



THREADNEEDLE PORTFOLIO SERVICES LTD
PROPOSED EXTERNAL PLANT INSTALLATION
SPECTRUM BUSINESS PARK, WREXHAM

NOISE IMPACT ASSESSMENT
R2202-REP01A-JW
8 June 2023

REPORT DETAILS

Project	Proposed Externally Mounted Condensing Units Unit F Spectrum Business Park Wrexham
Client	Threadneedle Pensions Ltd C/o Threadneedle Portfolio Services Ltd PO Box 3550 Swindon SN3 9AP
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SUMMARY

Red Acoustics has been commissioned by Threadneedle Portfolio Services Ltd to provide an assessment of noise impact from the proposed installation of 2no. externally mounted condensing units at Unit F, Spectrum Business Park, Wrexham.

The existing noise climate has been assessed at a position representative of the nearest noise sensitive receptor and target noise levels set in line with published guidance and typical Local Authority criteria.

This report presents the results of noise propagation modelling predictions at the proposed location based on manufacturer supplied plant noise data.

Compliance with the recommended target criteria is expected without the need for additional noise mitigation based on the indicative plant specification provided by the project M&E engineer.

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1.0 INTRODUCTION

Red Acoustics has been commissioned by Threadneedle Portfolio Services Ltd to provide an assessment of noise impact from the proposed installation of 2no. externally mounted condensing units at Unit F, Spectrum Business Park, Wrexham.

Red Acoustics has been commissioned by Threadneedle Portfolio Services Ltd to conduct the following assessments:

- Assess the existing background noise climate at a position representative of nearby noise sensitive receptors.
- Based on the measured existing background sound levels, determine target noise limits for the proposed externally mounted mechanical plant items.
- Prepare a 3D computer noise propagation model to predict the impact of environmental noise from the proposed mechanical plant items.
- Advise as necessary on the level of mitigation required to achieve target limits to enable approval to be sought from the Local Planning Authority for installation of the proposed mechanical plant items.

This report presents the results of an environmental noise survey and details an assessment of environmental noise impact from the proposed installation.

2.0 DETAILS OF THE PROPOSED DEVELOPMENT

The proposed plant installation is to be located within the external service yard area adjacent to the South-West elevation of the existing Unit F building which is currently unoccupied. The building is located on the Eastern Side of Spectrum Business park in a mainly commercial/industrial setting. The site location and proposed condensing unit locations are shown in Figure 2.1 below. The nearest noise sensitive premises are HMP Berwyn located to the West, on the opposite side the un-named road. The location of the nearest noise sensitive premises are also shown in Figure 2.1 below.

