 45 dB(A) measured at ST2 which is directly reflective of the receptor location in question.

Receptor No.	Location	Time	Background Level L _{A90} (dB)	Limiting Criteria for Normally Operating Plant L _{Aeq, T} dB
R1	Hazlemere Road (north)	07:00-23:00	43	45
		23:00-07:00	41	43
R2	Uxbridge Road (east)	07:00-23:00	54	55*
		23:00-07:00	45	47
R3	Future Residential (south)	07:00-23:00	50	52
		23:00-07:00	43	45
R4	Wexham Road (west)	07:00-23:00	52	54
		23:00-07:00	43	45

Table 3 Summary of background noise levels and limiting noise emissions criteria at each receptor location

****The criterion for this location and period is set against the ambient planning condition requirement (55 dB L_{Aeq, T} during the day) as this is more onerous than the background noise level criterion.***

The above limits apply to the total noise emission levels from all static plant and processes within the full commercial development i.e. the Substation and Buildings A, B and C. Therefore, noise from individual Buildings, or on a more granular level, individual plant items, will need to be designed to a lower limit such that the overall total level achieves the stated criteria above.

The final plant noise predictions would need to include the calculated noise emissions from Building C, which would need to be added to the calculated noise emissions from Building A, Building B, the Substation, and Mechanical Yard (as calculated by Sweco), to ensure the cumulative level achieves the criteria as required by Planning Condition 12.

5.1.2 Noise Emissions Calculated for Building A, Building B, the Substation and Mechanical Yard Including Generator Testing Schedule

The final noise emissions calculated by Sweco for Building A, Building B, the Substation, and Mechanical Yard, including an allowance for the generator testing schedule, are presented in Figure 6 and Table 4 below. Note that 3 no. receptor positions have been assessed for the properties on Hazlemere Road to the north (R1) and 2 no. receptor positions have been assessed for the Future Residential block to the south (R3). The individual receptor positions are described by their corresponding position in Figure 6.



Figure 6 Noise emission predictions for Building A, Building B, Substation and Mechanical Yard Including Generator Testing Schedule (provided by Sweco)

Receptor No.	Location	Time	Limiting Criteria for Normally Operating Plant L _{Aeq, T} dB	Predicted Noise Level for Building A + B, SS & MY* L _{Aeq, T} dB
R1 (west)	Hazlemere Road (north)	07:00-23:00	45	45
		23:00-07:00	43	40
R1 (central)	Hazlemere Road (north)	07:00-23:00	45	43
		23:00-07:00	43	41
R1 (east)	Hazlemere Road (north)	07:00-23:00	45	41
		23:00-07:00	43	39
R2	Uxbridge Road (east)	07:00-23:00	55	43
		23:00-07:00	47	38
R3 (west)	Future Resi (south)	07:00-23:00	52	47
		23:00-07:00	45	40
R3 (east)	Future Resi (south)	07:00-23:00	52	45
		23:00-07:00	45	41
R4	Wexham Road (west)	07:00-23:00	54	54
		23:00-07:00	45	45

Table 4 Summary of predicted noise levels from Buildings A and B, the Substation and Mechanical Yard (including generator testing) vs the limiting noise emissions criteria to ensure planning compliance
 *SS: Substation, MY: Mechanical Yard

5.1.3 Noise Emissions Calculated for Building A, Building B, the Substation and Mechanical Yard Excluding Generator Testing Schedule

The final noise emissions calculated by Sweco for Building A, Building B, the Substation, and Mechanical Yard, excluding an allowance for the generator testing schedule, are presented in Figure 7 and Table 5 below. It must be noted that the purpose of providing this information is that it is understood that the Environmental Agency restricts the number of generators under test at any one time to 1 no. generator. Therefore, in cases where the generators for Building C are being tested, no generators would be under test for Buildings A or B.

As above, 3 no. receptor positions have been assessed for the properties on Hazlemere Road to the north (R1) and 2 no. receptor positions have been assessed for the Future Residential block to the south (R3). The individual receptor positions are described by their corresponding position in Figure 7.



Figure 7 Noise emission predictions for Building A, Building B, Substation and Mechanical Yard with no Generator Testing (provided by Sweco)

Receptor No.	Location	Time	Limiting Criteria for Normally Operating Plant $L_{Aeq, T}$ dB	Predicted Noise Level for Building A + B, SS & MY* $L_{Aeq, T}$ dB
R1 (west)	Hazlemere Road (north)	07:00-23:00	45	42
		23:00-07:00	43	41
R1 (central)	Hazlemere Road (north)	07:00-23:00	45	42
		23:00-07:00	43	41
R1 (east)	Hazlemere Road (north)	07:00-23:00	45	41
		23:00-07:00	43	39
R2	Uxbridge Road (east)	07:00-23:00	55	41
		23:00-07:00	47	38
R3 (west)	Future Resi (south)	07:00-23:00	52	44
		23:00-07:00	45	40

Receptor No.	Location	Time	Limiting Criteria for Normally Operating Plant L _{Aeq, T} dB	Predicted Noise Level for Building A + B, SS & MY* L _{Aeq, T} dB
R3 (east)	Future Resi (south)	07:00-23:00	52	44
		23:00-07:00	45	41
R4	Wexham Road (west)	07:00-23:00	54	51
		23:00-07:00	45	45

Table 5 Summary of predicted noise levels from Buildings A and B, the Substation and Mechanical Yard (with no generator testing) vs the limiting noise emissions criteria to ensure planning compliance
 *SS: Substation, MY: Mechanical Yard

5.1.4 Noise Emissions Criteria for Building C (Excluding Generator Testing for Building C)

The noise emission calculations for the initial part of the scheme has allowed specific noise emissions criteria for Building C to be established, to ensure that once noise emissions from all aspects of the scheme are added together, the requirements of the Planning Condition are met.

Table 6 shows the limiting criteria for the full scheme, the predicted noise emissions from Building A, Building B, the Substation and Mechanical Yard (including the generator testing schedule for Buildings A and B) by Sweco, and the resultant maximum noise emissions allowable for Building C (excluding generator testing for Building C) to ensure the Planning Condition is met.

Receptor No.	Time	Limiting Criteria for Normally Operating Plant	Predicted Noise Level for Building A, Building B, SS & MY*	Maximum Noise Emissions from Building C Excluding Generator Testing
		L _{Aeq, T} dB	L _{Aeq, T} dB	L _{Aeq, T} dB
R1 (west)	07:00-23:00	45	45	35
	23:00-07:00	43	40	40
R1 (central)	07:00-23:00	45	43	41
	23:00-07:00	43	41	39
R1 (east)	07:00-23:00	45	41	43
	23:00-07:00	43	39	41
R2	07:00-23:00	55*	43	55
	23:00-07:00	47	38	46
R3 (west)	07:00-23:00	52	47	50
	23:00-07:00	45	40	43
R3 (east)	07:00-23:00	52	45	51
	23:00-07:00	45	41	43
R4	07:00-23:00	54	54	44
	23:00-07:00	45	45	35

Table 6 Summary of the allowable noise emissions from Building C based on the predicted noise levels from Buildings A and B, the Substation and Mechanical Yard and the limiting noise emissions criteria to ensure planning compliance
 *SS: Substation, MY: Mechanical Yard

5.1.5 Noise Emissions Criteria for Building C (Including Generator Testing for Building C)

The noise emission calculations for the initial part of the scheme has allowed specific noise emissions criteria for Building C to be established, to ensure that once noise emissions from all aspects of the scheme are added together, the requirements of the Planning Condition are met.

Table 7 shows the limiting criteria for the full scheme, the predicted noise emissions from Building A, Building B, the Substation and Mechanical Yard (without generator testing for Building A and B) by Sweco, and the resultant maximum noise emissions allowable for Building C (including generator testing for Building C) to ensure the Planning Condition is met.

Receptor No.	Time	Limiting Criteria for Normally Operating Plant	Predicted Noise Level for Building A, Building B, SS & MY*	Maximum Noise Emissions from Building C Including Generator Testing
		L _{Aeq, T} dB	L _{Aeq, T} dB	L _{Aeq, T} dB
R1 (west)	07:00-23:00	45	42	41
	23:00-07:00	43	41	39
R1 (central)	07:00-23:00	45	42	41
	23:00-07:00	43	41	39
R1 (east)	07:00-23:00	45	41	43
	23:00-07:00	43	39	41
R2	07:00-23:00	55*	41	55
	23:00-07:00	47	38	46
R3 (west)	07:00-23:00	52	44	51
	23:00-07:00	45	40	43
R3 (east)	07:00-23:00	52	44	51
	23:00-07:00	45	41	43
R4	07:00-23:00	54	51	54
	23:00-07:00	45	45	45

Table 7 Summary of the allowable noise emissions from Building C based on the predicted noise levels from Buildings A and B, the Substation and Mechanical Yard and the limiting noise emissions criteria to ensure planning compliance
 *SS: Substation, MY: Mechanical Yard

5.2 Proposed Building Services Plant for Building C

5.2.1 Chillers

The Chillers would be provided by Airedale (model DeltaChill R32) with a scheme of noise attenuation measures implemented by Allaway Acoustics. It is understood that the design targets provided to Airedale and Allaway Acoustics were as follows:

Chiller Measurement Location	Daytime Sound Pressure Level at 10m	Night-time Sound Pressure Level at 10m
Horizontally	43 dB(A)	37 dB(A)
Above	56 dB(A)	50 dB(A)
Below	58 dB(A)	52 dB(A)

Table 8 Design target noise levels for chillers

The mitigation for the chillers is comprised of an upflow acoustic enclosure, as shown in the figure below:

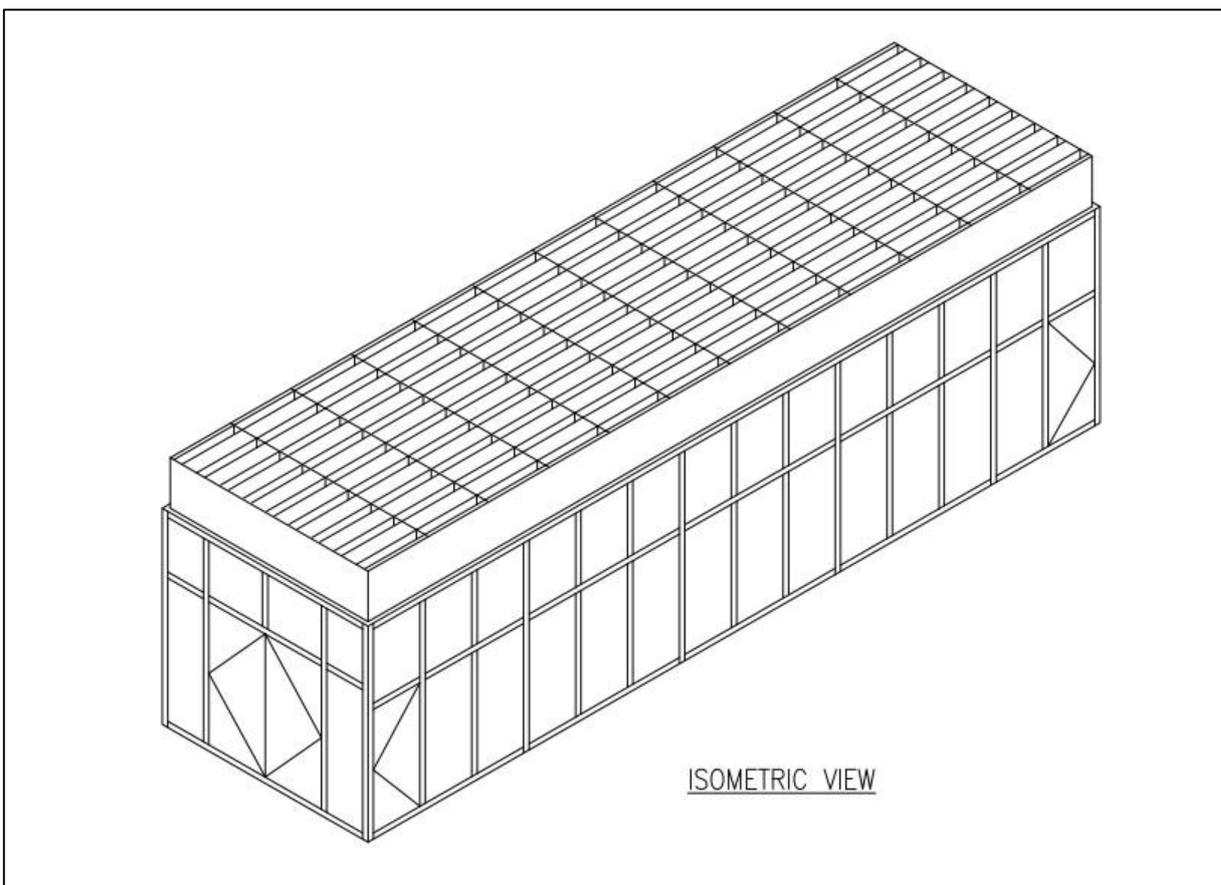


Figure 8 Isometric view of chiller enclosures

The resultant noise emissions from the Chillers once mitigated are as reported in Table 9.

