REPORT TITLE:

South Holland Health & Wellbeing Centre –

RIBA Stage 4 MEP Noise Impact Assessment (Planning Condition 9)

CLIENT DETAILS:

Willmott Dixon Construction

DATE:

5th May 2026

REPORT REFERENCE:

PC-23-0226-RP3-RevB

PREPARED BY:

Peter Young MSc MIOA

CHECKED/AUTHORISED BY:

Martin Jones BSc MIOA MASA

Southern Office
Oyster House, Severalls Lane
Colchester, Essex CO4 9PD
t: 0845 241 0142

Northern Office
The Axis Building, Maingate, Kingsway,
North Team Valley, Durham, NE11 0NQ
t: 0191 820 6027

info@paceconsult.co.uk
www.paceconsult.co.uk

Pace Consult Ltd Registered in England and Wales Number 05733634

Table of Contents

1. Introduction 3

2. The Site 4

2.1. Existing Site 4

2.2. Proposed Development 4

3. Planning Policy & Assessment Criteria 9

3.1. Planning Policy 9

3.2. Local Policy & Planning Conditions 12

3.3. BS 4142: 2014 + A1:2019 13

4. Noise Impact Assessment 16

4.1. MEP Noise Data 16

4.2. MEP Layout Drawings 30

4.3. Noise Modelling 37

4.4. BS 4142 Assessment Daytime 39

4.5. BS 4142 Assessment – Night-Time 41

5. Conclusions 44

Document Status and Revision Schedule

Issue/Revision	Description/Comments	Date	Prepared by	Approved by
First Issue	Checked & Authorised	15/07/25	PY	MJ
RevA	AHU noise data and calculations updated, results tables updated to reflect this	17/04/26	PY	MJ
RevB	Paragraph 4.1.6 deleted as not needed, ASHP noise data and calculations updated	05/05/26	PY	MJ

1. Introduction

1.1.1. Pace Consult was appointed and instructed by Willmott Dixon to complete a noise impact assessment from new fixed MEP equipment associated with the proposed South Holland Health & Wellbeing Centre development.

1.1.2. The development is a part new-build, part refurbishment mixed leisure and health care facility located on the site of the existing Castle Sports Centre at Albion Street, Spalding.

1.1.3. A baseline noise survey & noise impact assessment have previously been completed by Pace Consult in March 2024; the results of the survey & assessment are detailed in PC-23-0226-rp1-RevB. As part of the above, noise rating limits were established for new fixed items of MEP.

1.1.4. This technical report details the noise impact assessment of new fixed MEP equipment. It details the methodology, any assumptions (such as manufacturers noise data) and the calculations completed to assess potential noise impact.

1.1.5. Calculations have been completed using manufacturers & suppliers noise data supplied by the mechanical services engineer. SoundPLAN Ver 9.1 proprietary 3D noise modelling software has been used to calculate noise emissions and propagation from the proposed building; this software meets the requirements of ISO 9613 Acoustics - *Attenuation of sound during propagation outdoors - Part 2: General method of calculation*.

1.1.6. Assessment of the potential noise impacts arising from the site have been completed following the guidance of BS BS4142:2014 + A1:2019 *Methods for rating and assessing industrial and commercial units*.

2. The Site

2.1. Existing Site

2.1.1. The site is located on the site of the existing Castle Sports Centre at Albion Street, Spalding.

2.1.2. The closest residential dwellings to the site are immediately to the north-east on Chambers Crescent.

2.1.3. Figure 1 overleaf shows the location of the site relative the noise sources and closest noise sensitive receptors.

2.2. Proposed Development

2.2.1. The proposed development is for the construction of a part new-build, part refurbishment mixed leisure and health care facility.

2.2.2. Figure 2 overleaf shows the proposed site layout of the new development; figures 3 & 4 shows the internal floor plans.