Figure 2.1: Site Location in Relation to Surroundings

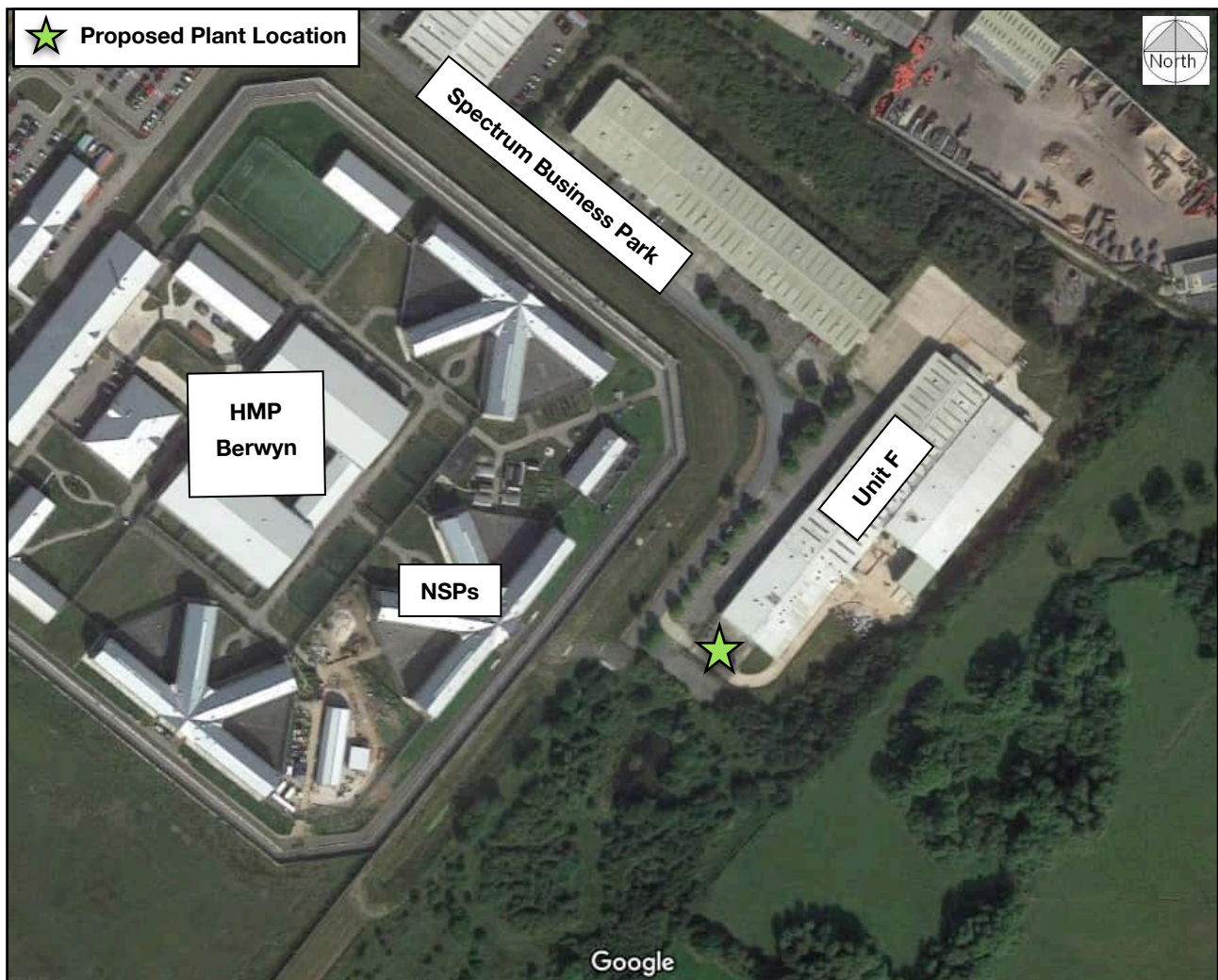
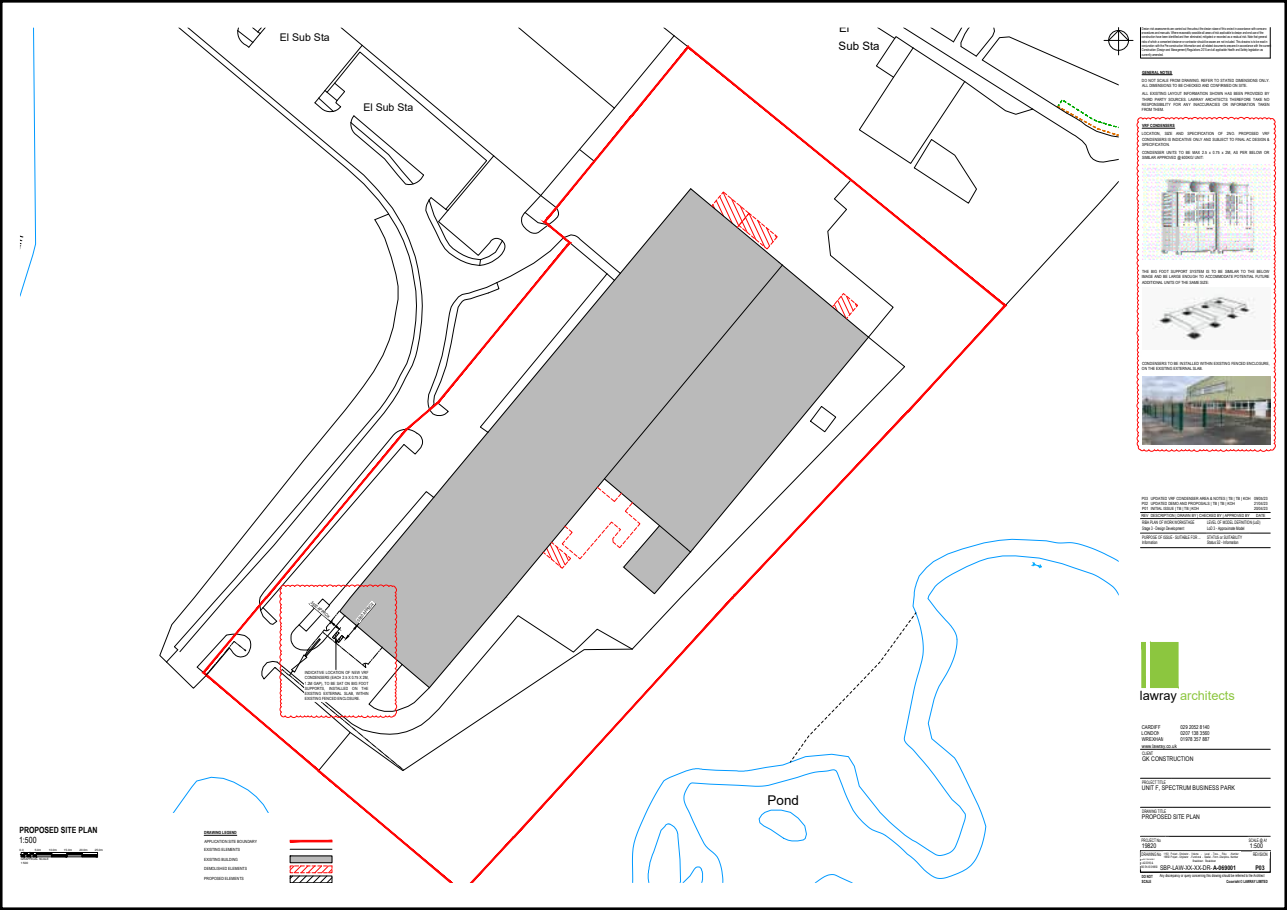


Figure 2.2 below shows drawn information provided by the client, detailing the location of the proposed condensing units.

