Technical Note

Date:	05 March 2024
To:	Thornton & Ross Limited
From:	Dr. Alex Stronach
Pages:	6 inc. this page
Regarding:	Application 2023/91210 – Planning Condition 6 (Noise Barriers)

Introduction

Planning permission has been granted subject to conditions for the erection of a new plant deck at Thornton and Ross Ltd, Linthwaite comprising new heating, ventilation, and air conditioning (HVAC) systems. Condition 6 of planning approval (ref: 2021/62/92779) pertains to the noise barriers proposed for the control of atmospheric noise emission levels from the proposed plant strategy and the nearest noise-sensitive receptors and states the following:

"Prior to the first operation of the plant hereby approved, full design details of the noise barriers, including location, elevations, colour, materials and acoustic specification, shall be submitted to and approved in writing by the Local Planning Authority. The barriers shall be installed in accordance with these approved details prior to the first operation of the plant hereby approved and retained as such thereafter.

Reason: In the interest of the visual amenities of the locality and residential amenity, and in accordance with Policies LP24 and LP52 of the Kirklees Local Plan and Chapters 12 and 15 of the National Planning Policy Framework."

The Discharge of Conditions Letter (ref: 2023/91210) was issued by Kirklees Council in June 2023 and states the following:

"At this time, it is not possible to discharge the requirements of condition 6 as the acoustic specification of the noise barriers is not known. The other elements submitted (design details of the noise barriers, including location, elevations, colour, materials) will not be assessed until final details of the acoustic specification are submitted.

You are invited to submit an up-to-date NIA (addendum) to address the uncertainty in the original and submitted NIA under this application (ref 2023/91210). If this results in amendments to the submitted proposed elevations and sectional elevation drawing ref AAA5581-RPS-XX-XX-DR-A-0010, this should form part of the amended submission."

This technical note has been written as an addendum to the original noise impact assessment report, prepared by RPS (ref: JAJ02698-REPT-01-R0), and outlines the methodology and results of an updated assessment of the plant noise emission levels at the nearest noise-sensitive receptors based upon the finalised design of the proposed plant deck.

Baseline Sound Survey

Full details of the original baseline sound survey can be found in the original RPS noise impact assessment report. The acoustics team at RPS undertook an additional baseline sound survey at the site in 2022 as part of the noise impact assessment works for a new effluent treatment system (application ref: 2023/62/90710).

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Full details of the survey can be found in the noise impact assessment report for the application (ref: JAJ03251-REPT-01-R0-221102[1]).

Baseline sound measurements were undertaken at a location representative of the nearest noise-sensitive receptors on Barber Row with the survey methodology and location agreed with Mr. Mohammed Nasim (Senior Technical Officer – Environmental Health) via email in October 2022.

These background sound levels have been included in the updated noise impact assessment detailed in addendum since they are more representative and recent than those outlined in the original RPS report for application 2023/91210. The measurement locations from both surveys are presented as LT1 and LT2 on Figure 1 attached to the end of this report.

The representative background sound levels at Barber Row and the other noise-sensitive receptors on Manchester Road are presented in Table 1 below for brevity and ease of reference.

Table 1: Representative background sound levels at the nearest noise-sensitive receptors

Measurement Position	Receptor	Representative Background Sound Level, $L_{A90,T}$ (dB)	
		Day (0700-2300)	Night (2300-0700)
LT1	Manchester Road	43	40
LT2	Barber Row	42	38

Proposed Installation

The noise impact assessment has been updated to include manufacturers' noise data for the proposed plant strategy. The proposed plant items and associated source noise levels (sound power levels) are set out in Table 2 below.

All sources have been modelled as point sources at the heights corresponding to the centre of the fan termination points. This corresponds to the centre of the duct termination points for the air-handling units and the centre of the discharging fans for the condenser units and chiller. This is considered a pessimistic assumption for the condensers since the condensing element which is typically situated on the side of a top-discharging unit and generates noise. However, this assumption has been adopted to inform a conservative and 'worst-case' assessment.