Figure 1: Existing Site Plan

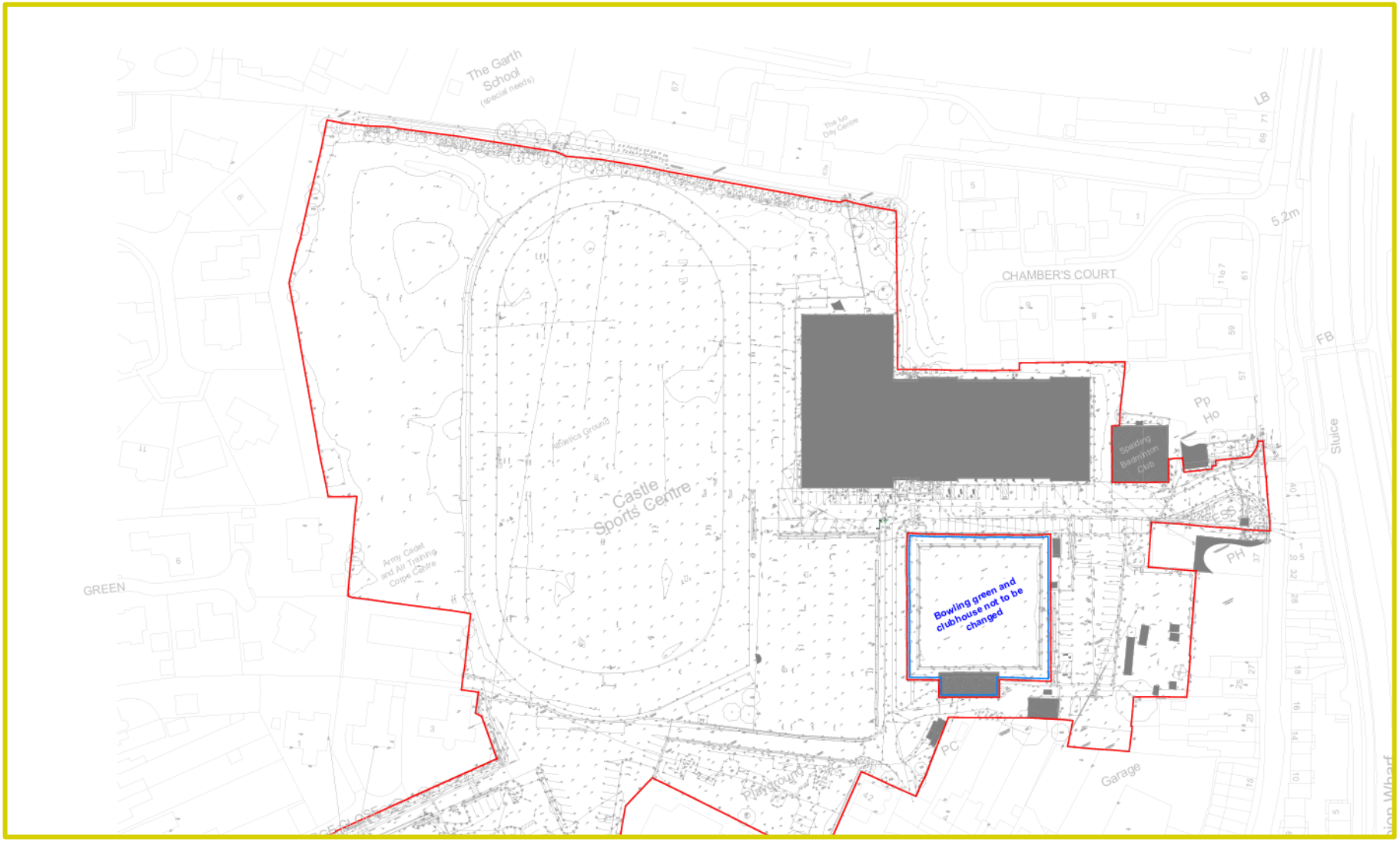


Figure 2: Proposed Site Plan

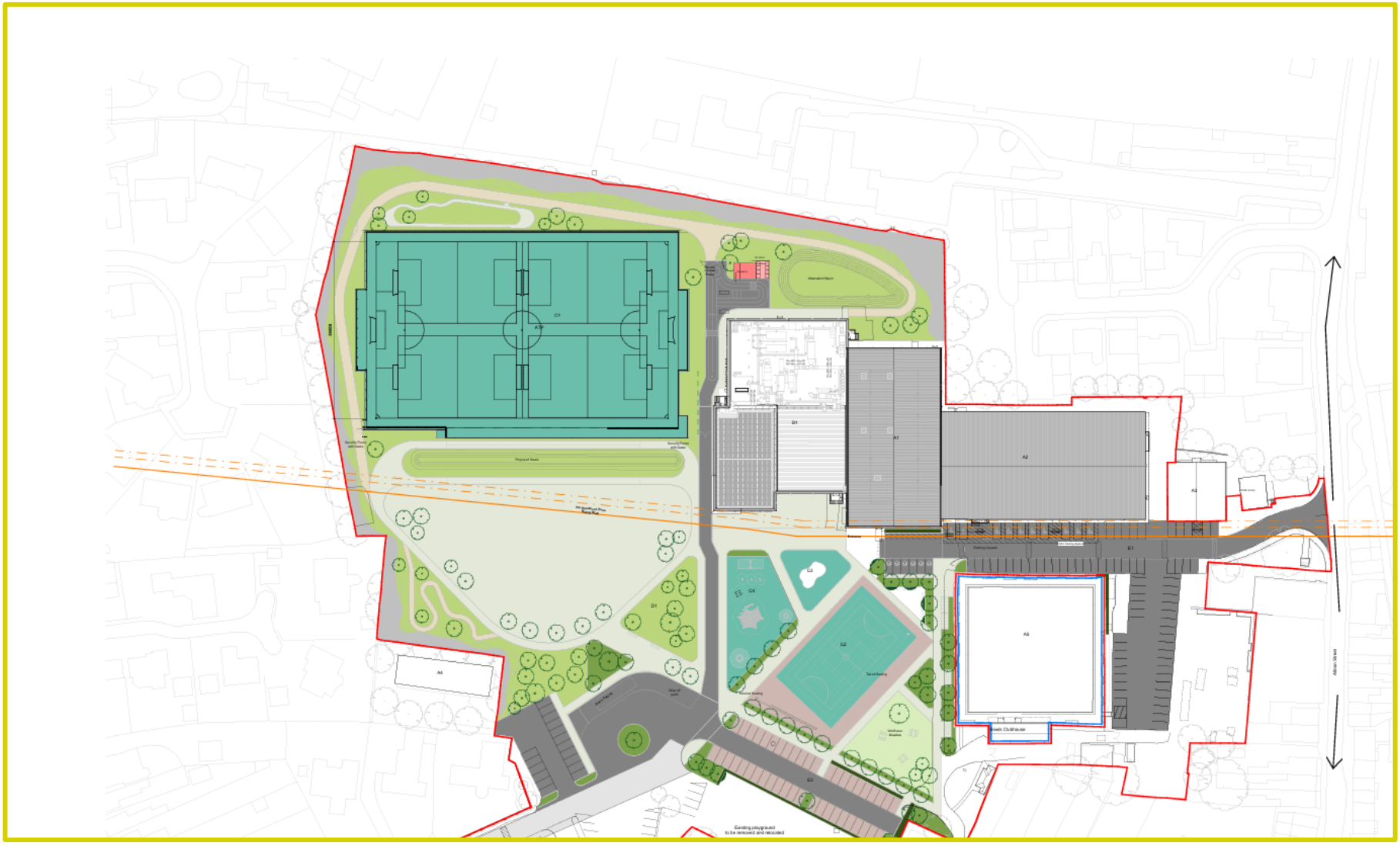


Figure 3: Ground Floor Plan

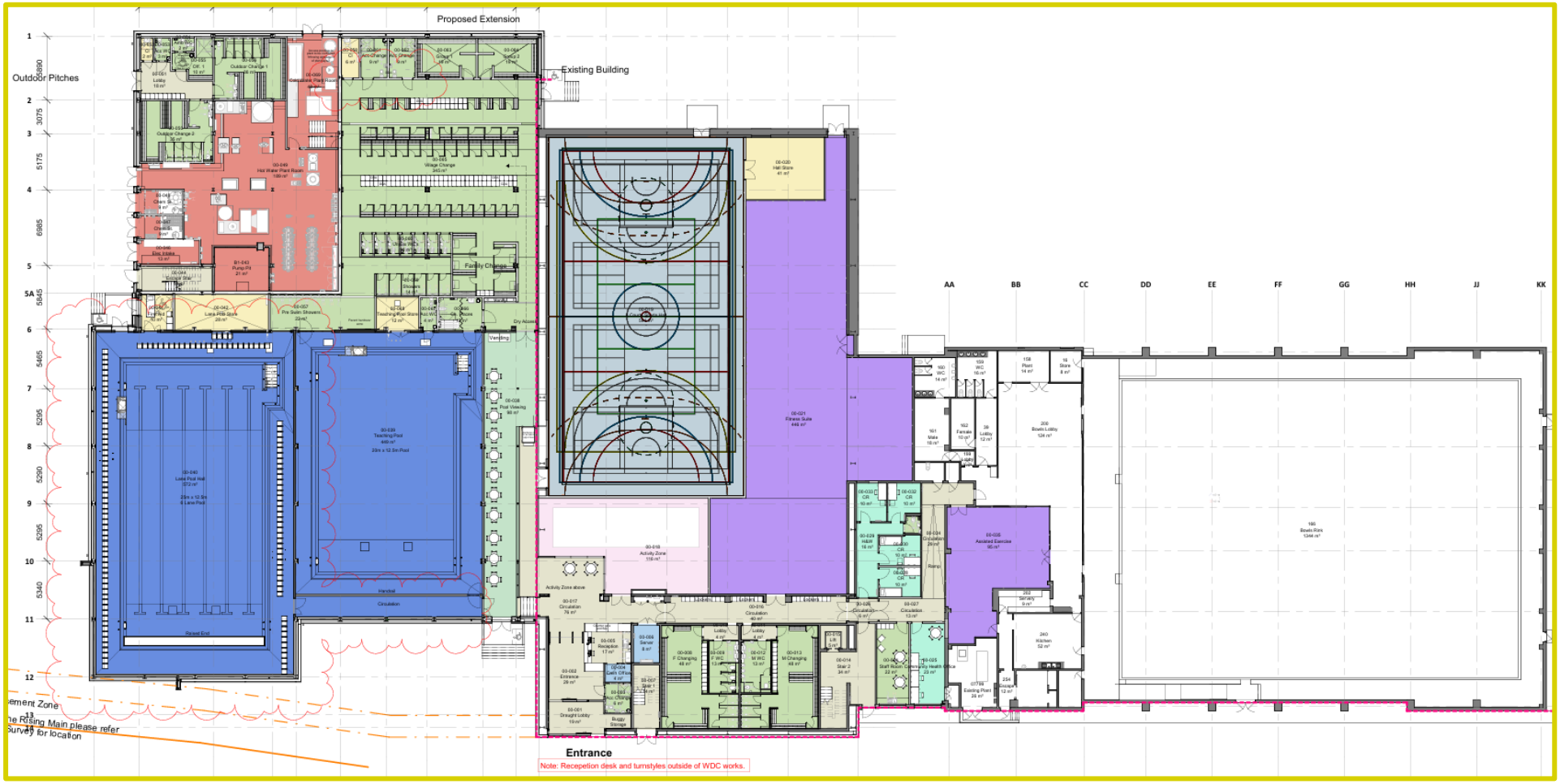
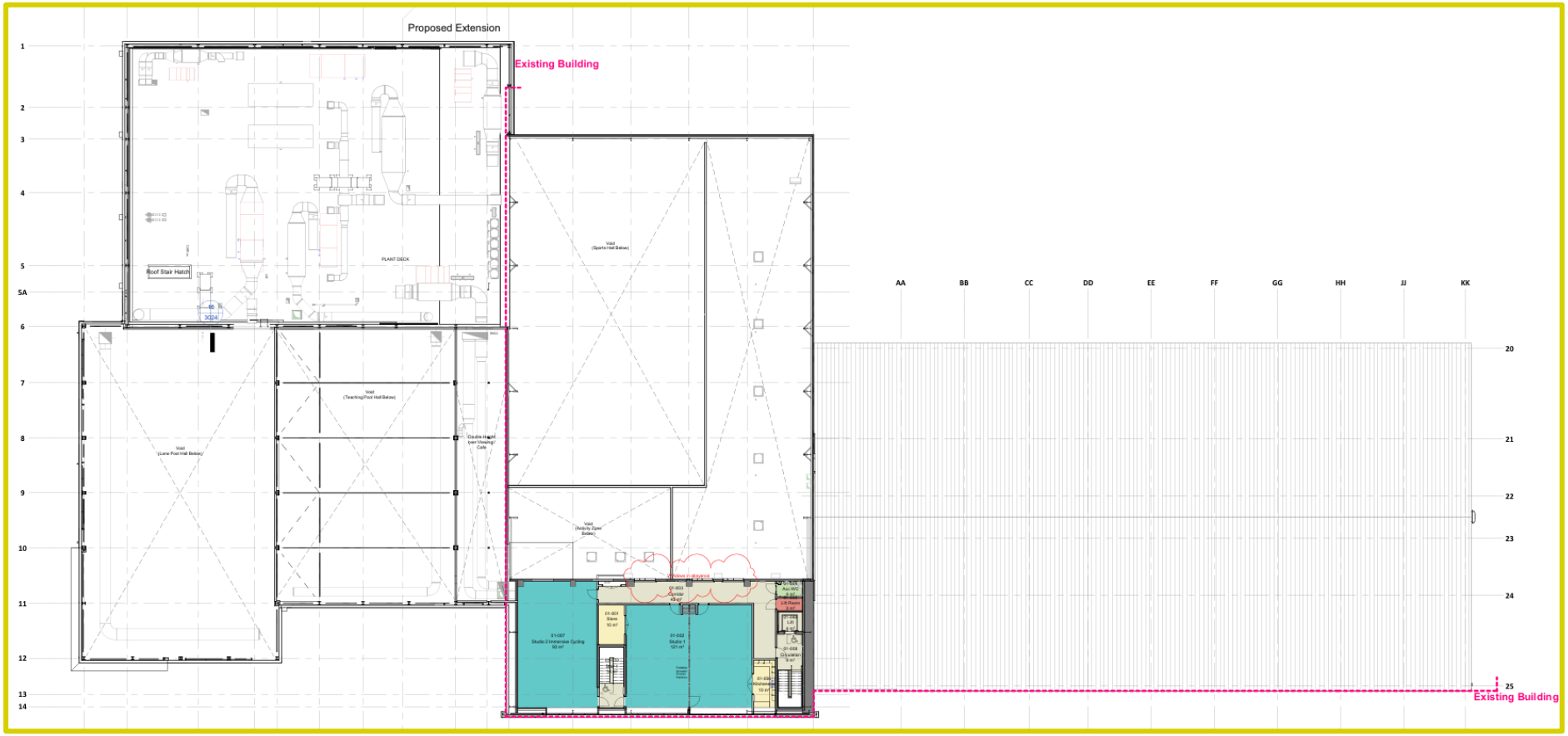


Figure 4: First Floor Plan



3. Planning Policy & Assessment Criteria

3.1. Planning Policy

3.1.1. *The National Planning Policy Framework* (NPPF) 2021 sets out the general requirements for gaining planning permission. Comments regarding noise found within the document are as follows.

S15. Conserving and enhancing the natural environment

Para 174

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.

S15. Para 185

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;

S15. Para 187

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.

3.1.2. The NPPF directs us for further specific guidance on noise to the *Noise Policy Statement for England* (DEFRA March 2010) which gives three aims, which should be adhered to when considering a development:

Noise Policy Aims

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

- **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.**

3.1.3. Within the document the avoidance of impact on health and quality of life are discussed in the context of terminology used in toxicology as the excerpt from the document discusses below.

3.1.4. There are several key phrases within the NPSE aims and these are discussed below.

"Significant adverse" and "adverse"

3.1.5. There are two established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation. They are:

3.1.6. **NOEL** – No Observed Effect Level

3.1.7. This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.

3.1.8. **LOAEL** – Lowest Observed Adverse Effect Level

3.1.9. This is the level above which adverse effects on health and quality of life can be detected.

3.1.10. Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse effect level.

3.1.11. **SOAEL** – Significant Observed Adverse Effect Level

3.1.12. This is the level above which, significant adverse effects on health and quality of life occur.

3.1.13. 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.

3.1.14. The first aim of the Noise Policy Statement for England

Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

3.1.15. The first aim of the NPSE states that significant adverse effects on health and quality of life should be avoided while also taking into account the guiding principles of sustainable development

3.1.16. The second aim of the Noise Policy Statement for England

Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

3.1.17. The second aim of the NPSE refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur.

3.1.18. The third aim of the Noise Policy Statement for England

Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

3.1.19. This aim seeks, where possible, positively to improve health and quality of life through the pro-active management of noise while also taking into account the guiding principles of sustainable development, recognising that there will be opportunities for such measures to be taken and that they will deliver potential benefits to society. The protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim.

3.1.20. When considering the requirements for the proposed development, the development should demonstrate that aims of the NPSE have been followed, this is through the application of the more suitable specific guidance on noise both affecting the developments and dealing with noise arising from it.

3.2. Local Policy & Planning Conditions

3.2.1. The following planning condition relating to external MEP noise emissions has been set by the local authority.

No building hereby permitted shall be first occupied until details of the noise from fixed plant and machinery (which shall not exceed the background noise level by more than 5dB(A) when measured as a 15-minute L(A)eq on any residential boundary not within the applicant's ownership) have been submitted to and approved in writing by the local planning authority.

Reason: To ensure development would not result in unacceptable impact on residential amenity.

This Condition is imposed in accordance with Policies 2 and 3 of the South East Lincolnshire Local Plan, 2019 and national guidance contained in the National Planning Policy Framework (December 2024).

3.2.2. Based on the measured background noise data from RP1, the following limits would apply.

Table 1: Noise rating limits at closest sensitive receptor.

Period	Cumulative Rating Level*
Daytime	49dB
Evening	46dB
Night/24 hour operation	36dB

3.3. BS 4142: 2014 + A1:2019

3.3.1. BS 4142: 2014 + A1:2019 provides a numerical means of assessing the significance of building plant noise. A key aspect of the BS 4142 assessment procedure is a comparison between the background noise level in the vicinity of noise sensitive receptors and the rating level of the noise source under consideration. The relevant parameters in this instance are as follows:

3.3.2. Background Sound Level, $L_{A90,T}$, defined in the Standard as the 'A-weighted sound pressure level that is exceeded by the residual sound for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels'; •

3.3.3. Specific Sound Level, $L_{Aeq,T}$, the 'equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T (being 1 hour for assessments between 07:00-23:00hrs and 15 minutes for night time assessments 23:00-07:00hrs).

3.3.4. Rating Level, $L_{Ar,Tr}$, the specific sound level plus any adjustment made for the characteristic features of the sound'.

3.3.5. BS 4142 allows for, as an absolute worst case, a cumulative +15 dB correction to be applied to the specific sound level based upon the presence or expected presence of the following 'Acoustic Feature Corrections':

Tonality – up to +6 dB penalty.

Impulsivity – up to +9 dB penalty (this can be summed with tonality penalty)

Intermittency – up to +3 dB penalty

Other sound characteristics (neither tonal nor impulsive but still distinctive) – +3 dB penalty.

3.3.6. The amendment made to BS4142 in 2019 does however allow for the focus on one characteristic if it is dominant above others, reducing or even eliminating the corrections which would have otherwise been added together arithmetically, in a more reasonable approach to assessment.

3.3.7. BS 4142 provides guidance as to the likely response from sensitive residential receptors to new fixed noise sources (e.g., building plant or services) through comparison of the rating level of the new noise source with the existing background level. The higher the rating noise level in comparison to the background noise level, the greater the likelihood of complaints arising. BS 4142 requires separate analysis for day and night-time periods.

3.3.8. The criteria for determining the significance of changes in noise levels from building services plant, based on guidance within BS 4142, and the potential effect on noise sensitive receptors are presented in below.

Difference Between Rating Level[1] and Background Level[2]	**Magnitude of Effect**
10 dB(A) below background	Very Low (LOAEL)
No difference	Low
+5 dB(A) above background	Medium (SOEAL)
+10 dB(A) or more above background	High

1 - The Rating Level is the noise level attributable to the new source(s), plus penalties if the new source has tonal or intermittent characteristics.

2 - The Background Level is taken as the L_{A90}; this is the ambient noise level in the absence of the source which is exceeded for 90% of the time.

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected.

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur.

4. Noise Impact Assessment

4.1. MEP Noise Data

4.1.1. The following figures show the mechanical equipment sound power levels used in the assessment.

4.1.2. The technical documents from which these levels have been drawn are also noted.

4.1.3. Where a ducted system terminates in a louvre, Pace Consult has completed calculations of duct & end reflection losses, and directivity corrections in order to determine the sound power levels at external louvres. The calculations are based on the mechanical services drawings detailed in the section below.

4.1.4. All AHU noise data extracted from M00514-DER-XX-XX-TS-M-5752 AHU.

Figure 5: AHU 01 (Lane Pool) Supply Air.

Supply air			Volume flow:	4.1330 m^3/s		tpd:	753 Pa			
Octave:	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**sum P.**	Unit
Outlet: sound power level in outlet cross section.										
Lw4	**72.5**	**77.3**	**71.5**	**72.7**	**73.6**	**70.3**	**67.5**	**54.3**	81.6	dB
LwA4	46.3	61.2	62.9	69.5	73.6	71.5	68.5	53.2	**77.5**	dB(A)
Intake: sound power level in the inlet cross section.										
Lw3	**65.9**	**69.2**	**62.3**	**58.9**	**56.1**	**52.0**	**52.3**	**42.8**	71.9	dB
LwA3	39.7	53.1	53.7	55.7	56.1	53.2	53.3	41.7	**62.2**	dB(A)
Unit: sound power level emitted by the unit walls without opening, measured and calculated in accordance with EN 1886/EN ISO 3744 including the sound-absorbing rate De.										
Lw2	**63.6**	**64.5**	**56.1**	**47.4**	**46.8**	**41.9**	**41.1**	**31.6**	67.6	dB
LwA2	37.5	48.4	47.5	44.2	46.8	43.1	42.1	30.5	**53.9**	dB(A)

Figure 6: AHU 01 (Lane Pool) Exhaust Air.

Exhaust air			Volume flow:	4.3500 m^3/s		tpd:	564 Pa			
Octave:	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**sum P.**	Unit
Outlet: sound power level in outlet cross section.										
Lw4	**69.1**	**69.8**	**65.7**	**65.8**	**66.1**	**62.9**	**61.5**	**48.3**	75.2	dB
LwA4	42.9	53.7	57.1	62.6	66.1	64.1	62.5	47.2	**70.4**	dB(A)
Intake: sound power level in the inlet cross section.										
Lw3	**68.7**	**71.2**	**69.7**	**67.8**	**66.8**	**65.7**	**69.5**	**57.8**	77.3	dB
LwA3	42.5	55.1	61.1	64.6	66.8	66.9	70.5	56.7	**74.1**	dB(A)
Unit: sound power level emitted by the unit walls without opening, measured and calculated in accordance with EN 1886/EN ISO 3744 including the sound-absorbing rate De.										
Lw2	**63.1**	**61.0**	**55.2**	**46.1**	**45.4**	**41.2**	**42.8**	**30.1**	65.7	dB
LwA2	36.9	44.9	46.6	42.9	45.4	42.5	43.8	29.0	**52.5**	dB(A)

Figure 7: AHU 01 Casing Radiated.

Sum										
Unit: sound power level emitted by the unit walls without opening, measured and calculated in accordance with EN 1886/EN ISO 3744 including the sound-absorbing rate De.										
LwSum	**66.4**	**66.2**	**58.7**	**49.8**	**49.2**	**44.6**	**45.0**	**34.0**	69.8	dB

Figure 8: AHU 02 Supply Air.