Mitigated Airedale Chiller Noise Emissions	Sound Pressure Level at 10m (dB) at Octave Band Centre Frequency, Hz								dB(A)
	63	125	250	500	1k	2k	4k	8k	
40C 10m horizontal	53.6	55.6	43.8	32.8	20.9	14.5	17.0	21.4	41.5
40C 10m above	53.5	55.5	41.8	31.2	24.1	23.3	25.7	33.3	41.6
40C 10m below	54.5	56.5	43.8	33.2	24.1	25.3	28.7	33.3	42.8

Table 9 Noise emissions data for Chiller plant (with mitigation applied)

In order to ensure the noise calculations and noise model presents a complete worst-case scenario, the higher design target noise levels would be used within the assessment.

5.2.2 CEPs

Each CEP unit will be served by and 2 no. condensers and 2 no. extraction fans.

The 2 no. condenser units will be MCL110-1 Mcx EC Fan units positioned on top of the CEP containers at a centralised position. The 2 no. extraction fans are yet to be selected but will not exceed a sound power level of 75 dB(A).

Table 12 presents a summary of the plant noise levels used for this assessment.

Plant Type	Manufacturer's Noise Emissions
CEP: Switchroom Container – Impulse/Extract Fans Make / Model to be selected	Sound Power Level: 75 dB(A)
CEP: Battery Module (Container) – Condensers MCL110-1 Mcx EC Fan units	Sound Pressure Level at 5m: 57 dB(A)

Table 10 Noise emissions data for CEP plant

5.2.3 Generators

Generator noise emission levels are presented in the table below. Each Generator will be located within an attenuating container and will have attenuation to the exhaust and flue. The generator enclosures have been selected to not exceed a sound pressure level of 60 dB(A) at 7m.

Description	Sound Pressure Level at 1m (dB) at Octave Band Centre Frequency, Hz								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Outside container wall	70	76	71	64	60	60	57	65	70
Before air inlet attenuator	90	83	73	59	54	51	48	60	71
Outside air outlet attenuator	91	83	73	61	57	53	50	66	72
Outside flue gas silencer	94	82	70	63	62	58	50	-	72

Table 11 Noise emissions data for Generator plant

Under normal conditions, the generators will be subject to regular testing. The proposed test regime for each generator is currently as follows:

- *Monthly testing for a duration of 15 minutes at no load; and*
- *6 monthly testing for a duration of 6 hours – totalling 12 hours per year.*

Onload testing is to be undertaken on one generator at a time, with the maximum number of generators being tested at any one time being 2 (one offload and one onload). In order to reduce the potential noise impact to the surrounding noise sensitive receptors, it is recommended that testing only occurs during daytime hours (07:00-23:00).

The emergency condition includes for all generators running at full capacity. This will only occur if there is a power outage is therefore not considered under normal operating conditions. As part of the previous reserved matters report for Buildings A and B, additional detail was sought regarding the average amount of time that power outages are likely to occur, and therefore the likely periods for which the emergency operating condition (all generators active) will occur. The site is to be connected to a reliable DNO network

supplied by SSE. Based on the latest published data from Ofgem in March 2021, the actual average minutes lost per customer per year for the network is 51.4 minutes.

5.2.4 Other Plant Items

A number of other small condensers and VRF condensers are proposed for the scheme to serve the internal office and ancillary spaces. The condensers will be situated under the chiller gantries, and split between the two core areas as follows:

West Plant Block

- 2 no. Airedale CR65-0 chillers (serving BSFE rooms)
- 4 no. Mitsubishi PUZ-Z100YKA units
- 1 no. Mitsubishi PURY-EP1100YSNW-A2 unit

East Plant Block

- 2 no. Airedale CR65-0 chillers (serving BSFE rooms)
- 6 no. Mitsubishi PUZ-Z100YKA units
- 1 no. Mitsubishi PURY-EP1100YSNW-A2 unit

Table 12 presents a summary of the manufacturers plant noise levels used for this assessment:

Plant Type	Manufacturer's Sound Power Levels
Airedale CR65-0 chillers	81 dB(A)
Mitsubishi PUZ-Z100YKA condenser	92 dB(A) at 100% capacity
Mitsubishi PURY-EP1100YSNW-A2 condenser	69 dB(A)

Table 12 Noise emissions data for 'other plant' items

5.2.5 Internal Noise Breakout from Data Halls

Calculations have been undertaken to predict the internal levels in the proposed Data Halls and Mechanical Corridors. The main sound sources dictating the reverberant noise levels in these spaces are fan walls. 24 no. fan walls are proposed per mechanical corridor and per data hall for a total of 48 no. fan walls.

At this stage it is assumed that the proposed fan walls proposed for Building C would be the same as those for Buildings A and B. Noise levels are shown in Table 13.

Description	Sound Pressure Level at 1m (dB) at Octave Band Centre Frequency, Hz								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Case breakout	96	101	95	91	87	84	84	76	97
Discharge air	96	101	95	91	87	84	84	76	97
Return air	96	101	95	91	87	84	84	76	97

Table 13 Noise emissions data for fan wall

Reverberant noise levels as per Building B are currently assumed, as follows:

- *Data Hall: 80 dB(A)*
- *Mechanical Corridor: 97 dB(A)*
- *Intermediate Distribution Frame Rooms: 90 dB(A)*
- *MEP for IDF rooms: 90 dB(A)*

Panelled façades with internal linings and lightweight roof systems are proposed. The sound reduction index specifications listed below have been assumed:

- *External Wall – Data Hall: 28 dB $R_w + C_{tr}$*
- *Roof – Data Hall: 38 dB $R_w + C_{tr}$*
- *Roof – Mechanical Corridor: 31 dB $R_w + C_{tr}$*

5.3 Noise Modelling Exercise

Proprietary modelling software SoundPlan 8.2 has been used to provide a visual representation of the noise emissions associated with Building C based on the proposed plant outlined above.

6 no. key operational scenarios have been assessed, which are as follows:

1. Daytime 07:00-23:00 – all plant operational to determine the worst-case scenario during daytime hours. This includes the emergency operating condition with all generators running simultaneously.
2. Daytime 07:00-23:00 – normal site operating conditions, including all plant (but not the generators or any generator testing)
3. Daytime 07:00-23:00 – normal site operating conditions, including all plant in addition to the generators at the outer edges of the compound as per Section 5.2.3)
4. Daytime 07:00-23:00 – normal site operating conditions, including all plant in addition to the generators at the inner edges of the compound as per Section 5.2.3)
5. Night-time 23:00-07:00 – all plant operational to determine the worst-case scenario during night-time. This includes the emergency operating condition with all generators running. Note that this would be a highly unlikely scenario, as generators would be tested during daytime hours and only operational during night-time hours in the emergency condition. Even in the emergency condition, it is highly unlikely that all generators would be operational at once.
6. Night-time 23:00-07:00 – normal site operating conditions, including all plant (but not the generators)

The resultant noise maps for each assessment scenario are presented below. Full sized maps are presented in Appendix C.