Figure 2.2: Location of the Proposed Condensing Units



Proposed Condensing Unit

The proposal is to install 2no. free standing external condensing units. The project M&E engineer has provided an example unit for the purpose of the assessment. The example provided is a Fujitsu AJY090GALDH unit.

In order to assess the potential for noise impact to the surrounding environment, manufacturer supplied broadband sound power level data has been used (Octave band data is not published/available at the time of writing). Information provided by the project M&E engineer advises that the plant items each have a broadband sound power level of 79dBA.

Typical Condensing Unit Hours of Operation

Although proposed hours of operation are not known at the time of writing, the assessment below includes an assessment for daytime and night-time periods for completeness, and to allow for potential future 24 hour use.

Specific plant operational hours have not yet been confirmed by the project M&E engineer however, daytime and night time period target noise levels have been determined through environmental noise measurements for the purpose of the assessment.

3.0 PLANNING POLICY & DESIGN TARGETS

Planning Policy Wales

Planning Policy Wales (PPW) Edition 11¹ is the latest version of PPW and was published in February 2021². The document sets out the context for planning in Wales and outlines the main policy objectives and principles. PPW emphasises sustainability as a key driver in land use planning and introduces the concept of placemaking.

PPW introduces four themes into the Welsh land use planning framework:

- Strategic and Spatial Choices
- Active and Social Places
- Productive and Enterprising Places
- Distinctive and Natural Places

PPW outlines policy on the main issues affecting development planning in Wales such as housing, transport, commercial and retail use, energy, minerals, infrastructure and services, economic development, electronic communications, tourism, biodiversity, environmental risk, coastal issues, the historic environment and recreation.

The Welsh National Development Framework (NDF) is Future Wales: the National Plan 2040 (Future Wales)³ which was published in February 2021. The document sets out a 20 year land use framework which forms a material consideration in planning decision making and local planning policy must be produced in line with the framework.

Both PPW and Future Wales are supported by Technical Advice Notes (TANs) which are intended to provide detailed guidance on specific technical issues such as noise.

¹ Planning Policy Wales Edition 11 February 2021 - Welsh Government: https://www.gov.wales/sites/default/files/publications/2021-02/planning-policy-wales-edition-11_0.pdf

² The Planning Series 1 - National planning policy December 2021 - Welsh Parliament: <https://senedd.wales/media/w1bdruqf/21-27-national-planning-policy.pdf>

³ Future Wales: the National Plan 2040 February 2021 - Welsh Government <https://www.gov.wales/sites/default/files/publications/2021-02/future-wales-the-national-plan-2040.pdf>

Welsh planning policy in relation to Noise makes reference to TAN 11: Noise 1997⁴. The document provides advice to planners on how the planning system can be used to minimise the impact of noise without placing unreasonable demands on business or unreasonable restrictions on development.

With regard to development control for noise generating development (as in the case of the development considered in this noise impact assessment), local planning authorities must ensure that noise generating development does not cause an unacceptable degree of disturbance.

To achieve this, reasonable and proportionate measures to limit the impact of new noise sources may include:

- Engineering - Reduction of noise at its source such as using quieter machinery, containment of noise or screening using barriers.
- Layout - Adequate distance between sources and receivers and adoption of the principle of good acoustic design to make use of site layout and features to minimise noise impact.
- Administration - Managing activities in terms of limits on produced noise or hours of operation.

Although TAN 11 discusses noise impact in a number of scenarios, the relevant scenario to this noise impact assessment is that of noise from industrial and commercial developments. Paragraph B17 in Appendix B of TAN 11 makes reference to the appropriate British Standard BS4142, though this document has been updated since the 1990 version referenced specifically.

BS4142:2014+A1:2019 is the most up to date version of the British Standard referred to in Tan 11 and as the relevant method of assessing noise in the specific scenarios considered in this noise impact assessment, this is discussed in more detail below.

⁴ Planning Guidance (Wales) Technical Advice Note (Wales) 11, Noise - October 1997 - Welsh Government <https://www.gov.wales/sites/default/files/publications/2018-09/tan11-noise.pdf>

British Standard 4142

BS 4142:2014+A1:2019⁵ presents methods for rating and assessing the potential impact of commercial and industrial sound upon noise sensitive receptors. In order to assess impact using BS 4142, the Rating Level of the new sound source is compared with the existing contextual Background Sound Level.

- Typically, the greater this difference, the greater the magnitude of the 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 Rating Level is determined by assessing the Ambient Sound Level, distinguishing the Specific Sound Level from the Residual Sound Level and applying any sound specific penalties for acoustic features that would subjectively cause the sound to be perceived differently.