Supply air		Volume flow:	2.6750 m^3/s		tpd:	713 Pa			
Octave:	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**sum P.**	Unit
Outlet: sound power level in outlet cross section.										
Lw4	**70.1**	**75.3**	**67.3**	**71.8**	**70.4**	**66.4**	**63.3**	**51.3**	79.2	dB
LwA4	43.9	59.2	58.7	68.6	70.4	67.6	64.3	50.2	**74.5**	dB(A)
Intake: sound power level in the inlet cross section.										
Lw3	**64.6**	**70.1**	**62.0**	**60.0**	**56.9**	**53.9**	**53.4**	**44.3**	72.2	dB
LwA3	38.4	54.0	53.4	56.8	56.9	55.1	54.4	43.2	**63.1**	dB(A)
Unit: sound power level emitted by the unit walls without opening, measured and calculated in accordance with EN 1886/EN ISO 3744 including the sound-absorbing rate De.										
Lw2	**61.4**	**63.1**	**52.7**	**46.0**	**43.8**	**38.8**	**37.3**	**28.4**	65.7	dB
LwA2	35.2	47.0	44.1	42.8	43.8	40.0	38.3	27.3	**51.5**	dB(A)

Figure 9: AHU 02 Exhaust Air.

Exhaust air		Volume flow:	2.8160 m^3/s		tpd:	560 Pa			
Octave:	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**sum P.**	Unit
Outlet: sound power level in outlet cross section.										
Lw4	**68.3**	**68.4**	**64.0**	**68.6**	**67.1**	**64.0**	**61.3**	**52.0**	75.1	dB
LwA4	42.1	52.3	55.4	65.4	67.1	65.2	62.3	50.9	**71.5**	dB(A)
Intake: sound power level in the inlet cross section.										
Lw3	**67.1**	**69.3**	**67.0**	**67.0**	**64.5**	**63.8**	**64.7**	**55.9**	75.1	dB
LwA3	40.9	53.2	58.4	63.8	64.5	65.0	65.7	54.8	**71.2**	dB(A)
Unit: sound power level emitted by the unit walls without opening, measured and calculated in accordance with EN 1886/EN ISO 3744 including the sound-absorbing rate De.										
Lw2	**61.5**	**58.5**	**51.8**	**45.6**	**43.0**	**38.8**	**38.0**	**28.6**	63.7	dB
LwA2	35.2	42.4	43.2	42.4	43.0	40.0	39.0	27.5	**49.9**	dB(A)

Figure 10: AHU 02 Casing.

Sum										
Unit: sound power level emitted by the unit walls without opening, measured and calculated in accordance with EN 1886/EN ISO 3744 including the sound-absorbing rate De.										
LwSum	**64.4**	**64.4**	**55.3**	**48.8**	**46.4**	**41.8**	**40.6**	**31.5**	67.8	dB
LwASum	38.2	48.3	46.7	45.6	46.4	43.0	41.6	30.4	**53.8**	dB(A)

Figure 11: AHU 03 Supply Air.

Supply air				Volume flow:	3.8670 m^3/s		tpd:	727 Pa		
Octave:	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**sum P.**	Unit
Outlet: sound power level in outlet cross section.										
Lw4	**71.3**	**77.3**	**70.8**	**71.9**	**72.6**	**69.4**	**65.7**	**52.7**	81.0	dB
LwA4	45.1	61.2	62.2	68.7	72.6	70.6	66.7	51.6	**76.5**	dB(A)
Intake: sound power level in the inlet cross section.										
Lw3	**65.8**	**70.9**	**63.2**	**61.1**	**58.8**	**55.3**	**54.8**	**46.1**	73.2	dB
LwA3	39.6	54.8	54.6	57.9	58.8	56.5	55.8	45.0	**64.5**	dB(A)
Unit: sound power level emitted by the unit walls without opening, measured and calculated in accordance with EN 1886/EN ISO 3744 including the sound-absorbing rate De.										
Lw2	**62.5**	**64.5**	**55.0**	**46.6**	**45.9**	**41.0**	**39.2**	**30.1**	67.1	dB
LwA2	36.3	48.4	46.4	43.4	45.9	42.2	40.2	28.9	**53.1**	dB(A)

Figure 12: AHU 03 Exhaust Air.

Exhaust air				Volume flow:	3.4770 m^3/s		tpd:	526 Pa		
Octave:	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**sum P.**	Unit
Outlet: sound power level in outlet cross section.										
Lw4	**67.7**	**70.8**	**64.8**	**66.3**	**66.5**	**64.7**	**59.1**	**48.8**	75.3	dB
LwA4	41.5	54.7	56.2	63.1	66.5	65.9	60.1	47.7	**70.9**	dB(A)
Intake: sound power level in the inlet cross section.										
Lw3	**65.9**	**71.1**	**65.0**	**65.0**	**63.5**	**63.0**	**61.2**	**53.3**	74.6	dB
LwA3	39.7	55.0	56.4	61.8	63.5	64.2	62.2	52.2	**69.5**	dB(A)
Unit: sound power level emitted by the unit walls without opening, measured and calculated in accordance with EN 1886/EN ISO 3744 including the sound-absorbing rate De.										
Lw2	**60.5**	**60.6**	**51.2**	**43.5**	**42.1**	**38.7**	**35.1**	**25.7**	63.9	dB
LwA2	34.3	44.5	42.6	40.3	42.1	39.9	36.1	24.6	**49.6**	dB(A)

Figure 13: AHU 03 Casing Radiated.

Sum										
Unit: sound power level emitted by the unit walls without opening, measured and calculated in accordance with EN 1886/EN ISO 3744 including the sound-absorbing rate De.										
LwSum	**64.7**	**66.0**	**56.5**	**48.3**	**47.4**	**43.0**	**40.6**	**31.4**	68.8	dB
LwASum	38.5	49.9	47.9	45.1	47.4	44.2	41.6	30.3	**54.7**	dB(A)

Figure 14: AHU 04 Supply Air.

Supply air			Volume flow:	2.630 m^3/s		tpd:	821 Pa			
Octave:	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**sum P.**	Unit
Outlet: sound power level in outlet cross section.										
Lw4	**73.2**	**72.9**	**72.3**	**74.1**	**75.7**	**73.1**	**73.2**	**67.2**	82.2	dB
LwA4	47.0	56.8	63.7	70.9	75.7	74.3	74.2	66.1	**80.4**	dB(A)
Intake: sound power level in the inlet cross section.										
Lw3	**68.7**	**70.0**	**68.8**	**67.5**	**66.1**	**63.4**	**68.5**	**58.6**	76.5	dB
LwA3	42.5	53.9	60.2	64.3	66.1	64.6	69.5	57.5	**73.1**	dB(A)
Unit: sound power level emitted by the unit walls without opening, measured and calculated in accordance with EN 1886/EN ISO 3744 including the sound-absorbing rate De.										
Lw2	**64.0**	**59.9**	**55.8**	**47.4**	**46.9**	**42.1**	**44.5**	**37.9**	66.0	dB
LwA2	37.8	43.8	47.2	44.1	46.9	43.3	45.5	36.8	**53.4**	dB(A)

Figure 15: AHU 04 Exhaust Air.

Exhaust air			Volume flow:	2.643 m^3/s		tpd:	660 Pa			
Octave:	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**sum P.**	Unit
Outlet: sound power level in outlet cross section.										
Lw4	**70.0**	**74.3**	**70.0**	**75.7**	**75.6**	**73.4**	**70.6**	**62.5**	81.9	dB
LwA4	43.8	58.2	61.4	72.5	75.6	74.6	71.6	61.4	**80.0**	dB(A)
Intake: sound power level in the inlet cross section.										
Lw3	**66.2**	**71.0**	**65.4**	**65.2**	**62.6**	**60.7**	**60.2**	**47.8**	74.4	dB
LwA3	40.0	54.9	56.8	62.0	62.6	61.9	61.2	46.7	**68.5**	dB(A)
Unit: sound power level emitted by the unit walls without opening, measured and calculated in accordance with EN 1886/EN ISO 3744 including the sound-absorbing rate De.										
Lw2	**60.9**	**60.6**	**52.0**	**45.5**	**43.1**	**38.4**	**36.6**	**27.6**	64.1	dB
LwA2	34.7	44.5	43.4	42.3	43.1	39.6	37.6	26.5	**50.2**	dB(A)

Figure 16: AHU 04 Casing Radiated.

Sum										
Unit: sound power level emitted by the unit walls without opening, measured and calculated in accordance with EN 1886/EN ISO 3744 including the sound-absorbing rate De.										
LwSum	**65.7**	**63.3**	**57.3**	**49.5**	**48.4**	**43.6**	**45.2**	**38.3**	68.2	dB
LwASum	39.5	47.2	48.7	46.3	48.4	44.8	46.2	37.2	**55.1**	dB(A)

Figure 17: AHU 05 Supply Air.

Supply air			Volume flow:	2.4681 m^3/s		tpd:	811 Pa			
Octave:	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**sum P.**	Unit
Outlet: sound power level in outlet cross section.										
Lw4	**72.5**	**73.6**	**71.6**	**73.3**	**74.9**	**72.2**	**71.9**	**64.5**	81.5	dB
LwA4	46.3	57.5	63.0	70.1	74.9	73.4	72.9	63.4	**79.4**	dB(A)
Intake: sound power level in the inlet cross section.										
Lw3	**68.2**	**70.4**	**68.1**	**66.7**	**65.3**	**62.6**	**66.9**	**55.6**	75.9	dB
LwA3	42.0	54.3	59.5	63.5	65.3	63.8	67.9	54.5	**71.9**	dB(A)
Unit: sound power level emitted by the unit walls without opening, measured and calculated in accordance with EN 1886/EN ISO 3744 including the sound-absorbing rate De.										
Lw2	**63.4**	**60.5**	**55.1**	**46.5**	**46.1**	**41.2**	**43.1**	**35.0**	65.7	dB
LwA2	37.2	44.4	46.5	43.3	46.1	42.5	44.1	33.9	**52.7**	dB(A)

Figure 18: AHU 05 Exhaust Air.

Exhaust air			Volume flow:	2.6050 m^3/s		tpd:	659 Pa			
Octave:	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**sum P.**	Unit
Outlet: sound power level in outlet cross section.										
Lw4	**69.8**	**74.1**	**70.0**	**75.5**	**75.4**	**73.2**	**70.3**	**62.2**	81.7	dB
LwA4	43.6	58.0	61.4	72.3	75.4	74.4	71.3	61.1	**79.8**	dB(A)
Intake: sound power level in the inlet cross section.										
Lw3	**65.9**	**70.9**	**65.3**	**65.1**	**62.4**	**60.5**	**59.8**	**47.5**	74.3	dB
LwA3	39.7	54.8	56.7	61.9	62.4	61.7	60.8	46.4	**68.3**	dB(A)
Unit: sound power level emitted by the unit walls without opening, measured and calculated in accordance with EN 1886/EN ISO 3744 including the sound-absorbing rate De.										
Lw2	**60.6**	**60.5**	**51.9**	**45.4**	**42.9**	**38.2**	**36.2**	**27.4**	63.9	dB
LwA2	34.4	44.4	43.3	42.1	42.9	39.4	37.2	26.2	**50.1**	dB(A)

Figure 19: AHU 05 Casing Radiated.

Sum										
Unit: sound power level emitted by the unit walls without opening, measured and calculated in accordance with EN 1886/EN ISO 3744 including the sound-absorbing rate De.										
LwSum	**65.2**	**63.5**	**56.8**	**49.0**	**47.8**	**43.0**	**43.9**	**35.7**	67.9	dB
LwASum	39.0	47.4	48.2	45.8	47.8	44.2	44.9	34.6	**54.6**	dB(A)

Figure 20: AHU 06 Supply Air.

Supply air			Volume flow:	0.7189 m^3/s		tpd:	485 Pa			
Octave:	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**sum P.**	Unit
Outlet: sound power level in outlet cross section.										
Lw4	**63.3**	**67.7**	**61.4**	**63.1**	**66.5**	**61.7**	**58.2**	**47.8**	72.6	dB
LwA4	37.1	51.6	52.8	59.9	66.5	62.9	59.2	46.7	**69.4**	dB(A)
Intake: sound power level in the inlet cross section.										
Lw3	**62.2**	**66.6**	**58.6**	**58.4**	**59.0**	**58.6**	**53.3**	**40.0**	69.7	dB
LwA3	36.0	50.5	50.0	55.2	59.0	59.8	54.3	38.9	**64.1**	dB(A)
Unit: sound power level emitted by the unit walls without opening, measured and calculated in accordance with EN 1886/EN ISO 3744 including the sound-absorbing rate De.										
Lw2	**55.8**	**55.6**	**45.2**	**37.3**	**39.0**	**35.0**	**30.4**	**19.9**	59.0	dB
LwA2	29.6	39.5	36.6	34.1	39.0	36.2	31.4	18.8	**44.9**	dB(A)

Figure 21: AHU 06 Exhaust Air.

Exhaust air			Volume flow:	0.7189 m^3/s		tpd:	363 Pa			
Octave:	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**sum P.**	Unit
Outlet: sound power level in outlet cross section.										
Lw4	**59.0**	**62.5**	**56.5**	**64.5**	**68.6**	**66.7**	**62.5**	**51.0**	72.9	dB
LwA4	32.8	46.4	47.9	61.3	68.6	67.9	63.5	49.9	**72.4**	dB(A)
Intake: sound power level in the inlet cross section.										
Lw3	**57.6**	**61.1**	**54.5**	**56.7**	**56.8**	**56.6**	**50.7**	**36.2**	65.6	dB
LwA3	31.4	45.0	45.9	53.5	56.8	57.8	51.7	35.1	**61.8**	dB(A)
Unit: sound power level emitted by the unit walls without opening, measured and calculated in accordance with EN 1886/EN ISO 3744 including the sound-absorbing rate De.										
Lw2	**51.0**	**49.8**	**39.8**	**35.6**	**36.7**	**33.0**	**27.8**	**16.1**	53.8	dB
LwA2	24.8	33.6	31.1	32.4	36.7	34.2	28.8	15.0	**41.4**	dB(A)

Figure 22: AHU 06 Casing Radiated.