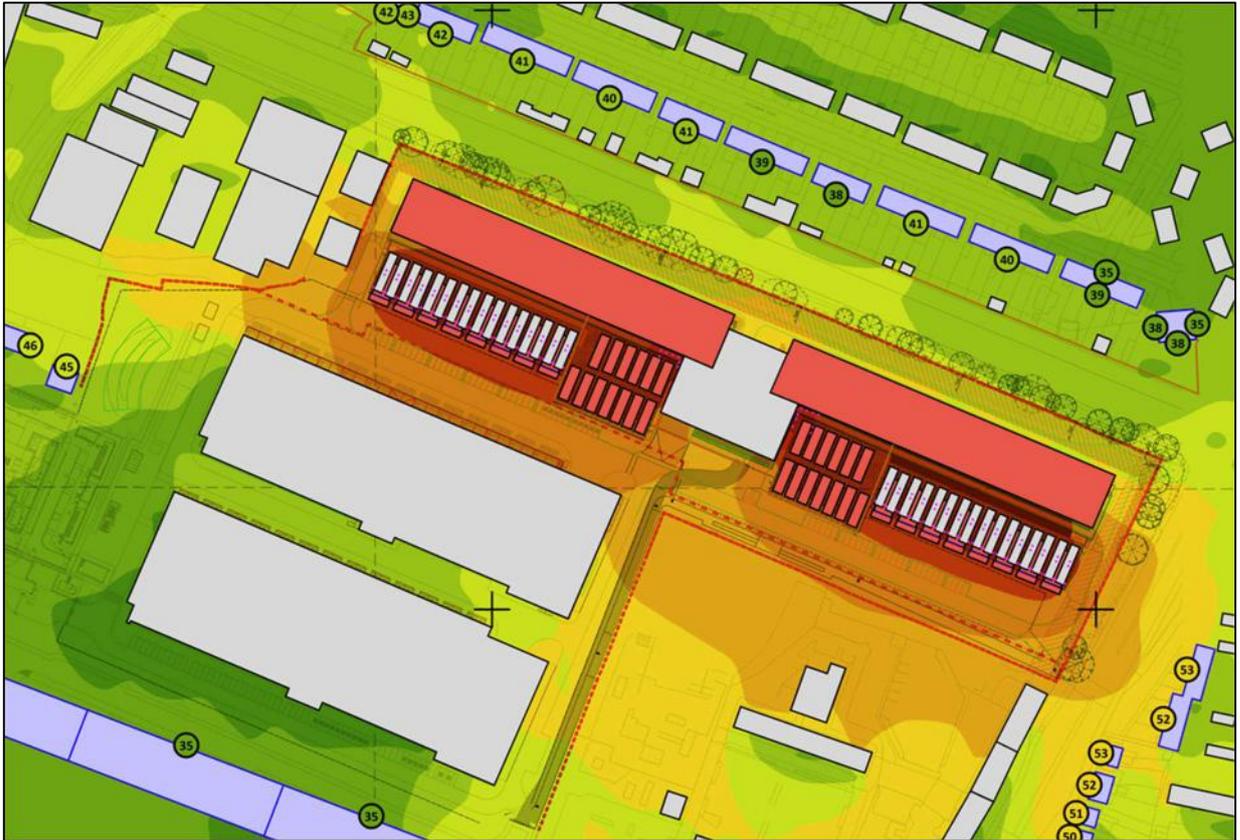


Figure 9 Noise Map 1: Daytime hours, all plant operational

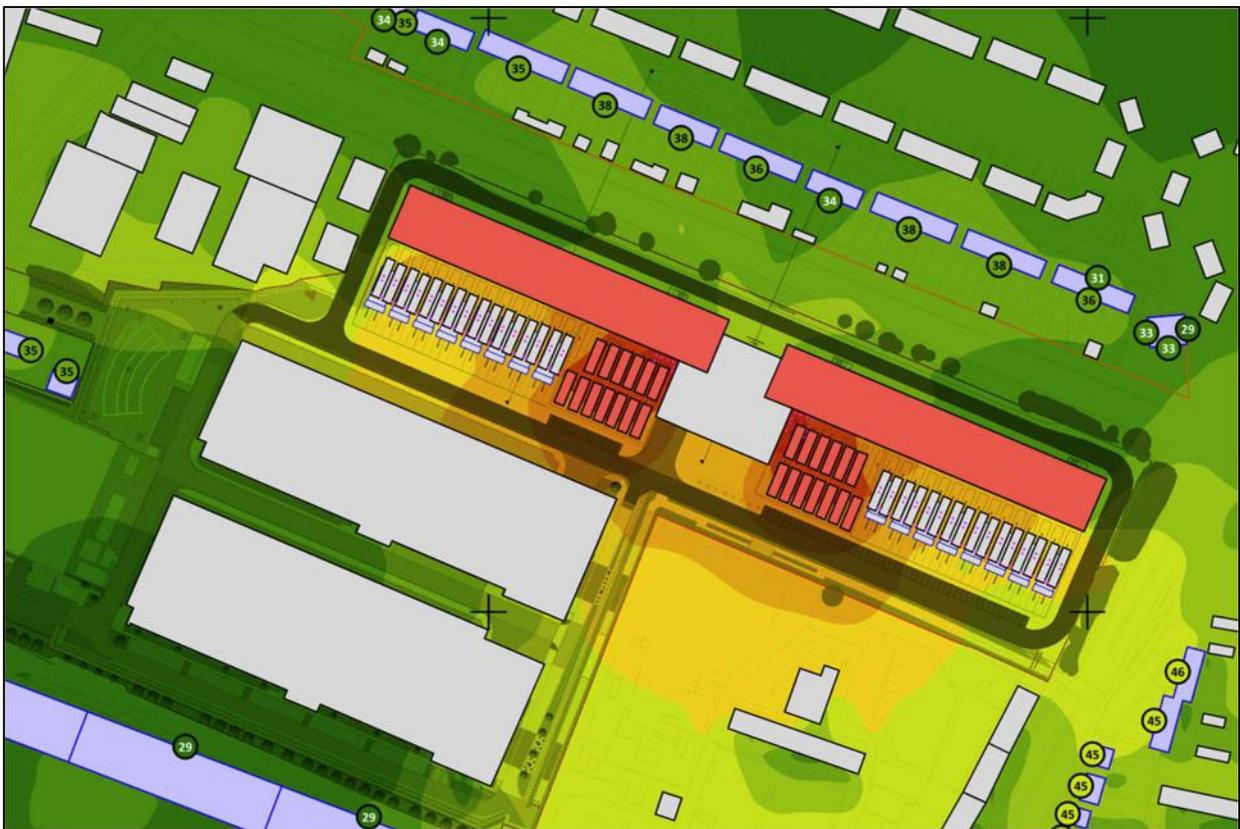


Figure 10 Noise Map 2: Daytime hours, all 'normally operating plant' on, generators off

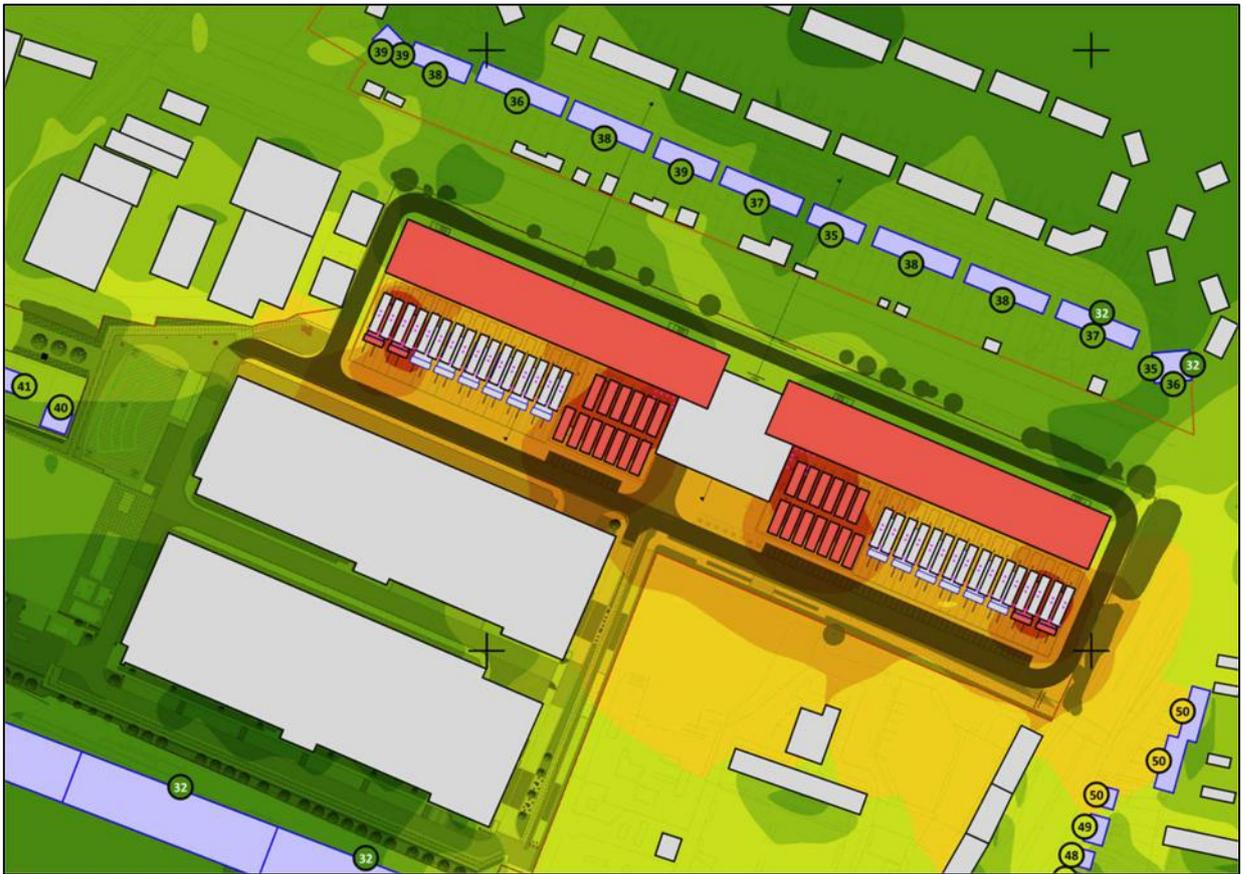


Figure 11 Noise Map 3: Daytime hours, all 'normally operating plant' on, generators testing at outer edges

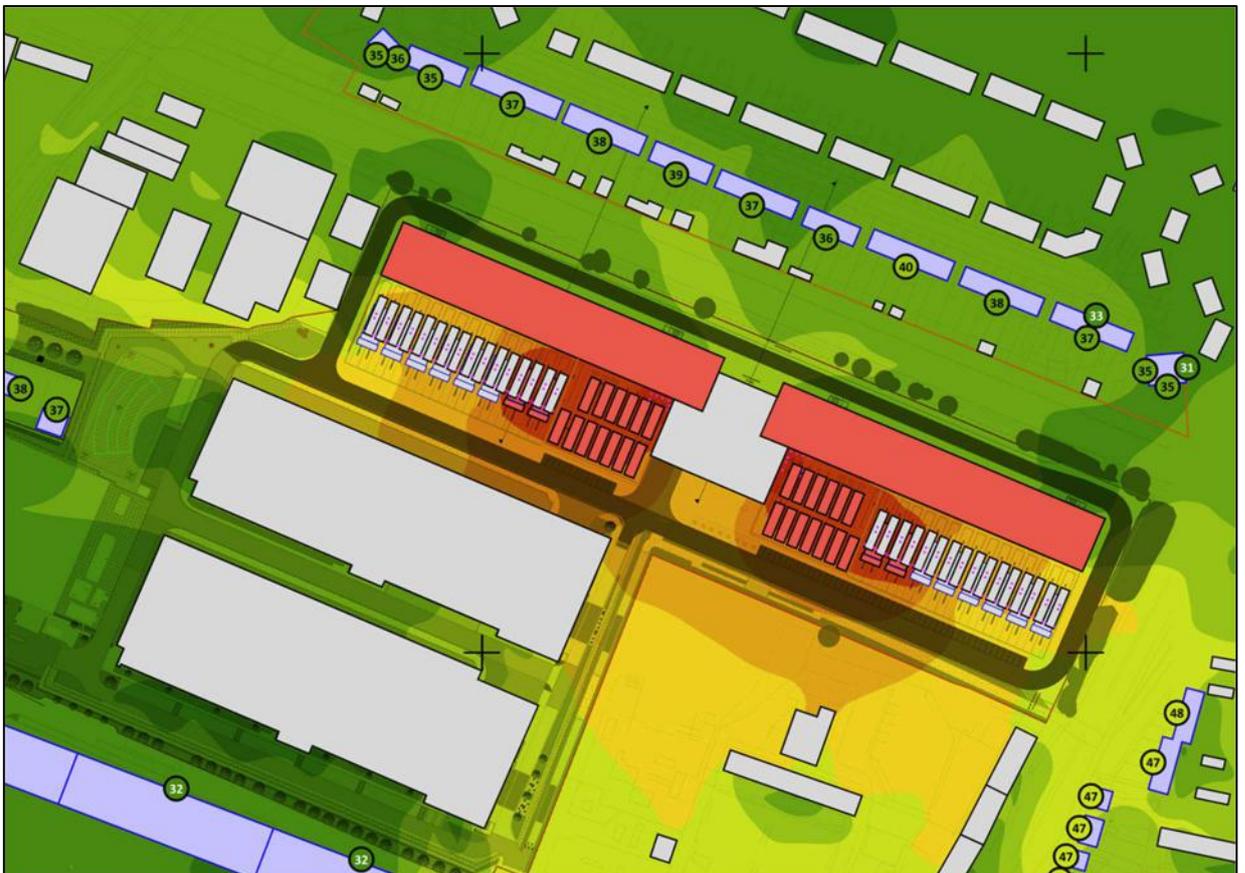


Figure 12 Noise Map 4: Daytime hours, all 'normally operating plant' on, generators testing at inner edges