The Specific Sound Level of the commercial / industrial sound source is determined by either; measurement or calculation with regard to the appropriate reference time interval (for daytime or night-time periods). The standard requires separate analysis for daytime and night-time periods, evaluating the Rating Level over an appropriate reference time interval (T_r) of: 1hr for daytime (07:00 - 23:00 hrs) and 15min for night time (23:00 - 07:00 hrs). The Specific Sound Level is defined as equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T (determined either by calculation or deducting the measured Residual Sound Level from the measured Ambient Sound Level).

‘Ambient sound’ is defined as the totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far (The ambient sound comprises the residual sound and the specific sound when present).

‘Residual sound’ is defined as the 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.

⁵ BS4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound

Where appropriate, a rating penalty can be applied to the specific sound level to account for the character of the sound, namely: tonality, impulsivity and intermittency. Such acoustic feature corrections can be added together linearly.

Tonality can be determined objectively (using adjacent third octave band analysis or the Joint Nordic method) or subjectively as described below:

- +2dB penalty: Just perceptible
- +4dB penalty: Clearly perceptible
- +6dB penalty: Highly perceptible

Impulsivity can be determined objectively (using Fast Fourier Transform analysis) or subjectively as described below:

- +3dB penalty: Just perceptible
- +6dB penalty: Clearly perceptible
- +9dB penalty: Highly perceptible

Where intermittency is present, a +3dB penalty can be applied. Where the acoustic feature characteristics are neither tonal nor impulsive, but are clearly distinguishable against the residual sound, a +3dB penalty can be applied.

4.0 ENVIRONMENTAL NOISE SURVEY

Environmental Noise Survey

In order to determine the prevailing environmental noise levels at the site, representative unmanned measurements were taken between 16th - 19th May 2023. The measurement location used during the survey is shown in Figure 4.1 below. This position was selected to provide a measurement at a position which is representative of background noise levels for the nearest noise sensitive receptors.

Figure 4.1: Noise Survey Measurement Location



During the measurement periods, the noise climate for the site was mainly driven by distant road traffic and noise from distant commercial uses. Figure 4.2 below shows the broadband noise survey data at the monitoring position. Figure 4.3 below shows the measured data for a typical 24 hour period. The measured data shown has been used to determine the typical background sound level during relevant periods.