Sum										
Unit: sound power level emitted by the unit walls without opening, measured and calculated in accordance with EN 1886/EN ISO 3744 including the sound-absorbing rate De.										
LwSum	**57.0**	**56.6**	**46.3**	**39.6**	**41.0**	**37.1**	**32.3**	**21.4**	60.1	dB
LwASum	30.8	40.5	37.7	36.4	41.0	38.3	33.3	20.3	**46.5**	dB(A)

Figure 23: Supply & Extract Fans 01 & 02 (Plant Room)

Unit Ref: EF.00.01 & SF.00.01
2No. duct mounted round fan model RM250/EC to pass 0.30m³/s of air against an external resistance of 150Pa.

The in-line duct fan is constructed from pressed galvanized steel, zinc coated blue, with a fitted pre-wired external terminal box. Fan is suitable for vertical or horizontal mounting.
Unit weight: 8kgs

Unit supplied with EC fan motors with built in speed control, overload and over current safety functions. If a VES control package is *not* supplied, additional inputs are required for fixed speed commissioning or remote variable speed.
The fan may be run at full speed by insertion of a link or modulated via either an external 0-10Volt input eg BMS, or remote manual potentiometer eg CFSC1

The unit comprises a circular in line, backward curved centrifugal EC fan running at 2700RPM and direct driven by a 0.161kW, 240volt, 1ph, 50Hz, single speed motor, rated at IP44. Full load current: 0.940.94amps

Sound Power Level Spectrum

Hz	63	125	250	500	1k	2k	4k	8k
PWL, dBW	58	67	70	66	67	65	56	47

SPL 46 dBA at 3 metres from fan outlet free field.

Figure 24: Extract Fans 01.01 & 01.02

Sound Data temperature: 50°C

Speed	Qv	SP	LwA	LpA *	Octave band (Hz)							
RPM	(m³/h)	(Pa)	dB(A)	dB(A)	63	125	250	500	1000	2000	4000	8000
1450	245	106	67	46	82	76	71	64	59	48	42	24
2870	414	485	81	61	97	91	86	79	74	63	57	49

4.1.5. All MVHR noise data has been extracted from M00514-DER-XX-XX-TS-M-5753 MVHR.

Figure 25: MVHR.01

Acoustic data

Fan Speed		Sound Power Level, dB re 1 pW, @ Octave Band Centre Frequency (Hz)								Casing Radiated			
		63	125	250	500	1k	2k	4k	8k	NR@1m	NR@3m	dBA@1m	dBA@3m
100%	Casing Radiated	72	64	60	46	43	40	34	28	36	28	40	33
	Intake (ODA/ETA)	84 / 80	83 / 71	86 / 78	78 / 71	79 / 69	78 / 67	74 / 60	69 / 52				
	Outlet (SUP/EHA)	81 / 97	69 / 89	77 / 90	72 / 87	71 / 86	69 / 89	61 / 81	51 / 78				
80%	Casing Radiated	72	64	60	46	43	40	34	28	36	28	40	33
	Intake (ODA/ETA)	84 / 80	83 / 71	86 / 78	78 / 71	79 / 69	78 / 67	74 / 60	69 / 52				
	Outlet (SUP/EHA)	80 / 98	69 / 90	77 / 87	72 / 84	71 / 83	69 / 85	61 / 78	51 / 74				
60%	Casing Radiated	61	58	57	39	36	34	32	29	34	26	36	28
	Intake (ODA/ETA)	73 / 69	77 / 65	81 / 72	71 / 64	72 / 63	71 / 60	66 / 51	60 / 44				
	Outlet (SUP/EHA)	68 / 88	63 / 80	70 / 81	65 / 74	64 / 72	62 / 77	53 / 67	42 / 62				
40%	Casing Radiated	53	55	43	29	26	25	25	26	21	13	27	19
	Intake (ODA/ETA)	65 / 59	72 / 59	69 / 60	61 / 53	61 / 52	59 / 48	53 / 38	43 / 26				
	Outlet (SUP/EHA)	58 / 76	58 / 74	58 / 66	54 / 63	53 / 62	51 / 65	40 / 56	25 / 42				

Units are independently tested at ISVR in accordance with BS EN ISO 3744:2010

Figure 26: MVHR.02

Acoustic data

Fan Speed		Sound Power Level, dB re 1 pW, @ Octave Band Centre Frequency (Hz)								Casing Radiated			
		63	125	250	500	1k	2k	4k	8k	NR@1m	NR@3m	dBA@1m	dBA@3m
100%	Casing Radiated	72	69	59	50	45	40	37	34	39	30	43	35
	Intake (ODA/ETA)	74	71	68	60	60	58	52	43				
	Outlet (SUP/EHA)	83	78	73	73	73	74	70	66				
80%	Casing Radiated	68	64	53	45	40	33	30	28	33	24	37	30
	Intake (ODA/ETA)	70	66	62	55	56	52	45	34				
	Outlet (SUP/EHA)	76	73	67	67	68	67	62	57				
60%	Casing Radiated	62	57	47	39	35	26	25	25	25	17	31	24
	Intake (ODA/ETA)	65	62	56	50	51	46	37	42				
	Outlet (SUP/EHA)	69	68	62	62	63	61	55	48				
40%	Casing Radiated	57	51	41	34	29	23	24	25	19	11	26	18
	Intake (ODA/ETA)	60	55	49	45	44	38	27	15				
	Outlet (SUP/EHA)	64	61	56	57	57	54	46	38				

Units are independently tested at ISVR in accordance with BS EN ISO 3744:2010

4.1.6. The following attenuators are proposed across the scheme; the data has been extracted from document M00514-DER-XX-XX-TS-M-5758 Attenuator TS.

Figure 27: Attenuator insertion losses 1 of 2.

Item	System Reference	Code	Suffix	DWG	L1	L2/ID	W	H	Vol	PD	Wt	No.		Performance, dB							
					mm	mm	mm	mm	m^3/s	Pa	kg	Off.		63	125	250	500	1k	2k	4k	8k
1	ATT.00.001 SF.00.01 FAI	PL	G	A13G	600	315			0.303	5	10	1	IL	2	3	6	15	19	14	13	10
2	ATT.00.002 SF.00.01 SUPPLY	PLP	G	A13G	600	315			0.303	15	17	1	IL	3	9	14	22	30	30	27	23
3	ATT.00.003 EF.00.01 EXHAUST	PL	G	A13G	600	315			0.303	5	10	1	IL	2	3	6	15	19	14	13	10
4	ATT.00.004 EF.00.01 EXTRACT	PLP	G	A13G	600	315			0.303	15	17	1	IL	3	9	14	22	30	30	27	23
5	ATT.00.005 MVHR.00.01 EXHAUST	SL	GE	A18G	600	200	340	255	0.1	10	19	1	IL	5	7	12	19	28	23	20	12
6	ATT.00.006 MVHR.00.01 FAI	SL	GE	A18G	600	200	340	255	0.1	10	19	1	IL	5	7	12	19	28	23	20	12
7	ATT.00.007 MVHR.00.01 EXTRACT	SL	GE	A18G	600	200	340	255	0.1	20	20	1	IL	6	10	15	23	32	30	25	19
8	ATT.00.008 MVHR.00.01 SUPPLY	SL	GE	A18G	600	200	340	255	0.1	20	19	1	IL	3	7	12	19	28	23	20	12
9	ATT.00.009 MVHR.00.02 EXHAUST	SL	GE	A18G	600	125	250	175	0.02	10	13	1	IL	5	7	11	19	33	29	26	15
10	ATT.00.010 MVHR.00.02 FAI	SL	GE	A18G	600	125	250	175	0.02	10	13	1	IL	5	7	11	19	33	29	26	15
11	ATT.00.011 MVHR.00.02 EXTRACT	PL	G	A13G	600	125			0.02	5	5	1	IL	1	2	6	16	23	19	17	12
12	ATT.00.012 MVHR.00.02 SUPPLY	PL	G	A13G	600	125			0.02	5	5	1	IL	1	2	6	16	23	19	17	12
13																					
14	ATT.RF.001 AHU.RF.01 EXHAUST	SP	GK	A02H	600		1000	800	4.35	50	56	1	IL	3	5	10	15	20	15	13	8
15	ATT.RF.002 AHU.RF.01 FAI	SP	G	A02H	600		1400	1400	4.133	15	125	1	IL	3	7	12	19	28	23	20	12
16	ATT.RF.003 AHU.RF.01 EXTRACT	SP	GK	A02H	1200		900	900	4.35	50	120	1	IL	6	11	20	32	43	34	30	18
17	ATT.RF.004 AHU.RF.01 SUPPLY	PLP	GBK	A15G	1140	1000			4.133	15	100	1	IL	6	10	17	26	28	24	19	17
18	ATT.RF.005 AHU.RF.02 EXHAUST	SP	GK	A02H	600		800	800	2.846	30	53	1	IL	3	5	10	15	20	15	13	8
19	ATT.RF.006 AHU.RF.02 FAI	PLP	GB	A15G	540	1250			2.675	15	87	1	IL	4	7	12	21	25	18	15	12
20	ATT.RF.007 AHU.RF.02 EXTRACT	SP	GK	A02H	1200		700	700	2.846	50	78	1	IL	5	10	18	28	36	28	24	14
21	ATT.RF.008 AHU.RF.02 SUPPLY	PLP	GBK	A15G	1140	800			2.675	15	76	1	IL	6	10	17	27	29	26	21	18
22	ATT.RF.009 AHU.RF.03 EXHAUST	SP	GK	A02H	600		800	800	3.477	50	53	1	IL	3	5	10	15	20	15	13	8
23	ATT.RF.010 AHU.RF.03 FAI	SP	G	A02H	600		1350	1100	3.867	15	105	1	IL	3	6	11	17	24	19	17	10
24	ATT.RF.011 AHU.RF.03 EXTRACT	SP	GK	A02H	1200		800	800	3.477	50	88	1	IL	5	10	18	28	36	28	24	14
25	ATT.RF.012 AHU.RF.03 SUPPLY	SP	GK	A02H	1200		800	800	3.867	50	88	1	IL	5	10	18	28	36	28	24	14
26	ATT.RF.013 AHU.RF.04 EXHAUST	SP	G	A02H	900		1000	500	2.643	50	68	1	IL	7	10	16	25	35	28	24	22
27	ATT.RF.014 AHU.RF.04 FAI	SP	G	A02H	600		1500	700	2.63	15	81	1	IL	4	7	12	18	26	21	18	16
28	ATT.RF.015 AHU.RF.04 EXTRACT	SL	GJ	A02H	900		1000	500	2.643	50	64	1	IL	7	10	17	22	27	22	18	10
29	ATT.RF.016 AHU.RF.04 SUPPLY	SL	GJ	A02H	900		1000	500	2.63	50	64	1	IL	7	10	17	22	27	22	18	10
30	ATT.RF.017 AHU.RF.05 EXHAUST	SP	G	A02H	900		1000	500	2.605	50	68	1	IL	7	10	16	25	35	28	24	22
31	ATT.RF.018 AHU.RF.05 FAI	SP	G	A02H	600		1200	850	2.468	20	85	1	IL	5	9	13	17	23	17	14	9
32	ATT.RF.019 AHU.RF.05 EXTRACT	SL	GJ	A02H	900		1000	500	2.605	50	64	1	IL	7	10	17	22	27	22	18	10
33	ATT.RF.020 AHU.RF.05 SUPPLY	SL	GJ	A02H	900		1000	500	2.468	50	64	1	IL	7	10	17	22	27	22	18	10
34	ATT.RF.021 AHU.RF.06 EXHAUST	SL	G	A02H	600		500	300	0.719	50	23	1	IL	4	8	12	16	20	15	13	7
35	ATT.RF.022 AHU.RF.06 FAI	SL	G	A02H	600		500	300	0.719	50	23	1	IL	4	8	12	16	20	15	13	7
36	ATT.RF.023 AHU.RF.06 EXTRACT	SL	G	A02H	1200		500	300	0.719	50	37	1	IL	8	14	21	29	33	27	22	13

Figure 28: Attenuator insertion losses 2 of 2.

Item	System Reference	Code	Suffix	DWG	L1	L2/ID	W	H	Vol	PD	Wt	No.		Performance, dB							
37	ATT.RF.024 AHU.RF.06 SUPPLY	SL	G	A02H	1200		500	300	0.719	50	37	1	IL	8	14	21	29	33	27	22	13
38	ATT.RF.025 EF.RF.01 EXHAUST	SL	GE	A18G	600	160	290	215	0.037	10	15	1	IL	5	9	14	23	36	33	27	20
39	ATT.RF.026 EF.RF.01 EXTRACT	PL	GK	A13G	600	160			0.037	5	6	1	IL	1	2	6	16	23	19	17	12
40	ATT.RF.027 EF.RF.02 EXHAUST	SL	GE	A18G	600	160	290	215	0.037	10	15	1	IL	5	9	14	23	36	33	27	20
41	ATT.RF.028 EF.RF.02 EXTRACT	PL	GK	A13G	600	160			0.037	5	6	1	IL	1	2	6	16	23	19	17	12

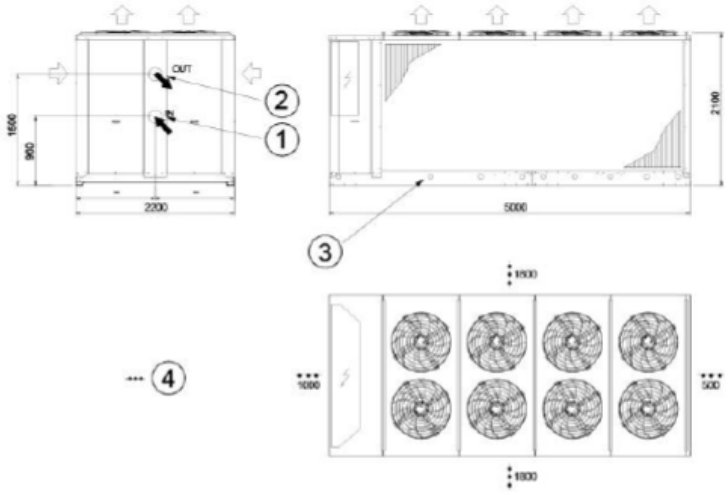
4.1.7. The following schedule and noise data has been provided for the two no. ASHPs located on the plant roof deck:

Figure 29: ASHP noise data.