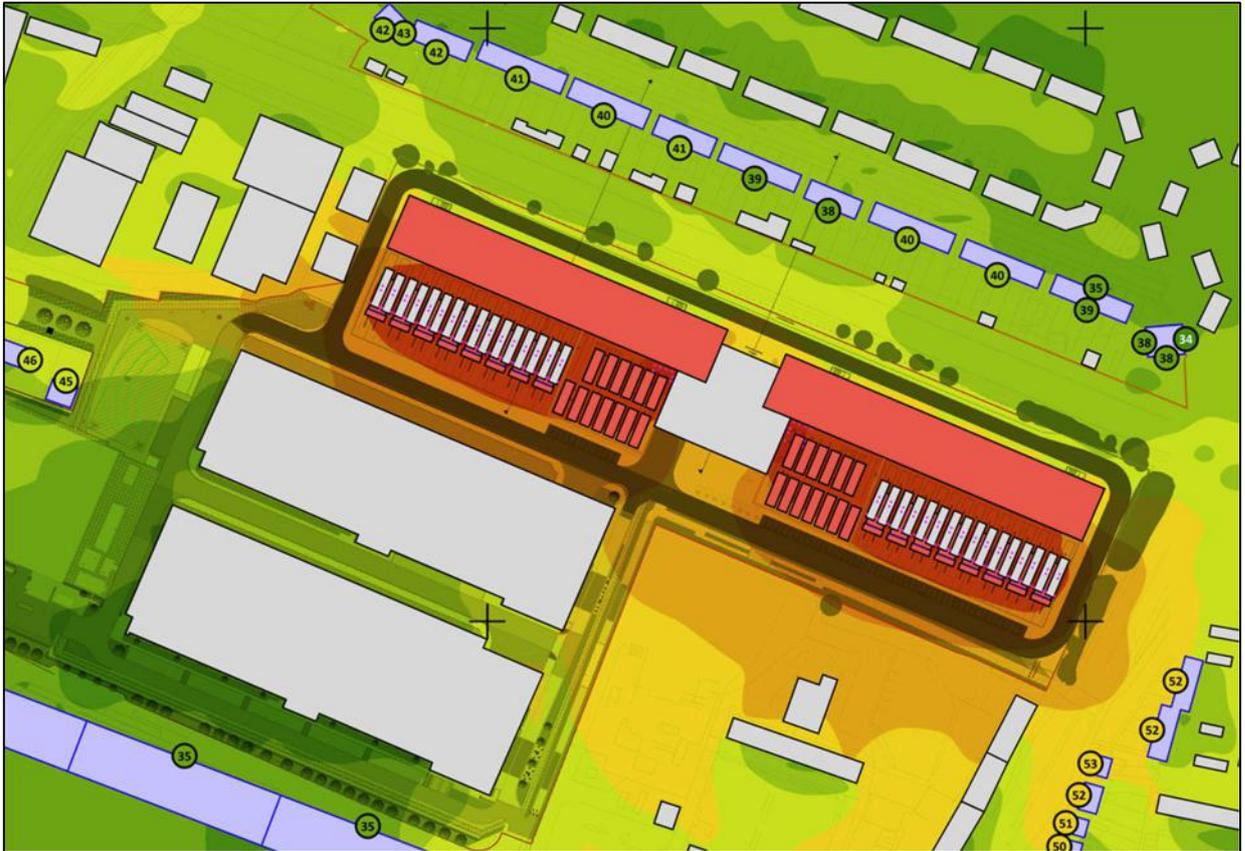


Figure 13 Noise Map 5: Night-time hours, all plant operational

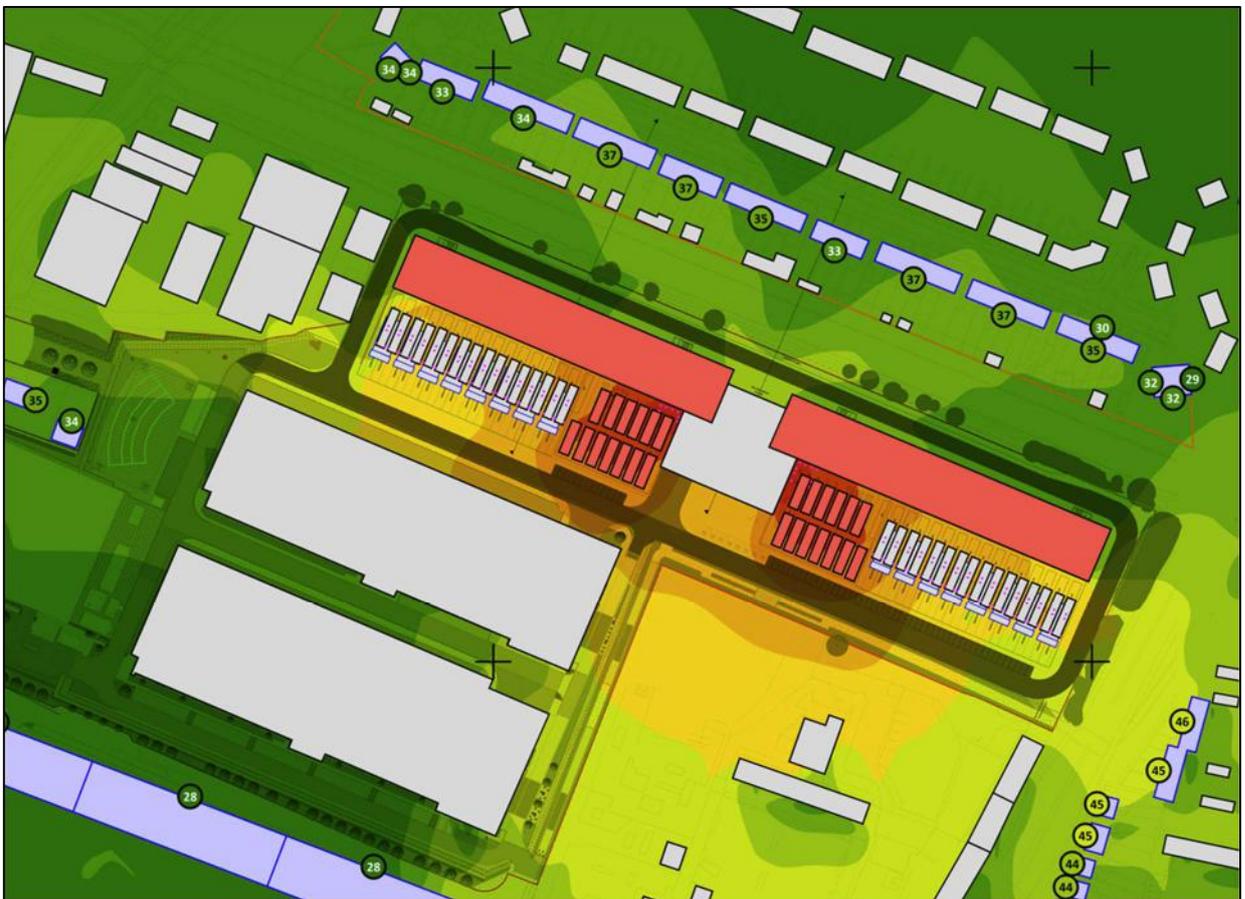


Figure 14 Noise Map 6: Night-time hours, all 'normally operating plant' on, generators off

5.4 Plant Noise Impact Assessment

BS 4142:2014 requires consideration of rating penalties for features in the noise, including tonality, impulsivity, and intermittency.

Noise from all plant under consideration would not be considered tonal, and therefore no correction for tonality has been applied to the modelling noise levels.

Generators will be tested as per the details in Section 5.2.3. As the generators will not operate continuously, there is potential for the on-off conditions for this noise source to be noticeable at the receptors. Therefore, the BS 4142 intermittency correction of +3 dB has been applied to the generator noise emissions within the noise modelling exercise.

Rating noise levels are presented in Sections 5.4.1 and 5.4.2, which include the following situations:

1. Normally operating noise from Building A, B and C plus emergency generator testing for Building A or B, but not Building C; and
2. Normally operating noise from Building A, B and C plus emergency generator testing for Building C only, but not Buildings A or B.

5.4.1 Total Noise Emissions Associated with Non-Emergency Plant from the Full Site (Buildings A & B plus Emergency Generator Testing, Building C with no Emergency Generator Testing)

The table below shows the predicted noise emissions from Building A, B (including emergency generator testing), the Substation and Mechanical Yard, the predicted noise emissions from Building C (excluding emergency generator testing), the total noise emissions from the site vs the planning condition criteria, and the degree to which the planning condition is met or exceeded.

Receptor No.	Time	Predicted Noise Emissions from Building A + B, SS, MY	Predicted Noise Emissions from Building C	Total Noise Emissions from the Site	Planning Condition 12 Criteria	+ / -
		L _{Aeq, T} dB	L _{Aeq, T} dB	L _{Aeq, T} dB	L _{A90, T} dB	
R1 (west)	07:00-23:00	45	38	46	45	0
	23:00-07:00	40	38	42	43	-2
R1 (central)	07:00-23:00	43	41	45	45	-1
	23:00-07:00	41	40	44	43	-1
R1 (east)	07:00-23:00	41	39	43	45	-3
	23:00-07:00	39	38	42	43	-3
R2	07:00-23:00	43	46	48	55*	-7
	23:00-07:00	38	46	47	47	0
R3 (west)	07:00-23:00	47	31	47	52	-5
	23:00-07:00	40	30	40	45	-5
R3 (east)	07:00-23:00	45	30	45	52	-7
	23:00-07:00	41	30	41	45	-4
R4	07:00-23:00	54	39	54	54	0
	23:00-07:00	45	38	46	45	0

Table 14 Predicted noise emissions of non-emergency plant from full site (including generator testing for Buildings A and B, and excluding generator testing for Building C)

*SS: Substation, MY: Mechanical Yard

5.4.2 Total Noise Emissions Associated with Non-Emergency Plant from the Full Site (Buildings A & B with no Emergency Generator Testing, Building C with Emergency Generator Testing)

The table below shows the predicted noise emissions from Building A, B (excluding emergency generator testing), the Substation and Mechanical Yard, the predicted noise emissions from Building C (including emergency generator testing), the total noise emissions from the site vs the planning condition criteria, and the degree to which the planning condition is met or exceeded.

Receptor No.	Time	Predicted Noise Emissions from Building A + B, SS, MY L _{Aeq, T} dB	Predicted Worst-Case Noise Emissions from Building C L _{Aeq, T} dB	Total Noise Emissions from the Site L _{Aeq, T} dB	Planning Condition 12 Criteria L _{A90, T} dB	+ / -
R1 (west)	07:00-23:00	42	39	44	45	-1
R1 (central)	07:00-23:00	42	39	44	45	-1
R1 (east)	07:00-23:00	41	37	43	45	-3
R2	07:00-23:00	41	50	51	55*	-5
R3 (west)	07:00-23:00	44	34	44	52	-8
R3 (east)	07:00-23:00	44	32	44	52	-8
R4	07:00-23:00	51	41	51	54	-3

Table 15 Predicted noise emissions of non-emergency plant from full site (Excluding generator testing for Buildings A and B, and including generator testing for Building C)

*SS: Substation, MY: Mechanical Yard

Note that night-time noise levels would be as shown in Table 14, as no emergency generator testing would take place for Building C during night-time hours.

5.5 Discussion of Results for Non-Emergency Plant

As shown in Table 14, the resultant noise emissions from the full site at the closest noise sensitive receptors are compliant with the requirements of Planning Condition 12 in all cases. Adverse impacts on health and quality of life would be avoided.

5.6 Total Noise Emissions Associated with Emergency and Non-Emergency Plant from the Full Site (Buildings A, B, C, the Substation and Mechanical Yard)

The table below shows the predicted noise emissions associated with both emergency and non-emergency plant from Building A, B, the Substation and Mechanical Yard, the predicted noise emissions associated with both emergency and non-emergency plant from Building C, and the total noise emissions associated with both emergency and non-emergency plant from the site.

As noted in Section 2.2.2, the noise emissions are predicted internally within the properties of the closest receptors with the windows both open and closed for the Local Authority to make a judgement on acceptability.

Receptor No.	Time	Emergency Plant Noise Emissions from Building A + B, SS & MY	Emergency Plant Noise Emissions from Building C	Total Noise Emissions from Full Site	Receptor Window Condition (Open or Closed)	Receptor Window Attenuation	Resultant Internal Noise Level
		L _{Aeq, T} dB	L _{Aeq, T} dB	L _{Aeq, T} dB		dB	L _{Aeq, T} dB
R1 (west)	07:00-23:00	52	43	53	Open	-15	38
		52	43	53	Closed	-30	23
	23:00-07:00	52	43	53	Open	-15	38
		52	43	53	Closed	-30	23
R1 (central)	07:00-23:00	49	43	50	Open	-15	35
		49	43	50	Closed	-30	20
	23:00-07:00	49	43	50	Open	-15	35
		49	43	50	Closed	-30	20
R1 (east)	07:00-23:00	48	41	49	Open	-15	34
		48	41	49	Closed	-30	19
	23:00-07:00	48	41	49	Open	-15	34
		48	41	49	Closed	-30	19
R2	07:00-23:00	57	52	58	Open	-15	43
		57	52	58	Closed	-30	28
	23:00-07:00	57	52	58	Open	-15	43
		57	52	58	Closed	-30	28
R3 (west)	07:00-23:00	51	37	51	Open	-15	36
		51	37	51	Closed	-30	21
	23:00-07:00	51	37	51	Open	-15	36
		51	37	51	Closed	-30	21
R3 (east)	07:00-23:00	51	36	51	Open	-15	36
		51	36	51	Closed	-30	21
	23:00-07:00	51	35	51	Open	-15	36
		51	35	51	Closed	-30	21
R4	07:00-23:00	60	46	60	Open	-15	45
		60	46	60	Closed	-30	30
	23:00-07:00	60	46	60	Open	-15	45
		60	46	60	Closed	-30	30

Table 16 Predicted noise emissions of emergency and non-emergency plant from full site
 *SS: Substation, MY: Mechanical Yard

6 CONCLUSION

ES Acoustics Ltd (ESA) have been commissioned by Yondr Group to prepare a noise impact assessment in support of a reserved matters submission for Building C of the proposed data centre development at Wexham Road, Slough SL2 5DB, as required by Planning Condition 12 of outline planning permission reference: P/00072/096. The prevailing sound conditions in the area have been determined by WYG as part of the noise impact assessment for the outline planning application (Report Reference A114100, dated December 2019), from which ESA have established the parameters set by the Planning Condition.