Figure 4.2: Broadband Noise Survey Data

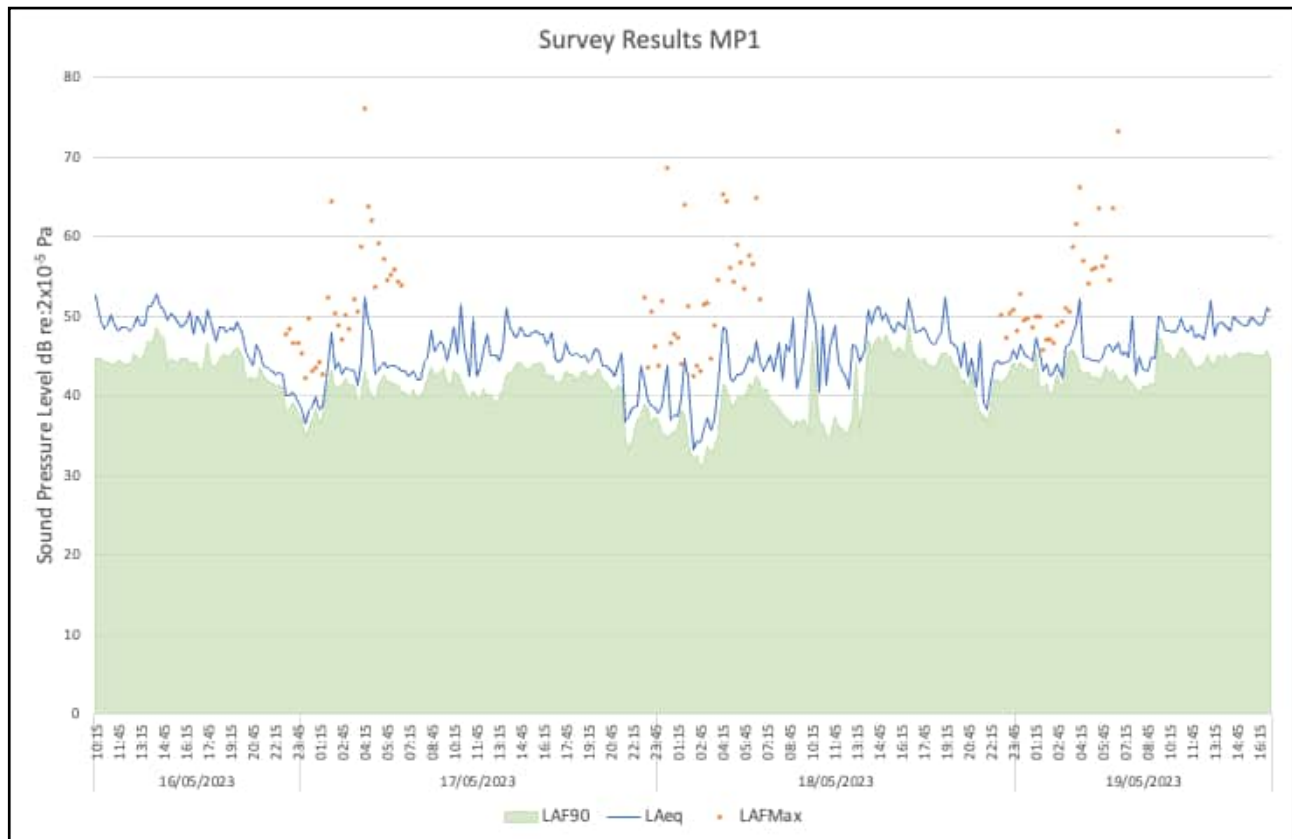
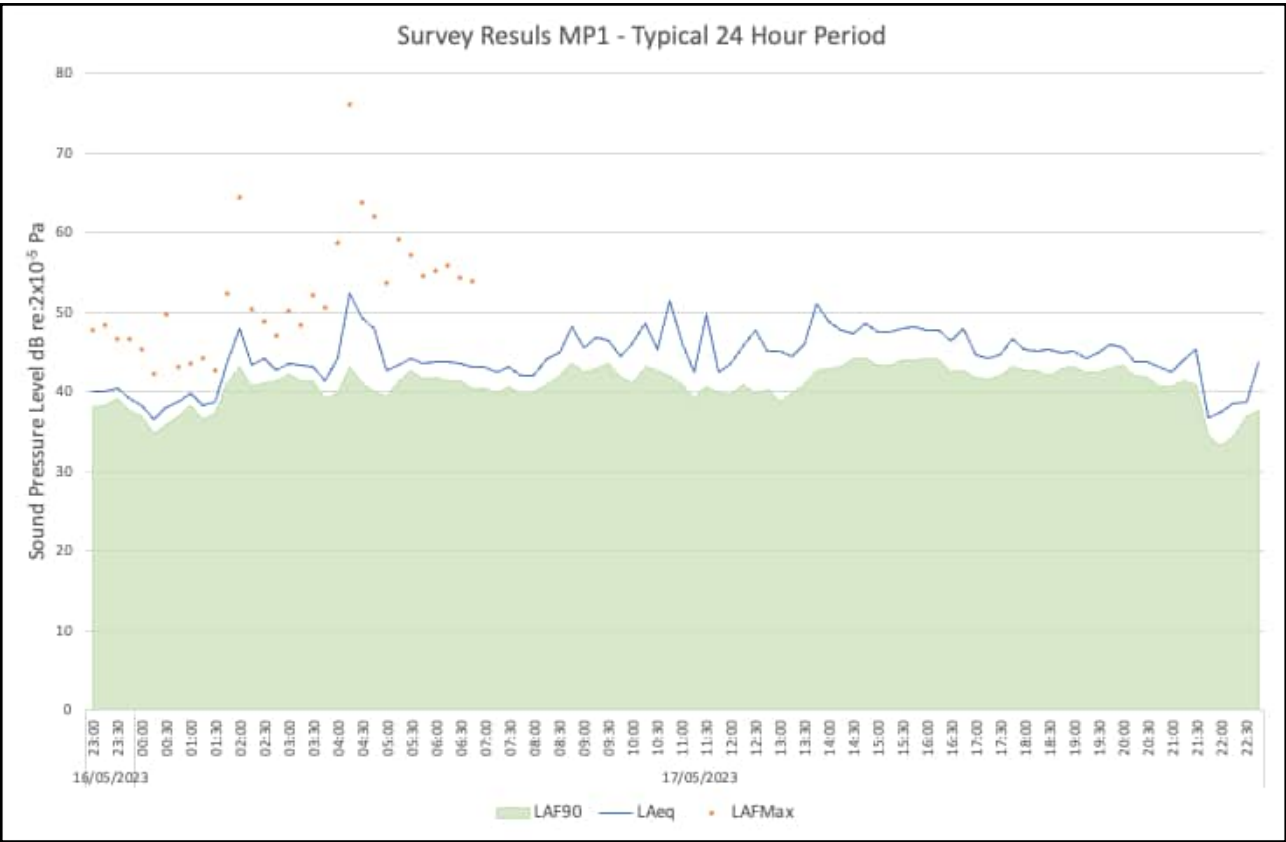


Figure 4.3: Broadband Noise Survey Data - Typical 24 Hour Period



An assessment of predicted noise impact on the nearby residential receptors is presented in section 5.0 below.

Based on the measured survey data, Table 4.1 below identifies the recommended L_{Aeq} plant noise limits for the proposed installation at the nearest noise sensitive receptors (HMP Berwyn). The assessments are based on the typical measured $L_{A90,15min}$ during the relevant periods..

Table 4.1: Plant Noise Limits at Nearest Noise Sensitive Facade

	Measured Noise Levels & Target Noise Limits			
	Day Time (07:00 - 23:00)		Night-time (23:00 - 07:00)	
Location	Typical Measured LA90, dB	Target Rating Level Noise Limit, dB LAeq	Typical Measured LA90, dB	Target Rating Level Noise Limit, dB LAeq
Nearest Noise Sensitive Facade	43	≤ 38	41	≤ 36

Target plant noise limits have been set in line with typical Local Authority requirements for a specific sound level of 5dBA below the typical LA90 background sound level during the relevant period when assessed in accordance with BS4142:2014+A1:2019.

5.0 CADNAA NOISE PROPAGATION MODELLING

To predict noise levels from the proposed external condensing unit installation to the surrounding environment and the nearest noise sensitive receptors, the latest version of CadnaA 3D noise propagation modelling software has been used, which implements the calculation procedure specified within ISO9613-2.

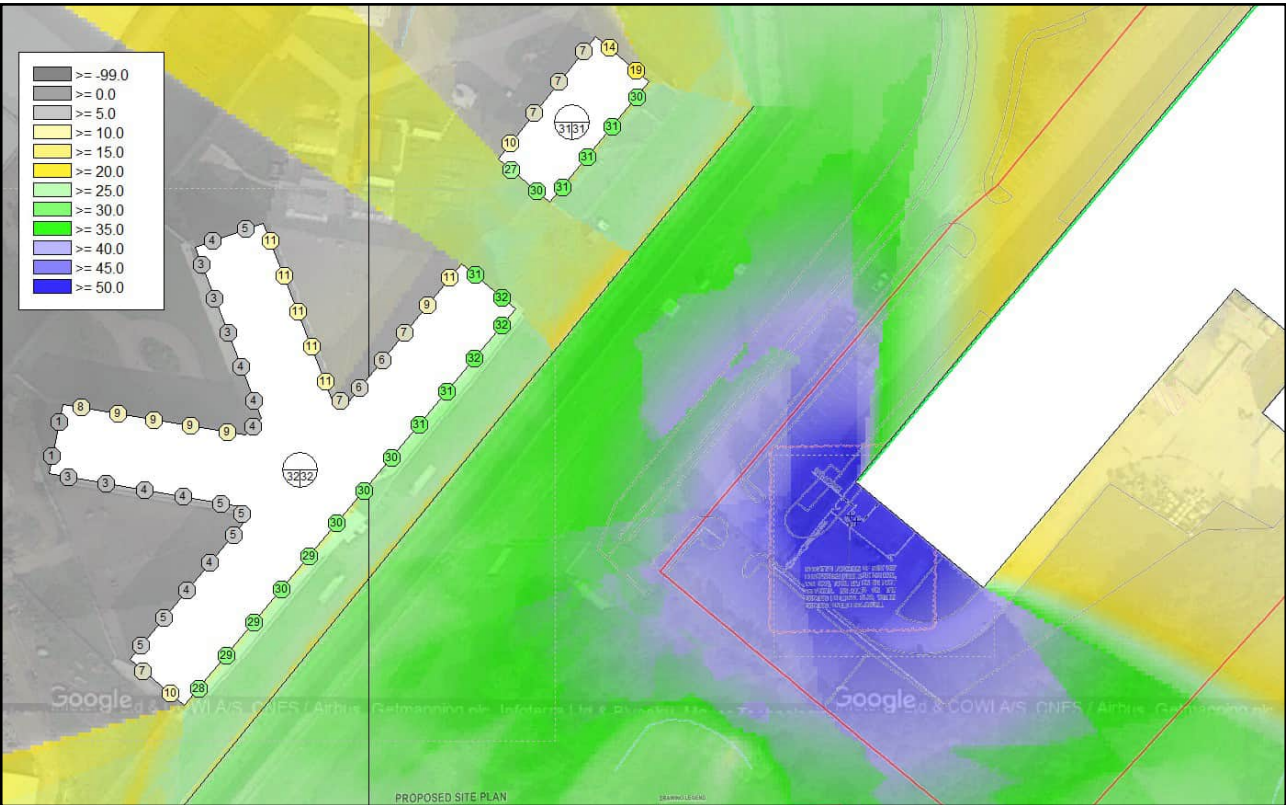
The model has been generated using the manufacturer supplied noise source sound power data presented in Section 2.0. The modelling of the surrounding environment was undertaken by modelling the existing buildings and the surroundings using Google Earth imagery and site inspection notes with ground heights set using 1m digital terrain height data obtained from the DEFRA data services platform.

Noise propagation is predicted from the proposed location of the plant installation with ground reflection set to account for conditions on site and 2 orders of reflection set within the model. Noise impact is predicted to the closest facades of the nearby noise sensitive uses with the highest predicted facade level used for the purpose of the assessment.

The results of the noise propagation modelling are presented below. Figure 5.1 below shows the grid prediction at ground floor level and the highest predicted facade levels (regardless of floor height) for the nearest noise sensitive dwellings.

The predicted level represents the Specific Sound Level in terms of BS4142:2014+A1:2019. It can be seen in Figure 5.1 below that the highest predicted Specific Sound Level at the nearest residential facade is 32dBA with both condensing units operating simultaneously. No correction for on-time has been made for a worst case assessment.