Technical Drawings – SSL Version

CHA/G/A/WP/SSL 13010-P

DIMENSIONAL DRAWING



Load percentage	***Sound power****	***Sound pressure 1m****	***Sound pressure 10m****
	[dB(A)]	***[dB(A)]***	***[dB(A)]***
100%	87.2	67.3	54.9
60%	86.4	66.7	54.1
50%	86.2	66.5	53.9
40%	86.0	66.3	53.7

*Estimated data

4.1.8. It is understood that the ASHPs will operate at 100% load during the daytime (07:00 to 23:00) and at not more than 40% load during the night-time (23:00 to 07:00).

Figure 30:

Frequency	Lw	Lp
Hz	dB(A)	dB(A)
63	73.5	41.2
125	78.0	45.7
250	79.0	46.7
500	82.5	50.2
1000	79.5	47.2
2000	78.5	46.2
4000	74.0	41.7
8000	64.0	31.7
TOT	87.2	54.9

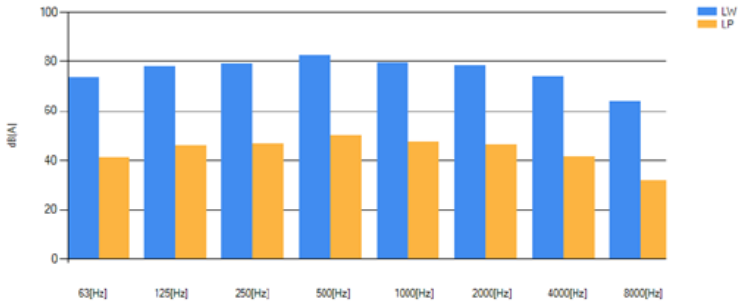


Figure 31: Condenser schedule (provided by email)

CON.RF.01 – See attachment PCA-M_R32_Power_Inverter_-_Single_Phase_PI_Sheet_MAY_24. PUZ-ZM71VHA2 Sound power level= 67dBa. Top of condenser is 2108mm above Plant Deck datum (+8165).
CON.RF.02 - See attachment R2-VRF_-_50-63kw_Standard_Efficiency__50-63kW__MAY24 (2). PURY-P450YNW-A2 Sound power level = 89dBa. Top of condenser is 3023mm above Plant Deck datum (+8165).
CON.RF.03 - See attachment Y_Series_Standard__69-96kW_-YNW-A2. PUHY-P600YSNW-A2 Sound power level = 87dBa. Top of condenser is 3023mm above Plant Deck datum (+8165).
CON.RF.04 - See attachment R2-VRF_-_50-63kw_Standard_Efficiency__50-63kW__MAY24 (2). PURY-P450YNW-A2 Sound power level = 89dBa. Top of condenser is 3023mm above Plant Deck datum (+8165).
CON.RF.05a - See attachment PUZ-ZM200-250_R322. PUZ-ZM200YKA. Sound pressure level= 62dBa. Top of condenser is 2500mm above Plant Deck datum (+8165).
CON.RF.05b - See attachment PUZ-ZM200-250_R322. PUZ-ZM200YKA. Sound pressure level= 62dBa. Top of condenser is 2500mm above Plant Deck datum (+8165).
CON.RF.06a - See attachment PUZ-ZM200-250_R322. PUZ-ZM250YKA. Sound pressure level= 62dBa. Top of condenser is 2450mm above Plant Deck datum (+8165).
CON.RF.06b - See attachment PUZ-ZM200-250_R322. PUZ-ZM250YKA. Sound pressure level= 62dBa. Top of condenser is 2450mm above Plant Deck datum (+8165).

Kind Regards,

The above schedule notes 'a/b' for units 05 & 06; however, the M&E designer has confirmed that only a single unit is required for each of these.

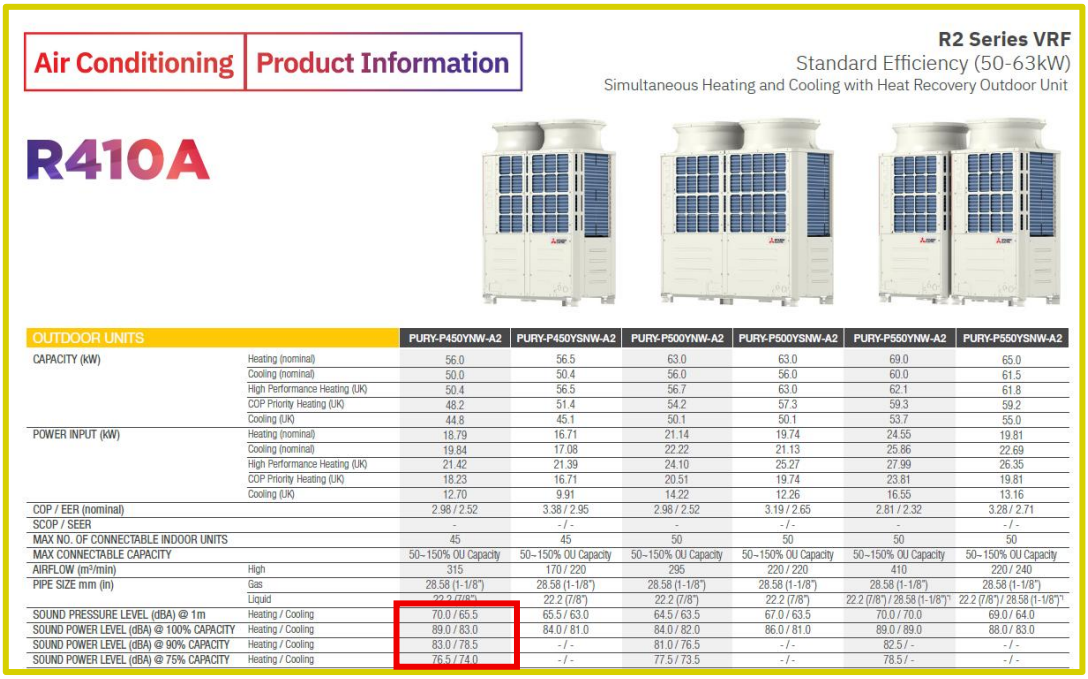
4.1.9. For CON.RF.01 the following spectrum shape has been calculated pro rata based on the stated single figure noise value above.

Figure 32: CON.RF.01 pro rata octave band noise levels

Freq.	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dBA
SPL @10m (Spectrum Assumed)	38	41	35	34	31	26	24	14	36.2
Lw	69	72	66	65	62	57	55	45	67.2

4.1.10. For CON.RF.02 & 04, the following data has been provided.

Figure 33: CON.RF.02 & 04 noise data.



Air Conditioning | Product Information

R2 Series VRF
Standard Efficiency (50-63kW)
Simultaneous Heating and Cooling with Heat Recovery Outdoor Unit

R410A

OUTDOOR UNITS		PURY-P450YNW-A2	PURY-P450YSNW-A2	PURY-P500YNW-A2	PURY-P500YSNW-A2	PURY-P550YNW-A2	PURY-P550YSNW-A2
CAPACITY (kW)	Heating (nominal)	56.0	56.5	63.0	63.0	69.0	65.0
	Cooling (nominal)	50.0	50.4	56.0	56.0	60.0	61.5
	High Performance Heating (UK)	50.4	56.5	56.7	63.0	62.1	61.8
	COP Priority Heating (UK)	48.2	51.4	54.2	57.3	59.3	59.2
	Cooling (UK)	44.8	45.1	50.1	50.1	53.7	55.0
POWER INPUT (kW)	Heating (nominal)	18.79	16.71	21.14	19.74	24.55	19.81
	Cooling (nominal)	19.84	17.08	22.22	21.13	25.86	22.69
	High Performance Heating (UK)	21.42	21.39	24.10	25.27	27.99	26.35
	COP Priority Heating (UK)	18.23	16.71	20.51	19.74	23.81	19.81
	Cooling (UK)	12.70	9.91	14.22	12.26	16.55	13.16
COP / EER (nominal)		2.98 / 2.52	3.38 / 2.95	2.98 / 2.52	3.19 / 2.65	2.81 / 2.32	3.28 / 2.71
SCOP / SEER		-	- / -	-	- / -	-	- / -
MAX NO. OF CONNECTABLE INDOOR UNITS		45	45	50	50	50	50
MAX CONNECTABLE CAPACITY		50~150% OU Capacity	50~150% OU Capacity	50~150% OU Capacity	50~150% OU Capacity	50~150% OU Capacity	50~150% OU Capacity
AIRFLOW (m³/min)	High	315	170 / 220	295	220 / 220	410	220 / 240
PIPE SIZE mm (in)	Gas	28.58 (1-1/8")	28.58 (1-1/8")	28.58 (1-1/8")	28.58 (1-1/8")	28.58 (1-1/8")	28.58 (1-1/8")
	Liquid	22.2 (7/8")	22.2 (7/8")	22.2 (7/8")	22.2 (7/8")	22.2 (7/8") / 28.58 (1-1/8")*	22.2 (7/8") / 28.58 (1-1/8")*
SOUND PRESSURE LEVEL (dBA) @ 1m	Heating / Cooling	70.0 / 65.5	65.5 / 63.0	64.5 / 63.5	67.0 / 63.5	70.0 / 70.0	69.0 / 64.0
SOUND POWER LEVEL (dBA) @ 100% CAPACITY	Heating / Cooling	89.0 / 83.0	84.0 / 81.0	84.0 / 82.0	86.0 / 81.0	89.0 / 89.0	88.0 / 83.0
SOUND POWER LEVEL (dBA) @ 90% CAPACITY	Heating / Cooling	83.0 / 78.5	- / -	81.0 / 76.5	- / -	82.5 / -	- / -
SOUND POWER LEVEL (dBA) @ 75% CAPACITY	Heating / Cooling	76.5 / 74.0	- / -	77.5 / 73.5	- / -	78.5 / -	- / -

4.1.11. As only single figure value has been provided for CON.RF.02 & 04, octave band values have been calculated pro rata from historic data.

Figure 34: CON.RF.02 & 04 pro rata noise levels

Freq.	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dBA
SPL@10m (Spectrum Assumed)	60	63	57	56	53	48	46	36	58.2
Lw	91	94	88	87	84	79	77	67	89.2

4.1.12. For CON.RF.03, the following data has been provided.

Figure 35: CON.RF.03 noise data.



OUTDOOR UNITS		PUHY-P600YSNW-A2	PUHY-P650YSNW-A2	PUHY-P700YSNW-A2	PUHY-P750YSNW-A2	PUHY-P800YSNW-A2	PUHY-P850YSNW-A2
CAPACITY (kW)	Heating (nominal)	75.0	81.5	90.0	95.0	101.0	106.0
	Cooling (nominal)	67.0	73.0	80.0	85.0	90.0	95.0
	High Performance Heating (UK)	71.3	77.4	85.5	90.3	96.0	95.4
	COP Priority Heating (UK)	68.3	74.2	81.9	86.5	91.9	91.2
	Cooling (UK)	60.0	65.3	71.6	76.1	80.6	85.0
POWER INPUT (kW)	Heating (nominal)	20.60	22.70	24.65	26.53	28.85	30.72
	Cooling (nominal)	23.34	27.96	28.88	32.56	33.96	37.69
	High Performance Heating (UK)	27.40	30.19	32.78	35.28	38.37	34.71
	COP Priority Heating (UK)	20.60	22.70	24.65	26.53	28.85	29.80
	Cooling (UK)	13.54	16.22	16.75	18.88	19.70	24.12
COP / EER (nominal)		3.64 / 2.87	3.59 / 2.61	3.65 / 2.77	3.58 / 2.61	3.50 / 2.65	3.45 / 2.52
MAX NO. OF CONNECTABLE INDOOR UNITS		50	50	50	50	50	50
MAX CONNECTABLE CAPACITY		50~130% OU Capacity	50~130% OU Capacity	50~130% OU Capacity	50~130% OU Capacity	50~130% OU Capacity	50~130% OU Capacity
AIRFLOW (m^3/min)	High	240 / 240	185 / 300	270 / 270	270 / 300	270 / 305	300 / 305
PIPE SIZE mm (in)	Gas	28.58 (1-1/8")	28.58 (1-1/8")	34.93 (1-3/8")	34.93 (1-3/8")	34.93 (1-3/8")	41.28 (1-5/8")
	Liquid	15.88 (5/8")	15.88 (5/8")	19.05 (3/4")	19.05 (3/4")	19.05 (3/4")	19.05 (3/4")
SOUND PRESSURE LEVEL (dBA)	Heating / Cooling	67.5 / 64.0	68.5 / 66.5	67.5 / 65.0	69.0 / 67.0	71.0 / 67.5	73.0 / 68.5
SOUND POWER LEVEL (dBA)	Heating / Cooling	87.0 / 83.0	87.0 / 83.0	87.0 / 83.0	88.0 / 84.0	91.0 / 85.0	91.0 / 86.0

4.1.13. As only single figure value has been provided for CON.RF.03, octave band values have been calculated pro rata from historic data.

Figure 36: CON.RF.03 pro rata noise levels

Freq.	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dBA
SPL@10m (Spectrum Assumed)	58	61	55	54	51	46	44	34	56.2
Lw	89	92	86	85	82	77	75	65	87.2

4.1.14. For CON.RF.05 & 06, the following data has been provided.

Figure 37: CON.RF.05 & 06 noise data.