The full commercial aspect of the scheme to which Planning Condition 12 relates comprises 3 no. data centre buildings (Buildings A, B and C) with an associated substation and mechanical yard. A previous noise impact assessment was prepared for Buildings A and B, the Substation, and Mechanical Yard of the development by Sweco (report reference 66202273-SWE-ZZ-XX-YA-RP-0002, Rev.: P02, dated 19/03/2021). Based on the outcome of this report, it is understood that Planning Condition 12 has been discharge in relation to Buildings A and B.

This report details the resultant noise emissions from the plant associated with Building C, allowing the full noise emissions from the site to be understood to such that Planning Condition 12 can be discharged.

The overall noise emissions from the full scheme have been established by adding the calculated noise emissions from Building C (undertaken by ES Acoustics) with the calculated noise emissions from Buildings A and B, the Substation, and Mechanical Yard (undertaken by Sweco).

Calculations show that the requirements of Condition 12 are met.

ACOUSTIC TERMINOLOGY

Decibel scale - dB

The decibel (dB) is a relative unit of measurement used in acoustics. The dB is a logarithmic ratio between a measured level and a reference level of 0 dB (i.e the threshold of human hearing). Simply put, the decibel compresses the wide range of sounds we hear into more manageable numbers.

Addition of noise from several sources

Sound produced by multiple sound sources are added logarithmically e.g. power ratio of 2 = 3dB, power ratio of 10 = 10dB. Therefore, two equally intense sound sources operating simultaneously produce a sound level which is 3dB higher than a single source e.g. 60dB + 60dB = 63dB.

Subjective impression of noise

Human response to sound is highly individualized and often based on psychological factors such as emotion and expectation. Sensitivity to sound typically depends on the loudness, pitch, duration of the occurrence, and time of occurrence (e.g. a sound source could cause annoyance during the night where it would not during the day). The following table is a guide to explain increases or decreases in sound levels for many scenarios.

Change in sound level	Change in perceived loudness
1 dB	Imperceptible
3 dB	Just barely perceptible
6 dB	Clearly noticeable
10 dB	About twice as loud

'A' Weighted Frequency Filter - dB(A)

The human ear is not equally sensitive in all frequencies. The A-weighting filter was devised to take this into account when undertaking noise measurements and allows a sound level meter to replicate the human ears response to sound.

$L_{Aeq, T}$

Sound can fluctuate widely over a given period. L_{Aeq} is the A-weighted equivalent continuous sound level, with T denoting the time period over which the fluctuating sound levels were averaged e.g. $L_{Aeq, 16h}$ is the equivalent continuous noise level over an 16 hour period.

L_{A90}

A-weighted sound level exceeded for 90% of the measurement period, calculated via statistical analysis. The L_{A90} descriptor is typically used to establish background sound levels for noise impact assessments

L_{A10}

A-weighted sound level exceeded for 10% of the measurement period, calculated via statistical analysis.

L_{AFmax}

A-weighted sound level maximum sound pressure level that has been measured over a given time period

ACOUSTIC TERMINOLOGY

Octave Bands

The audio or frequency spectrum of the human ear is in the range of 20Hz to 20 kHz. The spectrum tells how the energy of the sound signal is distributed in frequency. Octave bands divides the audio spectrum into 10 equal parts. The International Standards Organisation defines the centre frequency of these bands as 31.5Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1kHz, 2kHz, 4kHz, 8kHz and 16kHz.

Noise Rating (NR) Curves

A method of rating noise using a set of curves relating octave band sound pressure levels. Typically used for building services systems within offices

Airborne sound

Sound radiated from a source into the surrounding air e.g. musical instruments, tv/radio, machinery/equipment. Airborne sound insulation refers to the reduction or attenuation of airborne sound, usually via a solid partition between a source and receiver.

Impact sound

Sound resulting from the impact between colliding objects, e.g. footfall impact upon a floor. Impact sound insulation refers to the resistance of a floor to the transmission of impact sound, typically via the installation of a 'resilient layer'

Flanking sound

The transmission of airborne sound between two adjacent rooms by paths other than via the separating partition between the rooms, e.g. the abutment point of a wall and floor.

Structure-borne noise

Noise caused by the vibration of elements of a structure. This can result in reradiated noise, whereby the vibrating element transmits airborne sound into a space e.g. vibration caused by mechanical plant installed within a plant room which is not adequately isolated from the structure, or construction/demolition work in an adjacent building.

Reverberant sound

Sound in an enclosed space (usually a room), which results from repeated reflections at the boundaries. Reverberation time is the time taken for a steady sound level in an enclosed space to decay by 60dB, measured from the moment the sound source is switched off. A example of a typically reverberant space would be a classic church. Absorptive materials can be used to reduce reflections and reverberation times.

POLICY, STANDARDS AND GUIDANCE REVIEW

NATIONAL POLICY

National Planning Policy Framework (NPPF)

The National Planning Policy Framework (NPPF) superseded and replaced Planning Policy Guidance Note 24 (PPG24), which previously covered issues relating to noise and planning in England.

The paragraphs relating to noise state:

180. Planning policies and decisions should contribute to and enhance the natural and local environment by;
- e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans
191. Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:
- a) Mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;
 - b) Identify and protect tranquil areas which have remained relatively undisturbed by noise and are *prized for their recreational and amenity value for this reason; [...]*
193. Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.

Noise Policy Statement for England (NPSE)

The Noise Policy Statement for England (NPSE) was developed by DEFRA and published in March 2010. The long-term vision of the Government noise policy is to '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 vision noted above is supported by the following aims:

Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

POLICY, STANDARDS AND GUIDANCE REVIEW

- 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.

The NPSE outlines observed effect levels relating to the above, as follows:

- No observed effect level (NOEL): this is the level of noise exposure below which no effect at all on health or quality of life can be detected;
- Lowest observed adverse effect level (LOAEL): this is the level of noise exposure above which adverse effects on health and quality of life can be detected;
- Significant observed adverse effect level (SOAEL): This is the level of noise exposure above which significant adverse effects on health and quality of life occur;

Noise effect levels are not set at absolute noise level targets, but instead vary depending on the context and character of the noise and site specific factors which may impact on the severity of the effect. The NPSE states:

'It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available.'

National Planning Practice Guidance (NPPG)

The NPPG provides practical guidance on how the NPPF should be applied as well as and guidance on the factors influencing whether noise may be a concern at the planning stage and how adverse effects can be mitigated. The table below summarises the effect levels presented within the NPSE, as follows:

Response	Examples of Outcomes	Increasing Effect Level	Action
Not present	No Effect	No Observed Effect	No specific measures required
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude, or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	No specific Measures required
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, 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 small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate & reduce to a minimum

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Response	Examples of Outcomes	Increasing Effect Level	Action
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, 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
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

Table 1 Noise exposure hierachy

LOCAL POLICY

Slough Borough Council Planning Policy

The Local Development Plan for Slough sets out the long-term overall vision for how the area should develop, and a strategy for how this should take place. The plan must comply with the legal requirements set by national government, and also meet the needs of local residents and businesses.

This policy sets the framework for making decisions on individual planning applications. All planning applications – whether for a small extension to a building, or for a large development of multiple houses – must be approved or rejected in line with the policies in the development plan, unless any other strong planning reasons emerge.

The Local Development Plan for Slough is broadly comprised of:

- The Core Strategy Development Plan Document - Slough Local Development Framework Core Strategy 2006 - 2026
- Site Allocations Development Plan Document
- Local Plan Saved Policies

Relevant policies in relation to noise are as follows:

Core Policy 8 – Sustainability and the Environment

All development in the Borough shall be sustainable, of a high quality design, improve the quality of the environment and address the impact of climate change.

1. Sustainable Design and Construction Principles:

All development should, where feasible, include measures to:

- a) Minimise the consumption and unnecessary use of energy, particularly from non renewable sources;
- b) Recycle waste;

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- c) Generate energy from renewable resources;
- d) Reduce water consumption; and
- e) Incorporate sustainable design and construction techniques, including the use of recycled and energy efficient building materials.

2. High Quality Design:

All development will:

- a) Be of a high quality design that is practical, attractive, safe, accessible and adaptable;
- b) Respect its location and surroundings;
- c) Provide appropriate public space, amenity space and landscaping as an integral part of the design; and
- d) Be in accordance with the Spatial Strategy in terms of its height, scale, massing and architectural style.

The design of all development within the existing residential areas should respect the amenities of adjoining occupiers and reflect the street scene and the local distinctiveness of the area.

3. Pollution

Development shall not:

- a) Give rise to unacceptable levels of pollution including air pollution, dust, odour, artificial lighting or **noise**;
- b) Cause contamination or a deterioration in land, soil or water quality; and
- c) Be located on polluted land, areas affected by air pollution or in noisy environments unless the development incorporates appropriate mitigation measures to limit the adverse effects on occupiers and other appropriate receptors.

4. Flooding

- a) Development will only be permitted where it is safe and it can be demonstrated that there is minimal risk of flooding to the property and it will not impede the flow of floodwaters, increase the risk of flooding elsewhere or reduce the capacity of a floodplain; and
- b) Development must manage surface water arising from the site in a sustainable manner which will also reduce the risk of flooding and improve water quality.

POLICY, STANDARDS AND GUIDANCE REVIEW

GOOD PRACTICE GUIDANCE

BS 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound'

BS 4142:2014+A1:2019 provides a methodology for rating and assessing the impacts of industrial and commercial sound at noise sensitive receptors.

The methodology involves comparing the Rating Noise Level due to the sound source/s under assessment with the existing background sound level (L_{A90}) when the noise source is not operating to estimate the initial impact, as follows (Typically, the greater this difference, the greater the magnitude of the impact):

- a) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context
- b) A difference of around +5 dB could be an indication of an adverse impact, depending on the context
- c) The lower the rating level is relative to the measured background sound level, the less likely it is that there will be an adverse impact or significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound having a low impact, depending on the context

The standard notes that a noise source under assessment will have a 'low impact' when the 'rating level' of a noise source is less than the existing background sound. It is also important to note that any quantitative assessment results are assessed considering the context in which the sound occurs.

The standard notes three types of context within Clause 11, which are:

- 1) The absolute level of sound. For a given difference between the rating level and the background sound level, the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low.

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.

Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse.

- 2) The character and level of the residual sound compared to the character and level of the specific sound. Consider whether it would be beneficial to compare the frequency spectrum and temporal variation of the specific sound with that of the ambient or residual sound to assess the degree to which the specific sound source is likely to be distinguishable and will represent an incongruous sound by comparison to the acoustic environment that would occur in the absence of the specific sound. Any sound parameters, sampling periods and averaging time periods used to undertake character comparisons should reflect

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the way in which sound of an industrial and/or commercial nature is likely to be perceived and how people react to it.

- 3) 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, such as:
 - i. facade insulation treatment;
 - ii. ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and
 - iii. acoustic screening.