Figure 5.1: Predicted Specific Sound Level (dBA)



6.0 BS4142 PLANT NOISE IMPACT ASSESSMENT

To undertake an impact assessment on the proposed development in accordance with BS4142:2014+A1:2019, measured data at the proposed development site has been employed to determine the existing background sound level. The manufacturer supplied broadband sound power level as discussed in Section 2.0 above has been used within the CadnaA noise propagation model to predict the impact of the specific sound level to the nearest NSPs. Tables 6.1 & 6.2 below present the BS4142 assessment for the residential facades at HMP Berwyn during the daytime and night-time periods. The Rating Level has been rated against the typical measured $L_{A90,15min}$ background sound level during both periods.

Table 6.1: BS4142 Assessment Table - NSP Typical Daytime Period

	Period (07:00 - 23:00)	Commentary
Ambient Sound Level	NA	Prediction method to be used.
Residual Sound Level	NA	
Specific Sound Level (predicted from plant sound power data)	32 dBA	Typical predicted facade level.
Corrections	0 dBA	No penalty corrections as impact is not expected to be readily distinguishable in context.
Rating Level dB	32 dBA	
Typical Existing Background $L_{A90,t}$	43 dBA	
Difference	-11 dBA	
Target	-5 dBA	
Comments	No further mitigation proposed	Rating level is below target.
Conclusion	Low Impact	

Table 6.2: BS4142 Assessment Table - NSP Typical Night-time Period

	Period (23:00 - 07:00)	Commentary
Ambient Sound Level	NA	Prediction method to be used.
Residual Sound Level	NA	
Specific Sound Level (predicted from plant sound power data)	32 dBA	Typical predicted facade level.
Corrections	0 dBA	No penalty corrections as impact is not expected to be readily distinguishable in context.
Rating Level dB	32 dBA	
Typical Existing Background $L_{A90,t}$	41 dBA	
Difference	-9 dBA	
Target	-5 dBA	
Comments	No further mitigation proposed	Rating level is below target.
Conclusion	Low Impact	

It should be noted that no character penalties have been applied in relation to perceived impact of sound generated by the proposed units as specific character is not expected to readily be perceivable at the nearest NSP. This is due to the production of low impact (-9 to -11 dBA). It is however recommended that once specific plant has been specified, octave band sound power data be provided by the project M&E engineer for the specified items to confirm that the plant items meet the target noise levels and determine if tonality penalties are necessary in line with BS4142:2014+A1:2019 guidance. This assessment relates only to the external condensing units (of the example type provided by the project M&E engineer and discussed in Section 2.0 above) and the nearest residential noise sensitive property discussed. Any additional plant or activity is outside the scope of this assessment.

7.0 CONCLUSIONS

An assessment of noise impact due to the proposed installation of 2 no. externally mounted condensing units at Unit F, Spectrum Business Park, Wrexham has been undertaken to determine the likely impact to the nearest residential receptors.

Based on sound power data provided by the equipment manufacturer/project M&E engineer and an environmental noise survey to determine the typical background sound climate during the relevant operational periods, a CandaA noise propagation model has been used to assess potential noise impact.

Based on the current proposal, impact is predicted to be low and no further mitigation measures are proposed.

APPENDIX A: NOISE MEASUREMENT DETAILS

Location

Spectrum Business Park, Wrexham

Survey Date

16 - 19 May 2023 — Background Noise Survey

Weather during the relevant survey period was noted to be mainly dry with wind speeds below 5m/s

Survey Conducted By

Johnathan Whittle BSc (Hons), Pg. Dip. IOA AMIOA MCIEH

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Instrumentation

Table A1: List of Instrumentation Used

Equipment Description	Type Number	Manufacturer	Serial Number	Date of Last Calibration	Calibration Certificate Number	Calibration Due
Sound Level Meter	CR:171B Type 1	Cirrus	G300554	02-Dec-21	166932	02-Dec-23
Microphone	MK:224	Cirrus	211606D	02-Dec-21	166932	02-Dec-23
Preamplifier	MK:170	Cirrus	599	02-Dec-21	166931	02-Dec-23
Sound Calibrator	CR:515 Type 1	Cirrus	59153	12-Aug-22	1503025-7	12-Aug-23

Methodology

Before and after the measurements the sound level meter was check calibrated to an accuracy of $\pm 0.3\text{dB}$ using the sound calibrator. The calibrator produces a sound pressure level of 114 dB re 2×10^{-5} Pa @ 1kHz.

APPENDIX B: PLANT INFORMATION PROVIDED BY THE CLIENT/PROJECT M&E ENGINEER

Heat Recovery Modular Type VR-IV Series

AJY090GALDH [3Phase]



Outdoor Unit :
AJY090GALDH

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Features

- New intelligent refrigerant control
- Energy saving technology that boosted operation efficiency
- Extended connection ratio
- Additional installation without changing the main pipe
- Efficiency in actual operation
- All inverter compressor
- Multiple outdoor operation control
- Heat exchanger refrigerant control
- Flexible piping connection
- Flexible installation of RB unit

Capacity



28.0 kW



28.0 kW (Nominal) / 31.5 kW (Max.)