PUZ-ZM200/250YKA OUTDOOR UNITS		PUZ-ZM200YKA	PUZ-ZM250YKA
Capacity (kW)	Heating (nominal)	22.4	27.0
	Cooling (nominal)	19.0	22.0
SCOP (nsh) / SEER (nsc) (BS EN14825)*1		4.50 (177.1%) / 7.49 (296.4%)	4.47 (175.7%) / 7.43 (294.3%)
SOUND PRESSURE LEVEL (dBA)	Heating/Cooling	62 / 59	62 / 59
WEIGHT (kg)		137	138
DIMENSIONS (mm)	Width x Depth x Height	1050 x 330+40 x 1338	1050 x 330+40 x 1338
PIPE SIZE mm (in)	Gas	28.58 (1 1/8")	28.58 (1 1/8")
	Liquid	9.52 (3/8")	12.7 (1/2")
ELECTRICAL SUPPLY		380-415v, 50Hz	380-415v, 50Hz
PHASE		Three	Three
SYSTEM POWER INPUT (kW)	Heating/Cooling (nominal)	5.63 / 4.95	7.81 / 6.86
	Heating/Cooling (UK)	5.07 / 4.11	7.03 / 5.69
STARTING CURRENT (A)		5	5
SYSTEM RUNNING CURRENT (A)	Heating/Cooling [MAX]	9.57 / 8.58 [22.5]	13.3 / 11.6 [22.5]
FUSE RATING (BS88) - HRC (A)		25	25
MAINS CABLE No. CORES		5	5
MAX PIPE LENGTH (m)		100	100
MAX HEIGHT DIFFERENCE (m)		30	30
CHARGE REFRIGERANT (kg) / CO_2 EQUIVALENT (t)	R32 (GWP 675) - 30m	6.3 / 4.25	6.8 / 4.59
MAX ADDITIONAL REFRIGERANT (kg) / CO_2 EQUIVALENT (t)	R32 (GWP 675)	2.9 / 1.96	2.4 / 1.62

4.1.15. As only single figure value has been provided for CON.RF.03, octave band values have been calculated pro rata from historic data.

Figure 38: CON.RF.05 & 06 pro rata noise levels.

Freq.	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dBA
SPL @10m (Spectrum Assumed)	64	67	61	60	57	52	50	40	62.2
Lw	85	88	82	81	78	73	71	61	82.7

4.2. MEP Layout Drawings

4.2.1. The figures overleaf show the layout of mechanical equipment at the time of writing.

4.2.2. The drawing reference are included in the figure titles.

4.2.3. All items shown have been used in the calculation of potential noise emissions for the site.

Figure 39: Ground floor ventilation layout sheet 1.

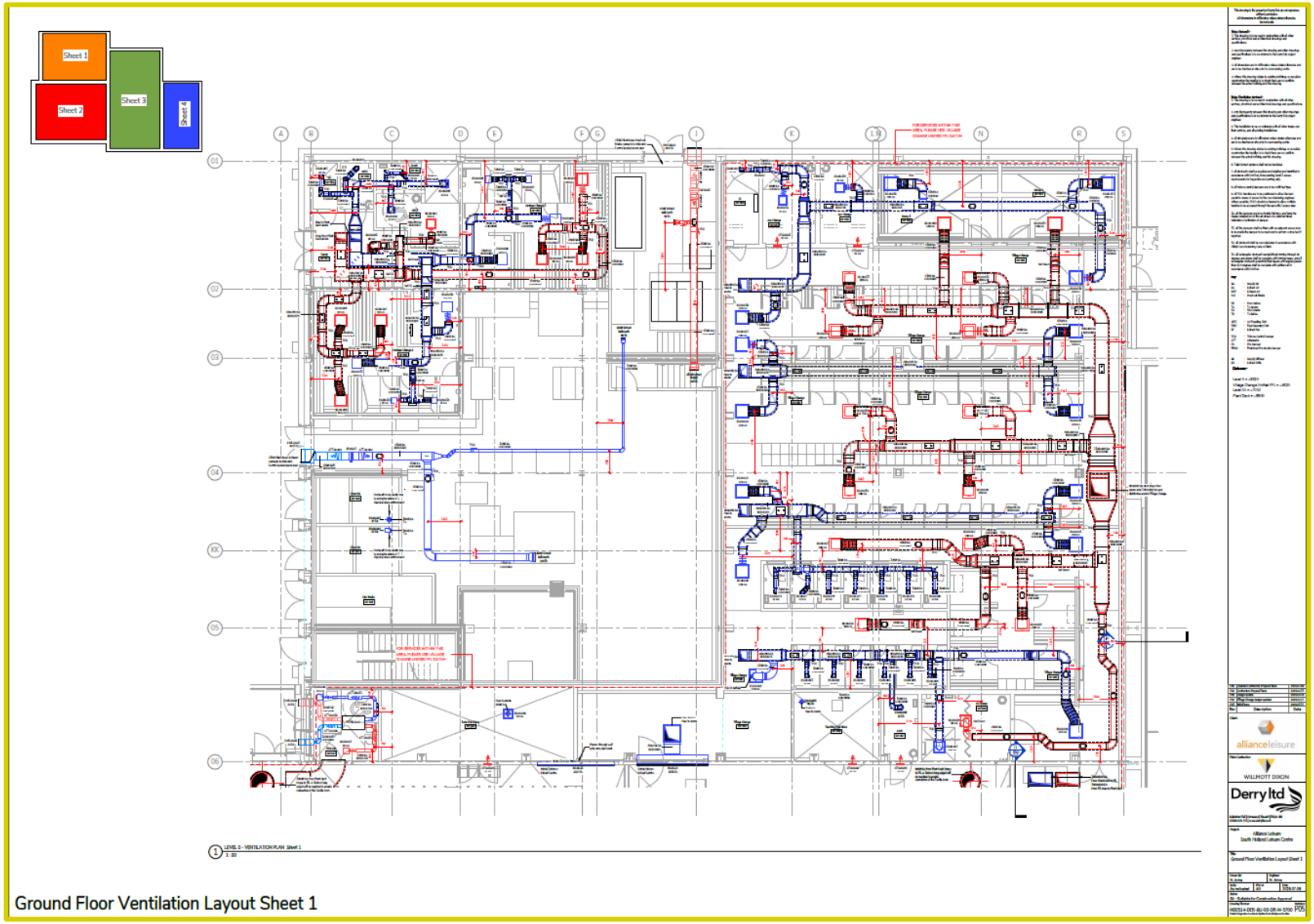


Figure 40: Ground floor ventilation layout sheet 2.

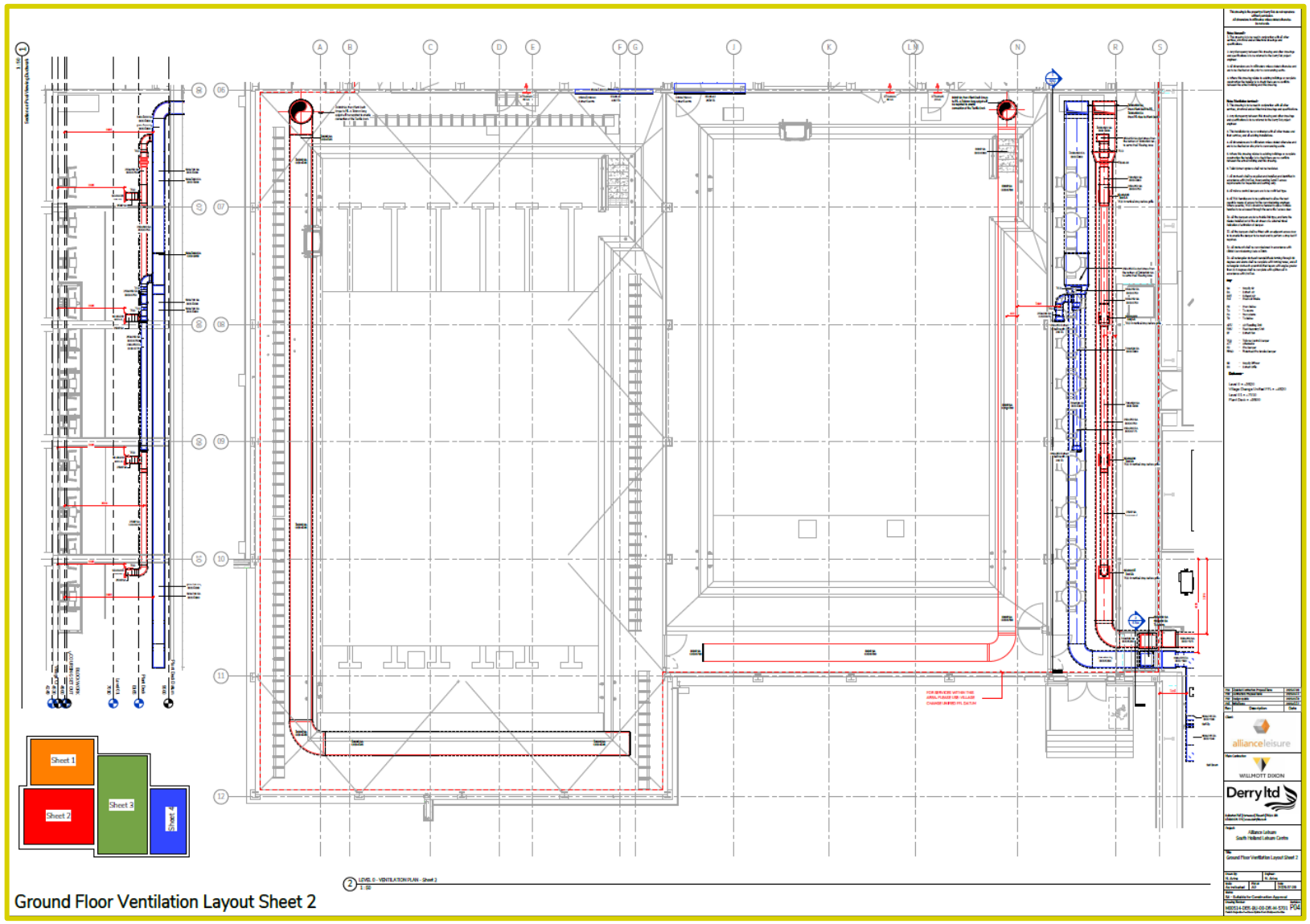


Figure 41: Ground Floor ventilation layout sheet 3.

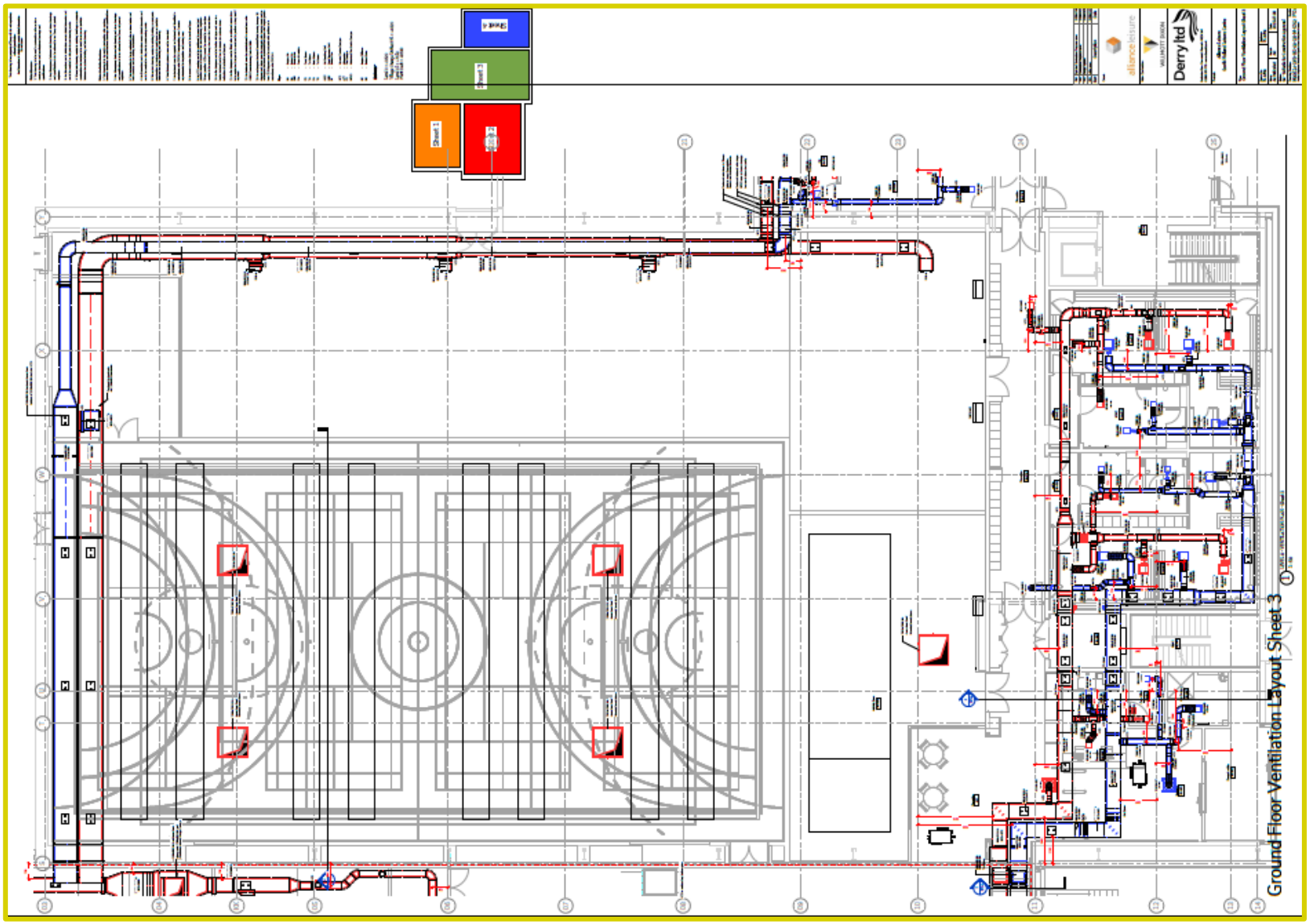


Figure 42: Ground floor ventilation layout sheet 4.