The definitions noted above are described below:

- **Specific sound** – sound source being assessed ($L_s = L_{Aeq, Tr}$)
- **Residual sound** – Ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound ($L_r = L_{Aeq, T}$)
- **Ambient sound** – totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far ($L_a = L_{Aeq, T}$)
- **Background level** – sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval ($L_{A90, T}$)
- **Rating level** – specific sound level plus any adjustment for the characteristic features of the sound ($L_{Ar, Tr}$)

With regards to background sound levels, BS 4142:2014+A1:2019 notes:

“In using the background sound level in the method for rating and assessing industrial and commercial sound it is important to ensure that values are reliable and suitably represent both the particular circumstances and periods of interest. For this purpose, the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods.”

With regards to the ‘rating level’, the adjustments for the characteristic features of the sound are outlined below:

- *Tonality – +2 dB for a tone which is ‘just perceptible’ at the noise receptor, +4 dB where it is ‘clearly perceptible’, and +6 dB where it is ‘highly perceptible’*
- *Impulsivity – +3 dB for a tone which is ‘just perceptible’ at the noise receptor, +6 dB where it is ‘clearly perceptible’, and +9 dB where it is ‘highly perceptible’*
- *Intermittency – +3 dB if the intermittency is readily distinctive against the residual acoustic environment*

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- Other sound characteristics – where the specific sound features characteristics that are neither tonal nor impulsive, nor intermittent, though otherwise are readily distinctive against the residual acoustic environment, a penalty of +3 dB can be applied.

It must be noted that as the rating level is determined at the closest noise sensitive receptor, the acoustic feature corrections should be applied based on the level at receptor location, not at source. This is particularly relevant when noise propagation characteristics cause differences in sound reduction at various frequency bands.

Note that the assessment reference periods that should be considered for daytime and night-time, as defined within the standard, are:

- One hour period for a sound source operating during daytime hours (07:00-23:00 hours)
- Fifteen-minute period for a sound source operating during the night-time (23:00-07:00 hours)

ES Acoustics Notes regarding Context:

The notes presented below are informed by the BS 4142:2014+A1:2019 Technical Note prepared by the Association of Noise Consultant Good Practice Working Group. Assessment context is often misunderstood or applied incorrectly, and the notes are therefore presented to provide a clear picture on what aspects of context should be considered when assessing the overall impact of a particular scenario:

Subclause 11(1)

The second paragraph notes that absolute levels may be as, or more, important than relative outcomes where background and rating levels are low. It is important to note that both background and rating levels would need to be low for this particular caveat to apply.

BS 4142 does not indicate how the initial estimate of impact should be adjusted when background and rating levels are low, only that the absolute levels may be more important than the difference between the two values. It is likely that where the background and rating levels are low, the absolute levels might suggest a more acceptable outcome than would otherwise be suggested by the difference between the values. For example, a situation might be considered acceptable where a rating level of 30dB is 10dB above a background sound level of 20dB, i.e. an initial estimate of a significant adverse impact is modified by the low rating and background sound levels. However, there may be situations where the opposite is true, and it is for the assessor to justify any modifications to the initial estimate of impact.

BS 4142 does not define 'low' in the context of background sound levels nor rating levels. The note to the Scope of the 1997 version of BS 4142 defined very low background sound levels as being less than about 30 dB L_{A90} , and low rating levels as being less than about 35 dB $L_{A,T,r}$. We would consider that similar values would not be unreasonable in the context of the current edition of BS 4142.

The third paragraph states that "where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts".

POLICY, STANDARDS AND GUIDANCE REVIEW

In the ordinary application of BS 4142 the residual sound level is not compared with the background sound level to determine the level of impact. The third paragraph is therefore taken to mean that the level of impact caused by the residual level has been determined by professional judgement or with reference to another document, such as the Noise Insulation Regulations 1975 (as amended 1988). Where professional judgement is used, it should be appropriately justified.

Where the residual sound levels are very high, a significant adverse impact might be declared in a situation where the rating level exceeds the background sound level by, say, 4dB, i.e. since the residual sound levels are already considered to cause a significant impact, any worsening of the situation would be considered a significant adverse impact, even if the difference between the rating level and background sound level would not suggest this to be the case.

Subclause 11(2)

The second aspect of context described in BS 4142 relates to the character and level of the specific sound. In essence, whether or not the character of the sound is distinguishable from the character of the ambient or residual acoustic environment or is incongruous.

BS 4142 does not provide instruction as to how to treat the assessment outcomes in these circumstances, nor does it explain how to distinguish between this contextual consideration and the process for applying rating penalties. The latter is itself informed by the distinctive characteristics of the specific sound in the context of the residual sound environment.

Where character-based contextual matters are taken into account, the assessor should make it clear how these matters are distinct from those that informed the rating level corrections, and what the implications of these further character assessments should be. For example; new deliveries on an estate entailing rating penalties for reversing alarms and impulsive noise but these types of noise are already present at other existing premises, so contextually the impact is reduced. Conversely, where the residual level is largely comprised of natural sounds, such as the sea or birdsong, so the impact from the specific source might be increased.

Subclause 11(3)

The third contextual matter described in Clause 11 relates to the receptor itself. It is important to note that the *reference at the start of this section of BS 4142 to 'the sensitivity of the receptor' refers to a generic receptor type, i.e. a dwelling, and not to the particular attitudes or responses of a particular person (although if the residential receptor type is specific it may have a bearing e.g. student accommodation).*

The ANC working group notes that this part of BS 4142 allows the internal noise environment to be considered, despite BS 4142 excluding such matters from its Scope (Subclauses 1.1, 1.2 and 1.3). The working group considers that the consideration of the internal noise environment is only valid in a BS 4142 assessment where it relates to the contextual elements of the assessment.

APPENDIX B

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BS 8233: 2014 'Guidance on sound insulation and noise reduction for buildings'

Table 4 of BS 8233:2014 (reproduced below) provides guidance on recommended internal ambient noise levels in residential spaces based on World Health Organisation (WHO) research.

Room	Daytime (07:00-23:00)	Night-time (23:00-07:00)
Living Room	≤ 35 dB $L_{Aeq,16hr}$	N/A
Dining Room	≤ 40 dB $L_{Aeq,16hr}$	N/A
Bedroom	≤ 35 dB $L_{Aeq,16hr}$	≤ 30 dB $L_{Aeq,8hr}$

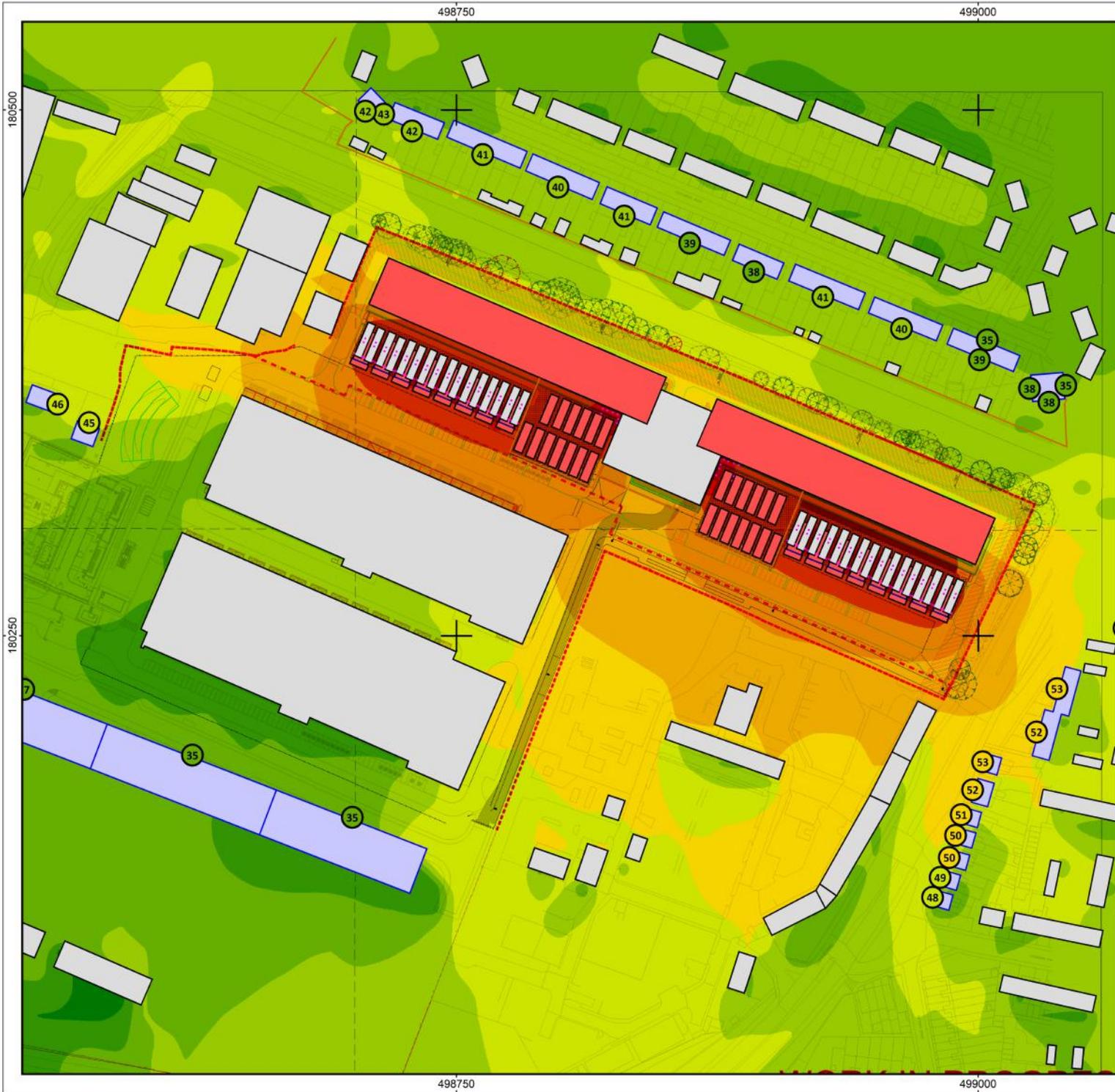
Table 2 BS 8233:2014 indoor ambient noise levels for dwellings

Whilst it is accepted that the levels presented above are for steady external noise sources without a specific character, the guidance provides useful context as to what acceptable internal noise levels are in an ideal situation.

The standard suggests that lower noise limits might be appropriate in cases where noise sources contain a specific character, however it doesn't not specify how such limits should be applied.