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Specifications

Rated Capacity Range		10 HP
Max. Number of Connectable Indoor Units*1		2 - 21
Connectable Capacity of Indoor Units		7.0 - 42.0 kW
Power Source	Phase	3 phase 3N
	Voltage	400 V
	Frequency	50 Hz
Capacity	Cooling	28.0 kW
	Nominal Heating	28.0 kW
	Max. Heating	31.5 kW
Input Power	Cooling	9.53 kW
	Heating	7.38 kW
	Nominal Heating	7.38 kW
	Max. Heating	8.96 kW
EER	Cooling	2.93 W/W
COP	Nominal Heating	3.79 W/W
	Max. Heating	3.51 W/W
Airflow Rate		11100 m³/h
Sound Pressure Level*2	Cooling	58 dB(A)
	Heating	59 dB(A)
Sound Power Level	Cooling	78 dB(A)
	Heating	79 dB(A)
Max. External Static Pressure		80 Pa
Compressor Motor Output		7.5 kW
Heat Exchanger Fin		Blue fin
Net Dimensions	Height	1690 mm
	Width	930 mm
	Depth	765 mm
Net Weight		262 kg

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Connection Pipe Diameter	Liquid	φ12.7 mm
	Discharge Gas	φ19.05 mm
	Suction Gas	φ22.22 mm
	Total Pipe Length	700 m
Max. Height Difference (Outdoor Unit: Upper/Lower)		50 / 40 m
Cooling		-10 to 46 °CDB
Operation Range	Heating	-20 to 21 °CDB
	Cooling / Heating	-10 to 21 °CDB

Note: Specifications are based on the following conditions.

Cooling: Indoor temperature of 27°CDB / 19°CWB, and outdoor temperature of 35°CDB / 24°CWB.

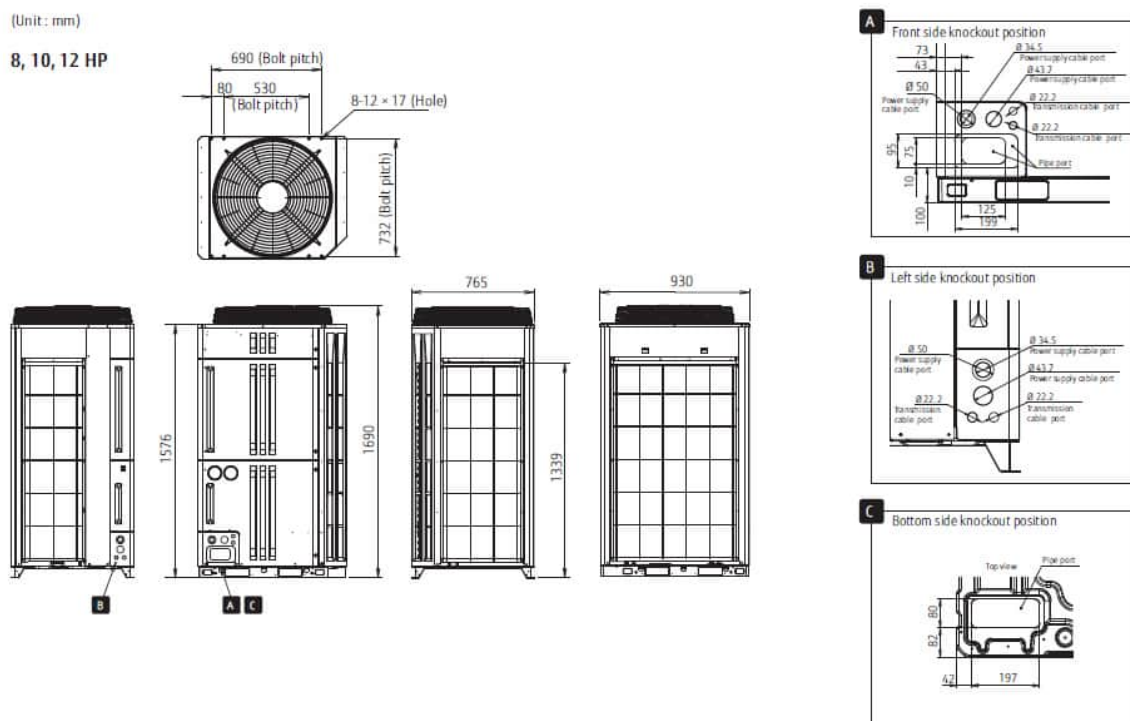
Heating: Indoor temperature of 20°CDB / (15°CWB), and outdoor temperature of 7°CDB / 6°CWB.

Pipe length:

7.5 m; Height difference between outdoor unit and indoor unit : 0 m. When cooling operation will be conducted at outdoor air temperature below -5°C, the outdoor unit must be installed in a position that is higher than or equal to those of indoor units.

Dimensions

Outdoor Unit : AJY090GALDH



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Ventilation	INFORMATION FROM FUJITSU GENERAL	Environment	
WATERSTAGE™ ATW Systems		Quality Control	
AIRSTAGE Mobile app - Global site		Patents and Technology	
FGLair app - Global site		Procurement	
		News: Press Release	