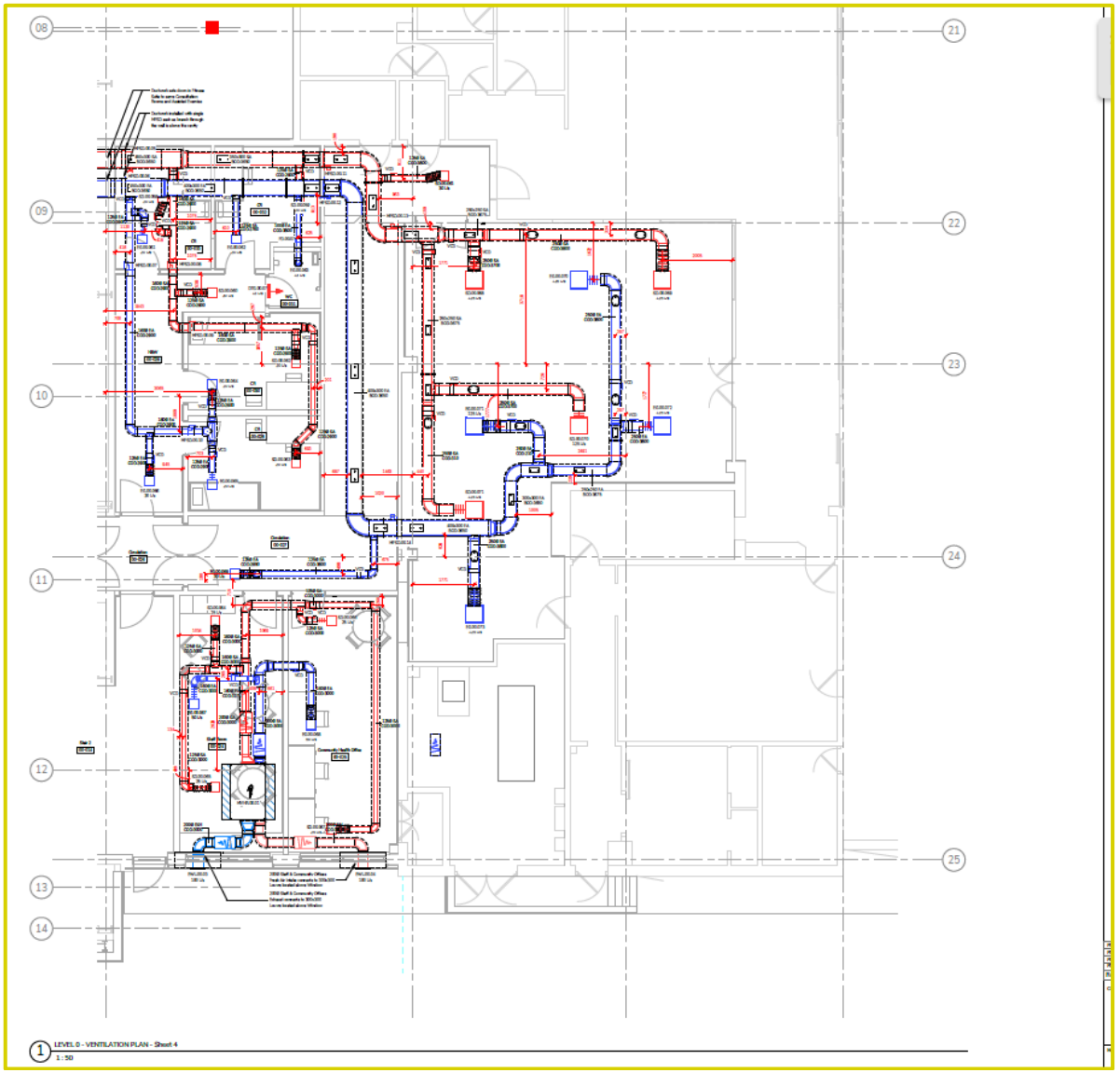


Figure 43: First floor ventilation layout.

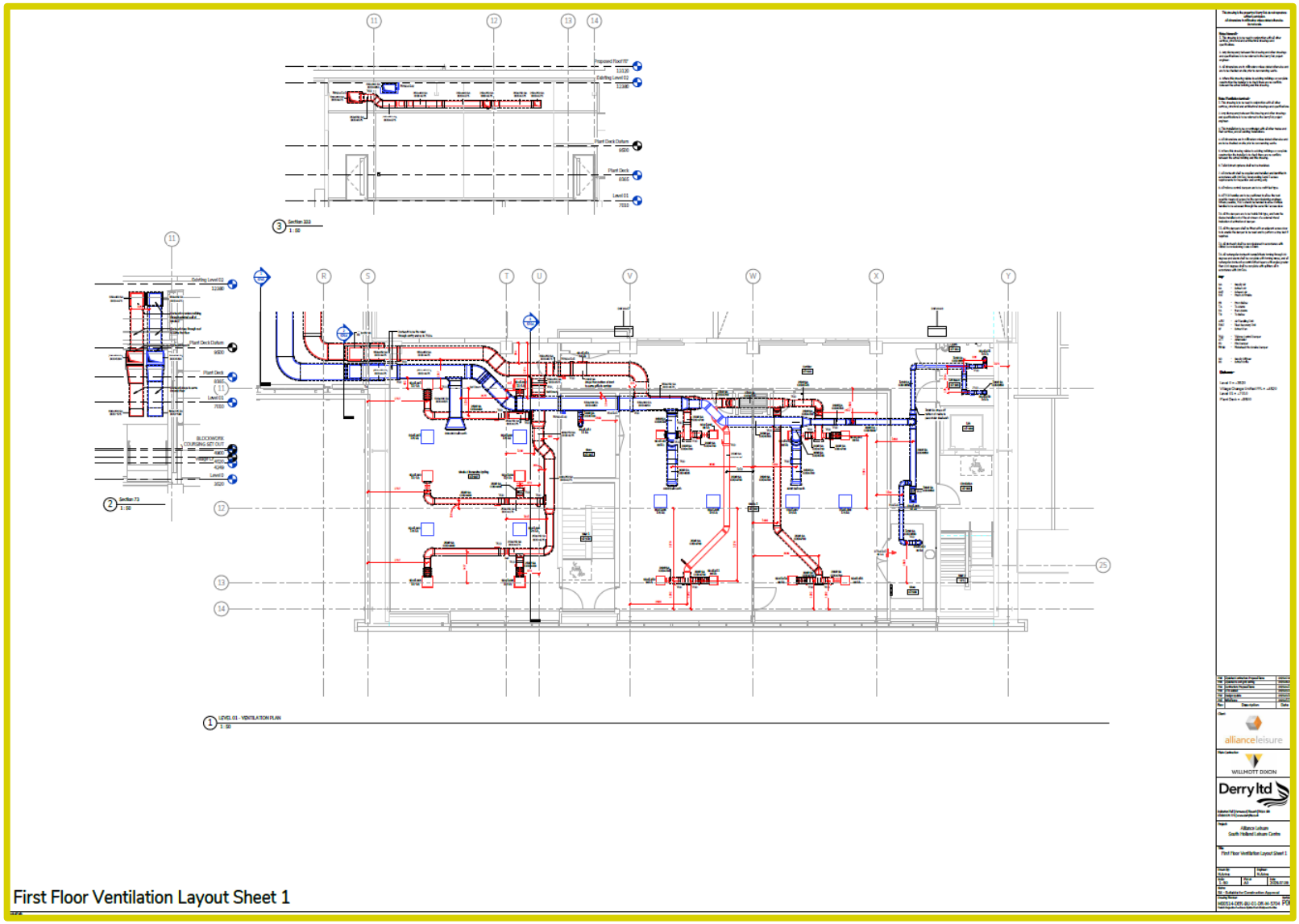
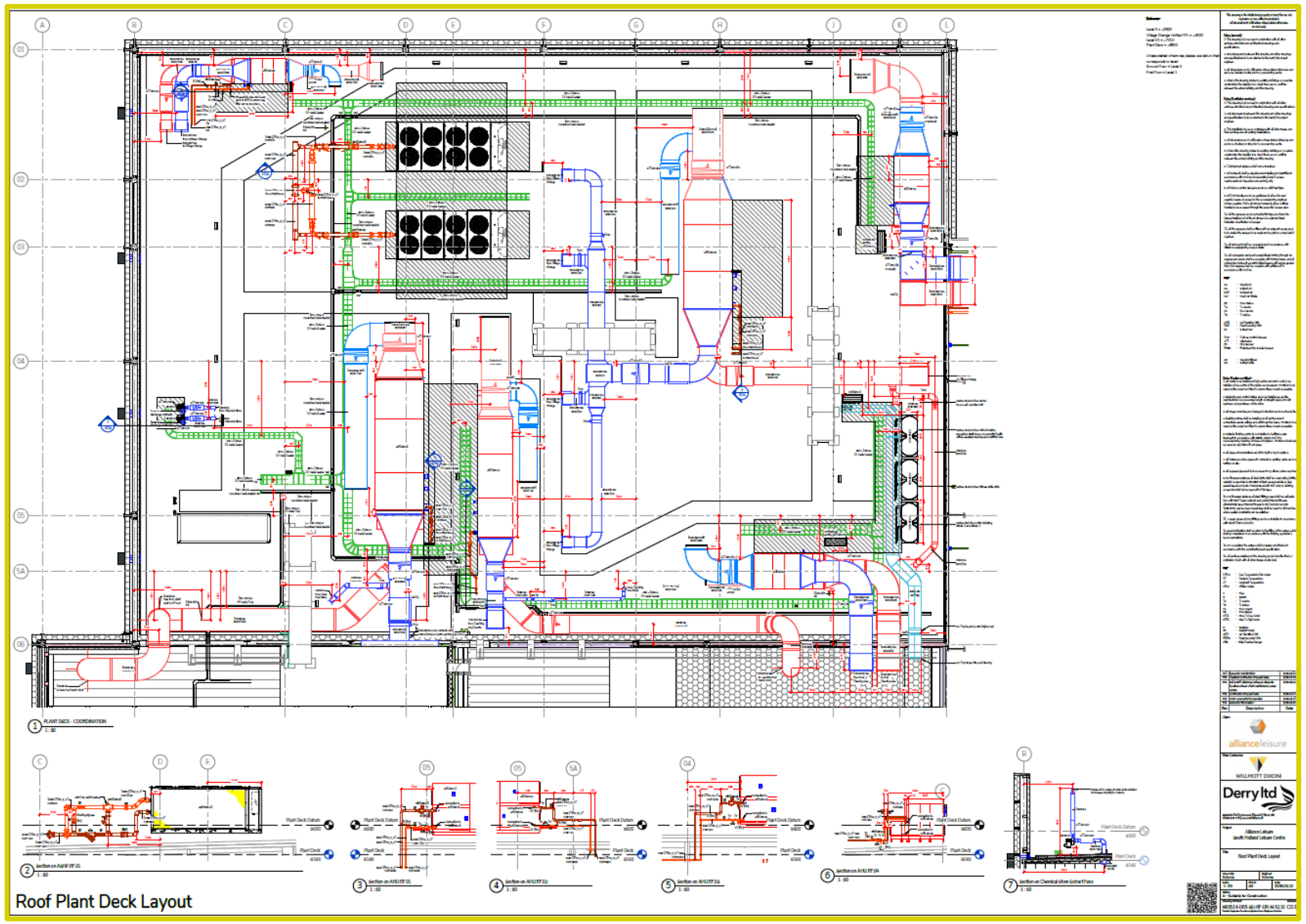


Figure 44: Roof plant deck layout



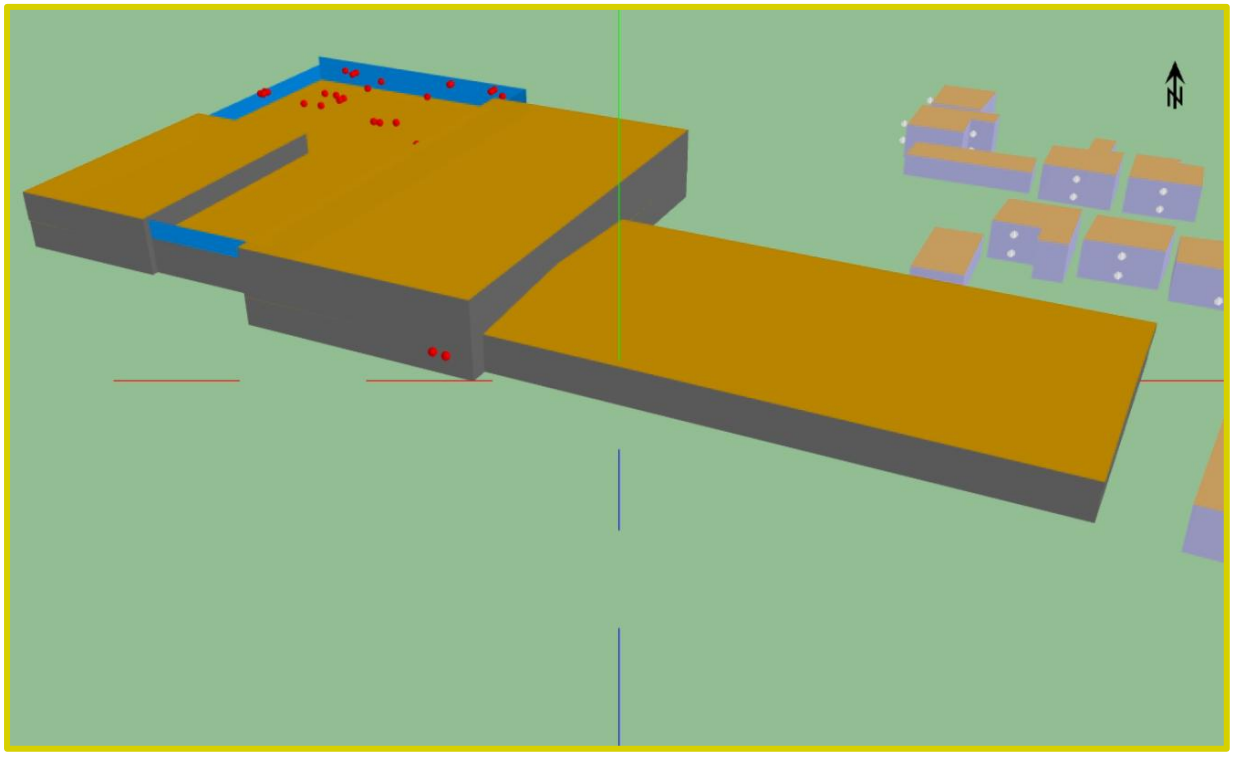
4.3. Noise Modelling

4.3.1. The calculated noise emission from the proposed plant is compared against the representative background sound levels measured at the nearby residential dwellings. The assessment is completed based on the methodology described by the most relevant acoustic guidelines: BS 4142:2014 + A1 2019. Methods for rating and assessing industrial and commercial sound.