APPENDIX C

NOISE MAPS



Customer: Yondr Group
 Project: Lon1 - Building C
 Project-No. 20309



Map 1

Daytime Noise Map (07:00-23:00)

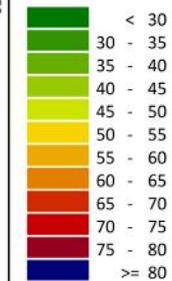
(All plant ON)

Calculation in 1.5 m above ground

Project engineers: Daniel Green MIOA & Duncan Arkley MIOA
 Created: 28/02/2024
 Processed with SoundPLAN 8.2, Update 09/11/2022

Levels Lday

in dB(A)

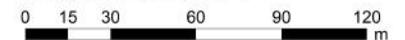


Legend

- Residential Receptor
- Building
- Noise Source Type 1
- (generators, chillers, datacentre, etc)
- Noise Source Type 2
- (point sources such as condensers, etc)
- Wall / Fence
- Facade Point

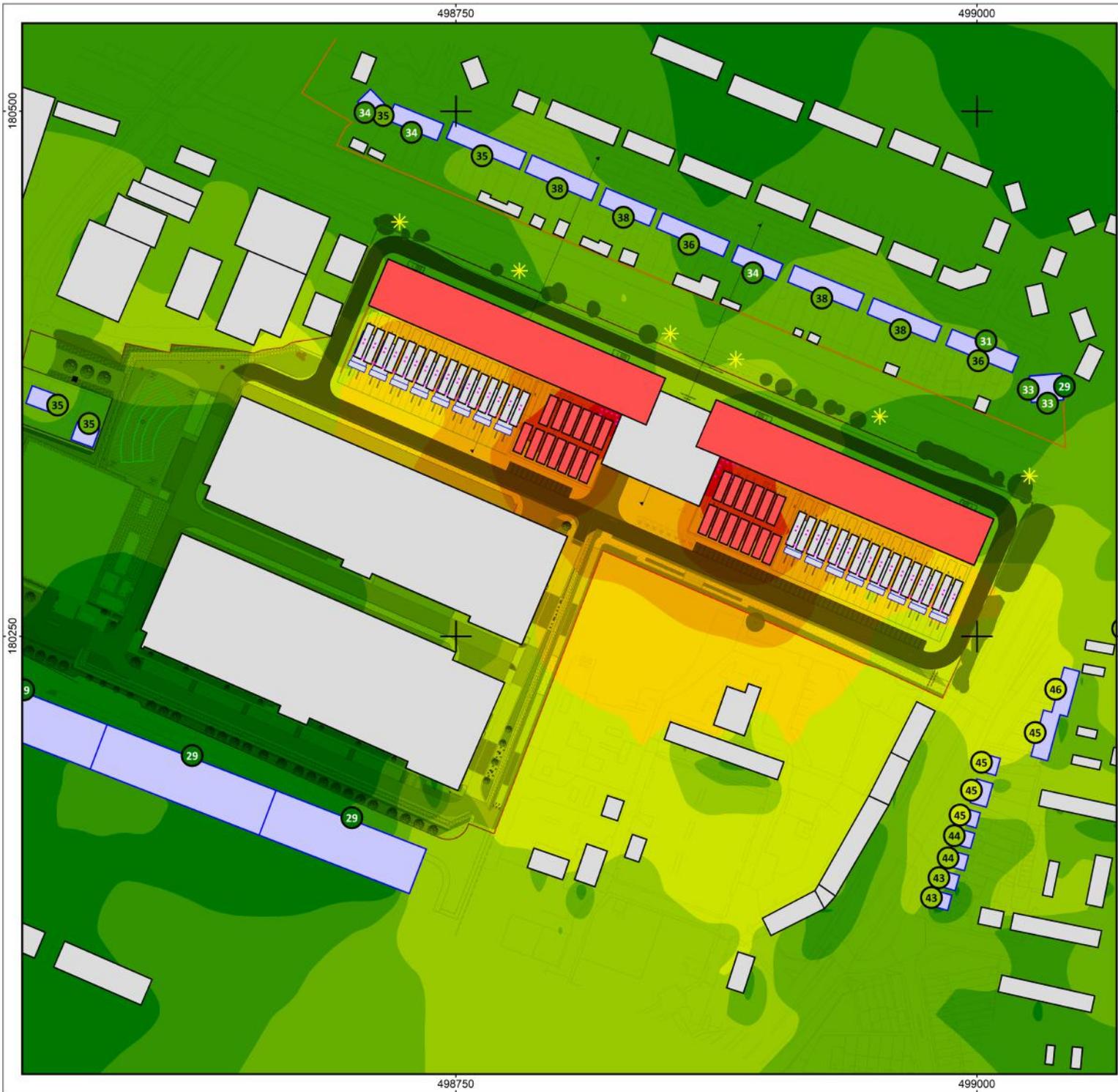


Length scale 1:1874



Noise Modelling
 & Map Prepared By:





Customer: Yondr Group
 Project: Lon1 - Building C
 Project-No. 20309

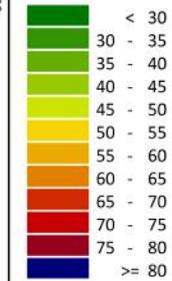


Map
2

Daytime Noise Map (07:00-23:00)
 (All 'normally operating plant' ON, generators OFF)
 Calculation in 1.5 m above ground

Project engineers: Daniel Green MIOA & Duncan Arkley MIOA
 Created: 28/02/2024
 Processed with SoundPLAN 8.2, Update 09/11/2022

Levels Lday
 in dB(A)

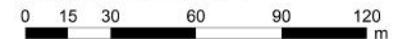


Legend

- Residential Receptor
- Building
- Noise Source Type 1
- (generators, chillers, datacentre, etc)
- * Noise Source Type 2
- * (point sources such as condensers, etc)
- Wall / Fence
- Facade Point

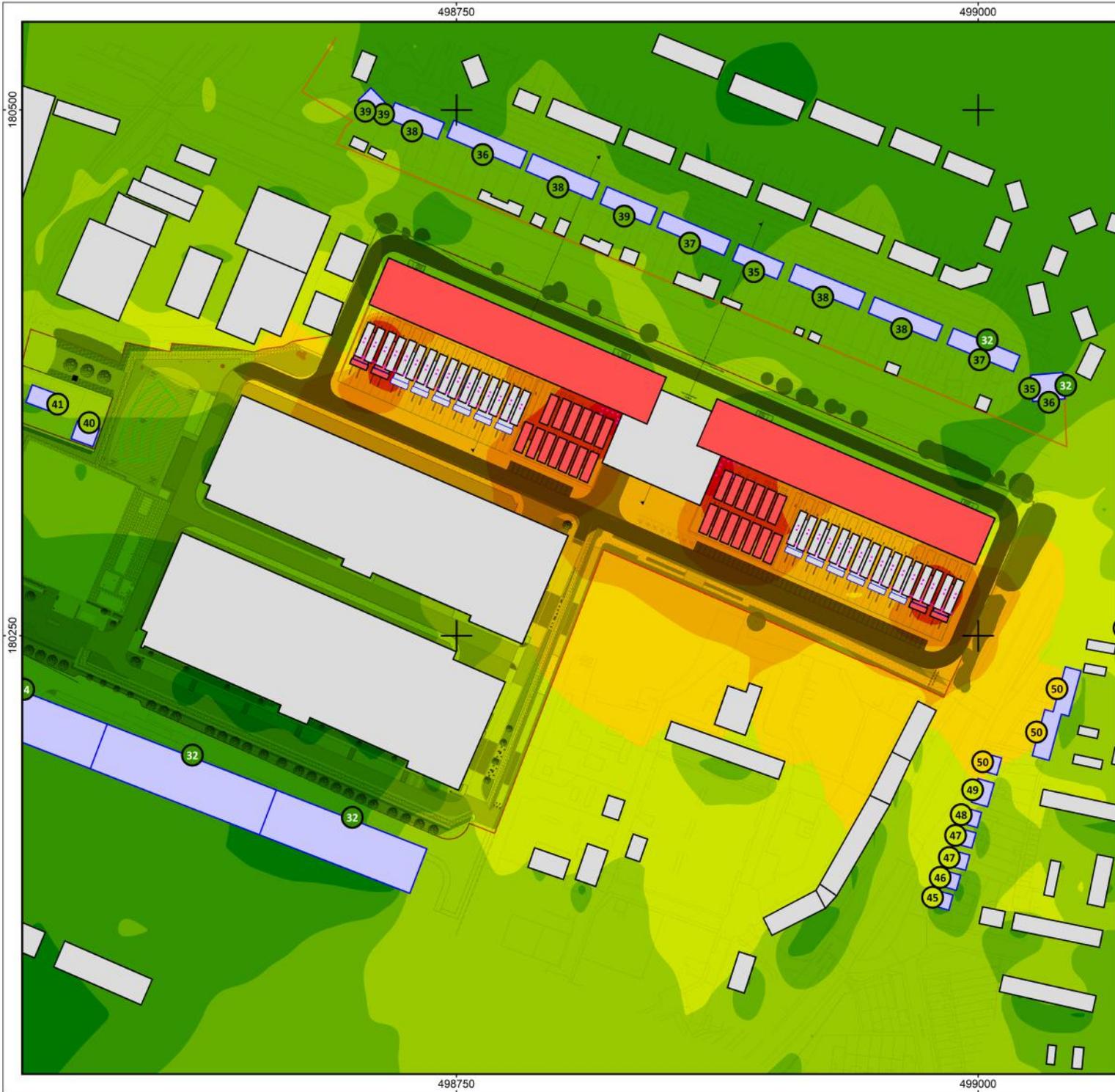


Length scale 1:1874



Noise Modelling
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Customer: Yondr Group
 Project: Lon1 - Building C
 Project-No. 20309

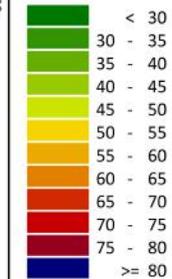


Map
3

Daytime Noise Map (07:00-23:00)
 (All 'normally operating plant' ON, generator testing at outer edges)
 Calculation in 1.5 m above ground

Project engineers: Daniel Green MIOA & Duncan Arkley MIOA
 Created: 19/06/2024
 Processed with SoundPLAN 8.2, Update 09/11/2022

Levels Lday
in dB(A)

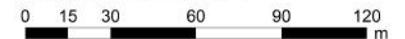


Legend

- Residential Receptor
- Building
- Noise Source Type 1
(generators, chillers, datacentre, etc)
- Noise Source Type 2
(point sources such as condensers, etc)
- Wall / Fence
- Facade Point

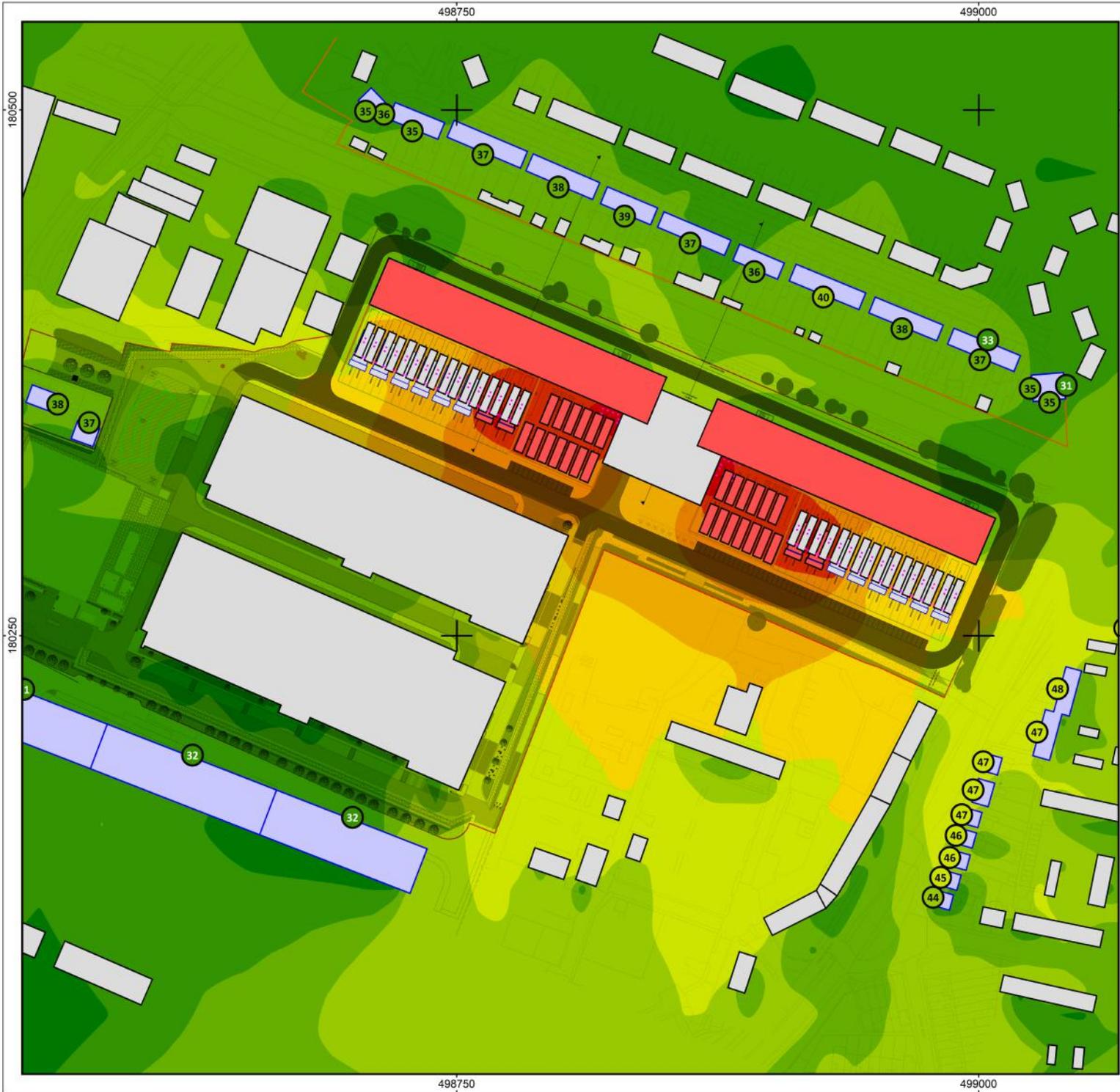


Length scale 1:1874



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Customer: Yondr Group
 Project: Lon1 - Building C
 Project-No. 20309