The 3D acoustic model has also been updated based on the following layout drawing to reflect the final layout of the plant deck:

- Plant deck layout: *1246-PIC-THR-GF-DR-M-0009 Rev P04*

The lower section of the plant deck sits at a height of 7.4 m above local ground level with the upper section (containing AHU01 and AHU02) elevated at a height of 9.5 m above local ground level.

The plant is proposed to operate continuously throughout a 24-hour period to maintain the efficiency and requirements of the pharmaceutical aspects of the site's operation.

[1] JAJ03251-REPT-01-R0-221102: https://www.kirklees.gov.uk/beta/planning-applications/search-for-planning-applications/filedownload.aspx?application_number=2023/90710&file_reference=979513

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Table 2: Plant strategy and source levels.

Reference	Plant Item	Model	Quantity	Modelled Height Above Ground Level (m)	Source	Sound Power Level, L_W, dB(A)
AHU01 & AHU02	Air-Handling Unit	Barkell Supply & Extract AHU	2	12.8	Fresh Air Intake	**91**
				12.8	Exhaust	**98**
				14.0	Casing	**78**
AHU03	Air-Handling Unit	Barkell Supply AHU	1	8.2	Fresh Air Intake	**84**
				8.9	Casing	**73**
CU01	Condenser	Airedale BluCube CUR122V35-VCO-0	8	9.2	Top Discharging Fans	**88**
CU02	Condenser	Airedale BluCube CUR092V29-VCO-0	3	9.2	Top Discharging Fans	**87**
CU03	Condenser	Mitsubishi PUZ-M100VKA	3	8.4	Side Discharging Fans	**70**
CH01	Chiller	Bluebox Tetris 2	1	9.9	Top Discharging Fans	**95**
PU01	Pump	Lowara VM Series	4	7.9	Pump	**60**

Mitigation

Atmospheric plant noise emission levels from the AHU01 and AHU02 have been controlled via the installation of the in-duct attenuators. The manufacturer's insertion loss data for the attenuators is presented in Table 3 below.

Table 3: Attenuator specification

Location	Insertion Loss (dB) at 1/1-Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
AHU01/02 Fresh Air Intake	7	10	16	21	28	19	15	10

Two barriers are also included as part of the design. These barriers are 3 m in height and are to be installed in the locations depicted in Figure 1 attached to the end of this technical note These barriers are of a lightweight construction with a superficial mass of approximately 9 kg/m^2 and comprise a steel composite panel with a louvred outer profile. The sound reduction performance of this barrier is presented in Table 4 below.

Table 4: Barrier specification

Barrier	Sound Reduction Performance (dB) at 1/1-Octave Band Centre Frequency (Hz)								R_w (dB)
	63	125	250	500	1k	2k	4k	8k	
Steel composite panel	10	14	16	20	25	29	23	20	**25**

Methodology

A 3D acoustic model has been constructed using SoundPLAN v8.2. The sources in Table 2 above have been modelled as point sources. The source levels for the fresh-air intake and exhaust terminations for the air-handling units have been corrected for the transmission losses associated with sound propagation through ducts. These include:

- **Duct losses:** Sound energy is lost as it is transferred to the duct walls.
- **Bend losses:** Sound energy is reflected as it interacts with the duct elbow.
- **End reflections:** Sound energy at low frequencies is reflected into the duct as sound travels between the duct and the atmosphere.
- **Grille directivity:** Sound energy emitted from the end of a duct is directional and thus the sound pressure level at a receptor position is dependent upon the angle of the receptor relative to the duct termination point.

The model predicts sound levels at the receptors under light down-wind conditions based on hemispherical propagation with corrections included for atmospheric absorption, ground effects, and screening. The site topography has been included in the model and the ground modelled as semi-hard with a ground factor of 0.6.

The nearest noise sensitive receptors are listed below, and their locations presented in Figure 1 at the end of this technical note.

- NSR A: Manchester Road (W)
- NSR B: Manchester Road (E)
- NSR C: Barber Row

Results & Discussion

The results of the noise modelling at the nearest noise-sensitive receptors are presented in Table 5 below. The majority of the noise sources are not considered to be tonal, intermittent, impulsive, or otherwise readily distinguishable against the existing acoustic environment in the context of BS 4142:2014+A1:2019[2]. As such, no acoustic character corrections have been applied. The exception is the pumps where the frequency content of the pump noise emission spectrum contains a tonal component around 1 kHz. However, the overall contribution of this source at the receptor is minimal and thus the tonality is unlikely to be perceptible and no acoustic character correction has been applied.

[2] British Standard 4142:2014+A1:2019 – Methods for rating and assessing industrial and commercial sound

Table 5: Noise impact assessment

Receptor	Background Sound Level, $L_{A90,T}$ (dB)		Specific Sound Level, $L_{Aeq,T}$ (dB)		Rating Level, $L_{Ar,T}$ (dB)		Difference Between Rating Level and Background Sound Level (dB)	
	Day	Night	Day	Night	Day	Night	Day	Night
NSR A	43	40	43	44	43	44	0	+4
NSR B	43	40	38	40	38	40	-5	0
NSR C	42	38	35	37	35	37	-7	-1

The guidance outlined in BS 4142:2014+A1:2019 states the following regarding the magnitude by which the rating level exceeds the background sound levels at the nearest noise-sensitive receptors:

- *"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 levels at receptors NSR B and NSR C are predicted to be equal to or less than the background sound level during both the day and night-time periods which is indicative of a low impact in terms of BS 4142:2014+A1:2019, depending on the context. This is the lowest category of impact defined by the standard.

The rating level during the daytime at NSR A is predicted to be equal to the background sound level, which is indicative of a low impact depending on the context. The night-time rating level is predicted to exceed the background sound level by +4 dB which indicates that adverse impacts have been avoided in terms of BS 4142:2014+A1:2019.

The assessment has been undertaken based on the assumption that all plant items will operate at maximum capacity 24-hours a day. However, it is more likely that the operational duty (and thereby noise emission levels) would be less during the night-time period since the external ambient temperatures would be lower. Notwithstanding the above, with the aforementioned mitigation measures in place, this noise impact assessment demonstrates that the final plant strategy will not give rise to any adverse noise impacts at the nearest noise-sensitive receptors, during the daytime and night-time periods, even with operation at maximum capacity assumed.

Summary & Conclusions

This technical note has been produced as an addendum to a noise impact assessment undertaken by RPS for the installation of a new plant deck at the Thornton & Ross facility in Linthwaite. Condition 6 of planning approval pertains to the noise barriers proposed for the control of atmospheric noise emission levels from the proposed plant strategy and the nearest noise-sensitive receptors.

An updated noise impact assessment has been undertaken in line with the guidance and methodology outlined in BS 4142:2014+A1:2019 to assess the final design, plant strategy, and mitigation measures against the existing sound climate to ensure adverse noise impacts are minimised.

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The noise assessment has comprised detailed computational noise modelling and calculations to determine the acoustic attenuation provided by various noise mitigation measures proposed as part of the design. These include in-duct attenuators for the fresh-air intake ducts of AHU01 and AHU02 as well as two acoustic barriers, both with a height of 3 m. These mitigation measures have been shown to reduce the specific sound levels generated by the site, such that adverse impact are avoided at the nearest noise sensitive receptors during both daytime and night-time periods. It is thus considered that, with the proposed mitigation measures installed across the whole site considered, the requirements of Condition 6 have been fulfilled.

Yours sincerely,

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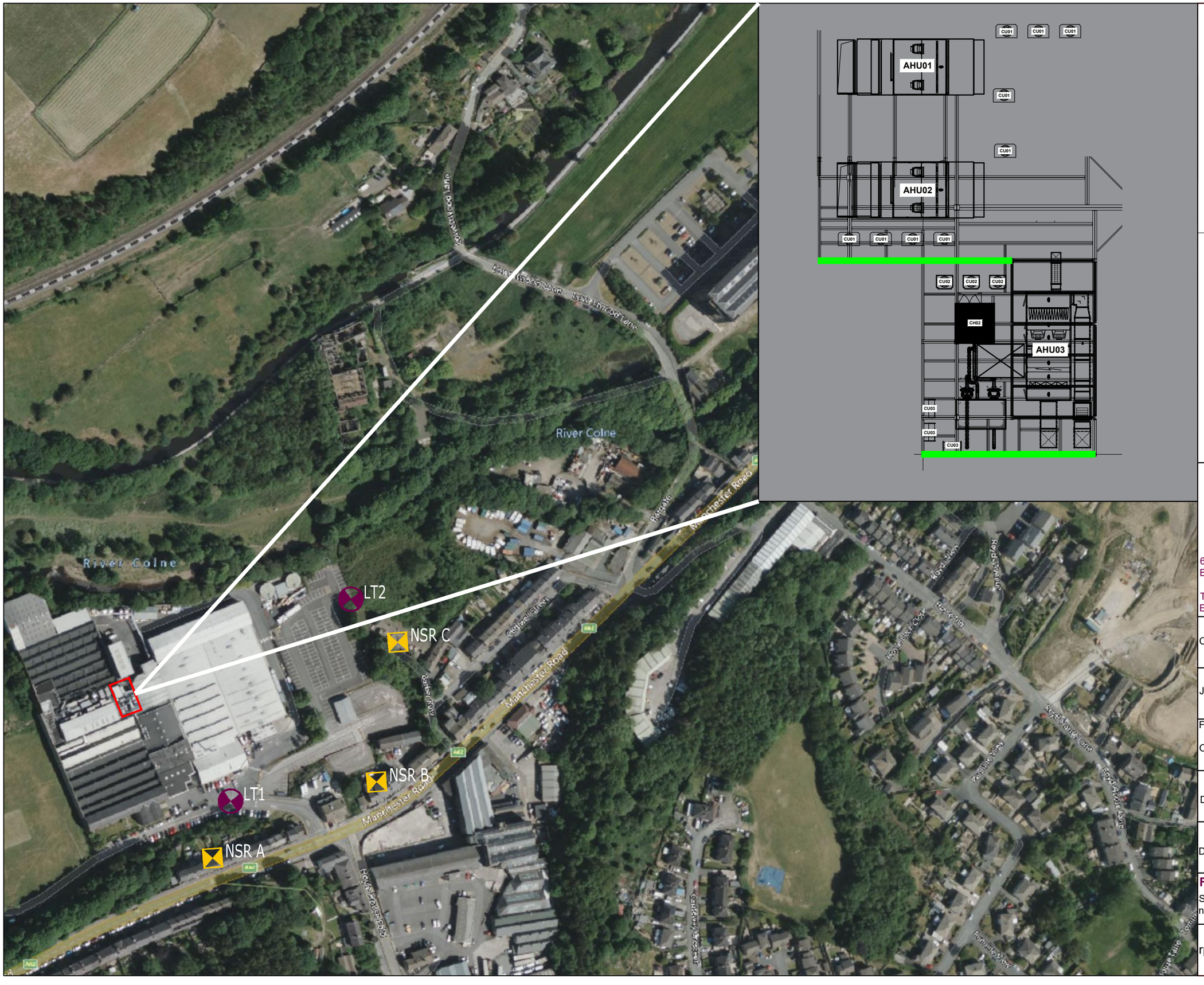

Key

- Long-Term Measurement Position
- Noise-Sensitive Receptor
- Plant Deck Location
- Acoustic Barrier

Notes

1. This drawing has been prepared in accordance with the scope of RPS' appointment with its client and is subject to the terms and conditions of that appointment. RPS accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided.
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Figure 1

Site plan showing long-term measurement positions, noise-sensitive receptors, and plant layout.

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