4.3.2. The calculated noise emission from the proposed plant has been executed according to the methodology recommended by ISO 9613 Acoustics -- Attenuation of sound during propagation outdoors -- Part 2: General method of calculation was used. This ISO standard is incorporated in the SoundPLAN software. This software was used to generate outdoor sound levels from the plant unit to the nearest noise sensitive receptors and to produce noise contour maps.

4.3.3. 3D images from the SoundPLAN model are included below for reference.

Figure 45: 3D image from noise prediction model



4.3.4. The confirmed operational hours for the development are shown in the figure below.

Figure 46: Opening hours of development.

Table 3: The proposed core opening hours for the new venue are:

Area	Monday to Friday	Weekend
General Opening Hours	06:45 – 22:00 (Monday to Thursday) 06:45 – 22:30 (Friday)	07:00 – 20:00
Main swimming pool	07:00 - 22:00	07:00 – 20:00
Learner pool	09:00 – 20:00	09:00 – 20:00
Fitness suite (Gym)	06:45 – 22:00	08:00 – 20:00
Bowls Hall	07:00 – 22:00 (Monday to Thursday) 07:00 – 22:30 (Friday)	07:00 – 20:00

4.4. BS 4142 Assessment Daytime

4.4.1. The tables below show the BS 4142 assessment for all assessed receptors.

4.4.2. The calculated noise levels assume that all items are operating continuously.

4.4.3. The figure overleaf shows the grid noise map, as calculated using SoundPLAN ver. 9.1, for the development.

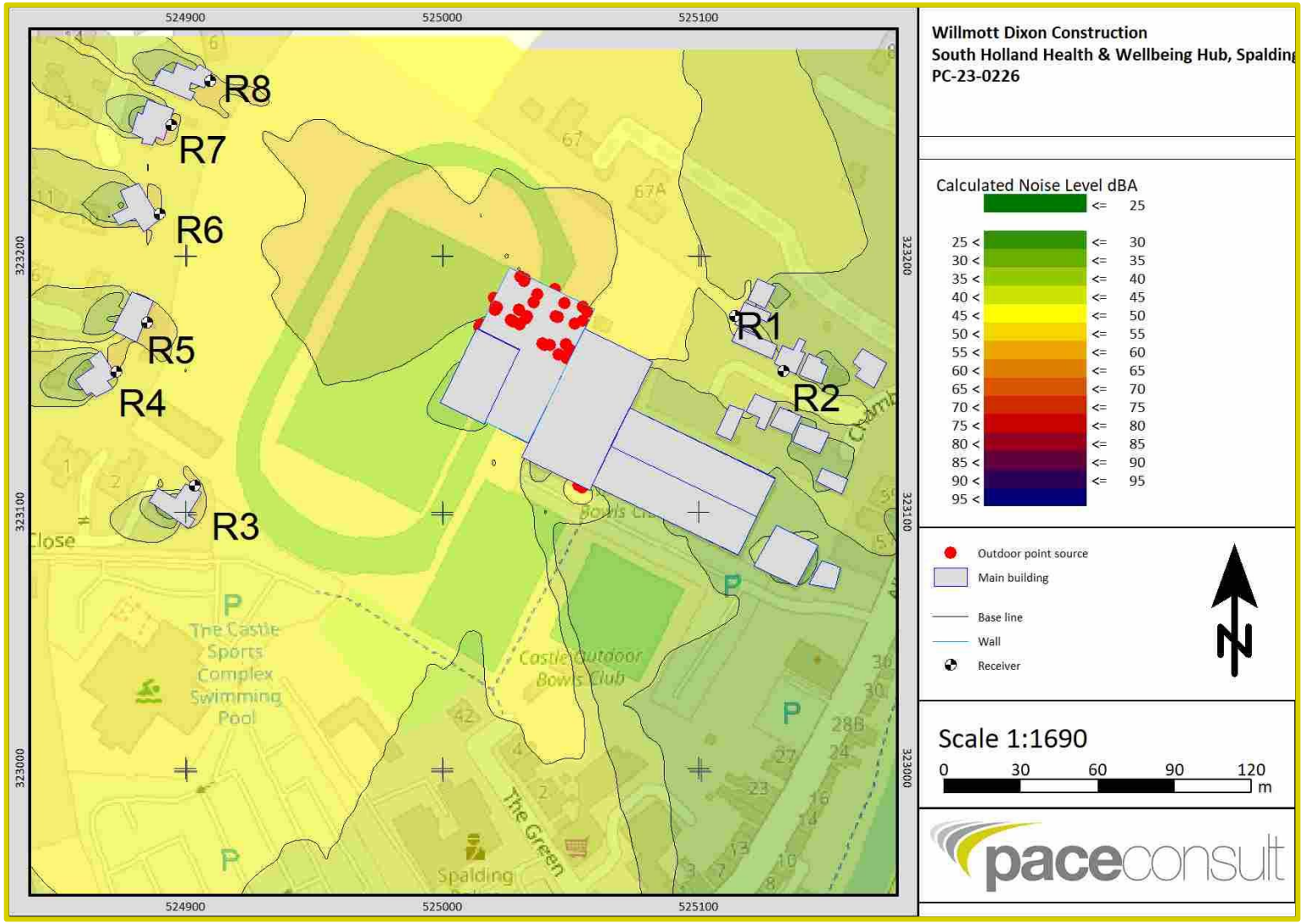
4.4.4. The table below shows the BS 4142 assessment for each receptor.

Table 2: BS 4142 Assessment daytime.

ID	Calculated Sound Pressure Level dBA	Correction as discussed in BS4142:2014	Noise Rating Level	Noise rating limit	Difference between required and predicted rating level
R1	38.6	0	38.6	46	-7.4
R2	36.3		36.3		-9.7
R3	39.3		39.3		-6.7
R4	38.7		38.7		-7.3
R5	39.0		39.0		-7
R6	39.1		39.1		-6.9
R7	38.2		38.2		-7.8
R8	38.6		38.6		-7.4

4.4.5. The assessed noise rating levels are equal to or below the noise rating limit criteria for the daytime period (07:00 to 23:00). This is an indication that a low noise impact would be expected at the nearby noise sensitive receptors.

Figure 47: Grid noise map daytime (at 1.5m height).



4.5. BS 4142 Assessment – Night-Time

4.5.1. The following items would be expected to operate during the night-time period (23:00 to 07:00), as confirmed by the M&E designer:

In terms of Condensers, our view would be that the following would be OFF:-

CON.RF.02 Office a /Activity/Exercise Areas

CON.RF.03 Fitness Suite

CON.RF.04 Studios

The proposed opening hours of the Centre need to be checked to see if they align with the time slot you have identified below.

We would also expect the following to be OFF.

CON.RF.05 AHU.RF.04 Fitness Suite, Assisted Exercise, Consultation Rooms

CON.RF.06 AHU.RF.05 Reception Area, Male & Female Changing Area, Studios

AHU.RF.03 Village Change

AHU.RF.06 Outdoor Change

AHU.RF.01 & 02 Expected to remain on to maintain pool atmosphere/conditions.

General Extract and Supply Fans expected to be on 24/7.

4.5.2. The cumulative noise impact from mechanical services plant at the nearby noise sensitive receptors has been calculated for the night-time period (23:00 to 07:00)

4.5.3. The figure overleaf shows the grid noise map, as calculated using SoundPLAN ver. 9.1, for the development. The closest noise sensitive receptors are labelled.

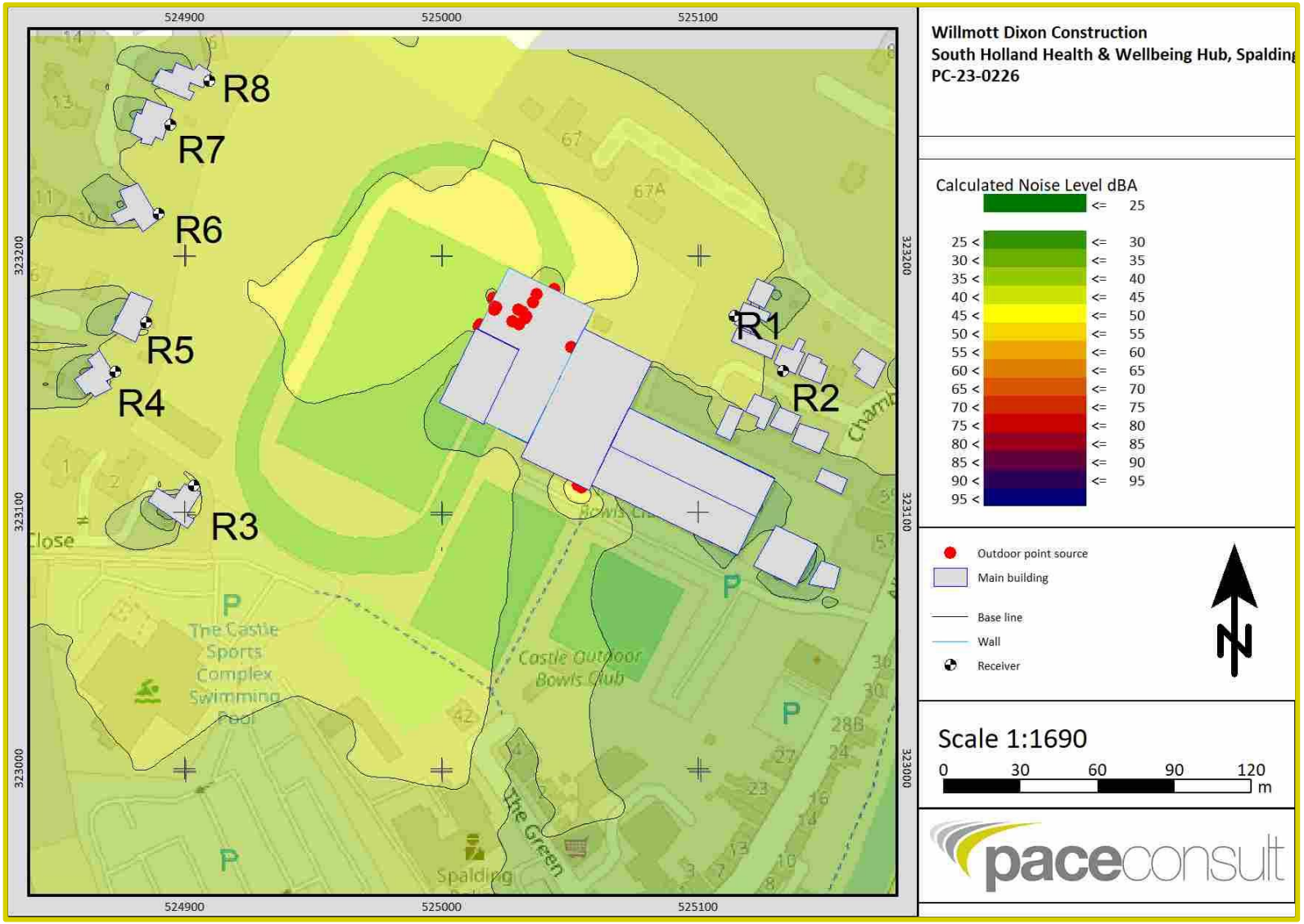
4.5.4. The table below shows the BS 4142 assessment for each receptor.

Table 3: BS 4142 Assessment night-time.

ID	Calculated Sound Pressure Level dBA	Correction as discussed in BS4142:2014	Noise Rating Level	Noise rating limit	Difference between required and predicted rating level
R1	35.8	0	35.8	36	-0.2
R2	34.3		34.3		-1.7
R3	33.9		33.9		-2.1
R4	33.0		33.0		-3
R5	32.9		32.9		-3.1
R6	32.2		32.2		-3.8
R7	31.6		31.6		-4.4
R8	30.9		30.9		-5.1

4.5.5. The assessed noise rating levels are equal to or below the noise rating limit criteria for the night-time period (23:00 to 07:00). This is an indication that a low noise impact would be expected at the nearby noise sensitive receptors.

Figure 48: Grid noise map night-time.



5. Conclusions

5.1.1. The noise levels of all significant items of externally emitting mechanical plant at the South Holland Health & Wellbeing Centre development have been calculated and assessed.

5.1.2. The cumulative external noise level of all fixed mechanical equipment has been calculated at the nearby noise sensitive locations.

5.1.3. Noise rating levels have been calculated for daytime & night-time periods.

5.1.4. The potential noise impact has been assessed following BS4142:2014 + A1:2019 Method for *Rating Industrial Noise Affecting Mixed Residential and Industrial Areas* and compared against the Local Authority's criterion, as set out in the relevant Planning Condition.

5.1.5. The calculation and assessment show that the specific cumulative noise from mechanical plant would be expected to meet the requirements of the planning condition, for all assessed periods.

End of Report