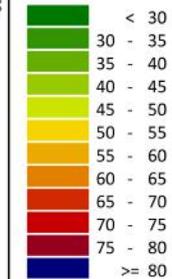


Map
4

Daytime Noise Map (07:00-23:00)
 (All 'normally operating plant' ON, generator testing at inner edges)
 Calculation in 1.5 m above ground

Project engineers: Daniel Green MIOA & Duncan Arkley MIOA
 Created: 19/06/2024
 Processed with SoundPLAN 8.2, Update 09/11/2022

Levels Lday
in dB(A)

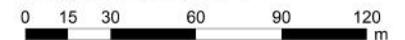


Legend

- Residential Receptor
- Building
- Noise Source Type 1
(generators, chillers, datacentre, etc)
- Noise Source Type 2
(point sources such as condensers, etc)
- Wall / Fence
- Facade Point

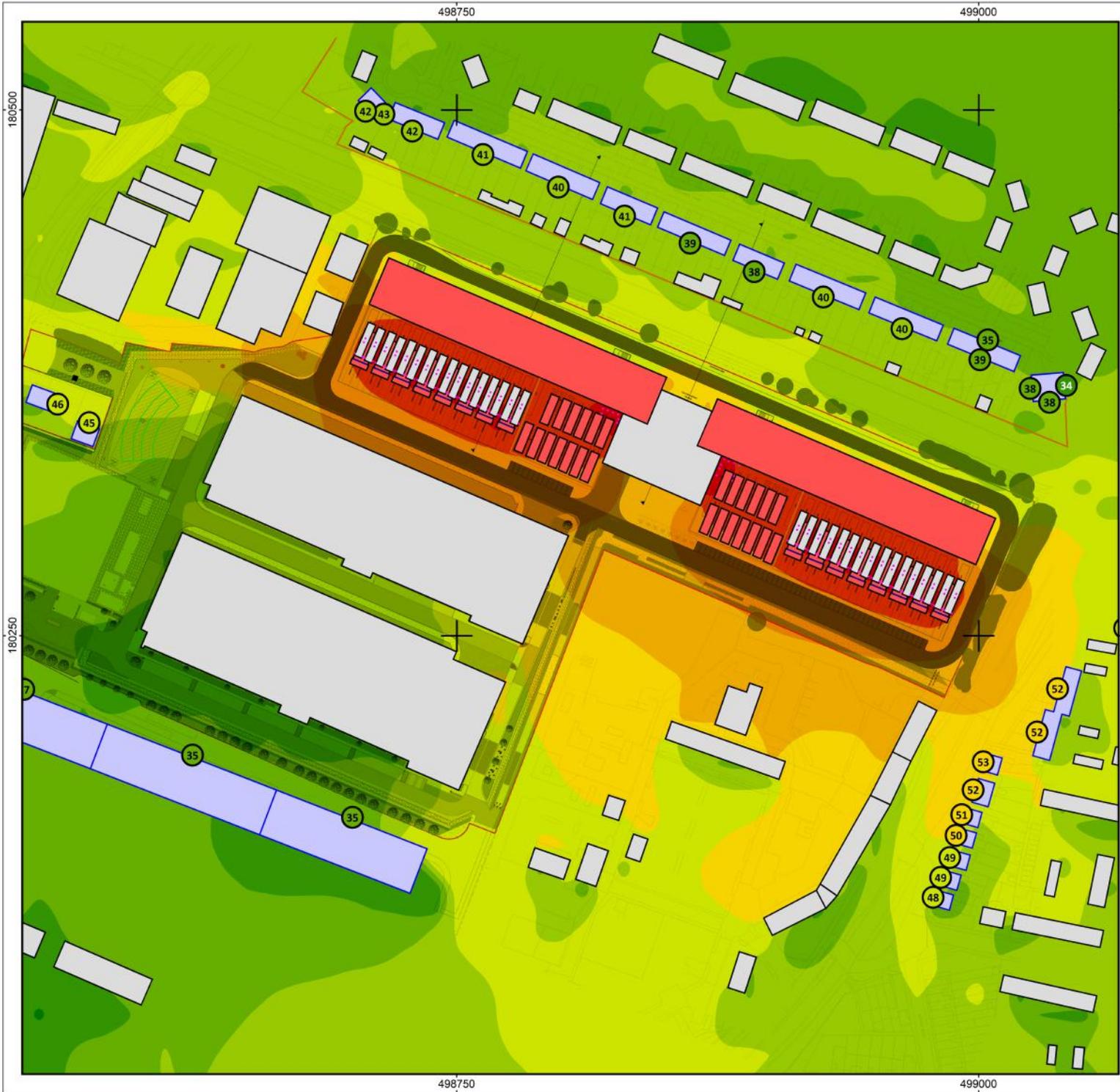


Length scale 1:1874



Noise Modelling
& Map Prepared By:





Customer: Yondr Group
 Project: Lon1 - Building C
 Project-No. 20309

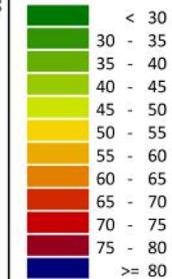


Map
5

Night-time Noise Map (23:00-07:00)
(All plant ON, chillers in night set-back mode)
 Calculation in 1.5 m above ground

Project engineers: Daniel Green MIOA & Duncan Arkley MIOA
 Created: 28/02/2024
 Processed with SoundPLAN 8.2, Update 09/11/2022

Levels Night
in dB(A)

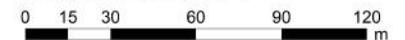


Legend

- ▭ Residential Receptor
- ▭ Building
- ▭ Noise Source Type 1
- ▭ (generators, chillers, datacentre, etc)
- * Noise Source Type 2
- * (point sources such as condensers, etc)
- Wall / Fence
- Facade Point

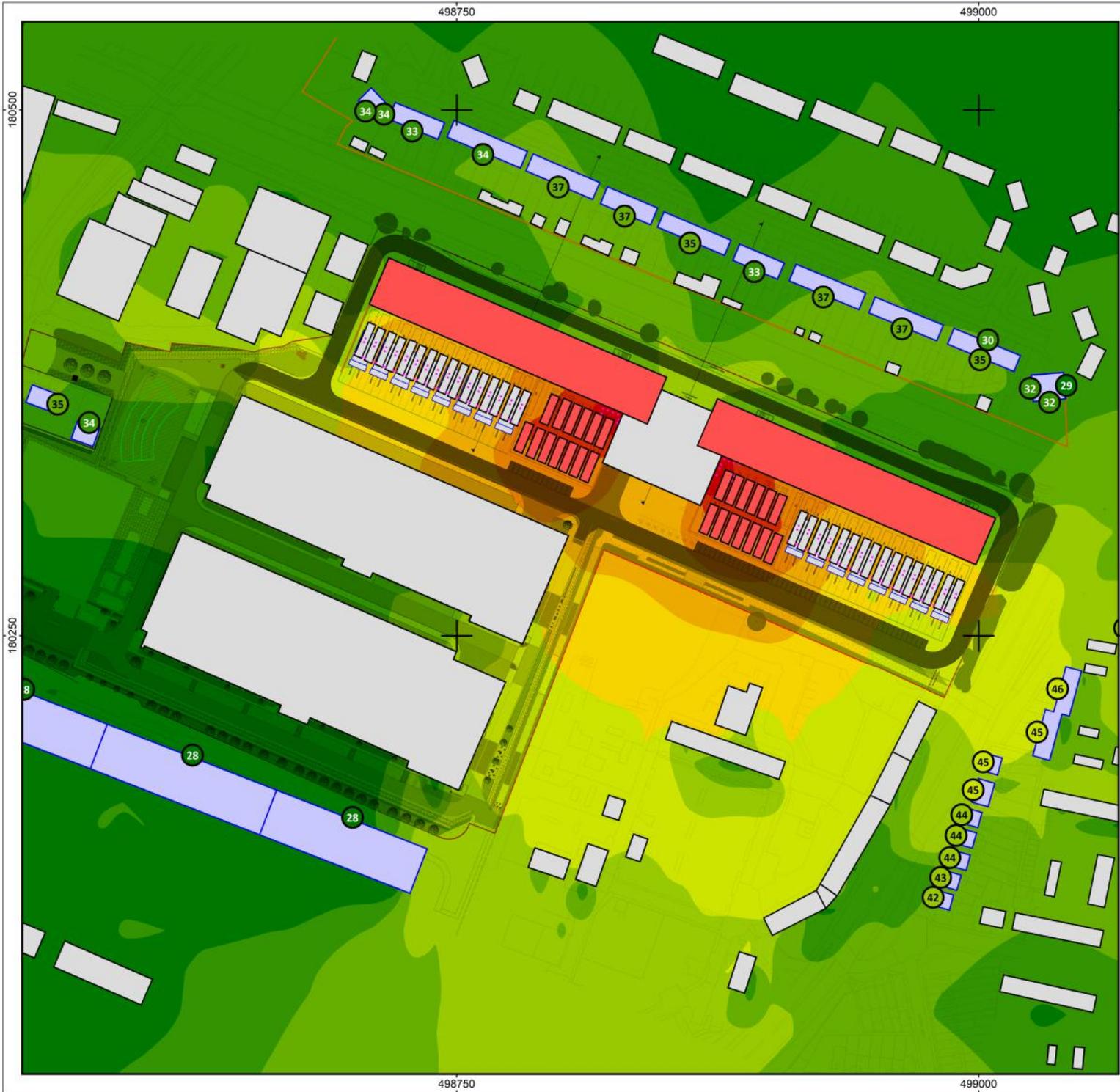


Length scale 1:1874



Noise Modelling
& Map Prepared By:





Customer: Yondr Group
 Project: Lon1 - Building C
 Project-No. 20309

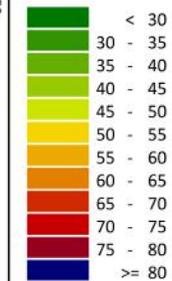


Map
6

Night-time Noise Map (23:00-07:00)
 (All 'normally operating plant' ON, chillers in night set-back mode, generators OFF)
 Calculation in 1.5 m above ground

Project engineers: Daniel Green MIOA & Duncan Arkley MIOA
 Created: 28/02/2024
 Processed with SoundPLAN 8.2, Update 09/11/2022

Levels Night
in dB(A)

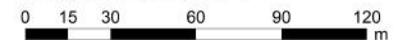


Legend

- ▭ Residential Receptor
- ▭ Building
- ▭ Noise Source Type 1
- ▭ (generators, chillers, datacentre, etc)
- Noise Source Type 2
- (point sources such as condensers, etc)
- Wall / Fence
- Facade Point



Length scale 1:1874



Noise Modelling
& Map Prepared By:

